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## WATER SUPPLY & SANITARY IMPROVEMENT

Vol. LXXVI. No. 1938.]

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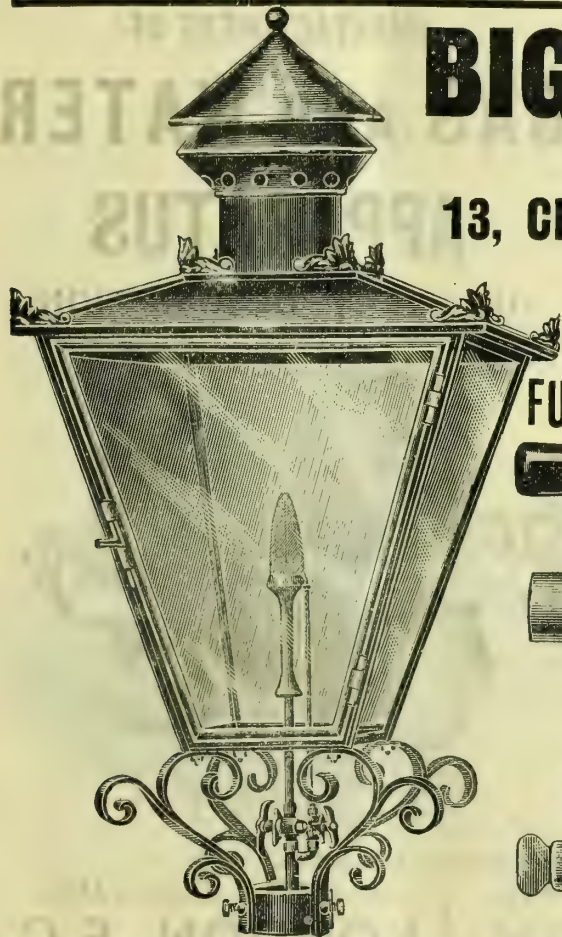
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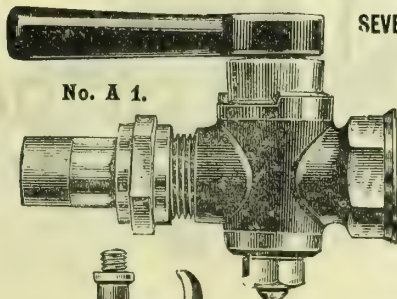
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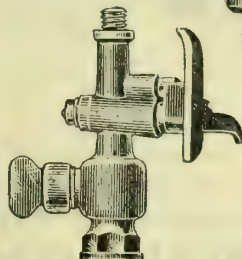


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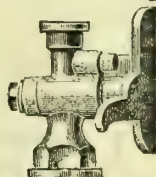
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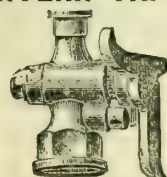
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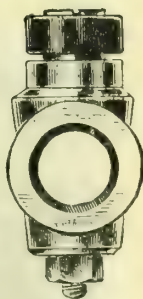
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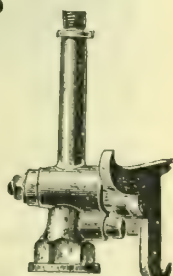
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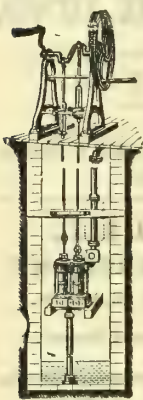


FIG. 307.



FIG. 18.



FIG. 34.



FIG. 46.

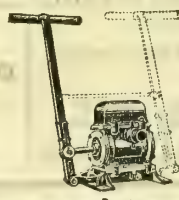


FIG. 185.



FIG. 550.

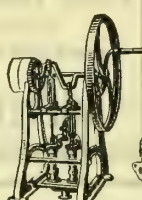


FIG. 222.

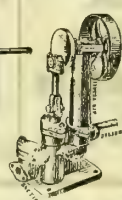


FIG. 256.



FIG. 69.



FIG. 108.

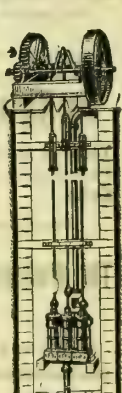


FIG. 326.

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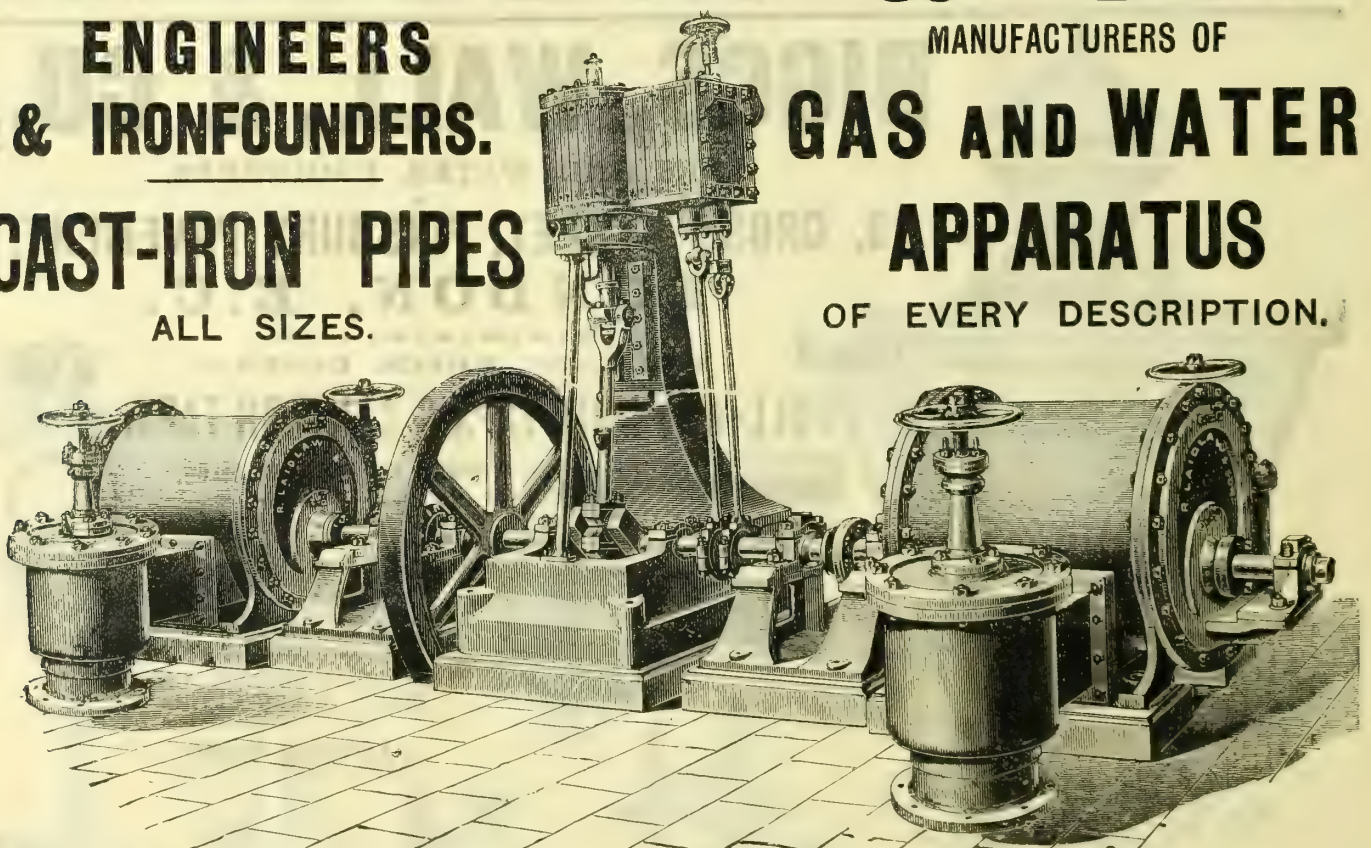
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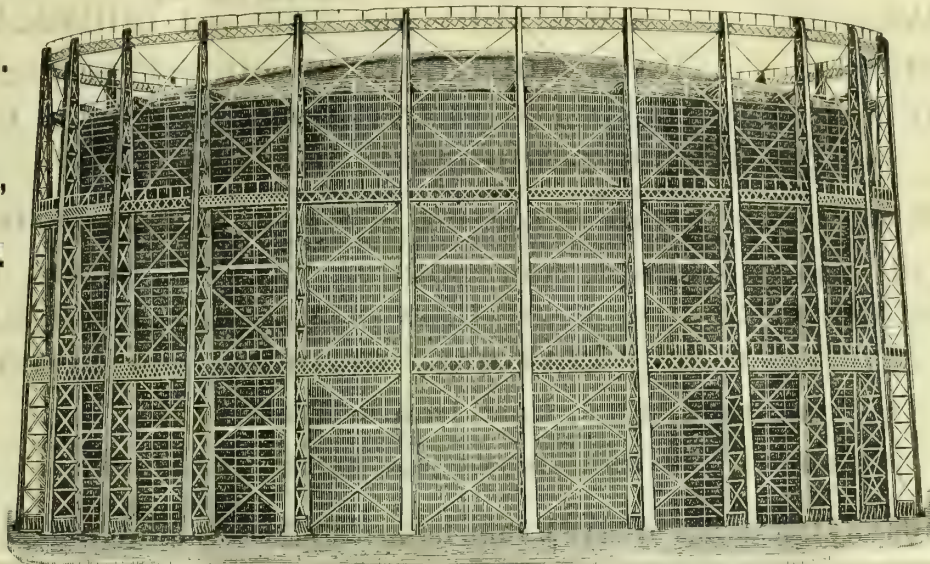
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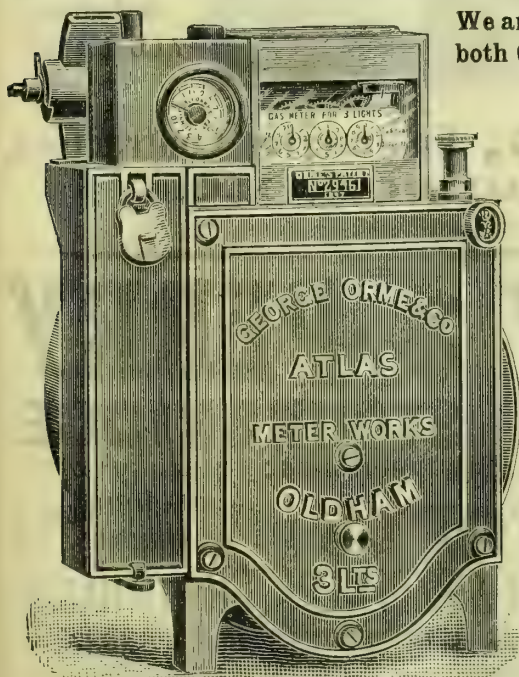
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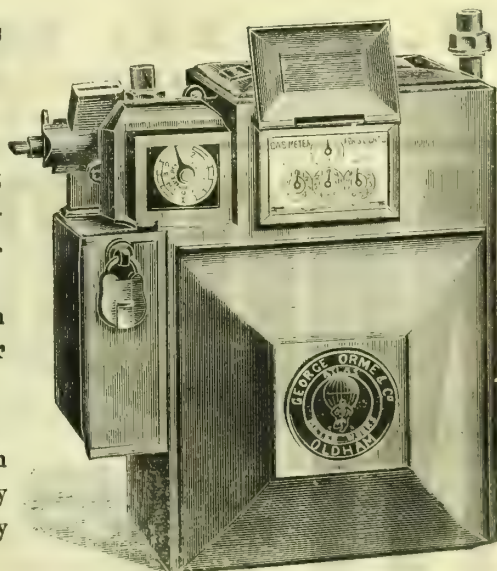
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For Carbonizing Advt., see last Issue.

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**Gas Retorts** (SEGMENTAL, HORIZONTAL,  
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Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

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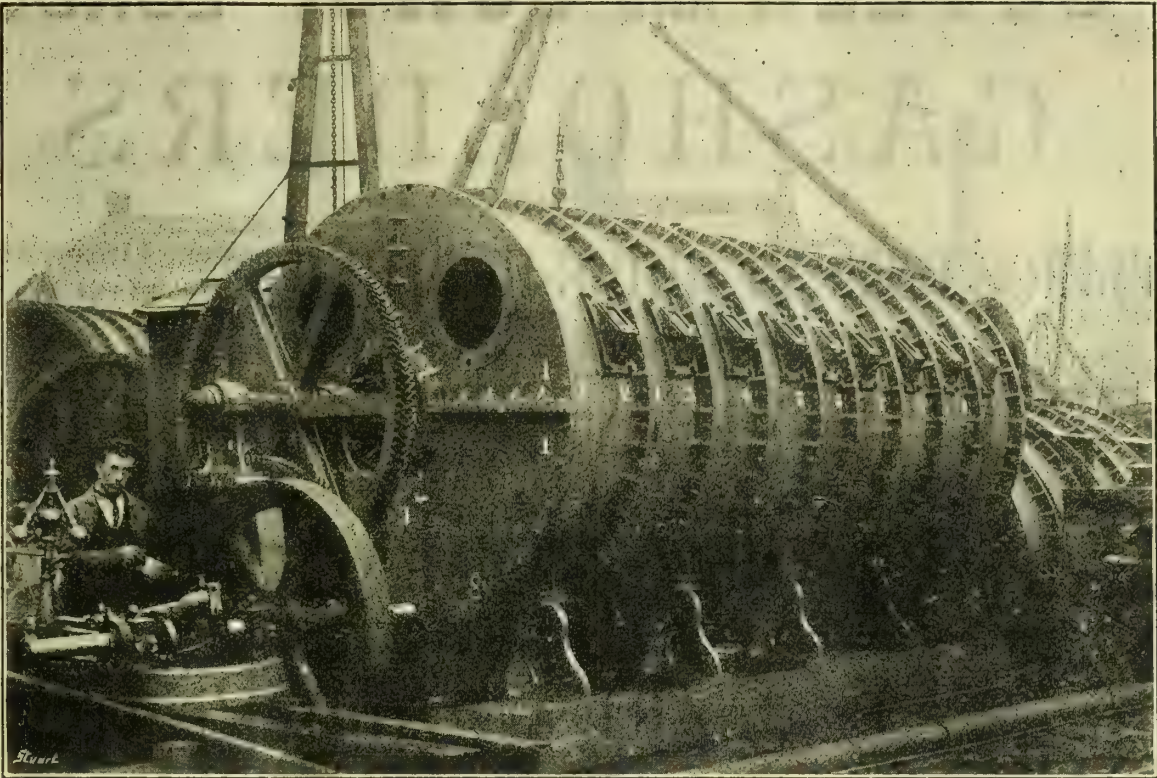
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# PATENT "NEW" SCRUBBER-WASHER

All Sizes from 50,000 to 5,000,000 Cubic Feet  
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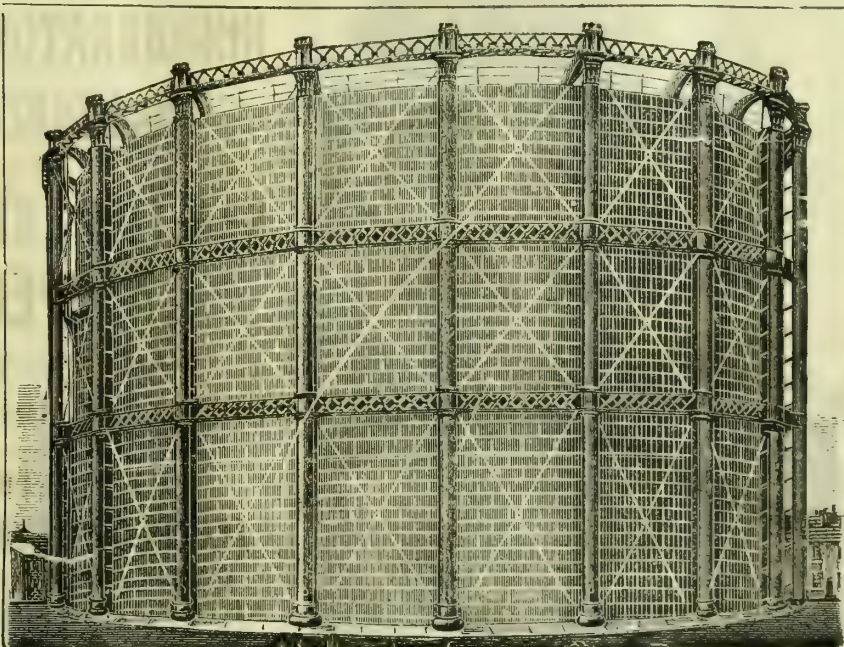
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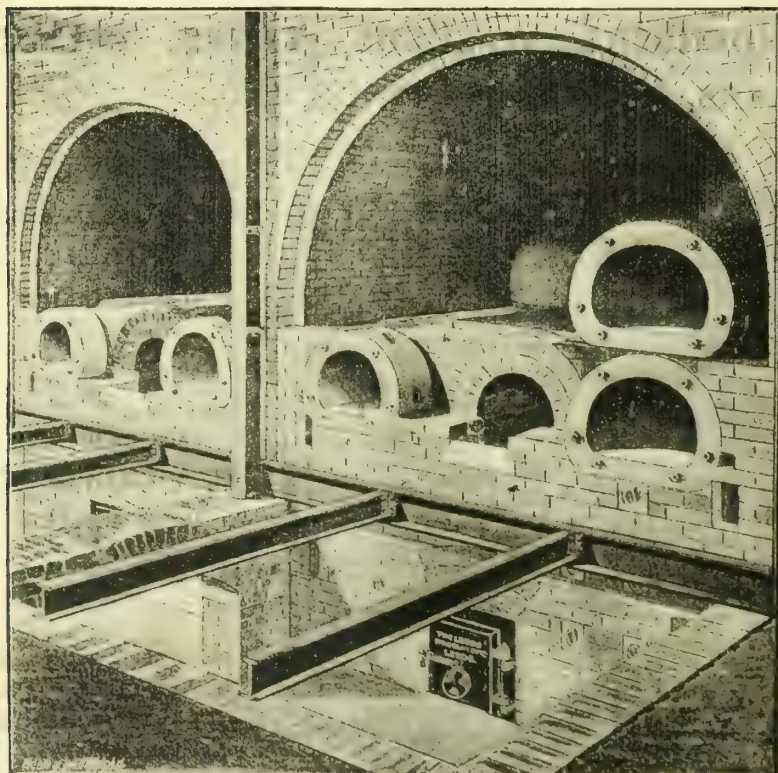
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COMPLETELY WINDPROOF.

BREAKAGE OF GLASS  
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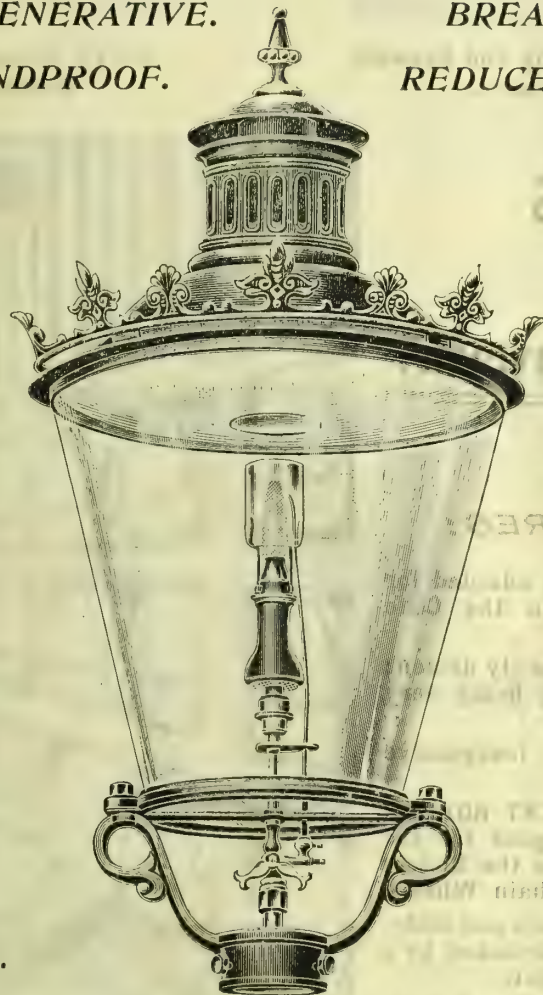
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Perfect Diffusion.

Glass Cylinders Renewed  
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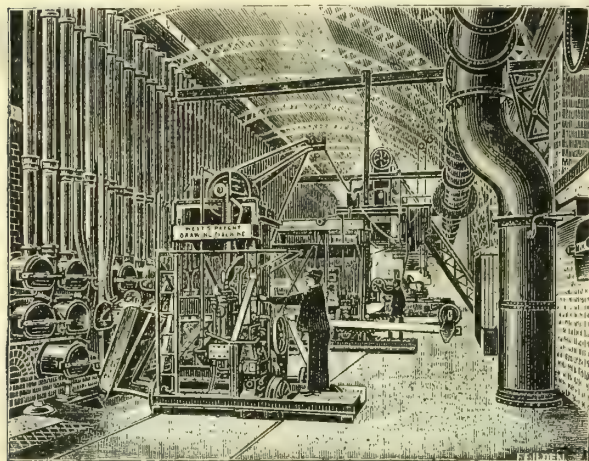


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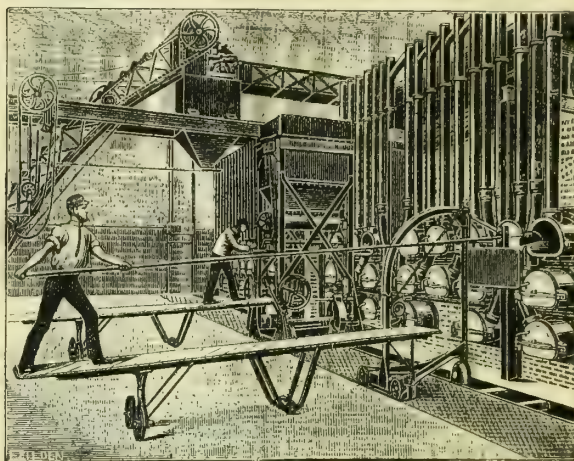
ALBION IRON-WORKS, MILES PLATTING,

And 104, QUEEN VICTORIA STREET,  
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### SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

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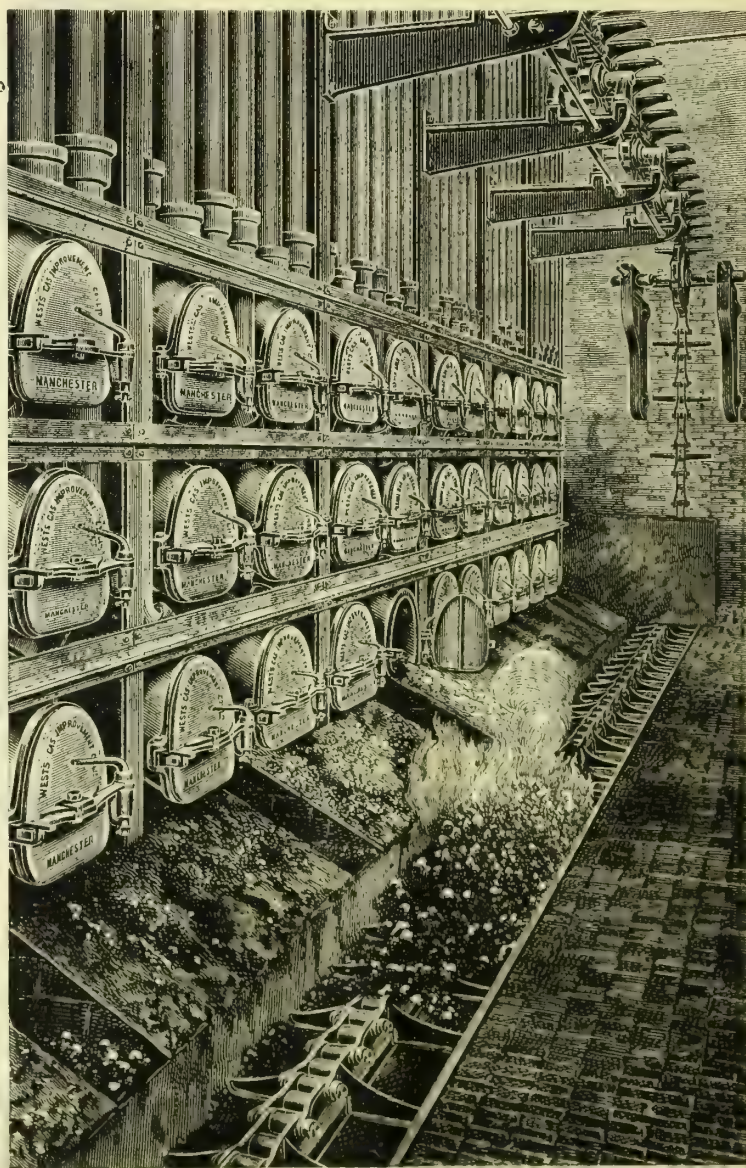
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**DOES NOT MAKE ANY BREEZE**, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.

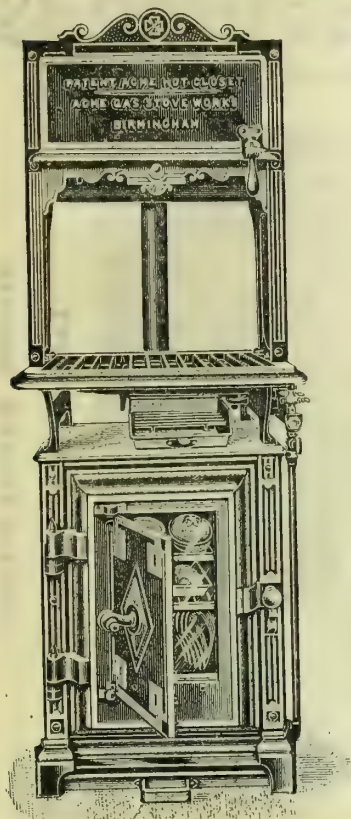


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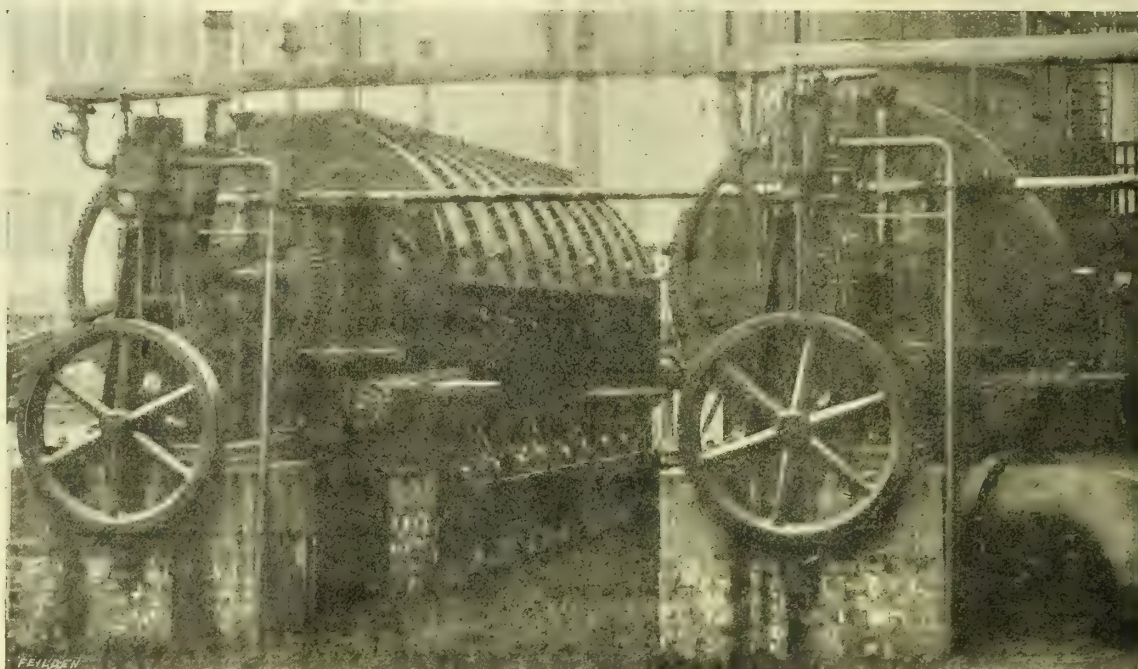


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Belfast . . . . .	1,700,000	Bordentown, N.J. . . .	125,000	Commercial (Second) . .	850,000
Belfast (Second) . . .	4,500,000	Winchester . . . . .	225,000	Commercial (Third) . . .	1,250,000
Brussels. . . . .	750,000	Shanghai . . . . .	225,000	Rotterdam . . . . .	850,000
Brussels (Second). . .	750,000	Stockport . . . . .	600,000	Dorking . . . . .	150,000
Liverpool . . . . .	3,500,000	Norwich . . . . .	1,000,000	McKeesport, Pa. . . . .	500,000
Liverpool (Second) . .	4,500,000	Holyoke, Mass. . . . .	600,000	G.L.&C.Co., Bromley . .	3,750,000
Tottenham . . . . .	750,000	St. Joseph, Mo. . . . .	750,000	G.L.&C.Co., Nine Elms. .	2,750,000
Tottenham (Second) . .	750,000	Lea Bridge. . . . .	350,000	Durham . . . . .	200,000
Santiago de Cuba. . .	400,000	Lea Bridge (Second) . .	350,000	New York . . . . .	4,000,000
Swansea . . . . .	750,000	Stockton-on-Tees . . .	500,000	Scarborough. . . . .	800,000
Manchester . . . . .	3,500,000	Edinburgh. . . . .	2,000,000	Perth, W.A. . . . .	125,000
Brighton. . . . .	1,750,000	Guildford . . . . .	350,000	Bremen . . . . .	550,000
Preston . . . . .	1,400,000	Brentford . . . . .	1,200,000	Maidenhead . . . . .	225,000
New York . . . . .	1,200,000	Syracuse, N.Y. . . . .	850,000	Epsom . . . . .	225,000
Southport . . . . .	750,000	Bridlington . . . . .	150,000	North Middlesex. . . . .	150,000
Bath . . . . .	1,000,000	Middlesbrough . . . .	1,250,000	Wandsworth. . . . .	1,800,000
Newburg, N.Y.. . . .	350,000	Croydon . . . . .	1,250,000	Aarhus . . . . .	800,000
Newburg (Second) . .	250,000	L. & N.W. Ry., Crewe .	700,000	Falmouth . . . . .	150,000
Hoylake . . . . .	125,000	Taunton. . . . .	225,000	Southampton . . . . .	800,000

### SINCE JANUARY 1ST, 1899.

Hartlepool . . . . .	750,000	Brussels. . . . .	1,000,000	Staines . . . . .	600,000
Utrecht . . . . .	1,000,000	Brighton (Second) . .	1,850,000	Commercial (Fourth) . .	2,000,000
Deventer . . . . .	150,000	Stockport (Second) . .	600,000	Dublin (Second) . . . .	2,000,000
Portsmouth . . . . .	1,000,000	Croydon (Second) . . .	625,000	Faversham . . . . .	200,000
Bournemouth . . . . .	1,000,000	Maidenhead (Second) .	225,000	Birmingham (Swan V'ge)	1,500,000
Aylesbury . . . . .	150,000	G.L.&C.Co., Beckton . .	2,250,000	St. Gallen (Switz.) . . .	225,000
Hamburg . . . . .	1,750,000	G.L.&C.Co., Fulham . .	1,750,000	Colney Hatch . . . . .	400,000
Redhill . . . . .	275,000	Tottenham (Third) . . .	350,000	Southampton (Second) .	500,000
Dublin . . . . .	2,000,000	Sydney (Harbour). . . .	500,000	Tunbridge Wells . . . .	1,000,000
Posen . . . . .	450,000	Sydney (Mortlake) . . .	500,000	Hebden Bridge . . . . .	200,000
Dunedin (N.Z.) . . . .	150,000	Manchester (Second) . .	3,500,000	Chorley . . . . .	300,000
Lincoln . . . . .	500,000	Hull . . . . .	1,500,000	Liège . . . . .	1,000,000
Antwerp. . . . .	1,500,000	Longton. . . . .	600,000	Staiford . . . . .	500,000

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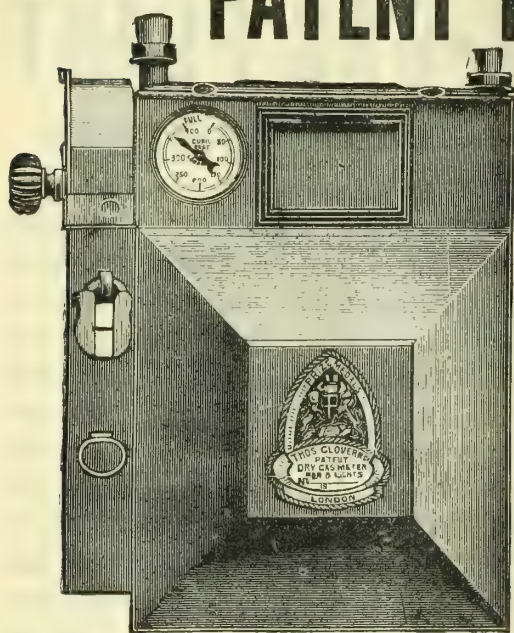
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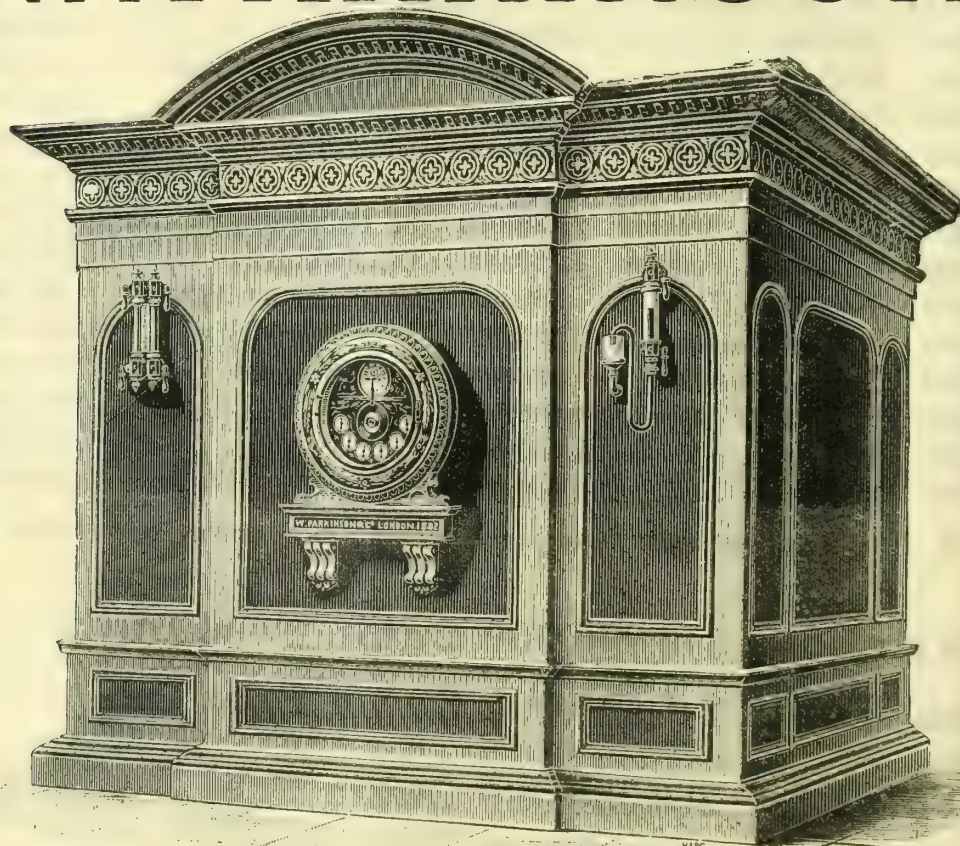
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## EDITORIAL NOTES.

## The Price of Gas in London.

THE announcement that the South Metropolitan Gas Company have been compelled to raise their price for gas by an additional 4d. per 1000 cubic feet—making the total advance for the season 7d., as against the other London Companies' 6d. per 1000 cubic feet—will probably prove a "staggerer" for those outside critics who have lately been airing their ignorance of the conditions of gas supply in the Metropolis and other places. Whatever else the gentlemen who write in the newspapers and speak at local authorities' meetings about the "scandalous" proceeding of the Gas Companies may be ignorant of—and their ignorance is usually "encyclopaedic"—they might charitably be supposed to know that the cost of coal has gone up, with the value of all other materials and labour. Yet we see Professor Silvanus P. Thompson, of the "Technical College, Finsbury (City and Guilds of London Institute)," as he signs himself, writing to "The Times" that "it is nothing less than a scandal that the Gas Companies . . . should suddenly announce a rise of prices varying from 10 to 16 per cent." Oh! these Professors! Now, before going farther into this particular professorial utterance, it may be remarked that one of the subjects of technical instruction in which the City and Guilds of London is interested is Gas Manufacture. Will Professor Thompson kindly state what should be the reward of the candidate in the Honours Grade of the Institute examination in Gas Manufacture who should successfully answer this question: "Given a rise in coal delivered at a gas-works of 8s. a ton net, how would you put gas into the holders at the same price as if there had been no such advance?" But Professor Thompson says other very funny things besides. He has made the tremendous discovery that the existing Gas Companies have only a "monopoly" for the supply of illuminating gas; and he therefore recommends the creation of a public supply of non-luminous gas, which, as he truly observes, could be rendered luminous by the consumer himself, at will, by the use of naphthaline (*sic*) enrichment. How carefully this Professor has got up his facts may be inferred from his statement that non-illuminating gas "can be supplied profitably at under 2s. per 1000 cubic feet, or at half the price to which illuminating gas has now been raised." He thinks there would be no difficulty in getting parliamentary powers for such a venture; being evidently innocent of the treatment the South Metropolitan Company received in Parliament when they merely proposed to give the public all the benefit of emancipation from the tyranny of the photometer.

What is mere aberration in the Professor, becomes twaddle in the common councillor, and sheer idiotcy in the hack journalist. Thus Mr. A. A. Wood, a member of the Corporation of the City of London, speaking on the notification of the Chartered advance, said it was within the power of the Corporation to supply a non-luminous gas, and he believed they could do so at a "nominal price." Finally, the last stage of degeneration of intellectual power to comprehend the situation is exhibited by certain contributors of London news to important provincial papers. One of these says that Professor Thompson "propounds a plan for turning the flank of the London Gas Companies," and misrepresents the Professor as maintaining that there is nothing in the statutory powers of the Companies "enabling them to exact" a higher price for gas. Another Press luminary thinks that Professor Thompson "again proves his genius" by showing how the oppressed gas consumer can get rid of the Companies' "monopoly." Still, both these newspaper men confessed to entertaining the suspicion that it would not be a very easy matter to "circumvent the Gas Companies"—meaning, to rob the shareholders in such undertakings of their property. One of the London newspapers the other day had a delicious examination story of a candidate who was so weak in his chemistry that the examiner asked him a few simple questions on matters of familiar knowledge, which proved equally embarrassing to the examinee, who was finally driven to protest indignantly that "he didn't come up to be examined in common sense." Is there a class in this subject at the Technical College, Finsbury?

After all this "flapdoodle," it is refreshing to get Mr. Livesey's plain words on the South Metropolitan position, to the interviewer for the "Daily News," which we have



reproduced in another column. The South Metropolitan Directors, upon second thoughts, have determined to put up their price to 2s. 8d. per 1000 cubic feet, at which the statutory dividend falls to 5 per cent., and the employees' share of profit vanishes. This movement therefore entails some important and interesting consequences, as Mr. Livesey freely admits. The mere facts, as he states them, should effectively dispose of the absurd suggestion that the increases of price are so much wantonness on the part of the Companies. We observe that he blames the Gaslight and Coke Company for not offering a reason for their increase, which act of courtesy to the public his Board are careful to show. It may be doubted, however, whether anything the Gaslight and Coke Company could have advanced would have served to sweeten the pill. It is reported that they did mention the enhanced cost of coal in communicating the intelligence to the City Corporation; but the explanation did not mollify the Common Council in the least degree. The South Metropolitan Company are differently situated, and constituted. Their Workmen-Directors now form a valuable bond between the Board-room and the working staff, and indirectly with the consumers also. All South London relies implicitly upon the good faith and ability of the Directors and management of the Company; and there is not a householder in the district but has the best reason for knowing that coal is dearer than it was. The interviewer of the "Daily News" spoke the practical wisdom of the people when he confined his last inquiries to the one question—how long this period of dear coal is likely to last. There is no denying the fact. In reply, Mr. Livesey advertises himself as playing the game with his cards on the table. He has only bought coal for six months. Let the coalowners make as much of the admission as they can. Of course, they knew it before; so that it is not news to them. Meanwhile, Mr. Livesey is content to watch and wait. All the professors in the world will not frighten him. He knows their quality too well. They are not, as a rule, persons who have any "practical knowledge and experience in the manufacture of and supply of gas;" and he has.

#### The Irish Appeal Court on Steam-Rollers and Gas-Mains.

A VERY important decision has been given by the Irish Court of Appeal upon the Dublin steam-roller case.\* It will be remembered that the Master of the Rolls, before whom the case originally came, granted an order on behalf of the Alliance and Dublin Consumers' Gas Company restraining the Dublin County Council from using a steam road-roller in such a way as to injure the Company's mains. The County Council appealed. The chief issue between the Company and the County Council was essentially the same as that in the St. Mary Abbots case—as to which of two concurrent rights should prevail. The result has also been the same; only, if anything, the judgment of the Irish Appeal Court is stronger than the earlier English one, and it is much stronger than that of the Irish Master of the Rolls. Lord Justice Fitzgibbon, in delivering the unanimous judgment of the Court, said that a Highway Authority unquestionably had a right to maintain the roads by all reasonable means, and also to advance with the times in the methods by which they discharge their duty to the public. On the other hand, a Gas Company also have a concurrent right to the use of the roads for their own lawful purposes, and are to be protected in the enjoyment of their right reasonably and properly—likewise in accordance with the fashion of the times. In the case in point, pipes properly laid in the roads were broken, and broken by a steam-roller. This being so, the Gas Company sought their remedy from the County Council, as owners and users of the steam-roller, together with an injunction as a precaution against repetition of the mischief. The question for the Court was accordingly concentrated upon the point as to whether the protection of an injunction ought to be given to pipes of the Gas Company that had been laid, properly in respect of the conditions prevailing at the time, before steam road-rollers were heard of in the land. Inasmuch as the effect of an affirmative answer to the question would be to stop steam road-rolling altogether in many places, the Court was very careful to clear the issue, and to narrow it down to the smallest possible bearing. Thus the judgment is extremely emphatic as regards what it will not give to the Gas Company. The Company are

bidden to recognize the use of steam-rollers as perfectly legitimate, and are ordered to so lay their pipes that this means of making and maintaining the roads may be safely used. With this proviso, an injunction is issued "against using any steam-roller on any road under which the gas-pipes of the plaintiffs have been laid so as to break or injure any pipes then properly laid under such road, regard being had to what at the time of the laying of such pipes were the ordinary traffic and the then reasonable means of repairing and maintaining roads." This is good sense, as well as sound law. The judgment did not conclude without a snub to both parties for their autocratic style of asserting what they believed to be their respective rights—the Gas Company, to the first consideration in regard to the treatment of the roads in which their mains lay; and the County Council, to the power of running steam-rollers anywhere, utterly regardless of what might happen to the gas-pipes. Nevertheless, the Gas Company get their costs.

#### Trade Unionism in All Its Glory.

A GOOD many easy-going, amiable people, who live comfortable lives under the protection of the police and in accord with neighbours submissive, like themselves, to the canons of polite society behaviour, are disposed to think favourably of the "principle" of Trade Unionism. They applaud the arguments of those public speakers and writers who contend for the right of working men to combine, or organize themselves, for their own protection and advantage, and profess themselves at a loss to understand why so many otherwise irreproachable employers, and periodicals like the "JOURNAL," maintain a position of absolute hostility to Trade Unionism in practice. This is, of course, the point upon which we and the admirers (from a distance) of the theory of Trade Unionism, split. They see the theoretical side. They read arguments about the idea. More rarely, they may happen to meet "Labour" representatives upon public bodies; and they usually find them the mildest-mannered men that ever cut a trade to pieces. Still the "JOURNAL" and many heads of national industries persistently decline to "recognize" the Trade Unions, as the phrase goes, and even declare that this resistance is as much in the interest of the workmen themselves as it unquestionably is the imperative duty of all the true friends of industry. Why is this? The answer is simply that there is all the difference in the world between the theory of Trade Unionism and the practice thereof. Theoretically, it is a beautiful dream of good fellowship and mutual helpfulness among the followers of every trade, which would gladly embrace the employer if he would only have it so. Practically, it is a grinding tyranny, subversive of the liberty of the subject which is every Englishman's birthright; resting on a system of violence and terrorism, and inspired with a spirit actively inimical to the prosperity of every trade and calling infected by it.

There is no excuse for mincing words in describing Trade Unionism as it is in practice. If any independent person entertains the faintest doubt that working Trade Unionism is what we declare it to be, let him read the plain and simple story in the "Leicester Daily Mercury" of the 26th ult., of the last days and the distressing death of Thomas Broadwell Shelton, a shoe-laster. The world of industry is often assured that all will be well when trades are fully "organized," and when the Trade Unions are properly "recognized" throughout the country. Then the fangs of Capital will be drawn, and the working population will get their deserts. Well, there is no trade more completely organized than the shoe industry of Leicester; and this is how it works out. Shelton was a good workman, for whom his employer entertained the highest respect—"admiration," he said at the inquest. He had left this particular employer for a few months, for another job with a firm which failed. His successor did not give satisfaction, and the shop foreman had instructions to discharge him. Before this order was acted upon, the foreman met Shelton, who was out of a berth, and asked him if he would return to his old job, as the new man was unsatisfactory. Shelton accepted the offer, and the other man was transferred to another job for a week, when he was given a week's notice to leave. Not unnaturally in the circumstances, the man under notice told Shelton that he (Shelton) had got him his discharge; whereupon Shelton replied that, if that was so, he would give a

\* The judgment of the Court was briefly given in the "JOURNAL" last week. The full text is unavoidably held over till our next issue.



week's notice himself. And after all this, the other man reported Shelton to the Union officials "for doing too much work for his money, but did not say anything to the officials about deceased getting him discharged." For this heinous offence—the one unpardonable crime in the Trade Union penal code—Shelton was summoned to answer before the Vehmgericht of his order. He did not attend. His wife said that he was "much put about by the letter" from the officials; and he went out and cut his throat, instead of standing his trial—leaving a pitiful note to his wife explaining that for the rest of his life he should be "spotted" for what he had done.

"There's the rub," as another prospective suicide once expressed it. This free-born Briton, of the race that vociferously shouts its contempt of slavery, preferred death to the alternative of being "spotted" at the instigation of a Unionist. The tale is beautifully complete. The model Trade Unionist, the man to whom the officials give heed, is the man whom the employer does not want. This man goes about to public-houses glorying in the fact that a better workman than himself has cut his throat "all through him," and ought to have done it years ago. Whereupon, the Coroner asked what was this man's grievance against the dead? Answer: "He did not do me any more harm than to anyone else in the trade." This is Trade Unionism in practice. To be "spotted"—that is the modern form of torture devised for those workmen who dare to do with their might whatsoever their hand findeth to do. Very simple, too; and trifling, perhaps, in the eyes of the gentleman living in a nice villa residence standing in its own grounds, such as a town councillor, a Justice of the Peace, or a Member of Parliament should have at the very least. But think of what it means in a street of artisans' dwellings, or in a model tenement. How would the refined amateur of Trade Union "principles" like to experience the treatment there?

#### Second Reading of the Companies Bill.

THE House of Commons, like the mediocre boarding-house described by Dickens, "can do it when it likes;" and it "did it" very well this day week, by discussing, reading the second time, and sending to the Grand Committee on Trade, the Companies Bill. The nature of the measure has already been explained in these columns; and it is only necessary to remark now that further examination of the Bill has enlisted stronger support for its provisions in and out of Parliament. As the President of the Board of Trade observed in moving the second reading, everyone must admit the importance of the questions raised by the measure, having regard to the enormous amount of capital invested in public companies and the advantages that are unquestionably derived from this principle of trading enterprise. No one disputes the beneficial operation of the joint-stock system as a whole; but it is equally incontestable that many abuses have crept into the practice of company promotion and administration which it is desirable to prevent for the future. At the same time, care is necessary to avoid injury to the tree by the process of cutting out the diseased growths. Fortunately, reform of company law by Act of Parliament is possible for the reason that the original laws themselves are of parliamentary manufacture. Consequently, those who set about the amendment of company procedure by the way of a statute have the supreme advantage of being on the same level as the subject of their attentions. It is a question of homœopathic, or at least of homogeneous, treatment. But very different is the case (say) of the people who desire to make everybody sober, or virtuous, or brave by Act of Parliament. This is as vain as an endeavour to "hit the nominative case with a stick." A director, however, is a creature of an Act of Parliament; and, accordingly, he can be reached by any and every Act of Parliament which we like to throw at him. The Government Bill does not go a whit too far on the way of reform; being almost exclusively aimed at what are generally recognized as abuses of the existing Acts. A good deal of the real law of companies has been made by the Courts to which has fallen the duty of applying the Acts; and it is impossible to praise too highly the manner in which this service to the community has been rendered. The present Bill will strengthen the hands of the Judges, and at the same time render a good deal of litigation of the usual nature unnecessary. It is one of the most important commercial measures of the session, and of this Parliament; and it is gratifying to

note that it was warmly welcomed in all parts of the House by representative merchants, financiers, and lawyers. It is a small point; but it is impossible to read the reported debate without being struck by the extremely limited and technical sense in which the word "qualification" is used throughout as applied to directorship. It means, of course, the possession of a specified number of shares in the company and nothing more. One cannot help wishing that it were possible to enlarge the meaning of the term, so that when a director is said to be qualified for his position the word might be understood in its full, ordinary sense. But, as the case stands, the distinction between the director and the manager of a company is that whereas the former need only be qualified, the latter should be competent also. Not, by any means, a distinction without a difference!

#### WATER AND SANITARY AFFAIRS.

LEAVING out of consideration the unpleasant meteorological conditions which prevailed at times on Monday last week, the visit of inspection paid by the members of the Staines Reservoirs Joint Committee to the works which are now in course of construction by them between Hampton and Bell Weir on the Thames, of which an account appears elsewhere, must have been productive of much satisfaction. Seeing that the distance between the two points named, which will be connected by an aqueduct, is rather more than seven miles as the crow flies, and that the two storage reservoirs at Staines cover an area about three-fourths that of the City of London, it is surely evidence of good progress to find that, in the two years and two months which have elapsed since the first turf was cut by the Chairman of the Committee (Mr. E. Boulnois, M.P.), enough work has been done to justify the confident hope that by this time next year the smaller reservoir will be ready for water to be pumped into it. Perhaps this should not be a matter for surprise when it is remembered that the Contractors are Messrs. John Aird and Sons, whose resources, whether of men or plant, are fully adequate to any works of this character, be they upon the banks of the Thames or of the Nile. No doubt the site was favourable. Providence, as Mr. Boulnois remarked at the luncheon, really seemed to have designed Staines as an auxiliary to the water supply of the Metropolis; the land in its neighbourhood being specially suitable for the construction of large reservoirs, while it could scarcely be used for anything else. The ground is level, the London clay lies a little below the surface, and there are upon the spot all the necessary materials. It was therefore a happy inspiration—or should we not rather say an exhibition of engineering skill?—which led to its selection for the works which Mr. W. Hunter and Mr. R. E. Middleton, the Joint Engineers to the Committee, are carrying out. The bounteous Thames flows close by, and the provision, as needed, of receptacles for the storage of its surplus waters seems, therefore, a more feasible solution of the London Water Question than the construction of gigantic reservoirs in Wales.

Of course, the London County Council do not agree with this; nor does Sir Alexander Binnie. He last Thursday told the Worshipful Company of Turners, who have conferred upon him the honorary freedom and livery of the Company, "in view of his extended service as Engineer to the London County Council," that it was a "disgrace" to the Metropolis that it had not taken control of its own water supply; and his remarks appear to have been received approvingly by his fellow-livermen. Moreover, he is satisfied that the time is not far off when resort will be had to some distant source of supply. We fail to see where the "disgrace" comes in. London is not so badly supplied with water by the Companies that the inhabitants are clamouring loudly for municipal control; and even if they were, we question whether they would select the body with which Sir Alexander Binnie is associated as the one to be entrusted with this important service. At present the Companies send out daily about 34 gallons of water per head of the population, at prices which are assessed on as equitable a basis as possible. Surely this cannot be called an inadequate quantity; and there is not much likelihood of it being reduced owing to the growth of the population. The works now in progress at Staines will, when completed, give London an additional supply of 35 million gallons of water a day; and as the two reservoirs there will contain 3300 million gallons, a store will be at hand which may be relied upon to furnish the quantity







## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 42.)

LAST week, being the closing week of the half year, imported a little more activity of a sort into the Stock Markets; but it was not of a purely beneficial character, being largely composed of professional operations. It had, however, the result of creating some movement to diversify the reigning stagnation; and the flatness which prevailed in the earlier portion of the week gave way later on to some little fluctuation. It can scarcely be said that there was any general tendency—the various issues moving, when they moved at all, in response to special circumstances affecting them. The result is that changes in quotation are pretty equally balanced; there being perhaps as many rises as falls, with nothing considerable either way. In the Money Market, there was the usual demand in connection with the close of the half year, which was met without difficulty; and discount rates ruled easier. Business in the Gas Market continued to flow at a very moderate level; and there was never at any time a sign of its rousing into real activity. It ran, too, very much in a groove, there being far more transactions in Gaslight issues than in all the rest put together. It almost goes without saying that prices are uniformly lower, owing to the announcements in all quarters of an increase in the charge for gas; but, singularly enough, the solitary exception to the general downward movement is in a Gaslight issue—a quarter which has incurred the most heckling over the rise. The ordinary stock was moderately dealt in every day; and after opening at par, it fell away steadily until 97 was marked more than once, and the quotation was lowered a couple of points. The maximum stock was flat; but the preference for some reason or other advanced a point. South Metropolitan was quiet, and had to give way both in the ordinary and in the debenture stock. Commercial lost the advance it had scored the previous week. In the Suburban and Provincial group, business was almost *nil*; but there was a big drop in Alliance and Dublin without any transaction marked in it. Moderate business was done in the Continental division, almost wholly confined to Imperial, which was weaker and receded. The remoter undertakings offered no feature of interest. The Water Companies were not quite so firm as they had been; and two or three of the quotations were marked down, but only to a very moderate extent.

The daily operations were: Business in Gas was quiet on Monday; and prices were unchanged, but for a fall of 1 in Imperial. There was rather less doing on Tuesday; and prices were flat. Commercial old relapsed 5, Imperial 2, and Gaslight ordinary and South Metropolitan  $1\frac{1}{2}$  each. Wednesday was much the same—Alliance old fell  $2\frac{1}{2}$ , and the new 1, Commercial debenture  $1\frac{1}{2}$ , and Gaslight ordinary  $\frac{1}{2}$ . Transactions on Thursday were moderate at unchanged figures. Friday was about as active, and no more. Gaslight preference rose 1; but South Metropolitan debenture fell 1. In Water, East London dropped  $1\frac{1}{2}$ , ditto debenture 1, and Southwark preference 2. Saturday was quiet and unchanged.

### ELECTRIC LIGHTING MEMORANDA.

The Decision of the Committee on the Electrical Power Bills—The Case for the Bills—A Big Experiment—Dublin Electricity Supply in Parliament.

SIR JAMES KITSON'S Committee gave their decision last Thursday on the grouped electrical power Bills. This was formulated in two stages. The first was a declaration that a local authority which undertakes and is prepared to give a full and ample supply of electrical energy for all purposes to consumers within its district ought not, without its consent, to be required to give facilities for the supply, within its district, of electrical energy by other undertakers. But if a local authority is unable or unwilling to provide, on reasonable terms and within a reasonable time, a full and adequate supply of electrical energy for any purpose to any company or person applying for the same within its district, such company or person should be at liberty, after notice to the local authority, to obtain their supply from other authorized undertakers; and the local authority should be required to give all necessary facilities for this purpose. Any difficulty arising out of this arrangement to be settled by arbitration as provided by the General Acts. This pronouncement was characterized as vague by some of the Counsel engaged in opposing the Bills; but Mr. Balfour Browne immediately appreciated it as tantamount to an acceptance of the preamble of the South Wales Bill, which was being opposed by the four largest local municipalities on general principles. Accordingly, he gave up further opposition to the preamble, and his example was generally followed. On the following day, the Committee completed their declaration by announcing that, subject to the principles stated above being embodied in clauses, the preambles of the South Wales, County of Durham, and Lancashire Electrical Power Bills were proved to their satisfaction; while the preamble of the Tyneside Bill was not proved.

Thus ends an inquiry of the first importance, on several distinct and independent grounds. The result shows, in the first place, that, in the opinion of this strong Committee, the general

case for electrical power generation and distribution on the large scale, taking advantage of what in this country stand for natural facilities for cheap working, which the Joint Committee had already approved in principle, is fairly supported in the concrete by the best of the schemes submitted to them. They believe that in certain extensive areas, in different parts of the country, electricity-in-bulk generation and supply is both feasible and likely to prove advantageous to the community at large. This is a great step in advance of anything that had been proved before. Secondly, they have assigned definite bounds to the right of pre-emption claimed by local authorities under the terms of the Electric Lighting Acts in respect of all possible electricity supply within their areas. This is an even more important declaration than the other. Municipal corporations have sought to force upon the Electric Lighting Acts applications which these statutes will not bear, and which were not in the mind of Parliament at the period when they became law. These Acts apply to electric lighting only, in essence; and they are also parochial, so to speak, in scope. It was never intended that because a local authority had spent, or even might at some time or other propose to spend, a few thousands of pounds in providing public electric lighting for a described area, therefore it might block the way of undertakings formed on a scale then unheard-of for supplying the cheapest possible electricity, for all purposes, over a wide region of which the municipal scheduled area would be only a small fraction.

It stands to reason that municipal electricity supply, with very few exceptions, cannot be produced or sold so cheaply as a big concern, doing the business in bulk, and not tied to sinking funds or hampered with antiquated plant, can provide the same service. Why then should the public, and industrial users of electrical power, be condemned to pay the municipal price? That is the question which the House of Commons Committee have now disposed of. Municipal "enterprise," commonly resulting in the production, on a small scale, of dear electricity, is not to be the dog-in-the-manger. This order of municipal trading has its limits; and the Committee have indicated their nature and location. No public body, working with public funds, could venture to do what any and all of these Electrical Power Companies must do, if they are to do anything at all beyond raising money from the public. The imputation of swindling being avoided, however—and many of the names appearing in conjunction with these projects render the suggestion one to be scouted—what is it that the Companies must do to justify their existence? They must launch a huge amount of capital upon a sheer experiment, which may or may not turn out satisfactorily, but which, at any rate, cannot be tried in any other way. In the course of this experiment, they must be prepared to ruthlessly "scrap" machinery and plant costing very large sums of money, on the unexpected advent of something better. Their shareholders, too, must be resigned to wait for their dividends for years, and perhaps see charge upon charge put before them on the Company's property. In the end, the public may get cheap electricity, in any quantity. Electric tramways and railways may run across the country in all directions; the smoke factory chimney may cease to blacken the air of towns; electric motors may do all manner of work; the electric light itself may be reduced to only three or four times the price of gas. But there is only one way by which all this can possibly be done; and it is not the parochial way contemplated by the Electric Lighting Acts.

There is something essentially funny about the recent parliamentary proceedings in regard to the electricity supply of Dublin. It is generally understood that the Irish race has a genius for politics—unfortunately for themselves, as some would say. Certain it is, however, that what is called politics gets mixed up inextricably with all Irish business of a public character; and Dublin electric lighting is no exception to the usual run of these things. Moreover, underneath most of this description of politics is somebody's personal interest. It seems to be conspicuously so in the present instance. The Corporation of Dublin have their own views and proposals anent electric lighting; but unhappily these clash with the plans of the Dublin Tramway Company, and the supporters of the latter are not the men to leave a stone unturned to get their own way. Accordingly, there have been great "ructions" over the whole affair; and in the event that shining light of the Irish contingent in the House of Commons, Mr. T. M. Healy, carried the Tramway Company's Bill against all that the Corporation could do to defeat it on the Report stage. The debate is highly interesting reading, and we regret not being able to report it in full.

**Distillation of Coal Tar in Spain.**—According to the "Revista Minera," there is room for the development of the coal tar industry in Spain. In Madrid there are some small works, which are employed mainly in the production of creosote for the Spanish Southern Railway, and pitch for making compressed fuel. In Seville, coal tar is distilled on a very limited scale. The gas-works in Catalonia produce from 3000 to 4000 metric tons of tar, some of which probably is distilled. Messrs. Burt, Boulton, and Haywood, the well-known English tar distillers, have works in Bilbao. The present entire production of tar in Spain is scarcely 16,000 metric tons; and the above-named publication considers it would not be difficult to increase this four or five times, as the dust of schistose coals, bituminous schists, and peat could be distilled solely to obtain tar.



## HERR W. VON OECHELHAEUSER AND THE GERMAN GAS AND WATER ENGINEERS.

THE address recently delivered by Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, to the Association of German Gas and Water Engineers, of which a practically full translation was given in the "JOURNAL" for June 19, p. 1640, deserves much more careful perusal and fuller consideration than it may possibly have received, owing to the bulk of matter contained in that issue. The speaker, whose address displayed a thoroughly broadminded and genuine liberalism—we use the word in its wide and non-party sense—combined with the strong practical sense of a man of affairs, dealt with two subjects of the greatest importance to those who (like Herr von Oechelhaeuser) are responsible for the success of gas undertakings: First, the social and moral duties of employers to their workmen; second, the need for better technical and intellectual training for those destined to engage in the practical work of the gas industry.

These subjects were suggested for consideration by the fact that, after the festival of the Berlin Technical College last autumn (which, as we at the time remarked, constituted the apotheosis of technical education in Germany), the German Emperor referred to the fact that, by their many associations with labour, workmen, and industry in general, the technical colleges are in a position to exercise widespread influence on social and moral relations, and possess great opportunities for stimulating and influencing others. It is a remarkable testimony to the real and actuating force of the Emperor's personality that his speech to the college principals—so far from being taken as a mere matter of ceremonial courtesy or platitude—should, after the lapse of some months, be recalled to the attention of an assembly of practical men, and, moreover, be referred to by Herr von Oechelhaeuser as a pronouncement which "should lead every Association of German engineers to revise its programme, and to act hereafter in accordance with the spirit of the Emperor's words." In order that his address should be of the greatest possible practical value to such of his hearers as might be moved to action in the matter of more fully and thoughtfully carrying out their social duties to their workmen, the President had previously caused to be addressed to the members of the Association, at home and abroad, questions directed to ascertaining what arrangements were already in force at the different works for the benefit and social welfare of the workpeople, "apart from the ordinances and requirements of the law in this respect."

The result of these inquiries showed—as might have been, and probably was, anticipated—that, although much remains to be done for the social welfare of the employees at both municipal and private gas and water works, yet there are already in operation many admirable arrangements deserving of wider recognition and adoption. The President referred to many of these beneficent, and (through the better health and contentment of the employed) ultimately profitable schemes; and the value of this portion of his address, both to his hearers and to those—we hope they will be many—who shall read the report, lies in its suggestiveness. There are few managers, we trust none, at whose works no single one of the hygienic or morally beneficial arrangements touched upon in the address is in force. But while, as the President truly said, no one would expect all these schemes to be everywhere adopted—local necessities varying with local conditions—many of them only need to be brought to the consideration of employers to be self-commended and put into operation.

We cannot here refer in detail to any of the arrangements brought together and commented upon by Herr von Oechelhaeuser, who grouped them under two heads: Those designed to render the hygienic conditions of labour as favourable as possible to the workmen; and those whereby bodily toil may be reduced through the adoption of labour-saving appliances. As is truly remarked, the health of gas workers is on the whole good; the buildings in which they are employed being well ventilated and the processes practically free from danger. But there are many gas-works where greater attention might with advantage be paid to the need for stokers' baths, and eating and reading rooms. In this respect the new works at Charlottenburg may be described as model, while our own Metropolitan works have little to learn and much to teach. To merely enumerate some other points: Workmen's dwellings, good service bonuses, sick and pension funds, summer holidays, workmen's institutes and clubs (even skittle alleys), social evenings for the men and their families—surely this is a list which "presents a cheerful picture of social efforts which [perhaps] can nowhere be introduced as a whole, but which should stimulate us to put them into practice as far as possible in our respective spheres of action."

As to the latter part of the address, devoted to the subject of technical education, we can only now so far deal with it as to say that it is of much interest to English readers, though specially directed, of course, to the circumstances existing in Germany. We may also remark upon the fact that, while we are having it so frequently impressed upon us by English writers and speakers that we lag hopelessly behind our German competitors in the matter of technical knowledge, we find Herr von Oechelhaeuser upbraiding his own countrymen for possessing, on the average,

less technical knowledge than Englishmen or Americans. The paradox is, however, apparent, not real. The average Englishman, whose vocation requires for its pursuit little or no technical training, very possibly—we think most probably—possesses a wider acquaintance with scientific subjects than the corresponding average German. But that avails us little beside the fact that the German engineer or manufacturer who requires for the successful prosecution of his business the best technical knowledge, receives a more practical and thorough training in technical matters than his English *confrère*. What we need is not more people with a smattering of scientific knowledge of no real practical use to them or their country, but a greater number of men carefully and specially trained in the technology of the particular practical business they are destined to conduct.

## THE HOUSING OF THE WORKING CLASSES BILL.

IT is impossible to pass over without notice the sound piece of work done, without show or fuss, on Monday of last week, by the House of Commons. On that day, the Government Bill for facilitating the provision of improved housing for the working classes of towns, chiefly by enabling the local authority to purchase land for the erection of dwellings outside its own area, passed through Committee after an ample, and on the whole well-intentioned, discussion. Not the least satisfactory feature of this proceeding was the discomfiture of those who had shilly hoped to make party capital out of the measure or its limitations. After having completely neglected the matter until the present Bill was brought in, certain politicians made frantic efforts to work up an agitation against the sponsors of the measure, because it did not propose to do this, that, and the other; and they fondly imagined they had injured its prospects of passing through the House of Commons by stigmatizing it as a puny Bill just touching the fringe of a huge question. It must have come as a great surprise to these suddenly interested amateurs of the subject, to learn that local authorities already possess extensive powers to deal with insanitary dwellings in their areas—powers which as a rule are allowed to remain a dead-letter. A circular just issued by the Local Government Board states the nature and extent of these powers, showing clearly that it is not Parliament that has been neglectful of the needs of the people in this respect, but their own representatives in local government, who have been unwilling to make full use of the sanitary laws.

One thing this old body of Public Health Law did not provide for—it did not contemplate the provision *de novo* of dwellings for the working classes, as accommodation required from considerations of public policy wholly apart from reasons of sanitation. The whole presumption of the old housing law rested on the idea that the motive of local authorities' action in this regard was the sanitary one. Action was to start with the declaration of an "area," or a certain patch of house property as being insanitary; and then the business of clearing it out and providing sanitary dwellings in its place could go on. And a very costly, tedious, and disappointing business it generally proved to be. Of course, perfervid political philanthropists blamed the law for this vexatious result, which in many cases caused local authorities to leave the whole thing alone. But the true weakness of this line of business was not in the law; it was in the conditions, and usually also in the circumstances. The confessed failure of the old system should act as a warning for the future against the passing of Acts of Parliament for doing things not in harmony with the natural order of such affairs. Take, for example, this fundamental idea of making any possible action under the Public Health Act start with an insanitary patch of dwellings. The first necessity is to prove that this condition exists, and that the owner will not remedy the evil by ordinary means. This is not so easy of proof. Truly incurably insanitary house property is not so common that town clearings of considerable extent can be accomplished on this excuse. Consequently, such clearings have to be effected by the far more costly procedure of buying the property at its normal value, which renders reconstruction impossible save at a sacrifice. There overcrowding is a dreadful evil, calling for a remedy; but it does not condemn the property where it occurs.

The short point of all this is that it is impossible to clear town areas and rebuild them with decent dwellings at rents which the present occupiers can pay, without either violating the rights of property, or laying out public money unremuneratively. This is the dilemma of the old dispensation. Local authorities with the best will in the world could not move in the matter, by reason of this impossible alternative. Naturally, the same consideration formed an impenetrable shield for the apathy of heedless authorities; and so long as the only legal motive for corporate action was the sanitary one, or that of the desirability of making town improvements, there was no way out of the deadlock. Private enterprise, both philanthropic and commercial, could still do something; but it could never be adequate to the public need. The private builder of improved workmen's dwellings has to wait for his opportunity, and build where he can, not where he would. Meanwhile, the state of things described over and over again in parliamentary debates has been going on, and the housing of the poor in busy, wealthy centres of population has grown from bad to worse. Ramsackle tenements, once merely thickly tenanted, have become chronically



overcrowded. They are in many cases not yet indictable as a nuisance; but the sanitary inspector is known to have his eye upon them, and the landlord does nothing but collect his rents. So the sanitary laws help to make slums. Meanwhile, the corner public-house and the small shops are valuable property, which must be reckoned with in the drafting of any scheme for improving the "area." And when the improvement has been completed, where are the old inhabitants of the quarter?

The great value of the new Act, it is to be hoped, will consist in the fact that it sanctions housing action by local authorities on a fresh motive, and permits action of a new kind. There will be no preliminary boggling over the old conditions. Once the local authority of a growing town is satisfied that a need for more working-class dwellings exists, and cannot be met in the private—which is the natural and ordinary—way, it will be able to buy up a suburban estate and build such houses as experience shows to be suitable. This is the measure which has been denounced as "inadequate," in some quarters. The cry was raised again in some newspapers last week; but the force was taken out of it by the circumstance that, during the debate in Committee, several members of "advanced" views objected to the enlargement of the Bill in various "popular" directions. The fact seemed to be recognized in the House, if not outside, that the Bill does really go quite far enough in permitting local authorities to deal in land and houses, free of all the restrictions hitherto regarded as proper for municipal enterprises of the kind; and also that it adequately rounds off the existing mass of statutory law dealing with town sanitation and improvement, by giving the authorities positive facilities for action in one way if action on other and older lines is impracticable. Whether it goes far or not, at least it offers local authorities a positive way of escape from the dilemma of which they have complained, with more or less good faith. If they mean business, they will now be able to do it to any reasonable amount.

The indirect influence of this constructive piece of legislation, however, is likely to be even more useful than its direct operation. By enabling the municipality to break away from the "insanitary area," it will deprive the "slum lord" of the assurance he has hitherto enjoyed—that in the long run the corporation must buy him out. The establishment on suburban estates of working-class colonies will relieve the pressure of population on the intramural tenements, and render these easier to deal with. It is unnecessary to point out how potent an attraction to respectable artisan families will be the outlying settlement, with its ample supplies of gas and water, and its cheap tramway connection with the town. Here will be the home of the pre-payment gas-meter; and the municipal baths and washhouse, the crèche, and, it is to be hoped, the municipal public-house, will all be found here. Meanwhile, the more strictly charitable agencies will be left freer to deal with the very poor and destitute class of townspeople—those who pick up a casual living in the streets, in ways best known to themselves, and who have hitherto been driven from pillar to post by the demolition of their "rookeries." These poor people must live, and they cannot go away from the neighbourhoods where alone they can help themselves and one another to solve the great problem. Not for such as these the Boundary Street settlements, with electric light laid on; but their share in what are called town improvements and the clearing out of insanitary areas has always been a pitiable one. It is their poor chattels that are thrown out on the pavement by the ejectment officers; and they are not wanted back again in the new dwellings. Such things must be, of course; but it is none the less hard upon those who have to bear them, for the good of others.

So much for the Bill. Only experience can prove exactly what it can and cannot do, directly and indirectly. But it is an enabling measure; and its utility will be largely what its administrators choose to make it. No Act of Parliament can work itself; but in this case, local authorities, particularly if they will take counsel with large employers of labour, have something to their hands by which the lot of the working classes may possibly be very considerably ameliorated, to the benefit of the community at large.

#### PERSONAL.

The management of the Witney Gas-Works has been entrusted to Mr. F. W. SELBY, of Watlington.

Mr. G. WATSON, of West Bromwich, has been appointed Manager of the Hungerford Gas-Works.

The estate of Mr. JOSEPH COWEN, of Stella Hall, Blaydon-on-Tyne, who died on the 18th of February, as noticed in the "JOURNAL" at the time, is sworn at £491,826 13s. 1d. gross.

Mr. HAROLD O. TIMMINS, son of Mr. Joseph Timmins, Gas Engineer to the Wigan Corporation, has been appointed Engineer and Manager of the Tipton Gas-Works, in succession to Mr. Vincent Hughes. The output of the works is 100 millions per annum. Mr. Harold Timmins was educated at the Leigh and Wigan Grammar Schools, and served his articles under his father. On completing his term, he entered upon a three years' probationary course, at the end of which he was unanimously appointed Assistant Gas Engineer. In this capacity he has served for rather more than four years, during which time considerable extensions of the works have been carried out; and, in

compliance with the instructions of the Gas and Electric Lighting Committee, a complete scheme of electric lighting was prepared, the drawings, &c., for which were made by him under the supervision of the Engineer.

At a special meeting of the Stafford Town Council on Friday, Mr. HUBERT POOLEY, of Dunfermline, was chosen, out of eighteen candidates, to fill the position of Gas and Electricity Engineer to the Corporation, in succession to Mr. J. Ferguson Bell. There were four selected candidates, and these were reduced to two, who were requested to have an interview with the Committee. The Council divided on the question, with the result that Mr. Pooley secured the appointment by 19 votes to 5. Mr. Pooley was called into the Council Chamber, and the Mayor (Mr. W. C. T. Mynors) informed him of the result, and expressed a hope that he would retain the position as long as Mr. Bell had done, and gain the same amount of respect from the Council and the town. Mr. Pooley thanked the Council for the honour they had conferred upon him in electing him to the position. Mr. Bell had so successfully filled. He said that in the profession Mr. Bell was held in the highest esteem, and it would be his constant aim to emulate the high character which that gentleman had evidently attained in the town, and at all times do his duty to the best of his ability. Mr. Pooley, who is 32 years of age, is the son of Mr. Henry Pooley, J.P., until recently senior partner in the firm of Messrs. Henry Pooley and Son, of London, Liverpool, and Birmingham. He was engaged in the works of the firm for two years, and there obtained considerable general engineering experience. He studied chemistry, civil engineering, and electricity and magnetism at the College University, Liverpool, under (among others) Dr. Oliver Lodge. He served his articles as a Gas Engineer under Mr. T. O. Paterson, at the Birkenhead Corporation Gas-Works, and subsequently was appointed one of that gentleman's assistants. He spent seven years altogether at Birkenhead, and then received the appointment of Manager and Secretary of the Dunfermline Gas Company. On the transfer of the works to the Corporation in 1896, he was continued in his position; and under his supervision new works have been erected. He joined the Gas Institute as an associate member in 1892, and was transferred to the class of members the next year, in which he was admitted to the Institution of Civil Engineers as an associate member.

#### OBITUARY.

The death is announced, after a long illness, at the age of 59, of Mr. WILLIAM MYERS QUESTED, late Manager of the Leatherhead and District Water Company's works.

The death has lately been announced, in his 81st year, of Mr. ALFRED VINCENT NEWTON, the well-known patent agent. Deceased was for some years Chairman of the Herne Bay Gas Company.

Mr. SAMUEL JOSEPH SYMS, the Superintendent of the Gillingham works of the Rochester, Chatham, and Strood Gaslight Company, died somewhat suddenly at his residence, on Tuesday last, at the age of 47. Mr. Syms, who had only been ill a few days, succumbed to an attack of meningitis. He was the son of a former Secretary of the Company (the late Mr. William Syms), and had been employed at the Gillingham works for the past 13 years. He leaves a widow and eight children.

The sympathy of many of our readers will probably be aroused by the announcement of the death last Friday of Mr. W. G. WATSON, who was well known to members of the gas profession some time ago as the Manchester representative of Messrs. W. & B. Cowan. After passing through various vicissitudes, he obtained, rather more than two years ago, through the influence of the Chairman, Mr. Donald D. Macpherson, of Manchester, an appointment as traveller for the Gandy Belt Company; and this he held at the time of his death. It will doubtless be a source of gratification to his former friends to know that a somewhat chequered life closed in useful work. He is to be buried in Edinburg to-day.

**The Action of Acetylene on Copper.**—In a recent number of the "Berichte," Mr. H. Alexander dealt with the above subject. He pointed out that acetylene has no action in the cold on pure precipitated copper; but when the temperature is kept at about 240° to 250° C., the gas is absorbed with the formation of small quantities of a greenish liquid, having the smell of a hydrocarbide, and a solid body of a bright brown colour, similar to cork in appearance, which gradually fills and finally obtrudes from the back end of the tube. No trace of acetylene has been obtained from this substance, which is not soluble in any reagent. When heated in air, it gives off yellowish fumes, smelling of Stockholm tar, and then takes fire and burns with brilliant incandescence. It contains about 2 per cent. of copper, which, however, can be eliminated by means of hydrochloric acid and ferric chloride, without any alteration in the properties of the substance. Further experiments are necessary to determine the constitution of this body. Provisionally, the author recognizes that the copper plays the rôle of contact agent, and effects the molecular condensation of the acetylene in the form of this hydrocarbide resembling cork.



## COMMUNICATED ARTICLE.

## THE PUBLIC AND THE PRICE OF GAS.

By "X."

An interesting subject for discussion might be suggested by the question: Why do the public generally appear to more strongly resent an increase in the price of gas than they do a proportionate, or even greater, increase in the price of any other commodity? For months past the householder who has had occasion to replenish his coal-cellar has had to pay something over 30s. a ton for the same coal that he previously bought at 20s.; but, although paragraphs more or less (as a rule, less) informed have appeared from time to time in the Press commenting on this tremendous rise in coal, there has not really been any expression of indignation thereat. Why, then, does the consequent rise in gas prices cause so much resentment? It is true that the strongest expressions of feeling are to be observed in articles and letters appearing in the local newspapers published on the north side of the River Thames, and that there are special reasons why the action of the Chartered Company in raising their charge to 3s. 5d. per 1000 cubic feet was not likely to be favourably received by their consumers (not the least among such reasons being the characteristically autocratic wording of the notice sent out—wording apparently calculated to cause the maximum amount of irritation). But, special cases apart, is it not the fact that the public have a tendency to look with unusual disfavour upon a rise in the price of gas?

There is, indeed, only one other increase that the ordinary householder more cordially detests than an increase in his gas bill, and that is an increase in his rates; and in that fact no doubt lies some explanation of his special aversion to a larger gas account. For, owing to the form in which the account is rendered, and the manner in which it is collected, very many householders class their gas bill in the same category with their rates, and look upon the whole as some form of imposition which they only put up with because they must. So many people speak as though they were the victims rather than the customers of their gas company—as though, in fact, they got nothing for their money—that it seems clear that this idea (carefully fostered by the so-called comic paper, with its antique gibes at the accuracy of the gas-meter) lies at the root of much of the hostility sometimes displayed towards gas undertakings. When, further, the gas company themselves lend colour to the popular conception, by acting towards their consumers in the manner of a swollen-headed vestry towards the tradespeople serving them, or of a Government Department towards the British taxpayer, who can be in the least surprised if the consumers begin to "say things"?

What, of course, is at present largely troubling the gas consumer is the question of whether the rise in gas is going to be permanent or merely temporary; and this is the point on which every care should be taken by managers to reassure the public. Here, as often before, Mr. Livesey has done the industry much service, not only by the terms in which his Company have announced the successive increases in their charge for gas, but also in frankly and fully explaining the situation to the Press. The very question just referred to, as being the one that is most troubling the gas consumer, was put to Mr. Livesey by a pressman last week—in an interview which was reported in the "Daily News": "But, Mr. Livesey, supposing this high price of coal should prove to be permanent, as some people are inclined to believe it will?" "It will not be permanent," answered Mr. Livesey promptly, with, says the reporter, "an optimism quite cheering after the warnings of the Coal Exchange people." And, surely, it is right and necessary that gas managers should let the public know that they think optimistically about the future, not only because it is bad business to "cry stinking fish," but because there is every good reason to believe that the present state of affairs is only temporary. All may not share Mr. Livesey's belief that coal will be purchasable six months from now at lower prices than those current; but, at any rate, a heavy fall is certain to be marked before contract time next year. Indeed, although Mr. Livesey stands practically alone in the gas world in not buying for more than the first six months of the usual contract year, his view of the situation is evidently shared in other quarters; for, while some of the great Railway Companies have swallowed the pill, and closed their contracts at the higher rates, others—among them, it is said, the Midland Company—are buying from hand to mouth in the market.

The interesting point to be determined when the fall in coal and iron comes is this: Is the present check to trade due solely to the high prices ruling, and will a partial return to old rates again stimulate business and revive the "boom;" or is that mysterious thing the "trade wave" actually receding? The answer to this question is hard to read; but it is of considerable importance to the gas industry.

Dr. OLIVER J. LODGE, F.R.S., Professor of Experimental Physics in the University College, Liverpool, has been appointed first Principal of the Birmingham University.

## NOTES.

## Boilers at the Paris Exhibition.

It is reported in the "Engineer" that there is nothing new in the boiler exhibits at the Paris Exhibition. With few exceptions—the chief of these being the fine exhibit of Lancashire boilers by the Galloways—most of the boilers shown are of the water-tube type. There must be, of course, a reason for this preference of the water-tube type of boiler by most Continental engineers. Our contemporary finds it in the paramount defect of the Lancashire and Cornish boiler—the restricted area available for the fire-grate. So long as the coal available is very good, or the boiler not much pressed, this defect is not much felt. But with the inferior small coal with which Continental engineers have to work, ample grate area is essential. This accommodation can, of course, be easily afforded in the case of the old French "elephant" boiler, and still more easily in the modern water-tube boilers. It does not strike our contemporary that the boilers at the Exhibition are at all hard-pressed; and the fuel in many cases is dust coal mixed with water to the consistence of mortar, and spread to dry on the dead-plate before being pushed back on the fire-bars. Great care is taken to collect dry steam from these boilers, by carrying the steam pipe up vertically, high into the air (over 16 feet) before it is bent over and led into the steam-main. On the whole, although there is no novelty in steam-raising practice on exhibition, the boiler engineering is up to a high standard of design and workmanship, for stationary work.

## Spirit Incandescent Lamps.

Mention was made in a recent "Note" of the introduction in Germany of the "spirit incandescent" lamp, in which a Welsbach mantle is heated by an alcohol flame. Further inquiries into the matter have given us the information that there are several makers of lamps upon this principle, which succeeds best in the case of lights of considerable power, such as are used for the lighting of railway stations, yards, &c., where town's gas is not available. These lamps and their lanterns are self-contained, and can be suspended by a chain. They are made to burn for 24 hours with one charge of spirit; and yield the light of 70 candles for a consumption of one-tenth of a litre of denatured potato spirit. Unfortunately, this is not an article of commerce in England. The English Government has been approached many times to permit of the marketing of alcohol denatured with something else than the wood or mineral naphtha which is relied upon to make the "methylated" spirit of the shops. In Germany, the same object is attained by adding pyridine to the spirit, the resultant mixture burning much cleaner than the English methylated spirit, which always leaves a dirty, sticky coating on everything it has touched. For this reason, imported burning spirit is requisite to enable the incandescent spirit light to be used in this country, which limits its use to large consumers. It is reported that the Imperial Palace Gardens of Sans Souci, Potsdam, are lighted with 220 of these out-door spirit incandescent lamps. The system is regarded as constituting a powerful rival of acetylene for isolated lighting in Germany.

## The Performance of Incandescent Electric Lamps.

Mr. Francis W. Willcox has expounded to the Franklin Institute the facts of incandescent electric lamp performance on the results of the best American practice. He admits that many of the published returns as to the candle power of lamps for current consumed are misleading. This is because it is not often that manufacturers state the efficiencies at which the test lamps were started, which makes all the difference. The same remark applies to the voltage, as it will not do to compare the performance of 50-volt lamps with those made for 100 volts. He shows a diagram of ten 100-volt 16-candle power lamps falling to between 11 and 12 candle power in less than 400 hours. This amount of falling-off in light seems to be usual with even the best lamps that passed through his hands. He speaks of an example showing how well-made lamps should perform; and not one of them maintained its original rated illuminating power for much more than 100 hours. At 200 hours they were all down to 15 candles, at 300 hours to 14 candles, and below 13 candles before 500 hours. With bad lamps, 12-candle power was reached in 100 hours. It appears that the American rule is to use the lamp to the 80 per cent. limit, which is about 12½-candle power; and this should be reached in little over 500 hours. It is observed that the filament of a lamp ought to show a bright, steely surface, free from black spots; for such filaments will prove both efficient and long lived when properly operated. Mr. Willcox insists on the economy of throwing away old lamps as soon as they have fallen off in their lighting effect by 20 per cent., declaring that the tendency to keep old lamps in use is responsible for most of the dissatisfaction felt by users of the electric light at the present day.

## The Lubricating Quality of Oils.

The question of what is the essential quality of lubricating oils has recently been discussed by Professor Joseph Claudy, and in the "Engineer." The former states that the only systematic method in laboratory use for testing lubricating oils is the determination of their viscosity, which is measured by the difference of the times of flow through a small hole of equal quantities of



the oil and of water. Although this method has lent itself to the useful classification of lubricating oils into groups of the same character—as spindle oils, cylinder oils, and so forth—it is far from being a complete indication of comparative lubricating value; and therefore practical machinists have preferred to judge lubricating oils by simply rubbing a drop between the finger and thumb, which enables experienced men to gauge the comparative slipperiness of the samples. Oil dealers call this quality “fattiness,” or “oiliness,” which is just what is wanted to enable an oil to stick to a rubbing surface and resist being squeezed out from between bearings. Dr. Claudy has endeavoured to regularize a test on the same principle, so as to obtain an arithmetical expression for the measure of this quality in lubricants, which he refers to the viscosity modified by adhesion to surfaces. With this object, he recently constructed an apparatus for measuring the capillary viscosity of samples of oil, consisting of a metallic cylinder and piston expelling the oils at a constant pressure in a layer of known thickness. The results in no way correspond to the measure of viscosity given by the rate of flow through a hole. Dr. Claudy divides one result by the other, and so arrives at what he regards as a reliable figure expressing the adhesion factor of the lubricant. The treatment of the subject by the “Engineer” does not go so far in the direction of a solution of the question of the accurate comparative measurement of the oiliness of a lubricating oil.

#### Experiments on Heat Radiation.

An interesting little experiment calculated to impress students of physics with several facts concerning heat radiation is described in “Nature” by Professor Fischer, of the Munich High School of Technology. Three similar chemical thermometers are selected, the bulb of one being left unaltered, while one is silvered over, and the third coated with dead-black by dipping it in lamp-black and spirit. These three thermometers indicate the same temperature if there is no source of radiant heat near them. But if a gas-flame is brought within 20 centimetres of the thermometers as they hang side by side on a stand, they begin to indicate very differently. Starting (say) at the figure of 20° C., the blackened bulb shows the effect of the heat quickest, and the mercury rises highest. The plain glass follows next; and the silvered thermometer is least and slowest in changing. The blackened bulb almost completely absorbs the rays falling on it; the silvered and polished bulb reflects the radiation; and the plain glass partly reflects and partly absorbs the rays. Thus, none but the silvered bulb thermometer indicates the temperature of the air communicating heat to it by conduction. As the other thermometers rise in temperature, they emit radiation; and when the amount of this emission balances the received radiation from the gas-flame, they are in the stationary stage, which is, of course, different for the three. When the gas-flame is put out, the mercury falls at different rates. Observations made simultaneously on them at one minute intervals, and plotted on squared paper, illustrate fairly well Kirchhoff’s law enunciating that a body emits those rays best which it absorbs best. If a piece of ice is put in place of the gas-burner, the blackened thermometer shows the greatest fall, and the silvered one the least, for the same reasons. If the blackened bulb is wetted, the temperature falls, even although the gas is lighted; but after a few minutes the mercury rises very quickly.

#### The German Brown Coal Industry.

The dearthness and scarcity of good coal lend additional importance to the enterprise that is being shown in Germany in the development of the brown coal or lignite resources of the Rhine Valley. According to a report of the British Vice-Consul at Cologne, this kind of fuel is mined, or quarried, in a large district having its centre at Brühl, half-way between Cologne and Bonn. Owing to the bulky nature of the brown coal, and its lightness, it never became an article of extensive trade until modern methods of treatment were applied to the raw material. The most important of these methods is the manufacture of briquettes by hydraulic pressure, which renders commercially possible the transportation of the coal to a distance. In this form it goes all over Central Europe, to markets where coal is dear. According to a contemporary report by F. Isaac on certain lignite briquettes of German origin which he found offered for sale in Belgium, this fuel is easy to handle, is not dusty, and burns easily and well with a long, bright flame at first, afterwards turning blue. It does not crepitate, and requires only a slight draught. It burns out completely, without cinders, but leaves a heavy red ash. Upon analysis, these briquettes showed 15 per cent. of moisture and 5 per cent. of ash, leaving 80 per cent. of combustible. Allowing for that required to evaporate the moisture, the net heating value of the fuel is 5500 calories, as compared with 7000 calories for Belgian coal with 2 per cent. moisture and 6 per cent. ash. Consequently, the useful ratio of coal to lignite is 1 : 0.8, which very nearly corresponds to the respective market quotations. At any rate, this Rhenish brown coal industry has become a feature in the industrial life of the Rhine-land, especially in the growing Cologne district. In addition to the briquettes, shale oil and other products of the same deposits are worked. The deposit is very large; and it is expected that the output of briquettes will shortly exceed a million tons annually. All this will certainly tend to relieve the pressure on the block coal supply.

## TECHNICAL RECORD

### WESTERN (U.S.A.) GAS ASSOCIATION.

(Continued from p. 1724 of Vol. LXXV.)

A paper on the public control of rates was read by Mr. G. McLean, of Dubuque, Iowa. The author argued that the right of the State to regulate and control the rates of public service was a principle of the common law—growing out of the policy of that law respecting monopolies—and that it was unjust and inexpedient to oppose the right of public control. He denied that such regulation need rouse the alarm of investors, or restrict an enterprising policy; and he proposed to show that it protected the public, it offered no menace to the legitimate interests of the company, and, indeed, was likely to be advantageous. The whole policy of the law supported the view that the body granting the charter should reserve the right to control the rates; but whether a city could do so without special powers, was a purely legal question. The right to control rates should not be exercised where competition existed, as that of itself was an excellent regulator. The decisions of the highest court as regards the prescribed rates being such as would give a fair profit on the value of the property as a going concern, afforded absolute security to investors. There was no greater risk than that due to incompetent management, which led to public hostility. Public control established a sense of security from extortion; and the company subject to it did not need to go into municipal campaigns to protect its interests, to carry politicians on its pay roll, or to pay a part of its earnings to the public treasury, while its charter was practically safe. And where it was resisted, the public authorities might resort to extremes.

Captain White, being called upon by the President to open the discussion, thought that the author was very optimistic as to the consequences of admitting the absolute right of a State or a city to determine the rates at which gas should be sold. It was all very well to let the State impose taxes; but would the city—possibly with municipal ownership and absorption in view—apply the principle indicated, and value the property as a going concern? In the course of a large experience, he had never known a city legislature to approach the subject of the price of gas, or the value of the gas undertaking, in honesty or decency; and the appeal to the Supreme Court meant an enormous expense and elaborate and tedious legislation, which very few companies could stand. Public opinion was more in favour of forcing the company to sell as low as possible than of dealing fairly with the question; and the opposition to the gas company did not come from the most thoughtful and intelligent men of the district. Could the author of the paper quote a single case of a gas company coming before a State Legislature and getting square, honest treatment? After appearing in courts and commissions all over the country, it seemed to him that the fundamental principle with which this question was approached was not one of fair, honest dealing. A man living close to a bank of the Mississippi River had to watch for the first trickle, so that it might be plugged forthwith; and in conceding the right and justice of the author’s theory, they would admit the first small break, and the flood of socialism would eventually destroy their corporate industries. The whole question was whether they were to be mere units with no rights, or at liberty to conduct and control their business in an independent manly way—letting natural competition control the field, and natural business aptitude control their actions. Mr. Pratt believed that the Courts of the States would afford better treatment and prospects of justice than the average city council. The President urged the importance of preventing the ordinary city council from interfering with gas affairs. There was, he said, no chance with them whatever, as they would take all they could get. He agreed with Captain White that this class of interference should be avoided. He knew of cases where the city council were simply trying to destroy the existing gas company. He did not know how they could resist the control of the legislature that granted their charter; but the legislature was better than the council. Mr. Doty said there was a difference between a company and a franchise. The first had certain powers, perhaps a special license from the State; but the second had made a bargain or contract with the city authorities, which both parties were bound to respect. The city could not change the price, or otherwise alter the conditions, during the life of the contract. While he did not object to a license or contract, he was opposed to public control of vested rights as neither fair nor just. No public authority should fix, as long as he could resist it, the price at which he should sell gas. Mr. Egner remarked that agitation sometimes arose from the low price at which gas could be sold in England; and that the difference in the purchasing power of money in different countries was overlooked. Mr. Diall said that selling cheaply was no protection. At Terra Haute his price was 3s. 4d. per 1000 cubic feet; but the City Council had granted a franchise to an opposition company who agreed to sell at 3s. 1½d., less 10 per cent. for cash. Mr. Britton thought the question was to some extent a local one, as different laws prevailed in different States. In California, the “Sand lot Constitution” gave municipalities prior rights both as to gas and water supply. The best way to prevent raids was to get into a position to make the cheapest rates



themselves. This would prevent all fair, honest competition; but could not keep out that other sort. At San Francisco, there was a Board of Supervisors who fixed the price. A man who ever trusted himself before an ordinary board of councilmen or supervisors took his life in his hands. Mr. T. D. Miller complained that the difficulty was that the companies' statement and evidence was not accepted; and he instanced a case in which the opposition actually brought out the profits as more than the total receipts. Mr. Doherty said that this matter was not at all peculiar to one Association or to the gas business, and counselled united action.

Mr. McLean, in replying, complained that many of the speakers in the discussion had missed the chief points in his paper, and had brought in extraneous matter. They could not overcome the principle of public control, because they could not alter the constitution of the United States. His critics had suggested no alternative; but he assumed the idea in their minds was a fixed contract for a stipulated period. He contended that this plan was useless in disarming public opposition, and where, after a great deal of trouble and expense, long-term contracts had been closed, the subject was under continual discussion. But where the control of rates was left open to the public authorities, the effect was to soften opposition and propitiate unfriendly sentiment. Then it was assumed that the city councils would fix ruinously low rates. They had no authority to do anything of the kind; and such ordinances could not be made effective. The Courts had repeatedly said that the power to regulate was not the power to destroy. All decisions clearly showed that the councils could be challenged to show that the rates fixed were sufficient to yield a fair dividend on the going value of the concern. Public control was a protection against competition, because when a new company came along with new terms, the old company could say, "If the new terms are compensatory, put them on us. There is no excuse for chartering a new company." His critics had proved nothing in favour of long contracts. One reason that seemed to justify his paper was the enormous cost to gas companies of the fear of legislative control. This fear that hostile authorities could endanger payment of interest or principal prevented gas companies from raising bonds as cheaply as other industries. Yet it was decided twenty years ago, in the "Granger" cases in the State of Iowa, that no public authority could put other than a compensatory rate upon a gas company.

Mr. Steinwedell, of Belleville, Ill., read a paper describing a form for a complete monthly report of the operations in a gas-works. He remarked that in many cases returns were limited to gas made and sold and coal purchased and used; no record being kept of coke, tar, purification, and several other details. He insisted on careful and accurate valuation of all stocks on hand, and described several precautions that must be observed.

The paper gave rise to a conversational discussion. Several members were in favour of a standard form for stating working and financial results, which could be used by authors of papers, &c., and constitute one even basis for calculating and comparing working in different localities. Others pointed out that a form, if prepared and agreed on, would not be strictly followed in every case. The size of the works, and possibly particular local conditions, would have to be considered; and after allowing for that, there would always be individual differences of opinion.

"Candle Power; its Present Relation to the Gas Industry" was the subject of a paper read by Mr. John R. Lynn, of Portsmouth, Ohio. Candle power, as ordinarily expressed and determined, apparently did not possess the importance attached to it in the past. It had never been the rule to take as a basis for calculation the rated consumption of gas by the form of burner generally used, but the argand burner consuming 5 cubic feet of gas per hour at standard temperature and pressure. At no time, however, was the argand largely patronized by the public; and while it may in the past have been a happy medium, owing to the great variety of flat-flame burners in use, it did not at present approach such a relation. Even if the 5-foot "Bray special" was used, the results did not express the value of the tested product, which should receive credit for what it can do and is doing. The bulk of commercial gas lighting was now done by the agency of the incandescent burner, which depended upon heating power, and not on photometrical value. The annual sales for fuel purposes had gradually crept up to a most important proportion of the whole output; and this department had no direct relation to candle power. The same might be said of gas used for motive power. Of 67,000 million cubic feet of artificial gas supplied during the year, he learned that 17,000 million were used for fuel and power, and estimated that 17,000 million were used to produce incandescent light. Thus more than half of the whole was consumed by appliances having for their primary object the generation of heat; and with regard to natural gas, by far the greater proportion was used as a source of heat. Some tests of the heating value of Ohio and Canadian natural gas, taken in 1895, showed an efficiency of 810 and 891 units respectively. The Ohio sample had evidently by some means been diluted with 12 per cent. or so of air, in the absence of which its value would be over 900 units. The natural gas in Pittsburg and Central Ohio was valued in practice at 1000 units; and though its candle power was only about 8, 2½ cubic feet per hour in a Welsbach burner would give a better result than 3 feet per hour of the best artificial gas, although the latter showed a photometrical value more than double. As instancing the

absurdity of valuing gas by its candle power, he mentioned that natural gas with a flat-flame burner might give a duty of only 1½ candles, but it would give 30 candles with a Welsbach; and makers of carbide, in comparing the value of acetylene, took the flat-flame result. A fair basis of comparison showed a value for acetylene only twice that of coal gas; and as the cost was three times as much, it was easy to see which was really the cheaper. If the relative heating value of the two gases was compared, it would be found that approximately the proportion was 5 to 3; and therefore no margin remained for economy by adopting the incandescent burner for acetylene. In the application of the term "candle power," other competitors had assumed a license injurious to gas interests, notably with regard to electric arc lamps. Even in comparing different gases, the same obtained. An 18-candle coal gas was practically equal in heating value to a 22-candle water gas. It was, therefore, only reasonable to claim that not only the candle value but the heating value of a gas should be considered in estimating its practical value; and many of the "new" processes would come out badly under such a test. Many gas companies were bound to furnish 22-candle gas; and if allowed to supply gas of similar heating value, they would not be forced to use water gas, and under some circumstances could work to better advantage.

Mr. A. S. Miller opened the discussion, and claimed that no man in the gas business had any reasonable or close idea as to how much gas went for fuel purposes and how much for incandescent lighting. The author stated that a good 18-candle coal gas had a heating value of 787 units; but he questioned whether such gas had ever been found to yield 687 units. He remarked that the temperature of a flame had a marked effect; and it was a fact that 22-candle water gas gave a higher temperature than 18-candle coal gas. He did not accept the statement that the heating values were the same. It might be a good thing to stipulate the heating value of a gas as well as its candle power. Mr. Egner remarked that calorimeters were expensive, and very difficult to get. Mr. Forstall said that the usually accepted data of 48 candle power duty for acetylene gas was much too favourable. Used in one-foot or half-foot burners, it was only about 35 candles. There was some confusion in the paper between heating value and flame temperature, which were not necessarily proportioned to each other. When a gas was burnt, to get any desired temperature all the products of combustion must be heated up to that point. Hydrogen required for its complete combustion 8 parts of oxygen, and therefore 26·8 parts of nitrogen, all of which had to be raised to the flame temperature. Carbonic oxide required only 0·6 part of oxygen and 2 parts of nitrogen. The flame temperature of the two gases was not far apart, although one had fourteen times the heating capacity of the other. Mr. Norris said that Mr. Forstall was dealing with weights, but gas engineers had mostly to do with volumes. A cubic foot of hydrogen had the same heating value as a similar bulk of carbonic oxide; and therefore the author's contention was fairly correct. He agreed that the argand candle power was of no interest to the consumer, and, as compared with flat-flame or incandescent results, it was misleading. The argand was a great leveller of qualities and a helper to lean gas; and a variation of 2 candles on the argand might mean 5 candles on the flat flame. The argand was too favourable to the gas; and the flat flame was the fairer test. The price of carbide was quoted at £12 per ton in cans for export; and he understood its heating value was 1584 units, not 1292 as quoted. Mr. Addicks took exception to the reflections on the argand burner, and claimed that the law provided that the best burner obtainable should be used. The argand was the best for coal gas; but Sugg's No. 6 table-top gave the best results with high-power water gas. He thought the author's valuation of the cost of carbide, and the yield, were too favourable to acetylene. Mr. Somerville said that, according to calculation, coal gas did not contain over about 650 units per cubic foot, and it was impossible to develop something out of it that was not in it. He thought there was a good deal in the idea of valuing coal gas by its heating power, or energy, which had been taken up by the South Metropolitan Company of London.

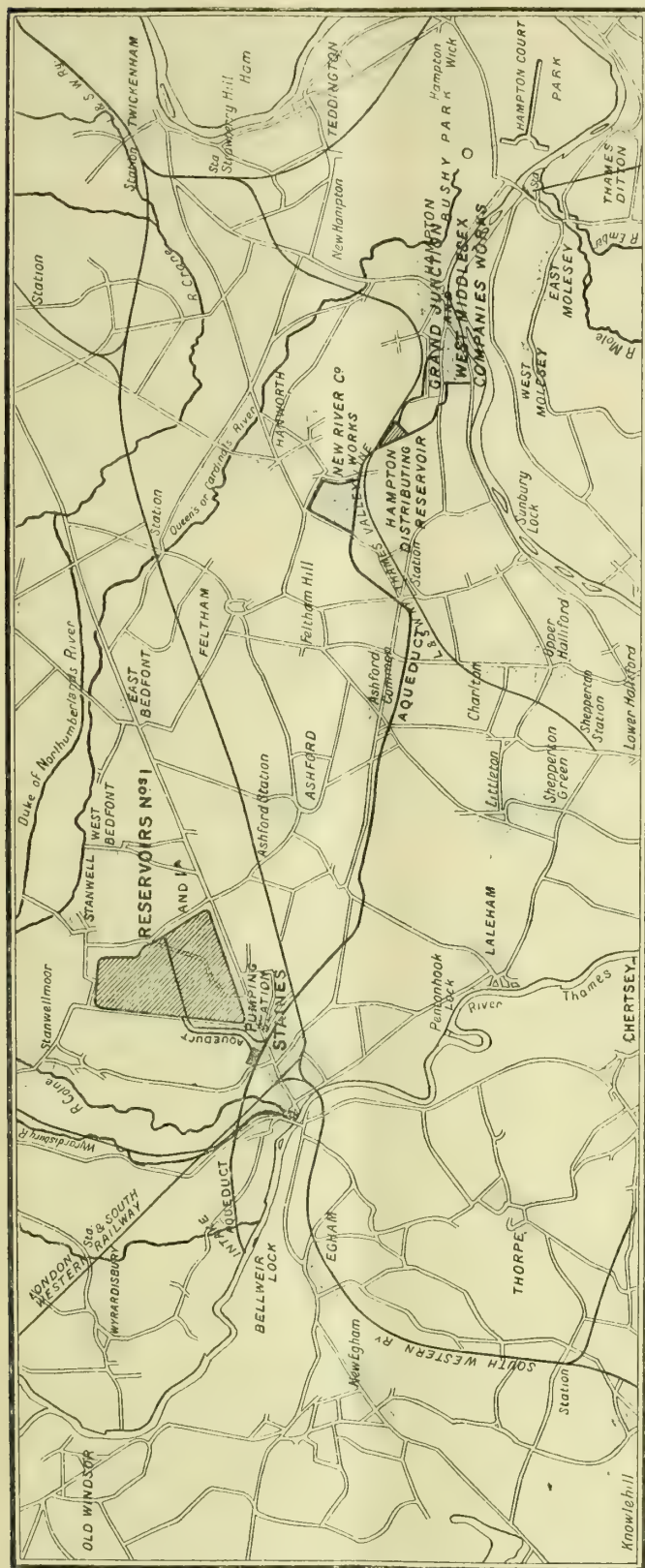
(To be continued.)

## THE STAINES RESERVOIRS SCHEME.

### Progress of the Works.

Those of our readers who have followed the Metropolitan Water Question through its various phases during the past few years will recollect the circumstances under which a Committee, composed of representatives of the West Middlesex, Grand Junction, and New River Companies, was constituted by Act of Parliament for the purpose of carrying out a scheme of storage reservoirs in the valley of the Thames, with the object of furnishing to the Metropolis an additional supply of water from that river. The scheme, which owes its inception to Mr. Walter Hunter, M.Inst.C.E., formerly a Director, and now Engineering Director, of the Grand Junction Water Company, was developed by him with the assistance of the late Mr. A. Fraser, M.Inst.C.E., who was at the time the Company's Engineer, and laid by them before Lord Balfour's Commission of 1892-3, who practically recommended that it should be carried out. Subsequently, Mr. Reginald E. Middleton, M.Inst.C.E., who had been engaged as





Assistant-Commissioner, was associated with the above-named gentlemen in the preparation of a definite scheme for submission to Parliament. Shortly afterwards Mr. Fraser died, and the work was left to be carried out by his surviving colleagues. It is unnecessary to trace the progress of the scheme, which was eventually sanctioned by an Act passed in the year 1896. Briefly stated, its object is to draw water from the Thames at a point on the Middlesex side of the river about 300 yards above Bell Weir, pump it into two reservoirs at Staines, and convey it, either from them or from the intake direct, to the works of the three Companies at Hampton.

The Committee having been duly constituted, with Mr. E. Boulnois, M.P., the Chairman of the West Middlesex Water-Works Company, as Chairman, Mr. F. H. Wybroo, Secretary of that Company, as Secretary, and Messrs. Hunter and Middleton as the Joint Engineers, the scheme was fairly launched. The contract was entrusted to Messrs. John Aird and Sons; and a formal commencement was made by the Chairman cutting the first turf on April 30, 1898. The event was duly recorded in the "JOURNAL" at the time, when a full description of the works was given; and since then we have noticed from time to time the progress made. Another opportunity of doing so was afforded on Monday last week, when a visit of inspection was paid to the works by the members of the Joint

Committee, accompanied by the Engineers, officials of the three Companies interested, Mr. John Aird, M.P., Mr. Basil P. Ellis, and other representatives of the Contractors, and numerous guests. Notwithstanding the unpropitious weather, a goodly party left Waterloo Station in a special train shortly after ten o'clock, and travelled to Sunbury, where conveyances were in readiness to take them on to Staines. It will be seen from the accompanying plan, which shows the portion of Middlesex embraced in the scheme, that the party were able, from the train, to see the progress which has been made with the distributing reservoir, of about 30 million gallons capacity, at the east of Kempton Park, where excavating, banking, and puddling work is going on. From Sunbury, the line of the smaller aqueduct was followed for some distance, and then it was left, and the drive continued to the intake. Here it was found that great advances had been made. The opening to the river is crossed by a heavy boom, to protect from injury the screens placed there to intercept leaves and other floating matter. The sluice-house, the keepers' cottages, and the gas-producer house are nearly ready; and the large aqueduct to the pumping-station, the first length of which (for about 350 yards) is covered, is practically finished. The water has to be carried by two steel syphons under the Colne Brook, after passing which it flows in an open conduit, the sides and bottom being formed of portland cement made in the proportion of about  $5\frac{1}{2}$  to 1. The conduit passes in double tunnel under the two railways shown on the plan, and under the Weyardisbury River through steel syphons; it then crosses Staines Moor, is syphoned under the Colne, and runs to the pumping-station. The walls of these buildings are up some distance, and the ironwork of the boiler-house roof is being fixed. The pumping plant (which is to be furnished by Messrs. J. Simpson and Co.) will consist of five triple-expansion Worthington engines supplied with steam by six Babcock and Wilcox boilers; and each engine will be equal to the delivery of 16 million gallons of water daily into the reservoirs.

Of the two reservoirs shown on the plan, the smaller one, which will hold 1400 million gallons, is in a very advanced state; while good progress has been made with the larger one, the capacity of which will be 1900 millions—making together 3300 million gallons. They cover an area of 421 acres, or about three-fourths that of the City of London. The embankments vary in height from 21 to 39 feet; the slopes being 3 to 1 inside and 2 to 1 outside. The width at the top is 14 feet; at the bottom, 224 feet. In the centre of each bank is a puddle wall, 6 feet thick at the top, 7 feet at the ground level, and tapering down to 4 feet where it joins the London clay, into which it is securely toothed. This wall, as our readers are aware, has lately been the subject of some criticism in the form of newspaper correspondence. But the Engineers maintain that the wall has nothing to do with the strength of the embankment—its sole function being to prevent the leakage of water; and that, so far as the security of the bank is concerned, it might be replaced by an iron or tin plate. This wall has been raised from 8 feet to 36 feet high for the entire length of the embankment— $4\frac{1}{4}$  miles; the part raised to the full height being 2240 yards, or  $1\frac{1}{4}$  miles. About the latter quantity of the embankment is up as high as it will have to go. The length of the outside slopes soiled is 2240 yards; the length concreted, 836 yards. The concrete lining is 5 inches thick for a vertical depth of 15 feet, so as to resist any wave action which may take place. This portion of the reservoir is therefore almost finished. The length of roadway formed on the top is 363 yards. In connection with the small aqueduct, excavations to the full depth have been made for a length of 4902 yards; the length of invert laid is 4476 yards; the side walls have been built to the full height on either side for 4099 yards; and 7682 yards of coping have been laid on each side wall.

In addition to the work here specified, a good deal of pipe laying, bridge building, and syphoning has been carried out; 376 12-feet lengths of 48-inch pipes, or 1504 yards, having been put down. The tunnels and water towers at the two large reservoirs—massive constructions of portland cement concrete, the former lined and the latter faced with blue bricks—are being pushed on with as much activity as possible. There are six steam navvies getting banking, and one getting clay for puddle, at the Staines reservoirs; two pug-mills grinding clay there, and one at Hampton. On the larger aqueduct there are 415 men at work; on the smaller one, 476 men; and on the two large reservoirs, 1044—making a total of 1935 employed by Messrs. John Aird and Sons. In addition to these, Messrs. T. Piggott and Co., who have the contract for supplying the steel pipes, have 14 men upon the works.

It is hoped that the smaller of the two reservoirs at Staines will be ready to receive water about this time next year, and that the whole scheme will be carried out well within the specified time. Its completion will give London an additional 35 million gallons, or, with the permission of the Local Government Board, in cases of emergency, 45 million gallons, of water daily. The maximum quantity allowed to be taken from the river for purposes of supply and for filling the reservoirs is 100 million gallons per day. But the Committee can only take in at Bell Weir the surplus water above a flow of 265 million gallons daily, which is equivalent to 364 million gallons at Teddington; and, after providing for the statutory 130 millions which the Companies have a right to take between Sunbury and Molesey, 234 millions will be left to flow over Teddington Weir. The reservoirs when full will contain sufficient water for the



supply of London with the extra 35 million gallons a day for three months.

It only remains to say that the fullest information was afforded to the visitors by the Engineers personally or by Mr. M. B. Duff, the Resident Engineer; and that the Contractors' agents (Messrs. Gilbert and James) answered freely any questions relating to their particular work. Before the tour of the reservoirs was made, luncheon was served in a marquee upon the embankment—Mr. Boulnois presiding. The party returned to London shortly after four o'clock.

### THE RATING OF WATER UNDERTAKINGS.

We commence to-day the publication of the technical matter which occupied attention at the recent meeting of the British Association of Water-Works Engineers, by giving the paper read by Mr. F. J. BANCROFT, B.Sc., Assoc.M.Inst.C.E. (Hull), on "The Rating of Water Undertakings." It was as follows:—

By 43 Eliz., cap. 2, intituled "An Act for the Relief of the Poor," A.D. 1601, and which first created Overseers of the Poor, it was enacted, "They (the overseers of every parish) . . . shall take order from time to time . . . to raise weekly or otherwise . . . by taxation of every inhabitant, parson, vicar, and other, and of every occupier of land, houses, tithes impropriate or appropriations of tithes, coal mines, or saleable underwoods in the said parish, in such competent sum and sums of money as they shall think fit, a convenient stock of flax, hemp, wool, thread, iron, and other necessary ware and stuff to set the poor on work, and also competent sums of money for and towards the necessary relief of the lame, impotent, old, blind, and such other among them being poor and not able to work . . ." This Act, so far as its main provisions for the relief of the poor are concerned, is still in force; but it will be noted the method of taxation was left open, and no uniform process defined.

By 6 and 7 Will. IV., cap. 96, intituled "An Act to Regulate Parochial Assessments," A.D. 1836, ". . . no rate for the relief of the poor in England and Wales shall be allowed by any justices, or be of any force, which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto—that is to say, of the rent at which the same might reasonably be expected to let from year to year free of all usual tenant's rates and taxes, and tithe commutation rent charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent." Although we find the Act refers to "net annual value," the term in the schedule is the "rateable value;" and we also have the expression "gross estimated rental." We do not, however, obtain a definition of the latter till 25 and 26 Vict., cap. 103, intituled "An Act to Amend the Law relating to Parochial Assessment in England," A.D. 1862, section 15 of which states: "The gross estimated rental . . . shall be the rent at which the hereditament might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe commutation rent charge, if any."

These definitions, however, appear to have been ambiguous; and the Poor-Law Commissioners deemed it necessary to give their constructions of "gross rent" and "net rent"—viz., "Gross rent" is the rent which would be paid "to a landlord who himself undertakes to pay all the usual tenant's rates and taxes with which the hereditaments or premises rented by the tenant are chargeable, together with tithe commutation rent charge, the expense of upholding the buildings in tenantable repair, insurance against loss by fire, and any other expenses (if any shall exist) necessary to maintain such hereditament in a state to command such gross rent." "Net rent" is "the amount which is received by, or which remains clear in the hands of a landlord after all such taxes, charges, and expenses as are above enumerated shall have been provided for."

These constructions appear to still have been subject to doubt and misconstruction; and we find another attempt, in the Valuation (Metropolis) Act, 1869, to place the meaning of these fundamental terms beyond dispute. By this Act "gross value" is defined to be "the annual rent which a tenant might reasonably be expected, taking one year with another, to pay for a hereditament if the tenant undertook to pay all usual tenant's rates and taxes and tithe commutation rent charge, if any, and if the landlord undertook to bear the cost of the repairs, insurance, and other expenses, if any, necessary to maintain the hereditament in a state to command that rent." The "rateable value" is defined as "the gross value, after deducting therefrom the probable annual average cost of the repairs, insurance, and other expenses, if any, necessary to maintain the hereditament in a state to command the rent."

These latter definitions are in force at the present day, with the modification that, under the Tithe Act, 1891, the landlord, and not the tenant, is liable for the tithe. The writer has deemed it necessary to set forth the several steps by which these constructions have been reached, as from them it follows that before a property can be rated—

(1) It must be an "hereditament." This has been defined by the Valuation (Metropolis) Act, 1869, as meaning "any lands, tenements, hereditaments, and property which are liable to any

rate or tax, in respect of which the valuation list is by this Act made conclusive." No specific mention is made of "water-works," and many like undertakings, as railways, gas-works, &c., no doubt come within the scope of the Rating Acts as being beneficial occupiers of land. Many properties are exempt from rating; but it is needless to say water-works, whether in the occupation of companies or of corporations, are not favoured in this respect.

(2) It must be in the occupation of some person or persons. This occupation must be exclusive (an easement is not rateable). It must be beneficial, not necessarily of pecuniary profit, as the tenant is assumed to be willing to pay a rent for its occupation. This is a most important consideration, as it renders rateable property the occupation of which may, or does, cause pecuniary loss. For example, sewers and sewage works were held in the London County Council sewers case to be rateable, as the occupation was valuable as capable of yielding a rent, and board schools have been held rateable although yielding no pecuniary profit. Applying this to a water-works, we see at once an undertaking, whether in the occupation of a company or a corporation, is rateable even if its operations involve pecuniary loss. Its occupation is necessary for the fulfilment of statutory duties; and the company or corporation could themselves be tenants of works provided by another, and in that case would pay rent.

(3) An estimate must be made of the rateable value. From what appears above, it will be seen that the gross value must of necessity be first determined. To ascertain the latter in the case of such undertakings as water-works, which are in general owned and occupied by the same body, a tenant must be assumed, and a further difficulty presents itself in arriving at what he "might reasonably be expected, taking one year with another, to pay for the hereditament."

The same conditions, it will be seen, have to be considered whether the undertaking is in the hands of a public authority or a company, as the ownership makes no difference in the rateable value. The undertaking may be carried on at a pecuniary loss or it may result in profit.

*Where there is a Pecuniary Loss.*—This is often the case where the undertaking is in the hands of a public authority, who carry on the works for sanitary reasons regardless of deriving profit, and the deficiency in the revenue is made good by levying a public water-rate. In this case it must be remembered there is a statutory obligation on the local authority (or company) to provide a water supply; and they themselves may be tenants, and must not be omitted as probable tenants. The question at once arises, What rent might a local authority be reasonably expected to pay for the tenancy of such an undertaking? The fact of the works being conducted at a loss shuts out competition, and, obviously, they could only be expected to pay such a sum as would, after deducting landlord's charges, leave the bare percentage on the capital outlay as the state of the money market at the time demanded for such security.

*Where a Profit is made.*—Where the profit is insufficient to pay the minimum rate of interest on the capital outlay, the value for rating purposes must be determined as in the preceding section. Where the profit is larger, a tenant could no doubt be found willing to pay a higher rent. Before proceeding to the determination of this rent, reference must again be had to the definition of gross value. By it the landlord is assumed to bear the cost of the repairs.

The words of the statute seemingly place the whole of the repairs upon the landlord, and would, therefore, bring the expenditure on current repairs within the items covered by statutable deductions. This appears to be the practice of some valuers, who place all maintenance and repairs charges under statutable deductions, and as they make no allowance for the provision of new plant, would have one imagine that works and mains can be patched up for ever, and that renewal is never required. It is, however, absurd to suppose that for ordinary repairs arising in the working of the undertaking, a tenant would call in the landlord to execute them. If a fire-bar required replacing by a new one, a valve-seat renewing, a plunger repacking, or a burst main repairing, it is only reasonable to suppose the tenant would do the necessary work out of his revenue; and these and similar items should be included in working expenses. For the landlord to do the current repairs would be for him to partly work and control the daily operations, and would confuse the relation of landlord and tenant, which it is the aim of the statute to separate. A time arrives when an engine must be entirely replaced or a main taken up and a new one substituted; this being necessary to maintain the hereditament in a position to command the rent. This is the work which should be taken as devolving on the landlord—viz., the renewal of the structural works when they are no longer capable of performing their functions with ordinary tenant's repairs.

The estimate of the rental value must be made on the conditions obtaining at the time. Present value is the only consideration; and neither correction for past losses nor prophecies concerning the future can be considered.

#### REMARKS.

*Receipts.*—In these are included meter-rents, although some valuers exclude them. In the case of *Regina v. The Parish of Lee*, meters were found to be mere chattels; consequently the



Example of Valuation for Rating a Water-Works Undertaking.

Gross receipts from water-rates, including meter-rents, and less bad debts, allowances, and empties		£24,307
Working Expenses.		
Pumping charges, including coal, wages, stores, tenant's repairs, and maintenance	£2,826	
Reservoir and filtration charges, including materials and labour	501	
District charges, including wages of turncocks, labourers, and tenant's repairs, and maintenance of mains	2,365	
Salaries	1,560	
Collection	300	
Printing, stationery, and miscellaneous charges	255	
Law and parliamentary charges	400	
	8,207	
Profit (plus rates) to be divided between tenant and landlord		£16,100
Tenant's Share.		
Estimated Working Capital.—Proportion of working expenses—stock, coals, meters, tools, &c.; cash balance at bank (say) £12,000		
17½ per cent. on estimated capital	£2,100	
Balance of profit (subject to deduction for rates) = Owner's share, or gross value plus rates		£14,000
Statutable Deductions. Sinking Fund for Renewal.		
Structural Valuation of	Estimated Life, Years.	Sinking Fund at 3 p. c. Interest to replace Structure at end of Life.
Buildings	£20,000 .. 40 at ..	1'32 p. c. .. £261
Machinery	40,000 .. 15 at ..	5'38 p. c. .. 2,152
Reservoirs	15,000 .. 40 at ..	1'32 p. c. .. 198
Wells	34,000 .. 30 at ..	2'10 p. c. .. 714
Mains	90,000 .. 30 at ..	2'10 p. c. .. 1,890
Chattels.	3,000 .. 15 at ..	5'38 p. c. .. 161
	£202,000	
Insurance of buildings, boilers, and machinery		50
		£5,429
Rateable value (plus rates) of whole undertaking (£14,000—£5,429) =		£8,571
Assessable value of works and land		£116,000
Assessable value of trunk-mains		28,000
		£144,000
Assessable value of distributing-mains		62,000
		£206,000
Rateable value of works, land, and trunk-mains (£144,000 at 3 per cent.)		£4,320
Division of Rateable Value of Works, Land, and Trunk-Mains between Parishes A, B, and C:		
Parish.	Description.	Assessable Value.
A	Works, land, and trunk-mains	£92,350 ..
B	Ditto	49,000 ..
C	Trunk-mains	2,650 ..
		£144,000
		£4,320
		£1,075
Rateable value (plus rates) of whole		£8,571
Do. of works, land, and trunk-mains (£4,320 + £1,075) =		5,395
Do. of distributing-mains		£3,176
Division of Rateable Value of Distributing-Mains between Parishes B, C, and D.		
Gross Receipts.	Receipts in Parish.	Rateable Value plus Rates of the whole of Distributing-Mains.
£24,307	£5,560 B	£3,176
—	7,107 C	—
—	11,640 D	—
		£24,307
		£3,176
Rateable Value of Distributing-Mains in Parishes.		
Parish.	Rateable Value plus Rates.	Rates in Parish.
B	£726	4s. 8d. .. £137
C	928	4s. 2d. .. 160
D	1,522	5s. 2d. .. 312
	£3,176	£6 9
		£2,567
Summary of Valuation.		
Rateable value of works, land, and trunk-mains		£4,320
Rateable value of distributing-mains		2,567
Total rateable value		£6,887
This is divided as follows:		
Parish.	Description.	Rateable Value.
A	Works, land, and trunk-mains	—
B	Works, land, and trunk-mains	1,470
	Distributing-mains	589
C	Trunk mains.	80
	Distributing-mains	768
D	Distributing-mains.	—
		£2,100
Total rateable value		£6,887

Note.—The above example is a purely hypothetical one, and has no real existence; and the figures given must be taken as illustrating principles only.

rents would be omitted. The tenant would, when entering upon his tenancy, have to purchase meters, as they are necessary for the working of the undertaking; and he consequently claims a percentage on this outlay. It would, therefore, appear unreasonable to exclude the rents from the revenue, and at the same time claim a return on the purchase price, and also include the cost of meter repairs in the expenditure.

The receipts on account of fitting work are excluded, as this is a source of income quite apart from the undertaking as a water-works. Consequently the expenditure on account of the same work is omitted from the working expenses. The same applies to any other miscellaneous sources of income which are not strictly derivable from a water-works undertaking *per se*.

Working Expenses.—Any extraordinary expenses should be averaged over a number of years, as the tenant is supposed to "take one year with another." No renewals of works or mains are to be included. These are entirely the concern of the landlord.

Rates.—The amounts at present paid must be omitted. If the existing rateable value is low, the rates paid are insufficient; and as the investigation is to find the correct rateable value, the tenant must have credit for paying the increased sum. On the other hand, if the existing rateable value is high, the rates paid are excessive, and to include them in the expenses would improperly reduce the rateable value. Again, when the undertaking extends over several parishes, the rates in the pound will vary; and until the rateable values are correctly determined in the several parishes, the amounts that are properly payable in each cannot be stated. A correction for rates must, therefore, be left till the last.

Tenant's Share.—The hypothetical tenant will require certain capital to conduct the undertaking; and in the case considered, it is estimated it will be from two to three months before he will receive any income from water-rents. The least that can be allowed him will be (say) three-eighths of expenses, including rates. He will also require to take over the stock of coal, meters, tools, &c., necessary to carry on the works. Still keeping in view that the undertaking is let to an imaginary tenant, who it must be presumed will have to pay his rent quarterly, some valuers allow him sufficient money to meet this liability, which will become due before he has received any adequate return for the expenses incurred in furnishing the supply to consumers. They, therefore, add a quarter's rent to the foregoing, and also a reasonable cash balance at the bank. In the case under consideration, it is assumed that the total capital required by the hypothetical tenant to carry on the business is £12,000.

The amount of the capital which it is estimated the tenant will require to conduct the business is a fruitful source of dispute. It is in some respects governed by the facts of the case—*e.g.*, whether the rates are collected quarterly or half-yearly, whether at the end of the term or in advance. The capital should be such as to enable the tenant to conduct his business with advantage, and as large as the landlord might reasonably expect the tenant to possess before undertaking the responsibilities of the management. It is obvious that an impecunious person would not be acceptable as a tenant.

On this capital (£12,000) by almost universal agreement, the tenant is allowed the following charges: 5 per cent. as interest on capital, 10 per cent. as trade profit, and 2½ per cent. for risks and casualties; making a total of 17½ per cent. = £2100. This cannot be said to be too large a return for the tenant out of a gross income of £24,307. Indeed, in the case of an appeal by the Metropolitan Gas Company of Melbourne against the assessment of their undertakings for the year 1897 by Melbourne and Prahran, heard before Judge Hamilton, the latter decided that the tenant should be allowed 6 per cent. for interest on capital, 10 per cent. for trade profits, and 4 per cent. for risks and casualties.

By deducting the tenant's share from the profit, the sum of £14,000 is arrived at as the yearly rental, *plus* rates, the tenant is in a position to pay his landlord for the occupation of the undertaking.

The point has now been reached when it is necessary to make a structural valuation of the several parts usefully constituting the whole undertaking, to enable the proper deductions to be made for the renewal (not working repairs) of the works as required to keep them in a condition to command the rent. The various parts, according to their original design and construction, may be taken on an average to require renewal, or to become obsolete, in the following times: Buildings, 40 years; machinery, 15 years; wells and adits, 30 years; service reservoirs, 40 years; mains, 30 years; and chattels, 15 years.

From this structural value and the estimated life, the amount of the sinking fund can be estimated; and this amount the prudent landlord is assumed to set aside each year, at compound interest, to replace the several parts as they become worn out or obsolete. The insurance charges are those which devolve upon the landlord—such as against fire and explosion, not employer's liability insurance, which would properly be included in the working charges. Sinking fund and insurance amount to £5429, and leave a sum of £8571 as the rateable value *plus* rates.

Having now ascertained the total gross and rateable value, if the undertaking extends over more than one parish, it remains to split the total up into the respective sums the several parishes are entitled to. This must not be accomplished by a division



based either on the extent of the mains (mileage principle) or on the capital expenditure in the parishes, as neither would form the basis of the rent which a tenant would give for the occupation of the works in the various parishes. The division must be on the parochial principle—i.e., on the earning value in the parish. This would be a comparatively easy matter if all the works in all the parishes were directly remunerative. This is rarely the case. An undertaking may be divided into two sections: (1) Indirectly remunerative; (2) directly remunerative. In the first section are included pumping-stations, reservoirs, and trunk-mains, and any other works which, although of themselves bringing in no revenue, are indispensable to the undertaking. The rateable value of such works should be arrived at in the same way as works which are conducted at a loss. A structural valuation must be made, and such a percentage taken thereon as the condition of the money market would warrant for such a security. Obviously, this is the net rent which either a corporation or company would guarantee to an owner if they themselves tenanted such works.

What is a trunk-main? This depends on the size of the undertaking. In one case an 8-inch or 10-inch main might come within the term, while in another no main under 24 inches could be so considered. Generally speaking, any main with no consumer's pipe attached thereto, and mains passing through one parish to convey water to another, and consequently larger in size than would be required for the supply of the former only, may be taken as indirectly productive.

**Directly Productive.**—This section includes all the service-mains, as it is here the revenue is earned. The rateable value of the directly remunerative portion is the remainder of the total rateable value after the rateable value of the indirectly remunerative portion has been deducted. This remainder is divided *pro rata* among the parishes with the gross receipts derived from the respective parishes. This is a most important consideration, as some overseers appear ignorant of the axiom that the whole is equal to the sum of its parts, and proceed to the valuation of the portion in their parish regardless of the claims with the other parishes.

**Rates.**—The amount of these must be taken at what they will amount to after the valuation has been made in the several parishes; and the mode of arriving at the figures has been given above.

**Surplus Works.**—When water-works are constructed especially in gravitation supplies, they are mostly designed in excess of the present requirements. This was the condition in the case of *Regina v. South Staffordshire Water-Works Company*. But it was held that as the whole of works were used for the distribution of water, the whole capital expenditure must be taken into account, and not so much as would have been necessary had only a small system been constructed. Apparently opposed to this decision, the case of the *Liverpool Corporation v. The Llanfyllen Assessment Committee* may be cited. Here the judgment of the Montgomeryshire Quarter Sessions in October, 1897, was that—

The Court were of opinion that the value for rating purposes of the property of the Corporation should be ascertained in the following manner: (1) The structural cost of the dam and reservoirs and other works in the two parishes concerned should be taken, as stated by the Corporation, at £646,932. (2) The cost of the land should be taken also, as stated by the Corporation, at £62,250. (3) The amounts expended by the Corporation on bridges, £8337; roads, £55,939; church, vicarage, and schools, £13,952—total, £78,228, should also be added as being, in the opinion of the Court, part of the dam and reservoir; making a total capital cost of £787,410. (4) The amount of capital cost thus ascertained, which is at present effective, is arrived at by taking the proportion which the daily quantity of the compensation water, together with the daily quantity of water at present drawn by the Corporation, bears to the total daily capacity of the reservoir—viz.,  $26\frac{1}{2} : 41 = £508,935$ . (5) One-third of the cost of the parts within the parish of the Hiranant tunnel and of the easement as stated by the Corporation—viz., £9312—to be added to this; making a total effective capital of £518,247. (6) The Court are of opinion that at the present time the outlay on the site and works would, in consequence of the growth of the population, and consequent greater demand for such sites as this, and of the increased cost of labour and materials required for such works, be greater than the actual cost of the site and works to the Corporation, and in consideration of this they think the gross rateable value of the works may be taken at 3 per cent. on the outlay, rather than  $2\frac{1}{2}$  per cent., the rate at which the Corporation may borrow. (7) The Court think that the straining tower should be rated separately from the reservoir in the parish in which it is situated.

An appeal to the Divisional Court confirmed the decision of the Quarter Sessions, with the exception that they held that the amount expended upon the roads, bridges, church, &c., ought not to be included in ascertaining the effective capital value of the undertaking, and that the effective capital value of the reservoir and site ought to be taken at  $26\frac{1}{2}$  to  $52\frac{1}{2}$  of the total capital expenditure. (The reservoir is capable of delivering  $52\frac{1}{2}$  million gallons per day, though the catchment area at present connected is only sufficient to provide 41 million gallons; but catchment areas capable of providing the remaining 11½ million gallons will ultimately be connected.)

From this decision, the Assessment Committee appealed. Lord Justice A. L. Smith, in giving the decision of the Court of Appeal, stated—

He could see nothing wrong in including those items of expenditure for church, vicarage, schools, roads, and bridges. The Corporation could not have got the reservoir as it was without paying the money for building the church, vicarage, and school, and asked why this was not the proper expenditure to take into account in arriving at the rateable value. As to the second point, he could not understand why any divisor was brought in at all. According to the decision in *Regina v. South Staffordshire Water-Works Company*, he did not see why anything should be taken off the cost of the

reservoir. But the Assessment Committee were willing to make some deduction. What right had the Divisional Court, as a matter of law, to say that  $26\frac{1}{2}$  to  $52\frac{1}{2}$  was the right amount, and not  $26\frac{1}{2}$  to 41, as allowed by the Quarter Sessions? It was a question of fact for the Quarter Sessions. The appeal must therefore be allowed, with costs in that Court and in the one below. Lord Justices Vaughan Williams and Romer delivered judgment to the same effect.

**Reservoirs (Land Covered with Water).**—Under the Public Health Act, 1875, section 211, sub-section (1)(b), it is provided that: "The owner of any tithes, or of any tithe commutation rent charge, or the occupier of any land used as arable, meadow, or pasture ground only, or as woodland, market gardens, or nursery grounds, and the occupiers of any land covered with water or used only as a canal or towing path for the same, or as a railway constructed under the powers of any Act of Parliament for public conveyance, shall be assessed in respect of the same in the proportion of one-fourth part of only such net annual value thereof." In this sub-section the Legislature apparently takes into consideration the benefits accruing to the property from the expenditure provided for by the rates.

In the case of *The Southwark and Vauxhall Water Company v. The Hampton Urban District Council*, the Company were rated in respect of a reservoir on the full net annual value. They tendered a sum calculated on one-fourth, contending that the reservoir was "land covered with water." The Justices determined that the reservoir was rightly rated on its full net annual value. This decision was reversed by the Divisional Court. Upon this the District Council appealed; and the arguments were heard in December last. The Court of Appeal dismissed the appeal, holding that reservoirs came within the description "land covered with water."

From this decision the District Council appealed to the House of Lords. The Lord Chancellor, in moving that the appeal be dismissed, said that no argument had been adduced to show that the Legislature used the words "land covered with water" in any other than their natural sense, which has been attributed to them by the Courts for more than thirty years. Words would have to be added so as to make the statute run "land covered by water which is not made so by artificial construction." No such words had been added; and he could not understand the doubts expressed in the Divisional Court. Concurrence was expressed by Lord Macnaghten and Lord Morris.

This is a most important decision, and places a not unimportant part of water-works in a favourable position. It will be seen that, under the sub-section above quoted, railways are charged on one-fourth their value; and the term "railways" has been held to include the line itself, with its embankments, the turntables, and sidings. It cannot be seriously contended that water-pipes, for example, derive the same value as do houses, or more value than do railways from the rates expended. That railways are exempt from three-fourths of the rates is, in the writer's opinion, a sufficient ground for asking that such property as gas and water pipes should be rated upon the same basis. Although this is a suggestion that at present cannot be acted upon, the above case respecting reservoirs is a step to that end, and the whole subject should be kept in mind with a view to obtaining redress when the opportunity arrives.

It will readily be perceived from the foregoing that, although the principles determining the valuation of such property as water-works may now be said to be fixed, they have to be applied entirely to hypothetical conditions in a suppositional case; and the whole valuation resolves itself ultimately into a question of opinion. It is, therefore, a matter of astonishment that more disputes do not arise, and can only be accounted for by attributing it to the desire of the opposing parties for compromise, and the hesitation with which both assessment committees and companies embark on litigation promising such doubtful issues.

With a view to placing the system of rating such undertakings on an intelligible basis, Mr. H. Wilkins, Secretary to the Lambeth Water Company, in April, 1897, made the following proposition: "If the gross profits do not exceed 1 per cent., the gross annual value to be taken at 3 per cent. on the rateable capital only, and for every additional 1 per cent. of gross profits, the gross annual value to be increased by  $\frac{1}{4}$  per cent. on such capital outlay. . . . The scale at variations of 1 per cent. in the profits would work out as follows:—

Gross Profits, not exceeding Per Cent.	Gross Annual Value to be calculated at per cent. on Rateable Capital only.
1	3
2	3½
3	3¾
4	4
5	4¼
6	4½
7	4¾
8	5
9	5¼
10	5½

"Suppose an undertaking has cost £1,860,000, has a gross revenue of £270,000 a year, and earns a gross profit of £149,000 a year. A gross profit of £149,000 is just over 8 per cent. on a capital outlay of £1,860,000, so the gross annual value would be 5 per cent. on the capital outlay, or £93,000. Allowing a deduction of 15 per cent. (estimated cost of repairs, insurance, &c.), the rateable value would be £79,050." Mr. Wilkins desires the writer to state that the percentages above suggested do not necessarily represent figures that ought to be adopted. They



are simply given to illustrate a method of obtaining an equitable result; and experience may suggest some modification.

Whether such a method would prove satisfactory requires careful consideration; and the writer brings it before your notice so that opinions may be elicited from those who have had experience in the present unsatisfactory methods, which are so prolific in irritation, dissatisfaction, and costly litigation. The present practice may be said to exist, and probably will continue to yield approximately fair results only by the spirit of fairness, candour, and compromise, with which experts and courts appear to treat such valuations as those necessary for the assessment of water-works undertakings.

#### Discussion.

The PRESIDENT (Mr. C. H. Priestley) referred to the difficulty of thoroughly grasping this question of rating, especially where works were situated in several unions, many parishes, and, as in Cardiff, more than one county. On the last septennial valuation for the Cardiff Union, the Water Committee were fortunate in being able to get a reduction of about £4000 in the net rateable value, which, on a septennial valuation, represented a saving of something like £10,000 to the rates payable by the water-works. This gratifying result was mainly due to one point only, which had been overlooked by the valuer in making his valuation. It was this, that he had not given the undertaking sufficient credit for the large amount of rates it paid in other unions and in another county. The author stated that to be rateable, occupation must be beneficial. He had seen a statement published which appeared to rather contradict this, although personally he was of the same opinion as Mr. Bancroft. He believed the question arose in Sheffield some years ago in the case of a large reservoir that was constructed, but not used for several years. In a case of their own at Cardiff, the Corporation were successful in getting the rating taken off a quarry, for which they paid £50 rent, although not getting any stone therefrom at the present time. The Corporation were held to have no beneficial occupation, although willing to pay the rent for use in the future. He thought the author could hardly quote the case of the Metropolitan Gas Company of Melbourne as applicable to an English undertaking, as money was always worth more in the Colonies than in England. The 17½ per cent. was, he believed, the universal allowance in England. He should like to know where a sinking fund for renewal of plant had been allowed as a statutable deduction. The author stated that some valuers did not allow this; but it would be very interesting to know where it had been allowed, and what was the law upon the matter. The estimated life of reservoirs, mains, wells, and buildings, he considered much too low. He had had trunk-mains recently taken out for connections which had been constantly in use for fifty years; and they were little the worse now than when first laid. These had been in good ground. On the other hand, he had had service-mains which had had to be re-placed, although not in use more than twelve years. They were laid in ground made up partly of scavenging refuse, which attacked and ate away the pipes. Large trunk-mains when laid in good ground were, he thought, likely to last at least twice the time stated by the author. Then, again, as to reservoirs, 40 years seemed to him a very short life, especially if large storage reservoirs were included. He knew of many practically as good as new that had been built more than forty years ago. The definition of a trunk-main given by the author was a very good one, although in country districts it was often necessary to tap the trunk-main itself for the purpose of supplying isolated farm buildings, &c., requiring a supply. The recent decision of the House of Lords in the case of *The Southwark and Vauxhall Company v. The Hampton District Council* was a most important one; but he saw that the District Council were not disposed to let the matter stand, and were agitating for an alteration of the law. He understood the matter was being brought before the District Councils' Association, with a view to taking further action. The suggestion that as railways were exempt from three-fourths of the rates, water-pipes should also be exempt was a reasonable one. The suggestion at the end of the paper of a scale of rating in accordance with the gross profits of an undertaking was also valuable. If some such method could be adopted, it would simplify to a great extent the whole system of water-works rating, and tend in a large measure to place all such undertakings on the same basis.

Mr. W. WATTS (Sheffield) said he was not fully acquainted with the circumstances in connection with the rating of the reservoir in Sheffield to which the President referred; but he believed it applied to the Damflask reservoir. Its construction, from the time of commencing to its completion, occupied something like 25 or 27 years. Structural difficulties were met with. The reservoir was a very large one, and was built by the late Mr. Hawksley. For many years, it simply existed as an embankment, without containing any water; and he assumed, during those years, the rating authorities thought they ought to have some rateable value for the site. Hence the contention to which the President alluded. During the last few years, a wing trench had been put in, at a considerable cost; and the reservoir was now in working order, and had been for some years. As to the figures in the paper, if wells and adits and service reservoirs were properly constructed, he felt sure they would have a longer life than the author had given them. The first of the Oldham reservoirs was constructed about 1836; and the pipes

put in at that time (which were not coated by Dr. Angus Smith's solution) were in use to-day, and were apparently in nearly as good condition as when they were laid. There was no doubt that much depended upon the nature of the subsoil in which pipes were placed; but surely no practical and intelligent engineer would be fool enough to put large pipes in ground which he knew, or ought to know, would begin to pit the iron the day after the pipes were laid.

Mr. FREDERICK GRIFFITH (Leicester) agreed that the life given by the author to the various parts of the works seemed too short. In Leicester, they had mains which were still alive, after being at work from thirty to fifty years. The author had exactly, and very fully, described the assessment of water undertakings; but, of course, different valuers had different views and ways of looking at the same object. There was no field where barristers and lawyers had greater "gathering-grounds" than in the assessment of water-works undertakings. It was generally admitted that water should be supplied as cheaply as possible; but when the water authorities proceeded to extend their systems, they met with the greatest opposition from the various local authorities and landowners. Then, when the works were constructed, after the utmost compensation possible had been wrung out of the water authority, the rating authorities endeavoured to get the works assessed at the highest possible point. He hoped the time would come when water undertakings would be looked upon as a necessity for the people, and exempt from rating altogether.

Mr. G. GREENSLADE (South Hants Water Company) remarked that, when anomalies were pointed out to public valuers—such as a 12-inch pumping-main in one parish being rated at £20 a mile, and the same main in another at £40 a mile—their simple reply was that they did not go on that basis at all, but on some other. Sometimes he had been successful in getting an Assessment Committee to compare one parish with another, and so had satisfied them as to the fairness of the Company's contentions. He should very much like to see some special line of rating laid down—either on the mileage, profits, or other definite basis. He had raised the question as to the rating of reservoirs, but was told that, his being a covered reservoir, it did not come under the definition "land covered with water." It was a building or structure, and therefore must be rated in the ordinary way. He should like to know whether Mr. Bancroft considered a covered reservoir was "land covered with water," in the same way that an open reservoir was held to be.

Mr. ARTHUR ANDREW (Oldham), referring to the practice in some towns of rating according to the gross receipts, said that in one town close to Oldham, they charged as much as 28 per cent. on the gross receipts. A portion of the Oldham supply district came within that area; and the Corporation resisted the charge, and got it reduced to about 15 per cent. of the gross receipts. In the rest of their supply district, the charge generally was on the basis of 10 per cent. of the gross receipts. But he did not think there was any fairness in charging at this rate. The rateable value ought to be ascertained in a proper way; but this was the practice in many places—it was easy for computation; and it saved a lot of bother to the rating authorities. As to the life of mains, Mr. Watts was quite right in what he stated, that the oldest main in Oldham (it was laid about 70 years ago) was the best main to-day in the district. It was 18 inches in diameter from the reservoir down to Waterhead; and then it was reduced to 13 inches to the town. On the other hand, the main from another reservoir, constructed in 1850 odd, had to be renewed last year. He believed this was a 14-inch pipe. It passed through the same streets as the other, and practically through the same ground. In this instance, he did not think the life mentioned by Mr. Bancroft was very far out. Forty years might be taken as the fair average life of a main.

Mr. T. MOLYNEUX (Stockport) thought the life given by the author for wells and adits was an argument in favour of gathering-grounds. At Stockport, they were at present thinking of increasing their supply. They had two schemes under consideration—one from wells, and the other from gathering-grounds; but personally he was in favour of the latter. He should like to know the author's experience regarding these wells, as he only put their life at 30 years. As to the life of mains, he fancied Mr. Bancroft had averaged trunk and service mains together. If so, 30 years would be approximately correct. As to making the profits the basis of rating, he wondered how this would work out in the case of an undertaking which was not allowed to make any profits at all.

Mr. C. GILBY mentioned that at Bath they had two covered service reservoirs, one of which was constructed in 1764 and the other in 1767, and they were both in use at the present time. He need scarcely say they were probably in as good condition now as when they were built. Therefore he thought that 40 years was putting the life of a service reservoir rather low. His own works were treated very badly indeed in regard to rating. They paid, and had paid for many years past, 12½ per cent. on their net receipts in rates and taxes; and when he raised the question with his Committee as to the iniquity of this, they said: "Well, don't bother about it; it is only taking money out of one pocket and putting it into another."

Mr. W. INGHAM (Torquay) gave some actual figures as to the rating of an undertaking in the North with a capital of £130,841. It would, he explained, have to be nameless, as the figures arrived at were rather favourable. First, they started with



gross receipts £9011; and the working expenses to earn these gross receipts were £1313. An estimate was made of the rates and taxes, which were included in the rent; and these were taken on an average of 4s. 6d. in the pound, which worked out to £1035. Of course, an estimate of some kind had to be made in dealing with the rates and taxes, because they had to be deducted before making the final apportionments. However, the net receipts left to divide between the tenant and the landlord were £6663. For a works of this class, it was only reasonable a tenant should require about £4000 working capital; and an allowance of 17½ per cent. upon this was £700, which left £5963. General repairs were based on three years' average, and came to £663; and renewals were put down at £700. He was not following in the same sequence as Mr. Bancroft; but he got the same results. These figures made the rateable value of the whole concern £4600. On a capital of £130,841, this gave 3½ per cent., which he thought it would be agreed was a fair return for landlord's capital. Then they came to the troublesome part of the business—that was, the separation of the productive and unproductive works. Out of the capital of £130,841, they found the unproductive works amounted to £88,670; and this, reckoned out at 3½ per cent., gave them £3103—leaving £1497 as the amount to be apportioned for productive works. The capital for productive mains and other works was £42,171. With regard to the apportionment of the £3103 (unproductive works) to the various parishes, it was based simply on the structural value of the works; but in the case of the £1497, the rateable value on the productive works, it was calculated out on the gross receipts in the parishes. As to the life of works, he thought he saw in the figures quoted by Mr. Bancroft something very similar to those the Local Government Board gave when they were lending money. With regard to unproductive mains, in one of the Gaslight and Coke Company's cases, the Judge, in summing up, gave it as his idea that the unproductive mains were the high-pressure ones. This was a very liberal way of looking at the matter, because in some districts the high-pressure mains would be worked at about 60 to 70 lbs. on the square inch; and in others at 150 lbs. The whole law of the matter seemed to be based on hypothesis alone. He thought the figures given by the author were far from being merely a hypothetical case.

Mr. W. MATTHEWS (Southampton) remarked that the President rather differed from Mr. Bancroft in saying there must be, for the purpose of rating works, an absolutely beneficial occupation. The Corporation he represented were in the position a few years ago of having established new works and abandoned old ones. Having ceased to pump at the old station, they immediately applied for a reduction in the rateable value—in fact, they claimed they were no longer entitled to be assessed at all. But they were met with the contention that these works were a stand by, which to some extent was true. Time went on, and it became certain they could not use the place; and they severed the connections between the station and the mains, so that the rating authorities might see that it could not be used. They again asked for a reduction; and the reply was: "You have still got your machinery in the building; and if we do not assess it as a pumping-station, we shall assess it as a store for machinery." Upon this the machinery was pulled out and sold. They again applied, and they were then told that, as long as they had the building as part of their undertaking, they must pay rates upon it. Far from being a beneficial occupation, the place was a positive loss to them; but they had to pay rates all the same. It was now rated as land and buildings. Mr. Priestley had asked a question as to allowances for renewals. He (Mr. Matthews) was glad to say that, within the last few weeks, he had got an allowance for renewals of 2·1 per cent.; and it had made a considerable difference to them. He agreed that it was only reasonable they should be rated at one-fourth upon trunk-mains, in the same way that railways were rated. This was a point that should be strongly urged before the Association of Municipal Corporations. As to the life of works, Mr. Ingham had cut at the verge of the question when he said that in the case of a corporation borrowing money, Parliament or the Local Government Board said they should repay the money by way of a sinking fund over a certain number of years; and therefore they had to set by, in the way of a renewal fund, a certain sum of money. When they went before the Assessment Commissioners, and stated that they put this sum of money away for the purpose of renewing their perishable works, it seemed to him no set of valuers could come in and say that it was not a fair way. Then they had to face the question when it came to a company. If a company were doing as they ought to be doing, they would be setting aside a sum of money every year into a proper renewal fund. Unless they could show, when they came before an Assessment Committee, that they were putting a sum of money by in this way, they did not get anything allowed. He had no sympathy with them; and he did not think they ought to be allowed for perishable works, if they did not set aside a sum for the purpose. It appeared to him the thing was settled in principle in the case of the local bodies by the amount they were compelled to set aside, and in the case of companies by the amount they did set aside. Therefore he did not think the actual life of the plant was a very serious matter from the purely rating point of view. He was afraid he should not have very much faith in going to the Assessment Commissioners for an abatement on a covered reservoir.

Mr. W. JONES (Pontypridd) spoke of the inconsistency of

rating authorities, especially when they themselves were adversely affected. For some years, he said, the Company he represented supplied a workhouse through a meter; but in consequence of a recent decision of the High Court, the Clerk of the authority gave him notice that henceforth he would expect to be supplied like any other house within the district, considering he was entitled to the usual rate for domestic supply. This to the Company meant a serious loss; but on looking up the rateable value of the workhouse, they found it was simply a nominal sum. This was pointed out to the Clerk; but he said the question of the rating of the workhouse was a matter for the whole Union, so that it did not much matter whether it was high or low. To them as a Water Company it was very important; and so he told the Clerk that, unless he accepted the Company's terms, they should oppose the rateable value of the premises at the next Quarter Sessions, in order to, if possible, receive a fair return for their service to the authority. The Clerk saw danger at once; and the danger was this—that it would not only apply to the poor rates, but to the other rates as well. When he saw the position the Company were taking up, he assented to the old system for a time; but the present arrangement was that the authority had agreed to pay a certain sum for supplying the workhouse. He hoped the paper would tend to bring about, if possible, a standard of rating for water-works throughout the country—at any rate a little more consistency in the valuations of experts.

Mr. A. WELLS (Lewes) stated that his works had been re-assessed this year; and they had succeeded in getting their covered reservoirs assessed at one-fourth. This related to three reservoirs.

Mr. C. SAINTY (Windsor) said the paper appealed to him at the present time as their undertaking was in three parishes. One District Council had instructed a professional valuer to re-assess their works; and, consequently, this good gentleman came down and doubled their assessment. He (Mr. Sainty) wrote and asked him upon what he based his great increase; and his reply was: "That is a point I really cannot answer. The question is too straight for me; and it has been decided in the House of Lords that we cannot give you any instructions as to the basis upon which we make our valuation." He valued one of their islands, which was in use—for one thing it helped to guide the water into their stream which assisted them with their water power. To his (Mr. Sainty's) great astonishment, the assessment at this particular point was doubled. He wrote asking the valuer why, and the answer was the one he had referred to.

Mr. JOHN SHAW (Boston) said his experience was that there was nothing more difficult for a water-works engineer to preserve his consistency in than in this question of rating. If he was not present as the Manager of the Boston Water Company, he might venture to put the matter from the other point of view, and show that in most cases the rating was perfectly fair. He had had to do with the rating of three different companies whom he had been with; and, unfortunately, they had had different styles of rating. At some length, he commented on the system of rating in the case of companies; and, proceeding, he said Mr. Bancroft had stated that one Act which defined the amount of the gross value was the Valuation (Metropolis) Act of 1869. His (Mr. Shaw's) impression was that it only applied to the Metropolis; but it might be a guide all over the country. In the county of London, he believed the calculation was somewhere about five-sixths of the net value as the rateable value; whereas going over the border into Essex, he believed the valuation there was somewhere about four-fifths; and in the town in which he lived the Assessment Committee put the valuation of property as three-fourths of the annual value. But the Gas Company, the Water Company, and the Railway Company were assessed up to the full annual value. Assessors were brought in to assess the works of the three Companies; and their terms for making the re-assessment were 1 per cent. on the increased rateable value which they could maintain before a Court. At that time, the total amount of rates and taxes of the Water Company were £125 a year, including income-tax. He had no doubt they were then greatly under-assessed; but the next year the rates and taxes jumped up to above £470. When they had a revenue of £3550, the rates and taxes came to £523, which was rather over 12½ per cent. of the net takings. Mr. Shaw also spoke of his later experiences, and of the divergencies in the systems adopted by the valuers. In the case of local authorities, he thought that it would be fair to allow in their working expenses the amount paid as interest upon the water-works loan.

Mr. H. ASHTON HILL (Birmingham) said in connection with the question as to the desirability of some practical steps being taken to bring water-mains into the same category as railway lines, he might mention this little fact: When the Company with which he was associated was first established, the Engineer of the railway was also the Engineer of the Water Company; and he very conveniently ran the two things together. The railway became incorporated in the London and North-Western Company; but to this day they had for a distance of about 20 miles a 24 inch pumping-main, passing from 4 to 5 million gallons of water a day, running along the railway on the top of an embankment. He would not recommend water engineers to copy this example; for about three years ago the main burst, and they had the rather startling spectacle of seeing the railway lines



suspended over a channel in mid air. This showed that the running of a main in this way was not advisable; but as a matter of fact, it was evident that at the time it was considered that the water-main and the railway lines were of a kindred nature. Mr. Matthews had been very strong on the point as to water companies being obliged to form a renewal fund. It was not usually considered to be necessary; and he would submit that a renewal fund was simply a "balancing reservoir." They put into it out of the revenue; and they took out of it for extraordinary extensions—renewals really. That was to say, supposing they spent £1000 on the renewal of the mains in a year. They had to provide for that, and had to take the £1000 from the revenue, and put it into the renewal fund; and then they took it out of the renewal fund, and spent it on the mains. If they took the £1000 straight out of the revenue, and paid direct for the works, it made no difference. If they relied upon the renewal of mains costing on an average £1000 a year, that was all they wanted in the way of renewal fund. The only thing was that sometimes it might cost £5000 in one year; and therefore they required a "reservoir." If a few thousand pounds were carried over, instead of distributing it in dividend, this would answer the purpose. Regarding the reference to the rating and supply of workhouses, he would point out that they were not bound by the poor-law assessment. If they did not like it, they could get a valuation made, and the rate fixed before Justices at what it ought to be. On the general question, he said in his previous experience, it was the practice of the assistant overseers not to rate portions of his premises. He used to give them particulars from time to time of the parts that were beneficially occupied. New works, reservoirs, and so on, they did not pretend to rate; but they gave them an idea of the date when they began to benefit from them. He agreed that this question of rating might be reduced to some system, without cutting it too finely.

Mr. MATTHEWS wished to correct an erroneous impression in Mr. Hill's mind as to what he meant by renewals. He should be the last to object in the case of one company who were consistently renewing perishable works out of revenue. What he did object to was where a company consistently did renewals out of fresh capital, and had no renewal fund at all.

Mr. BANCROFT, in reply, said he had been somewhat criticized as to the life he gave to various works; but he was afraid those members who had claimed such longevity for particular sections of their works would find they had given themselves somewhat away when they went to get their assessments reduced. He adhered strictly to his figures, in which the *useful* life of the works was fairly averaged. One speaker had asked him to give his view as to wells and adits; but every case must be considered solely upon its merits. He knew of one instance in which, owing to the gradual fall of the water-level in a district, adits that were of the utmost value twenty years ago were now perfectly dry. The life of that work, as adits, had ceased; and thirty years would have been too long to allow. The life depended entirely upon the character of the work, and the district in which it was constructed. With reference to a reservoir not being in use, that was a little confusion of terms. It must be beneficially occupied before it could be rated. Whether it was in use or not had nothing to do with the question. It might be simply a stand-by in case of need; and in that case it was certainly beneficially occupied. As to the 17½ per cent. allowed to the tenant as his share, it depended entirely on the money market for one thing whether the risk in that particular district warranted him in getting his 2½ per cent., and whether 5 per cent. was a fair percentage for his capital. Mr. Griffith had suggested that the rating of water-works should be done away with. He (Mr. Bancroft) was afraid that would not come to pass. In cases where the works were entirely in one district, which was supplied and benefited by the works, there would, of course, be no hardship; but in the case of a large extensive works in a district supplying another district, and entirely separate, and subject to different conditions, it would be a considerable hardship in one case, and a financial benefit in the other. Mr. Greenslade had mentioned a comparison of the rating per mile of water-main in different parishes. Comparisons of parishes were no guide whatever. They must go upon the rating in a systematic manner. Whether it came to more or less, there was a proper way to arrive at a particular rate in one parish; but to compare that with any other parish was no argument whatever. It might be too high or too low an assessment; but it was no use going before an Assessment Committee or other authority with simply a comparison of other parishes. As to covered reservoirs, whether they were entitled to be rated at one-fourth of their value was a matter upon which he preferred not to give an opinion. Mr. Andrew had mentioned rating on gross receipts. In taking similar undertakings, it might be possible to arrive at a percentage—15, 12½, or 10, whatever it might be—of the gross receipts that would be a fair amount for the net rateable value. But such a figure could not possibly be applied to all water undertakings. Circumstances would vary; and they must be treated in a systematic method, and no rule-of-thumb could possibly avail in all cases. As to the rating of corporation works, and the payment of rates being simply a question of taking money out of one pocket and putting it into another, he said that whether the works were gas, water, or electricity, they could not afford to have them subjected to the bolstering up of other undertakings. Let every undertaking, he said, whether it was conducted at a profit or at a loss, stand entirely on its own

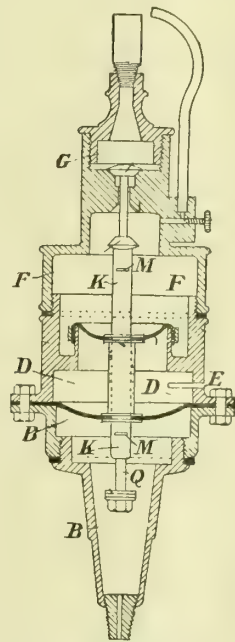
merits, so that every one could see how it was conducted. Mr. Shaw had stated that the rateable value depended upon which side they were on. As scientific men they ought to object very strongly to that view; and they ought to take the view put forward by Mr. Hill—that they should not strain too finely for advantage. As to Mr. Matthews's remarks about abandoned works, he (Mr. Bancroft) undoubtedly thought that works that had become obsolete and abandoned, should not be rated as water-works. Whether a corporation or company put on one side a renewal fund, as a matter of fact had nothing whatever to do with arriving at the rateable value. Under the definitions of the Acts, the landlord was entitled to be allowed, whether he did it or not, so much per cent. to renew perishable parts of his works to the end of their life; and therefore it was not a question they could go into as to whether or not it was actually done in practice.

A cordial vote of thanks was passed to Mr. Bancroft for his very useful contribution.

## REGISTER OF PATENTS.

**Governor and Self-Igniting Gas-Burner.**—Hardy, J. T., of Norton Woodseats, Derbyshire. No. 9390; May 4, 1899.

This apparatus consists of a metallic casing, divided into several compartments. Immediately above the supply-chamber B is an "atmospheric chamber" D, open to the air through a slit or inlet E in the casing. The chamber F above is a "regulating chamber." The fourth and last chamber G is the "burner-chamber."



The chamber B is separated from D by a flexible oil-dressed leather diaphragm; and the chamber D is also separated from F by a similar diaphragm, which, however, contains only half the area of the first. The chamber F is separated from the burner-chamber by a division, in which is provided a central passage with a double-faced valve-seat. Passing through the diaphragms, is a hollow metallic tube K, closed at both ends, but apertures M are provided through which the gas can pass from the chamber B into the chamber F. At the top end of the tube is provided a stalk carrying two conical valves, the apexes of the cones facing each other. The lower end of the tube is furnished with a stalk G, on to which may be secured a number of discs or weights. Alongside the burner is placed a pilot-jet, attached to an ignition-tube, which passes into the chamber F.

Having adjusted the weights on the spindle Q to the night pressure in vogue, it will be found that during the day time, when under low pressure, the weights cause the tube K to fall until the upper valve closes upon its seat, and cuts off the supply of gas to the burner. The supply to the pilot-jet, however, is provided for from the chamber F, which is always in communication with the supply-chamber B, through the tube, so that during the day the pilot-jet only remains lighted. When the night pressure is turned on, the lower diaphragm is forced upwards; and being of so much larger area than the upper one, the tube K, with its valves, is raised. As soon as the upper valve is opened, the gas from the regulating chamber F passes to the burner, and is ignited by the pilot-jet. The lower valve is so placed on the stalk that under normal pressure it does not reduce the opening between the chambers F and G; but if the pressure became abnormal, then it would reduce the opening in proportion to the pressure, and so regulate the supply of gas to the burner. But at no time would it entirely close the orifice; this only being effected by the top valve when under day pressure.

**Incandescing Media for Lighting Purposes.**—Langhans, R., of Berlin. No. 12,950; June 21, 1899.

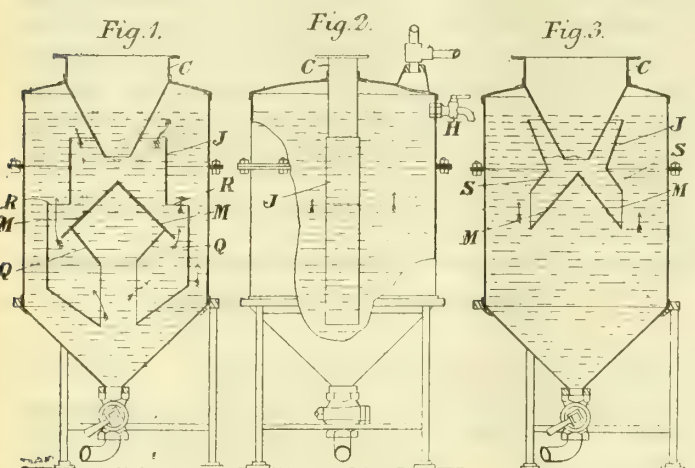
This invention relates to "the manufacture of mineral structures for use with incandescent burners, as the incandescent bodies thereof or as the skeletons or foundations of such bodies," by impregnating a combustible fibrous structure with a solution of mineral salts, drying the impregnated fibrous structure, burning the fibre, and exposing the mineral structure left behind to the action of an intensely hot flame in the usual well-known manner. The improvements consist in impregnating the fibrous structure with a fluid prepared from compounds reducible to oxides by the action of heat—such as nitrates of thorium, an alkaline metal, and zirconium, together with silicic acid, and a cerium compound, such as cerium nitrate—in such quantitative relation that the elements silicon and zirconium are present each in the proportion of one molecular weight (slightly more or less), and the element thorium in the proportion of at least eight molecular weights for the incandescent body, and of at least four molecular weights for the skeleton; the proportion of cerium being such that the amount of ceria present in the mineral structure left behind on burning the fibre will not be materially greater than 1 per cent. of the thorium then present. A modification of this manufacture consists in adding to the fluid named "a compound reducible to oxide by the action of heat, of an alkaline earth metal of the type RO or of thallium, particularly compounds of beryllium;" the proportion of alkaline earth metal or thallium introduced being "not materially greater than two molecular weights."

**Acetylene Generators.**—Husson, A., of Parrentury, Switzerland. No. 13,145; June 24, 1899.

This invention relates to acetylene generators of the type in which the carbide is allowed to fall into a vessel containing water. The objects



aimed at are : To dispense with all mechanism for feeding the carbide into the generator ; to dispense with the perforated discs or trays generally used to receive the carbide ; to prevent the gas generated escaping through the charging-orifice by means of the water contained in the generator ; and to shape the bottom of the generator and the charging-hopper in such a manner that the waste material and water are easily removed from the generator.



Figs. 1 and 2 are sections of the generator at right angles to each other. Fig. 3 is a section of a similar generator, but having the bottom of the casing inclined in the opposite direction.

The generator has a domed cover and a conical or tapered bottom, fitted with a cock, to enable the waste water and other material to be run off or blown out when necessary. The internal casing J is narrower at the top than at the bottom ; the sides of the casing extending from a little above the bottom of the hopper C to within a short distance of the bottom of the main vessel—the casing being open, not only at the top, but also about half way up the ends. In some instances, instead of the bottom of the casing J being approximately parallel to the bottom of the main vessel, it may be inclined in the opposite direction (as shown by fig. 3) ; and instead of having one central opening in the bottom, orifices may be formed at the sides. The bottom then forms inclined planes M, which may, if desired, have other inclined planes or baffles S parallel to them, so as to form shoots having their mouths vertical, or slightly inclined towards the hopper C.

The action of the apparatus is as follows : The main vessel is filled with water to the level of the cock H. The carbide is charged into the hopper C, and falls through the water on to the inclined planes M, and thence to the inclined bottom of the vessel. The gas generated escapes mainly past the outside of the casing J to the surface of the water in the main vessel, and collects under the cover, whence it is drawn off. The gas which ascends into the casing is deflected outwards by the baffles Q, and escapes through the orifices R and top of the casing ; the gas always tending to take the shortest path to the surface of the water. If the shoots shown in fig. 3 are used, instead of the baffles Q, any gas striking the bottom of the shoots is deflected upwards, and no gas enters the shoots, as the mouths are vertical or only slightly inclined inwards at the top, and the gas thus rises vertically to the surface of the water.

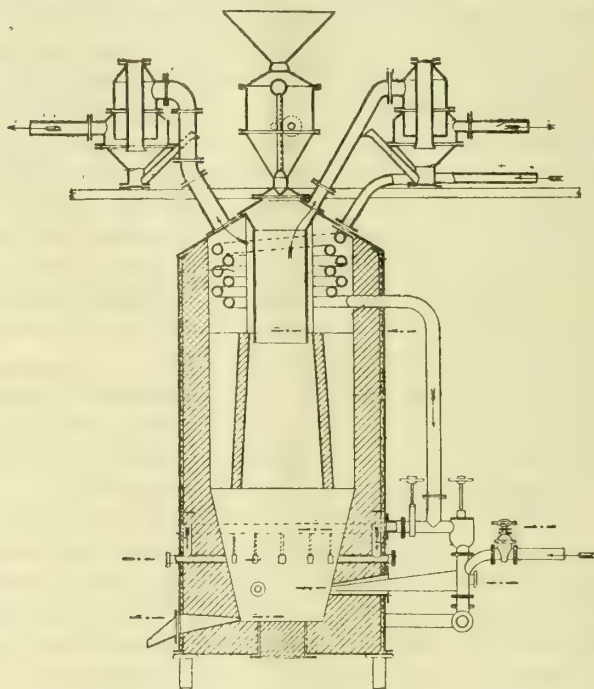
**Incandescent Gas-Burners.**—Tatham, J. E., of Brixton, S.W., and Cope, J. L., of Drury Lane, W.C. No. 14,023 ; July 7, 1899.

It is the object of this invention to provide means whereby with a minimum consumption of gas, and at pressure varying from 5-10ths to 10-10ths, a flame of such a temperature is produced as to give a proper lighting effect, with any ordinary type of incandescent mantle. The gas-inlet (as shown) terminates in a nozzle situated in a mixing chamber, into which air-ports open. In this chamber, the air and gas become mixed and pass upwards through pipes to the gauze at the top, where the mixture is ignited. The air-ports are made so as to have an upward direction ; the angle of the ports being about the same as the angle of the exterior of the gas-nozzle. About an angle of 30° to the axis of the burner is said to give the best results, and the distance of the opening of the gas-nozzle above the upper side of the air-ports should be about  $\frac{1}{4}$  inch. The tubes above the mixing-chamber are arranged so as to be raised and lowered on one another, and be fixed in position by a set-screw. The height of the gas-nozzle can also be regulated by screwing it out from, or into, the mixing-chamber, and fixing it in position by a set-screw. "Hit-and-miss" air-openings are also employed, which can be regulated by rotating the upper part of the mixing-chamber upon the lower part—a set-screw fixing the parts in their adjusted position.

**Manufacture of Water Gas.**—Imray, O. ; a communication from the Gesellschaft für Lindes Eismaschinen, of Wiesbaden, Germany. No. 14,239 ; July 10, 1899.

In the manufacture of gas by distilling it from mineral coal (the patentees point out), the production of coke necessitates repeated interruptions of the working for charging and discharging the retorts, and the extraction of the bye-products requires special devices ; while in the direct production of gas without the distillation of carboniferous substances, the gases are obtained mostly from the non-volatile constituents, if by incomplete combustion of the materials, or with addition of steam

for the production of water gas. In the latter cases, the large proportion of nitrogen in the air introduced for combustion constitutes a very great quantity of useless incombustible gas, which either reduces the calorific power of the useful gas or, as in certain processes, has to be separated. This involves great difficulty in the working—reducing the production of valuable products and of bye-products. To obviate these difficulties, Herr Andrae, of Vienna, has proposed improvements in the production of gas "which, however, have not given satisfactory results." According to his proposals, first, the heat for manufacturing gas is produced by using atmospheric air very rich in oxygen ; and the heated coke decomposes the steam afterwards introduced. This necessitates, as in most apparatus for producing water gas, a regular change of the working, so that at least two separate plants having vertical retorts must be coupled together. Each single apparatus of the Andrae type, however, continuously produces gas ; but during the alternating periods of hot and cold blowing, gases of very low value are obtained during the one period, and it is only in the other period that water gas of high value is secured.



The present invention has for its object a simplified process and apparatus for the continuous manufacture of "highly valuable water gas ;" single shaft-furnaces being employed. By this process, there is a continual production of gases and a complete gasification, without distillation, of the carbonaceous substances ; "all the volatile bye-products being utilized, and the production of useless gases being greatly reduced." These results are obtained by employing atmospheric air freed from most of its nitrogen, and at the same time introducing superheated steam into the zone of gasification. The two periods of the hot and cold blowing in the process of Andrae, the effects of which are so sharply distinguishable from each other, are said to be avoided in this process, which is continuous ; and the temperature of the combustion produced by the blast rich in oxygen is so high that the immediate admixture of steam to take up heat is necessary. But the temperature is nevertheless so high that it allows of other special admissions of steam into the boshes situated above the hearth ; and thus the durability of the structure of the gasification chamber is considerably increased.

In this process, where air rich in oxygen is used, illuminating gas is produced in the retort ; but, in contradistinction to the Andrae process, a gas consisting of carbonic oxide and hydrogen, and a little nitrogen, is regularly produced in the gasifying chamber. A generator similar to a cupola or shaft-furnace (as illustrated) is employed in carrying out the process. The generator is supported by an iron ring, and is enclosed in a gas-tight casing of sheet-metal, closed at the top by an annular sheet-metal lid, capable of expanding when heated. The casing is lined with refractory material, as shown. The furnace contains a retort widened at the bottom, and around which flow the gases ascending from the boshes and hearth into circularly arranged vertical flues, and into an annular space above ; the gases being taken off from the charge in the usual way. The lower part of the wall of the retort is made of refractory material, and likewise the part which carries it and forms the flues.

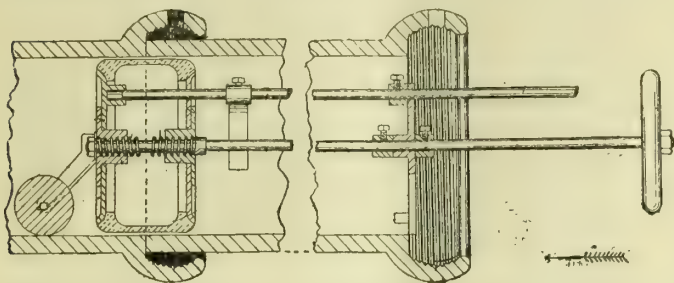
**Jointing and Stopping of Pipes or Mains.**—Morley, W., of Keighley, and Barker, P. W., of Bradford. No. 15,388 ; July 27, 1899.

This invention relates to apparatus for forming the joints of pipes or mains, "whereby such joints are rendered more thoroughly water-tight and more free from undesirable cavities and obstructions, which afford lodgment for objectionable matter, than they have been as heretofore formed or produced ; while the line or series of pipes are at all times brought into perfect concentricity with each other, with the resultant advantages well understood."

In carrying the invention into effect, the patentees make use of an annular piece of india-rubber, leather, or other flexible material (as shown), of a size somewhat approximating that of the internal diameter of the pipes to be joined. This annular pipe is secured between two discs mounted upon a screwed shaft (the screws of which preferably lead in opposite directions—that is, one screw is right hand and the other left hand), so that as the shaft is rotated, the discs approach each other, and force the annular rubber radially to assume a larger diameter and press upon the inner walls of the pipes, where the jointing of one pipe to the other is being effected. Then plastic semi-liquid binding substance (coal-tar and sulphur boiled together, with any other material—as sand, saw



dust, cork dust, or the like, for thickening or bringing same into a less fluid state) is poured into the annular cavity formed by the spigot and socket ends of the pipes; its passage through the joining to the interior of the pipe being stopped by the flexible annular piece, although the piece will



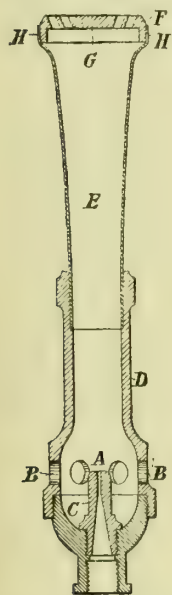
allow it to flow and fill any irregular internal openings that are not covered by it. After the binding substance is run into position, the screwed bar is rotated to cause the discs to move apart, and so free the annular piece as to enable its easy withdrawal.

To secure concentricity of the screwed shaft and the pipes, a guide-roller is mounted on the shaft, on the discs, for contact with the inner walls of the pipes, so as to hold the screwed shaft in position while it is being rotated. A handle is secured to the shaft, as is also a gauge-piece (which likewise acts as a bearing) to enable the rotating of the screwed shaft and its mounting in proper position for the annular piece to be brought into proximity with the joint and so form same as desired.

#### Incandescent Gas Lighting Burner.—Sugg, W. T., of Westminster. No. 15,521; July 28, 1899.

This invention relates to a burner for incandescent gas lighting, consisting of a circular chamber having holes in its walls, and a tubular extension surmounted by a trumpet-mouthed tube, in combination with a gas-nozzle of coned section internally, leading up to a long outlet-passage with parallel walls, and a disc-burner held in the enlarged mouth of a burner-tube by spring tongues—the disc having a central solid portion surrounded by holes, the axes of which are at an angle from the vertical. It is one of the elements of the combination that was described in patent No. 23,398 of 1899—see "JOURNAL" for May 29, p. 1441.

Explaining his proposal, the patentee remarks in his specification: "In incandescent gas lighting, it is well known that an atmospheric burner is required to produce a flame of the necessary quality to cause the incandescence of the mantle. It has hitherto been thought that, in order to obtain the best results, a thorough and complete mixture of the gas and air must be effected before they reach the burner; and so all improvements made in these burners have been with a view to ensure this complete mixture, either by causing eddies in the mixing chamber or otherwise. By a series of experiments, I have found that, however successful the mixing may be, the illuminating power of the light is only slightly, if at all, increased; and therefore I have come to the conclusion that, if any increase in the illuminating power is to be obtained in incandescent lighting, it must be looked for in quite another direction. According to my view, the brilliancy of the light does not depend on the thorough mixture of the air and gas, as hitherto suggested, but on their admission to the mantle at a high velocity, and in proper proportions to produce, under the influence of the heat evolved, an illuminant of great illuminating power. It must not be assumed, from the above remark, that I do not mix the air and gas, as such is not the case—a heating flame must necessarily consist of air and gas mixed in proper proportions; but what I wish to convey is that I make no special arrangement for producing the mixture before it is actually required. On the contrary, I delay the mixing—until the last moment, as will be presently more fully explained. Now, in the burners as hitherto constructed, no attempt seems to have been made to ensure that the current of gas issuing from the injector shall reach the point of ignition accompanied by a proper volume of air, without its speed being unduly retarded. On the contrary, everything appears to have been done to retard the velocity of the gas and air, in order to effect the so-called mixture; and thus the brilliancy of the light suffers considerably in consequence. In carrying out my invention, I employ a gas-injector of steatite; but I make the gas-passage of considerable length comparatively, and quite smooth, and thus I prevent the usual hissing noise, and give a true direction to the jet of gas. The gas should be under pressure, to get any result at all in incandescent gas lighting; and I have found that a pressure of from 9 to 10 inches gives the most satisfactory results. The speed at which the gas is flowing will draw in the requisite quantity of air, and will, at the same time, give to the air an equivalent speed. The burner consists of a length of tube, at one end of which is the gas-nozzle or injector, and at the other end a piece of reticulated or perforated material, which constitutes the burner proper. This material is preferably steatite, in the form of a flat disc, having a ring or rings of holes, according to the size of the burner—the holes being bored at a slight angle, so as to give an outward direction to the gas and air issuing therefrom. The centre of the disc is solid; and the stream of gas issuing from the injector will impinge upon it, and will be made to spread. The velocity of the gas will thus be arrested; but as, in spreading, it comes into contact with the currents of air which are passing out through the holes, the velocity of which has been given them by the flow of the gas, the velocity of the gas will be restored. Thus, a mixture of the air and gas is effected at the point of ignition, and this mixture becomes an illuminant of extremely high illuminating power—possessing great affinity for the oxygen of the air, and giving an in-

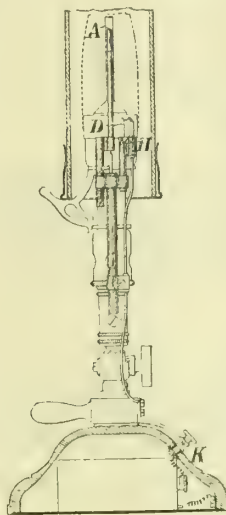


tensely brilliant light. The gas has, by these means, a free flow direct to the point of ignition, irrespective of the currents of air; it draws in the proper quantity of air; a mixing, so called, takes place, practically at the point of ignition; and the velocity of both air and gas are maintained, so that they are admitted to the mantle at a high velocity. The highest illuminating power coincides with great velocity of gas and air at an appreciable pressure at the point of ignition."

The action of the burner shown is as follows: The gas issuing from the nozzle C forms a column of gas, which, having a clear and uninterrupted flow, strikes against the solid part G of the burner proper F. As the gas rises (and according to its velocity) it draws in, through the holes B, the air, which forms a tube or sleeve of air round the column of gas, but does not mix therewith. The air thus attains a velocity equal, or nearly equal, to that of the gas. When the gas strikes the solid part G of the burner F, its velocity is arrested, and it is caused to spread. It is thus thrown outward into contact with the upwardly rushing current of air, and is carried with it through the holes in the burner. The gas and air, which have become heated by contact with the burner, thus practically mix at the point of ignition, and the flame, by reason of the inclined axes of the holes, is thrown outwards on to the mantle.

Means for Lighting Gas.—Borchardt, H., of Berlin. No. 7015; April 14, 1900.

This invention relates to means for lighting gas by electricity, wherein the main flame is ignited by an auxiliary flame which, after effecting the ignition of the main flame, becomes extinguished. The gas to form the auxiliary flame is ignited by means of a thin platinum wire on one side of the burner, outside the area affected by the heat of the main flame, and adapted to be heated to incandescence by the combined action of an electric current and gas. But, after the main jet has been ignited, the platinum wire does not continue in the incandescent state, as the auxiliary flame goes out the instant the main jet is ignited—the gas supply to the igniting burner being cut off.



There is an expandable body A arranged within a porcelain carrier or sleeve, through which the gas-valve within the burner-body is operated the moment it comes under the control of the auxiliary or igniting flame. Over the burner H of the latter is arranged a thin platinum wire D, in such a position that it is outside the heat-area of the main flame, on one side of the burner. The platinum wire is electrically connected with a cell or battery within the base of the lamp, while its lower end is electrically connected with the igniting burner. The battery is electrically connected with the body of the lamp, and also consequently with the igniting burner; while at the same time a contact K is placed (say) on the lamp-base, as shown. Upon the gas supply being turned on, the circuit is closed by means of this contact, whereby the platinum wire is subjected to the simultaneous influence of the gas escaping from the igniting jet and the weak current supplied from the battery, under the action of which it becomes incandescent and ignites the auxiliary jet. But the moment the gas-valve in the burner opens, the supply of gas to the auxiliary jet is cut off; so that the auxiliary flame is extinguished the instant the main flame is ignited. The result is that, after the main flame has been ignited, the platinum wire ceases to be incandescent, even should the electrical contact be maintained "inasmuch as without the co-operation of the gas, the electrical current of reduced power is incapable of maintaining the wire in the state of incandescence."

#### Self-Lighting Gas-Burners.—Thompson, W. P.; a communication from A. Simonine, of Brooklyn, U.S.A. No. 7595; April 24, 1900.

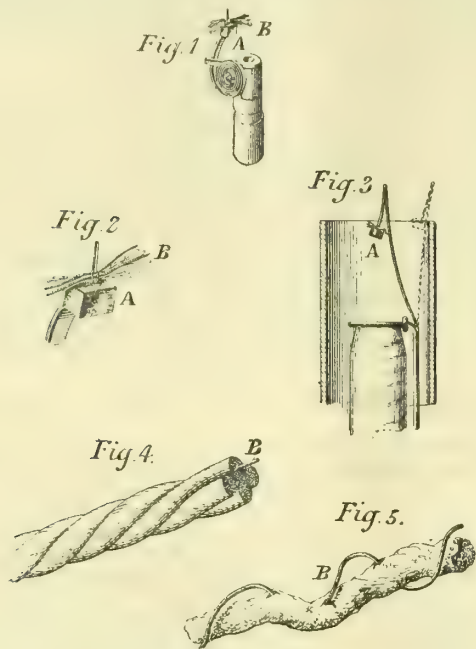
The present invention comprises "the combination of a preliminary heater, the essential part of which consists of platinum black, capable of absorbing and condensing gases or vapours, and thereby cause to glow a second or intermediate heater consisting of metallic platinum sponge or very porous metallic platinum or other metal of the platinum group which absorbs a certain degree of heat from the preliminary heater, and in doing so becomes active, igniting the gas under certain circumstances, or heating up under other circumstances a third member or igniter, which in and of itself is incapable of becoming active, but which when heated by the intermediate heater, will become active and highly incandescent, finally igniting the gas."

Fig. 1 (next page) is a view of an open burner showing the invention applied. Fig. 2 is an enlarged view of the igniter proper. Fig. 3 is a view showing the invention adapted to ignite the gas in an incandescent mantle. Fig. 4 is an enlarged detail view of one of the strands or threads before it is burned. Fig. 5 is a similar view of the strand after it has been burned.

The preliminary heater A is composed largely of platinum black. The secondary or intermediate heater may be prepared in the following manner: A cotton thread which has a very fine platinum wire embodied in it (as B, fig. 4) is impregnated with a solution of platinum chloride. After drying, the cotton is burned out, and the wire is left coated with a covering of porous platinum. If a strong solution is used, then it often occurs that the platinum wire is surrounded by, or forms a support for, a mass of spongy platinum, as in fig. 5, which shows the incinerated thread. The degree of covering of porous platinum formed upon the wire, and the amount of spongy platinum which is left after the thread has been incinerated, are dependent upon the concentration of the solution used; and, in like manner, and to a like degree and extent, the ultimate capabilities of the thread or wire thus formed are affected. For instance (says the patentee), if the solution be not too concentrated, and the porous covering is consequently thin, the thread will act as an igniter direct; but should the solution be quite concentrated, then the coating is thick and heavy, and the thread is incapable of the action which will bring



about an ignition of the gas. In other words, it will not become heated to a sufficient degree to ignite the gas, and can then act only as an intermediate heater to take up the glow from the pill of platinum black and transfer it to the igniter proper.



The construction shown in figs. 1 and 2 embodies the thermostatic device for carrying the lighter out of the path of the flame after the gas has been ignited; but the lighter is, of course, returned to the position where it will be in the path of the issuing gas, after the flame is extinguished and the thermostatic device becomes cool. This, however, forms no part of the present invention, and is simply shown for the purpose of illustrating the working of the device.

#### APPLICATIONS FOR LETTERS PATENT.

- 11,031.—NICHOLAS, J., "Producing oil and gas." June 18.  
 11,038.—KÖRTING, E., "Internal combustion engines." June 18.  
 11,057-60.—BEAUMONT, F. J., "Atmospheric gas-burners." June 18.  
 11,124.—WIGLEY, P., and ARCLUS, E. A., "Incandescent gas-lamps." June 19.  
 11,141.—THE NEW SUNLIGHT INCANDESCENT COMPANY, LTD., and LEWES, G. H., "Incandescent mantles." June 19.  
 11,158.—FORRESTER, S., "Gas-engines." June 20.  
 11,247.—HEYS, W. G., "Internal combustion engines." A communication from J. J. Heilmann. June 21.  
 11,261.—NOWMAN, J., "Mantles for incandescent gas lighting." June 21.  
 11,268.—GORE, J., "Compressing gas or air." June 21.  
 11,270.—DOWLE, A. G., "Illuminant appliance for use with gas or oil burners." June 21.  
 11,283.—WILLANS and ROBINSON, LTD., and POWEL, H. C., "Gas-engines." June 21.  
 11,296.—CONOVER, C. F., "Cooling attachments for condensers." June 21.  
 11,314-15-18-19.—GARDNER, E., T. H., & L., "Internal combustion engines." June 22.  
 11,326.—BIRTWISTLE, R., trading as S. S. STOTT and Co., "Elevators and conveyors." June 22.  
 11,350.—BORCH, S. O., "Mixture of carbide of calcium for illuminating purposes." A communication from O. Borch and L. P. Hvild. June 22.  
 11,369.—DELIN, G., "Burners for incandescent gas lighting." June 22.  
 11,385.—BRAY, J. W., "Acetylene gas-burners." June 23.  
 11,408.—WILKINSON, J., "Treating atmospheric air with the vapours of hydrocarbon oils, and utilizing the product for obtaining light, heat, and power." June 23.

**The Price of Gas at Leeds.**—At the meeting of the Leeds City Council to-morrow, Mr. Ratcliffe will move that the resolution passed at the last meeting, increasing the price of gas from 2s. to 2s. 3d. per 1000 cubic feet from July 1, be rescinded, and that the advance should not take place until the 1st of January next. The abnormal prices the Gas Committee are obtaining for residuals, Mr. Ratcliffe maintains, will enable them to fully pay their way, in view of the stock of coal they have in hand, to the end of the year, "without robbing the gas consumer."

**The Totnes Town Council and the Gas Company.**—Further discussion took place at a meeting of the Totnes Town Council last Tuesday respecting the complaint of the advance of 1s. per 1000 cubic feet in the price of gas. The Town Clerk read a letter from the Manager of the Gas Company (Mr. S. Samuel), stating that the Directors had resolved to await the result of the next quarter's consumption, after which the question of concession or reduction (if any) would be further considered. The Mayor (Mr. Windeatt) said he and another member of the Council waited on the Directors as requested. They were met most courteously by the Chairman; but one of the other Directors challenged their right to "dictate" to the Company. They put it to the Directors that the advance of 1s. was excessive, and out of proportion to the increase in other towns, and that a public company with no statutory rights, and dependent upon the local authority for facilities for conducting their business, should regard themselves as not existing entirely for the benefit of the shareholders. They asked them to reduce the increased price, and to allow a discount to large consumers and those who paid promptly. The Directors promised to consider the matter. They had therefore better now await the result of the Directors' deliberations.

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following progress was made with Private Bills last week:—

Bills read the first time, and referred to the Examiners: Gas Provisional Order (No. 3) Bill, Oldham Corporation Bill.

Bill read a second time: Gas Provisional Order (No. 3) Bill.

Bills read a second time and committed: British Gaslight Company (Staffordshire Potteries) Bill, Gaslight and Coke, Commercial Gas, and South Metropolitan Gas Companies Bill, Lambeth Water Bill, Local Government Provisional Orders (Gas) Bill, Mid-Kent Water Bill, Portland Urban District Council Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, St. Albans Water Bill, South Metropolitan Gas Bill, Wandsworth and Putney Gas Bill.

Bills reported: Bedford Gas Bill, British Gaslight Company (Staffordshire Potteries) Bill, Local Government Provisional Orders (Gas) Bill.

Bills reported, with amendments: Airdrie, Coatbridge, and District Water Trust Bill, Hartlepool Gas and Water Bill, Morley Corporation Bill, North Warwickshire Water Bill, Wolverhampton Gas Bill, Woodbridge District Water Bill.

Bills read the third time and passed: Local Government Provisional Orders (Gas) Bill, Morecambe Urban District Council (Gas) Bill, North Warwickshire Water Bill, Water Orders Confirmation Bill.

Bills Royal Assented: Cleethorpes Gas Bill, Dorking Water Bill, Fishguard Water and Gas Bill, Glastonbury Corporation Gas Bill, Higham Ferrers Water Bill, Maidenhead Gas Bill, Menstone Water (Transfer) Bill, Newtown and Llanllwchaearn Urban District Gas Bill, Otley Urban District Council Water Bill, Southport Water Bill.

The Standing Orders Committee reported on Tuesday that the Standing Orders not complied with in respect of the South Metropolitan Gas Bill ought to be dispensed with, and the Bill allowed to proceed. This was agreed to.

Petitions have been presented against the following Bills: Lambeth Water Bill, Mid-Kent Water Bill, Portland Urban District Council Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, South Metropolitan Gas Bill (19 petitions from Local Authorities), Wandsworth and Putney Gas Bill.

### HOUSE OF COMMONS.

Monday, June 25.

#### THE GASLIGHT AND COKE COMPANY'S CHARGES.

Mr. PICKERSGILL, in accordance with the notice given by him on the previous Thursday, asked the Secretary of State for the Home Department whether his attention had been called to the fact that the Gaslight and Coke Company had just issued notices to their consumers raising the price of gas to 3s. 5d. per 1000 cubic feet, and that these notices stated that the enhanced price would be charged from the date of recording meter indices for the June quarter—the Company thus claiming to charge the enhanced rate for gas consumed during a week or ten days, or even longer, before the notices were served; and whether he would exercise the powers vested in him by section 45 of the Metropolis Gas Act, 1860, which (*inter alia*) provided that if it appeared to the Secretary of State that a Metropolitan Gas Company were acting in a manner unauthorized by law, and it would be for the public advantage that the Gas Company should be restrained from so acting, he might set the Attorney-General in motion to take proceedings at law to restrain the wrongful action of the Company.

Mr. RITCHIE (President of the Board of Trade), replying for the Home Secretary, said: I am not aware of any obligation upon the Company to give notice of their intention to raise the price of gas. The obligation to give such notice imposed by the Metropolis Gas Act, 1860, no longer exists. It was superseded by the sliding-scale provisions applicable to the various Companies.

The following further progress was made with Bills last week:—

Bill read the first time and referred to the Examiners: Water Orders Confirmation Bill [Lords].

Bills read a second time and committed: Glyncorrwg Urban District Council Gas Bill [Lords], Margate Corporation Bill [Lords], Westgate and Birchington Water Bill [Lords].

Bill reported: Perth and Paisley Gas Provisional Orders Bill.

Bills reported, with amendments: East Shropshire Water Bill [Lords], Falkirk and District Water Bill [Lords].

Bills read the third time and passed: Bristol Water Bill [Lords], Gas and Water Orders Confirmation Bill [Lords], Gas Provisional Order (No. 3) Bill, Oldham Corporation Bill, Paignton Urban District Water Bill [Lords].

On Wednesday, the order for the second reading of the Water Supply Bill, introduced by Mr. Cornwallis to "amend the law respecting the supply of water by companies and other bodies and persons," was read and discharged, and the Bill withdrawn.

#### CORPORATIONS AND THE SUPPLY OF ELECTRIC POWER.

##### An Important Decision.

Our readers are aware that several Bills were brought in at the beginning of the session to enable certain companies to supply electrical energy over large areas. These measures were entitled the County of Durham Electric Power Supply Bill, the Tyneside Electric Power Bill, the Lancashire Electric Power Bill, and the South Wales Electrical Power Distribution Bill; and they were all referred to one Committee, presided over by Sir James Kitson—the other members being Sir A. Scole, Mr. Bartley, Mr. T. Gair Ashton, Mr. Howard, Mr. Billson, Colonel Long, and Mr. Bonham Carter (Referee). The inquiry began immediately after Easter, and was continued without interruption (except for the Whitsuntide holidays) until last Thursday. At the close



of the cases for and against the first three Bills, the Committee announced their intention of giving their decision on the whole of the measures at once. The South Wales Bill was then proceeded with; and the case for the promoters having closed, Mr. Balfour Browne, Q.C., addressed the Committee on Wednesday in support of the hostile petitions of the Corporations of Cardiff, Swansea, Newport, and Barry. At the conclusion of his speech, the Chairman said the Committee thought the time had arrived when it would be convenient for them to make a declaration. He then read the following statement of their views: "A local authority which undertakes, and is prepared to give, a full and ample supply of electrical energy for all purposes to consumers within its district, ought not, without its consent, to be required to give facilities for the supply within its district of electrical energy by other undertakers. But if a local authority is unable or unwilling to provide, on reasonable terms and within reasonable time, a full and adequate supply of electrical energy, for any purpose to any company or person applying for the same within its district, such company or person should be at liberty, after notice to the local authority, to obtain their supply from other authorized undertakers; and the local authority should be required to give all necessary facilities for this purpose. Any difficulty arising out of the above questions should be subject to arbitration, as provided by the General Acts." Mr. Balfour Browne said he was perfectly prepared to accept the decision of the Committee, and to concede the preamble in view of the Committee's expression of opinion. Other Counsel took up a similar position. The next day, the Chairman made the following further announcement: "The Committee are of opinion that, subject to the principles contained in their declaration being embodied in clauses to be approved, and subject to such additions and amendments in clauses as, on going through the clauses of the Bill, appear necessary, the preamble of the South Wales Electrical Power Distribution Bill is proved. It may be convenient, although the Bills are not down for to-day, to announce also that the preamble of the County of Durham Electric Power Supply Bill is proved; that the preamble of the Tyneside Electric Power Bill is not proved; and that the preamble of the Lancashire Electric Power Bill is proved. The intention of the Committee is to insert, so far as may be applicable, the same conditions in each of the Bills." The Committee then adjourned till to-day (Tuesday), when clauses will be considered.

#### THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons, appointed to consider and report as to the principles which should govern the powers given by Bills and Provisional Orders to Municipal and other Local Authorities for industrial enterprise within or beyond the area of their jurisdiction, continued their investigation on the 22nd ult., under the presidency of the Earl of Crewe.\*

The first witness called was Mr. E. Garcke, M.Inst.E.E., the Managing-Director of the British Electric Traction Company. He said he was largely in sympathy with the desire of many local authorities to extend their operations in industrial enterprise; but there were certain conditions which, in his opinion, ought to be imposed upon them. He was in favour of the municipalization of industrial undertakings which had for their object the rendering of a public service; but he was most strongly opposed to what was called municipal trading—that was to say, the carrying on of industrial operations by local bodies with the view of making a profit. Any surplus that accrued from such operations should be applied in reduction of price or of capital account, and not to reducing the rates or the provision of other enterprises. He thought it would be a serious thing for the nation if private enterprise were discouraged, because the history of all undertakings proved that local authorities were not able to take the initiative. He was strongly in favour of facilities being given to local bodies to purchase undertakings on fair terms to the capitalist; but he did not think the present terms of expropriation under the Tramways and Electric Lighting Acts were at all fair to the capitalist. Local authorities were actuated at the present time by a feeling of jealousy in regard to the profits made by private enterprise; and they asked themselves why they should not make these profits. His definition of municipal trading would be, any industrial undertaking carried on primarily or partially with a view to making a profit rather than to rendering a public service more efficient. He contended that the price charged by a municipality for a commodity supplied, or for services rendered, ought to include the cost of direct and indirect salaries and wages, a proportion of all standing charges, the full and fair cost of all materials consumed for the purpose of the undertaking, the cost of insurance, a provision for depreciation and wear and tear, and against supersession by new inventions, the amount of the rates that would have been paid by a company, interest on the outlay, and the formation of a sinking fund for the redemption of capital. It would be desirable, he thought, that a portion of these costs should be put on the ratepayers in the form of a rate. The item of interest, for instance, they might very well bear, so that they might be led to look into the conduct of the enterprise. Witness put in a diagram showing that municipalities worked electric light undertakings at a profit, though they supplied the current at rather less per unit than private companies. But in many cases the cost of generation was lower; and if allowance were made for the way the accounts were kept, it would be seen that municipalities were in a somewhat better position than companies. In some enterprises it would not be possible to avoid making a profit; but, in his opinion, any surplus over working expenses should be applied to the reduction of capital. There was a danger that municipalities would go in for over-trading if no limit or restriction were put upon their enterprise. There was, of course, the same risk with private enterprise; but in the latter case there were checks which did not exist in the former. As an example of the desire on the part of local authorities to make profits, he said he was engaged on a scheme for converting certain steam tramways in South Staffordshire into electric tramways. One local authority concerned suggested that the electricity should be taken from them. When reminded that they had no power station, and were in treaty with

a company to take electricity in bulk from them, they replied that they could buy the current from them and sell it at a profit. Municipal trading, he thought, could not well be carried farther than that. The injury caused by the action of local authorities to the electrical industry of the country was very evident. The Electric Lighting Act of 1888 gave power to private enterprise to undertake electrical supply; but the local authorities, judging from the number of applications for Provisional Orders, thought the power was a valuable possession which they should not part with, and refused their consent in a large number of instances, and applied for Orders themselves. In very few cases, however, did they take steps to establish stations for some years; and when they decided to do so, English manufacturers were not in a position to deal with their demands, and the result was that a large proportion of electrical apparatus was being imported from America.

Mr. Garcke was followed by Mr. A. A. C. Swinton, who gave evidence on very similar lines.

Last Tuesday, the first witness called was Sir Benjamin Browne, the Chairman of Messrs. R. & W. Hawthorn, Leslie, and Co., Limited, shipbuilders, of Newcastle and Hepburn-on-Tyne, and an ex-Mayor of Newcastle. He said his impression was local authorities were not suitable bodies for carrying out any kind of industrial enterprise except as a last resource. They should try, if possible, to get the work taken up by companies or private individuals. If a company failed in their duty, the local or other authority could bring pressure to bear to keep them in order; but if a public body went wrong there was no such controlling authority. With regard to tramways and large schemes of electric power, it was a serious drawback that a local body were not likely to go outside their own area, and, in fact, could not do so profitably without exciting the jealousy of the other body on whose territory they encroached. An industrial enterprise required to be controlled by a group of men such as a Board of Directors, who ought among them to have a large amount of special knowledge for the work in question. Councillors might think they could get over the difficulty by having experienced engineers and officials; but the tendency would be for authority to get into the hands of permanent officials, whereas the Directors should decide, and the officials carry out their decisions. For a corporation to take up an industry was, he thought, an injustice to the ratepayers. In a company, only those who were able and willing among the inhabitants of the district would take shares; but if the enterprise was conducted by the local authority, every ratepayer was forced to become a shareholder.

The next witness was Lord Avebury, who expressed the apprehension he felt at the extension in recent years of the principle of municipal trading. Most Chambers of Commerce, he said, shared his view. Local indebtedness showed an alarming tendency to increase; and this must much affect the security which had hitherto attached to municipal loans. When municipal funds were embarked in trading ventures, there necessarily would be an increase of risk, and the rate of interest would presumably have to be higher than it was now. The supply of water was a somewhat exceptional case; but, generally, the more a municipality had to borrow, the higher the rate of interest. Municipal trading checked private enterprise. A great deal of industrial improvement arose out of new inventions and patents; and it was not likely that municipalities would take up a patent with the risk attaching, nor was it desirable that they should do so. The tendency of corporations having control of the gas supply had been to check the development of electric lighting as a competitor. If electrical power was to be distributed in the cheapest manner, it must be from important centres and over considerable areas. On the labour question, he said it had been generally felt that discussions in the House of Commons on the pay of Government employees were very undesirable; and the same remark applied to those of the County Council. There was increasing difficulty in settling the wages of men, many of whom were the constituents of the Council. The time of the Council in London, as he knew from experience, was now fully occupied; and the present state of the agenda indicated the enormous extent of their labours. This already deterred business and professional men from joining the Council. In relation to the housing of the poorer classes in London, he questioned the wisdom of the Council undertaking the erection of houses. As regarded water supply, every case must be considered on its merits; and a controlling authority, to ensure the adequacy and purity of the supply, was an important consideration. He would not lay down any principle for general application; but in regard to any enterprise, the local authorities should have the obligation of showing that there would be public advantage in taking it over. Any extension of municipal trading should not be sanctioned without special parliamentary inquiry, at which other than persons having *locus standi* should have an opportunity of giving evidence. The Borough Funds Act did not, he thought, sufficiently protect the ratepayers' interests in this respect.

On Friday, when Viscount Peel presided, Mr. E. O. Smith, Town Clerk of Birmingham, gave evidence. He said the Corporation owned their gas, water, and electric supply undertakings, and also the markets, baths, tramways, and cemetery. The tramways were at present leased to companies; but, on the expiration of the leases, it was the intention of the Corporation to apply to Parliament for power to work the lines themselves. The Corporation also had a large building estate in the centre of the town, now almost entirely built over, known as Corporation Street. The scheme had been not only a great sanitary but also a great town improvement, and it was now represented by about £40,000 a year in ground-rents, and something like £19,000 in rack-rents on property not sufficiently bad to be pulled down. The Corporation had also acquired 60 or 70 square miles of land in Wales in connection with their water scheme. This was rather a novel departure, and appeared so to Parliament in 1892. But the Corporation came to the conclusion that it would not be worth while undertaking the scheme unless they could get command of the whole watershed, and thus secure that it should be kept clean for the supply of water to Birmingham. There were eight undertakings owned by the Corporation; and the capital invested in them was something like £10,000,000. They made a profit on four of these undertakings, and incurred a loss on the rest. Asked by the Chairman to state which of the concerns he considered came under the head of "municipal trading," witness said that gas, water, and electrical supply, in his opinion, were municipal trading. Markets were scarcely trading, though they were a property from which the Corporation derived a profit. Baths were a sanitary obligation; and

\* The previous proceedings were reported in the last Volume of the "JOURNAL," pp. 1593, 1732.



on these there was a loss. Tramways would be municipal trading if the Corporation ran them themselves. The cemetery was an obligation; and the building estate was the result of a public improvement. They made a profit of about £30,000 a year by their gas-works, and this went to the reduction of the price and to the improvement rate. On water they had a loss of £6000, which was rather less than they had anticipated. This loss did not fall upon the rates, but came out of a special water fund authorized by Parliament. It was then put to the witness whether, if these eight undertakings were worked by eight great companies, without competition from other companies, he was of opinion that they would not have given to their respective consumers and customers the same advantages that the Corporation were able to give. He replied: "That is my opinion; and I will go further and say that some of the undertakings would not have been entered upon by a company—the Welsh water scheme, for instance. In Birmingham, as far as I can see, we have got nearly all the powers we want." In answer to other questions, witness said he thought it was extremely difficult to put a limit to municipal enterprise. He thought the practice of Parliament, of considering each case on its merits, was the right one. A general line could not be drawn. He was distinctly opposed to the setting up of a boot and shoe factory for Council employees in competition with private trade with public money, which was not necessitated by the nature of the case. Asked if he saw any danger, political or otherwise, in a municipality having in their employ a vast number of workpeople, he replied: "I do think it is a danger, but it is one which must be faced. I should like to see all corporate employees disfranchised; but I am afraid we cannot go back to that. Up to the present, however, we have not experienced any disadvantage from having a large number of corporation workmen who are also municipal voters."

The Committee adjourned until to-day."

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, June 29.

(Before Justice BUCKLEY.)

In re Kern's Patent No. 294 of 1897.

This was a petition presented by the Sunlight Company for the revocation of the above-named patent, granted to M. Ottmar Kern, of Paris, on Jan. 5, 1897, for "Improvements in incandescent gas-burners." A full illustrated abstract of the specification was given in the "JOURNAL" for May 10, 1898 (p. 1062).

Mr. BOUSFIELD, Q.C., and Mr. NEILL appeared for the petitioners; Mr. FLETCHER MOULTON, Q.C., Mr. TERRELL, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. WALTER represented the Welsbach Incandescent Gas-Light Company, Limited, the owners of the patent.

As is usual in these cases, the respondents were first heard.

Mr. WALTER (in the temporary absence of Mr. Moulton) stated the facts. He said the patent was attacked on the grounds that the patentee was not the first and true inventor; that it was not useful; that the specification was insufficient; and that it was not novel—the anticipations alleged being De Mare's patent of 1894, and also patents by Moul and Horwitz, though he did not think much reliance was placed on the two latter, or on common knowledge, which was also mentioned. The great advantage of the invention was that it enabled incandescent burners to be used without chimneys, and with a great economy of gas; and it was ridiculous to say that such an invention was not useful. [On the table of the Court was an array of burners and apparatus; and to illustrate this point two of them—one a Kern burner, and the other an ordinary "Gem" burner of the Welsbach manufacture, consuming the same quantity of gas—were lighted, and there was a marked superiority in the light given by the former.] Counsel then went carefully through Kern's specification, explaining the construction of the burner with the aid of models, and then shortly referred to the alleged anticipations, which, he contended, were entirely different in their scope and in the results produced. De Mare did not profess to produce a self-burning mixture, as Kern did; and his burner would not produce it, nor would either of the others. This was the main feature of the invention.

Mr. Dugald Clerk was then called. He said he had examined Kern's specification and the alleged anticipations, and he had made apparatus and experiments to test every statement. He explained the action of the ordinary bunsen burner, consuming gas and air in the proportion of about 1 to 4. He said it depended for its operation on the access of outside air to the flame. A proportion of 1 to 6 was an explosive or self-burning mixture. With such a mixture, the rapidity of combustion through it was about 4 feet per second; and this would cause it to light-back, unless the rate of emission were greater than that of propagation of the flame. A self-burning mixture might be made which was not explosive, by having an excess of air; but then the amount of heat was comparatively low. The object of Kern was to produce a self-burning mixture with a bunsen burner fed from an ordinary gas-main, in order to obtain a high temperature without a fan. He accomplished this by the combination of a mixing cone and a suction cone (all of certain proportions), together with a suitable tip for his burner. If the gas and air were not properly mixed, there was a noise during combustion, owing to a succession of small explosions. He had satisfied himself by experiment that Kern's burner gave a self-burning mixture—1 of gas to 6 of air. He said he worked according to fig. 1 in the specification; and he described the mode in which he carried out the experiment. He found that the Kern burner passed 6 cubic feet per minute, while an ordinary bunsen burner would pass 4 cubic feet; the proportion of air in the former case being 6 to 1, and in the latter 4 to 1. The former was about the maximum explosive mixture, and gave a temperature of 2000°. Kern was singularly accurate in his descriptions of phenomena. His burner gave a very high temperature, which was not confined to one particular zone, and was therefore very efficient in heating the mantle. The effect of the nozzle shown in fig. 12 was to make the surface of the flame cylindrical. He had made a burner according to fig. 13, and it produced a very good

flame; but a mantle had not yet been made to fit it. Witness then showed an experiment to prove that a self-burning mixture was produced by the Kern burner. He also made an experiment to show the importance of the exact position and dimensions of the two cones, as described in the specification. He had experimented with suction cones of different angles, and found that with angles over 10° they became like ordinary bunsen burners; the shape and character of the flames altered. He had also made an experiment to show that the gas-jet must not be at the upper part of the cone. He had constructed a burner in which the jet could be raised and lowered, and a great difference in the light followed the raising of the jet too high. He had also tested the illuminating power, and found a mantle in a Kern burner gave from 1½ to 2 times the light of an ordinary Welsbach burner. There was no difficulty in putting the specification in practice. He knew of no anticipation of any of the claims. It was the first apparatus he knew of which supplied a self-burning mixture of gas and air from the ordinary gas supply. There were at present about 300,000 of these burners in use; they had only some slight improvements.

Cross-examined: He believed he was right in his first experiment as to the volume of the gas and air passing within 2 per cent. There was a much greater passage of air when the double cones were used than with an ordinary straight tube. The effect of double cones was referred to by De Mare, who laid stress upon its function. The inner cone varied greatly in his different figures.

Mr. BOUSFIELD read several passages in the specification to show that De Mare appreciated the importance of having the proper proportions of air and gas, the right pressure, &c.

Witness assented to this; but he said the effect of what he described was to increase the pressure and to alter the proportions at the same time. In the old De Mare burner, the mixture would never light-back, even if turned down, because it was changed, so that it would not light-back apart from any question of velocity. Mantles were made by the Welsbach Company to fit the No. 4 Kern burner as sold commercially. A burner was produced which Counsel suggested was made exactly in accordance with fig. 4 of De Mare, of a size suitable to the mantles made by the Welsbach Company. Witness said it had been modified—in the size of the holes, for instance. The original drawings were produced, and the dimensions were checked by the witness with the drawings. He said it was not exactly in proportion, but not much out. He had never seen a bunsen burner so large as this. A Kern burner (according to fig. 11) was then produced, made by the petitioners to take a No. 4 mantle as sold by the Welsbach Company. It appeared to be made according to the specification, but he thought there were too few holes, and they were certainly too small. A burner should be specially constructed for the mantle to be used with it. The mantle required to exactly fit the flame. The burner used in 1894 had a head with an annular opening covered with gauze.

Mr. BOUSFIELD said he should have a number of experiments arranged, one of which would show that the De Mare and Kern burners he had been dealing with, produced exactly similar results.

Witness said he believed De Mare used a chimney.

Mr. BOUSFIELD said there was a very slight difference with a chimney—he forgot whether it was better or not.

In further cross-examination, witness said he had made his Kern burner to consume 80 litres per hour, as mentioned in the specification, and compared it with a Welsbach burner passing the same quantity. He produced models which he had made according to the various figures in De Mare's specification. One of them smoked a little, or rather showed a white tip, which proved that there was too much gas for the air. He had imitated the size of the hole from the drawing, as nearly as possible. He thought this was the right thing to do. He had not tried more than one head with De Mare's No. 4 burner, because he found the mixture was 2 to 1; and no kind of head would have made it a good burner. The model of fig. 1, which gave a smoky flame, passed about 3½ cubic feet of gas, which was about the right quantity for that size. He had not experimented with fig. 2. He had increased the number of air-holes to try to reduce the smokiness. No. 2 gave a mixture of 2 to 1. This also passed 3½ cubic feet per hour with the De Mare cone in; with the cone out it consumed 3·6 feet. As an ordinary bunsen it would require 4 feet to burn properly. He did not agree that he had passed too much gas through, but he would make a further experiment with a smaller gas-inlet. Another model of fig. 1, made by petitioners, with a modification as suggested in the specification, was next put to the witness; and he said it was not on the same scale as the drawing, which might make a difference in the result, as it altered the resistances. The drawing was on a good working scale. The lower cone was different in form from the one shown in fig. 1 or fig. 2; it was much deeper. It made it a better injector.

Saturday, June 30.

On the resumption of the proceedings this morning,

Mr. Dugald Clerk was further cross-examined by Mr. BOUSFIELD. The first point the learned Counsel dealt with was the witness's experiment to show the velocity with which the mixture of air and gas passed through an ordinary bunsen and a Kern burner respectively. Witness would not admit that his results were 50 per cent. wrong. He did not agree that the passage of air or gas through a long glass tube was analogous to the current of water in a river, in which a cork in the middle might travel very much faster than one near the banks. There would have been great difficulties in the way of measuring the velocities by a meter. A method of doing this was then suggested by Counsel, in detail. He did not agree that the illuminating power of the Kern burner was about 10 candles per cubic foot. He found it considerably above this; but he would assume that. A diagram was put to him indicating results of experiments carried out by petitioners with a Kern burner as made by them from the specification, and consuming 3·6 cubic feet per hour. His criticism upon it was that the burner in question was too large, and the consumption of gas much too low for such a burner. He consulted, there were indications in the specification to show the proportions Sir A. sary for any size of burner required; the important point was the velocity, or rate of consumption. An almost identical diagram resulting began similar experiments with the respondents' own model was then put to the witness, and he said he could not explain it without repeating the experiment himself. Bunsen burners with an adjustment



for altering the air supply were very common. One of these was produced and lighted, and considerable discussion ensued as to the chemical changes going on in the different zones of the flame. An experiment was then shown with a similar burner placed in the bottom of a glass tube, which was again enclosed air-tight in a somewhat larger one, and the admission of air so regulated that the blue or green cone descended and rested on the top of the first tube, while the other gases burned at the top of the second tube, where the carbonic oxide and hydrogen took the necessary oxygen from the outer air. The advantage of the self-burning mixture was that one got rid of all fine distinctions between the zones of combustion. Witness did not agree that in the Kern burner a portion of the oxygen necessary for complete combustion was obtained from the atmosphere at the surface of the mantle, and that it was this fact which made it so efficient. The paper by Messrs. Smithells and Ingle at the Chemical Society in 1892\* was then read; but the witness would not agree that the result was to show that the hottest portion of the flame of a Kern burner was in the interior of the cone of combustion. The flame must fit the mantle fairly well; but it was of less importance with the Kern burner than with those of the ordinary kind. The flame came through the interstices of the mantle. Witness then described the result of experiments he had made since the preceding day with petitioners' models of Kern and De Mare burners. In one case, the burner consumed 4.6 cubic feet, and gave a light which he called 1, while the other, consuming 3.8 cubic feet, gave a light of 1.2; or calculating for an equal consumption of gas, the illumination was as 145 to 100, the Kern being the superior. He then recounted the results of several other comparative experiments he had made, the general conclusion being that the Kern gave a better duty than the De Mare. Questions were then asked as to the operation of the lower or "mixing" cone as respondents called it. It was important to have the air and gas thoroughly mixed, or else the flame flickered; insufficient velocity also caused flickering. The proper mixture depended on the distance between the gas-jet and the top of the mixing cone and the angle. A portion of the cross-examination had to be deferred because the bottle of gas used for the experiments was exhausted; and a few questions on the Harwitz and Moul patents concluded the proceedings for the day. Witness could not admit that there was any anticipation of Kern in either patent.

#### A Gas Manager's Money-Lending Transactions.

At the last Devon Summer Assizes, before Mr. Justice Lawrance and a Jury, an action was brought by Mr. H. Fisher, of Vinnicombe Farm, near Crediton, against Mr. T. Stormonth, described as a "money lender," of Exeter, for £150 damages for libel. The defendant counter-claimed for damages for the detention of goods. The dispute arose in connection with a loan of £45, for which plaintiff was to pay interest at the rate of £3 9s. a month. The farming business was not successful, and an agreement was entered into under which the concern was to be carried on by the parties in partnership. After a time the defendant issued a number of posters to the effect that the plaintiff's goods had been seized under distress for rent, and were to be sold without reserve. It was alleged by the plaintiff that there was no truth in this statement, which constituted the libel. For the defence, it was stated that Fisher was anxious for the sale to take place, as there was more stock on the farm than could be kept, and that the words "seized for rent" were put in the bill with his consent. Defendant, in the course of his evidence, said he was a gas engineer, and was at one time Manager of the Teignmouth Gas-Works; but he could not get enough money at that, and therefore he had to get a living any way he could. He stated that he had lost by lending money. Plaintiff's Counsel remarked that £3 9s. a month was rather good interest on £45. Eventually the Jury found for the plaintiff on both the claim and the counter-claim, and awarded him £150 damages.

#### New Capital for the East Grinstead Gas and Water Company.

—At a meeting of the East Grinstead Gas and Water Company last Thursday, the shareholders authorized the Directors to increase the capital by the creation of 800 additional "C" shares of £10 each.

**New Joint-Stock Companies.**—Under the title of Metropolitan Gas-Meters, Limited, Frank Wright's Prepayment Gas-Meter Corporation, Limited, has been reconstructed, with a capital of £60,000, in 10s. shares, to adopt and carry into effect a certain agreement, and generally to carry on the businesses of manufacturers of and dealers in coin-freed and prepayment gas-meters, or any other meters for recording the supply of gas, oil, spirits, and other light and heat producing agents; and also the businesses of producers and suppliers of gas and electricity for the purposes of light, heat, or power, of general, mechanical, electrical, and hydraulic engineers, ironfounders, &c. The Direct Automatic Oil Lighting Syndicate, Limited, has been registered with a capital of £100, in £1 shares, to adopt an agreement with W. Butler, and carry on the business of a mineral oil illuminating Company.

**Fatal Accident at the Tipton Gas-Works.**—Last Friday, Mr. F. W. Ensor, Deputy Coroner, held an inquest at the Town Hall, Dudley, concerning the death of William Henry Rogers (41), who died from injuries sustained while employed at the Tipton Gas-Works. Deceased was engaged on the previous Tuesday in shunting coal, with a young and spirited horse attached to the wagon. The horse, in starting, stumbled and fell, and on regaining its feet became detached from the wagon, and rushed between the rails and a wall of coal. Deceased followed, and while running with the horse they were overtaken by the wagon. Horse, man, and wagon then travelled together for about 20 yards, and as deceased was endeavouring to get in front of the animal he was knocked down, and the truck passed over his right leg. He was removed to the Guest Hospital, and died on Wednesday. A man named Johnson, employed at the gas-works, said he did not think the distance between the rails and the wall of coal sufficient to allow a man to regain his feet if knocked down. Mr. W. H. Jukes, Surveyor to the Council, said the stacks of coal were about 8 feet high, and the distance between the sides of a wagon and the coal was about 2 ft. 9 in. The Factory Inspector (Mr. J. H. Nicholl) said there should be a clear interval of not less than 3 feet between railway lines and stacks of coal. Here it was greater. A verdict of "Accidental death" was returned.

See "JOURNAL," Vol. LIX., p. 63.

## MISCELLANEOUS NEWS.

### THE INCREASED PRICE OF GAS IN THE METROPOLIS.

The Corporation of London and the Increase—Suggested Supply of Non-Luminous Gas.

At the Meeting of the Court of Common Council of the City of London last Thursday, a letter was received from the Gaslight and Coke Company, stating that, in consequence of the serious increase in the price of coal, they had been compelled to increase the price of gas supplied by them in their district north of the Thames (except for that consumed in the street-lamps) from 2s. 11d. to 3s. 5d. per 1000 cubic feet, as from the date of recording the meter indices for the current quarter. On the reading of the letter,

Mr. A. A. WOOD moved that the question be referred to the Streets Committee for their consideration, as the increase was a grievance which affected every citizen of the Metropolis, and should not be allowed to pass unheeded. He said that what was required was a non-illuminating gas which could be used with incandescent mantles and for heating, cooking, and motive-power purposes. Such gas could be supplied for less than 2s. per 1000 cubic feet; and it was within the right of the Corporation to enter into competition with the Company and provide it. In his opinion, the gas consumers north of the Thames had been very unfairly treated; for in addition to a very large difference in price as compared with that charged by the South Metropolitan Company, they were now to be saddled with an extra 6d. He therefore moved that the whole question go to the Streets Committee with his suggestion as to a competitive supply of non-luminous gas.

Mr. J. JUDD seconded the motion, and stated that a good water gas could be manufactured, suitable for heating, cooking, and motive-power users, for 5d. per 1000 cubic feet.

Mr. WALLINGTON suggested that the proper Committee to consider the matter would be the County Purposes Committee, as they carried out the provisions of the Acts of Parliament relating to the testing of gas.

Mr. A. C. MORRIS twitted the County Purposes Committee with having given evidence in favour of the Gas Companies before the House of Commons this session, and urged this as a reason why the matter should not go to them, but to the Streets Committee, who, he said, were, and had been, working hard in the interests of the ratepayers during the last two or three years, and were trying to save them £50,000 per annum on the public lighting. He pointed out that the difference in the price charged by the two Companies north and south of the Thames was now 13d. per 1000 cubic feet. The Corporation had stood by the ratepayers in 1868, in 1876, when the sliding-scale was introduced, and in 1883, at the time of the amalgamation with the London Company. But the Gaslight and Coke Company, after swallowing up all the little Companies of the Metropolis, and becoming a giant monopoly, had broken all their promises; and therefore, as a protest against this monopolist Company, he trusted the resolution would be carried.

The motion was carried unanimously.

Mr. C. T. HARRIS then moved that Mr. Wood be especially added to the Streets Committee for the purposes of the reference; and the proposition was agreed to.

#### Further Advance by the South Metropolitan Gas Company—Interview with Mr. Livesey.

In view of the announcement by the Gaslight and Coke Company, of their intention to raise their price 6d. per 1000 cubic feet, a representative of the "Daily News" called a few days ago upon Mr. Livesey to talk over the matter with him; and last Friday the result of the interview was published in that paper, accompanied by an announcement of a further rise of 4d. on the south side of the river. The interviewer says one is apt to think of Mr. Livesey as "the most ruthless of critics of the great Gaslight and Coke Company;" and naturally he expected to hear some sharp comments on their management. In this, however, he was mistaken. He was, in fact, "struck with the light of sympathetic benevolence that the mention of the other Company called forth," instead of the "stern aspect of the censor" he remembered on the last occasion he had called upon him. The reason of this change very soon became apparent. Mr. Livesey confessed that he thought the northern Company were quite justified in the advance they have made; and he added: "We are going up too. We are going to put on another 4d. from Midsummer. That will make 7d. against their 6d." He went on to explain that the larger Company would have had to go up 7d. too, only they were fortunate enough to have an undivided balance of £193,000 from last year, which helped them to some extent. The South Metropolitan Company would, he said, have had a balance of £90,000, but they reduced the price of gas by 2d. per 1000 cubic feet eighteen months ago. He thought the Gaslight and Coke Company would have been quite justified in putting on 7d.; and the only fault he found with them was that they made the announcement of the rise without explaining the reason for it. He went on to inform his interviewer that he had just drawn up an explanatory circular which was to be sent out to his Company's consumers; and he proceeded to read it. This "doleful document," says the interviewer, "was couched in the most suave and conciliatory language, that certainly might be expected to modify the indignation of the gas consumers of South London if anything could do it." [The text of the circular referred to is given below.] But Mr. Livesey hastened to point out to his interviewer that, under the profit-sharing system, the Company's officers and workmen will by the increased price lose £25,000. Asked how the employees were going to take this, he said the two workmen Directors on the Board had talked it over with some of them, and he believed they saw the necessity for it, and would accept the inevitable, like sensible men. He was not altogether sorry that they would be affected by the rise in price, because it was objected, when the profit-sharing scheme was proposed, that it might work very well when profits were good, but the question was whether it would do so when they went down, or disappeared altogether. "Now," said Mr. Livesey, "we shall see. I said then, and I still believe, that the men would take a sensible view of things, and would be prepared to take bad times with good; and I am not altogether sorry to have the matter tested." His interviewer put the supposition of the high price of coal being permanent, and he



asked how the men would take the loss of their share of the profits. Mr. Livesey promptly replied that he felt sure it would not be permanent. Such was his confidence of this that he had taken the risk of making contracts for only six months ahead. He acknowledged that it was a "great risk," and but one other gas company—the Crystal Palace—had, he said, ventured to do likewise. Asked the grounds of his confidence, Mr. Livesey said the main cause of the advance in the price of coal was the extraordinary activity in the iron trade. But he had the best reasons for believing that the rush in this trade was over. Orders were falling everywhere; and the exceptional demand for coal was practically at an end. When the contracts now in hand were got off, things would be slack, and the price of coal was bound to go down. It was just the same in 1873. Prices were even higher then than now. Coal went up from 6s. per ton in 1871 to 20s. in 1873; and the cause was just the same—the great activity of the iron trade. Mr. Livesey added that the coalowners were believed to have made something like 60 millions of money, which was reckoned to be about what the South African war would cost. They were having a good time now; but they had had some very bad times in years gone by, and were only making up losses.

In the circular referred to by Mr. Livesey in the course of the interview, the Directors express their great regret at having to inform the consumers that the extremely high price of gas coal has been rather more than maintained during the three months which have elapsed since the issue with the March accounts of the notification of the increase of 3d. per 1000 cubic feet,\* and that contracts which were made in 1899, at the high figure of 8s. per ton in the Tyne, have this year been taken at 16s., while freights have also advanced. Coal now costs the Company about 10s. per ton more than in 1898; and so far coke, on the average of contracts and the retail trade, has only realized about 4s. per ton advance. This is only equal to 2s. per ton on the price of coal, because each ton of coal produces half a ton of coke for sale. The price of gas must therefore, they say, be increased to 2s. 8d. per 1000 cubic feet from Midsummer. At this price, by the operation of the sliding-scale, by which, as the price rises the dividend falls, the dividend payable to the shareholders will be reduced by £40,000. The Company's profit-sharing system is simply an extension of the sliding-scale to the employees. For each 1d. reduction below 2s. 8d. per 1000 feet, a fixed percentage on their salaries and wages is paid annually. This now amounts to 9 per cent., and will all disappear until the price again falls below 2s. 8d. The officers and workmen will thus lose about £25,000 in twelve months. Consumers, shareholders, and employees have been partners in prosperity; they now become sharers in adversity. Any remaining deficiency must be drawn from the reserve funds, which unfortunately are small. Had the price of gas not been reduced 2d. per 1000 cubic feet during the last 18 months, there would have been a further £90,000 in hand. The Directors again take the opportunity of correcting the common mistake of supposing that the shareholders receive large dividends. Since 1876 Parliament has ordered that all new capital shall be raised under the auction clauses—that is, it has to be issued to the public at the market price, which only yields 3½ per cent. to the purchaser. In the last ten years, the consumers have thus invested over £600,000 in the Company's stock, on which this small rate of interest will be temporarily reduced, as a consequence of the increase in the price of gas. The Directors do not believe that this excessive price of coal can be much longer maintained. They say they have the strongest reasons for reducing the price of gas, and will use their utmost efforts to do so as soon as possible.

#### The Crystal Palace Gas Company's Increase.

The Directors of the Crystal Palace District Gas Company have also offered some explanation on this subject to their customers. In a circular lately issued by the Secretary (Mr. Charles M. Ohren) they express regret at there being no reduction in the price of coal since the notice of increase was sent out in March. They say that contracts have been made at about double the price of last year, and, in addition, freights are also higher. About one-fourth of the extra expenditure on coal will probably be met by the increased value of coke. This will leave a deficiency equal to about 8d. per 1000 cubic feet of gas sold. The price of gas was raised 2d. from the March quarter; and the Directors now give notice that a further increase of like amount will be made from Midsummer; thus bringing up the price to 2s. 10d. per 1000 cubic feet. The consumers, therefore, bear one-half of the loss. The other half will be met by drawing on the reserves, by reducing the dividend to the shareholders under the operation of the sliding-scale, and by a reduction of the profit-sharing bonus of the employees, which, being based on the principle of that scale, falls as the price of gas rises, and *vice versa*. Thus consumers, shareholders, and employees are partners in adversity as in prosperity. Under these circumstances, the Directors think it scarcely necessary to say that they will reduce the price of gas at the earliest possible moment.

### THE REGULATION OF LONDON STREETS.

#### The Opening of Roads by Gas, Water, and Electric Light Companies.

At the County Hall, Spring Gardens, last Friday, a conference was held between the London County Council and representatives of the various Authorities engaged in the administration of local affairs in the

\* In the March circular notifying the first increase of 3d., the Directors offered the following explanation of the circumstances which had led to this step: "The Company's coal contracts, free on board in the Tyne, made a year ago, were at a material (about 20 per cent.) advance, which has been to a considerable extent met by increased receipts for coke. The coal contracts expire this month, and the prices demanded for Newcastle gas coal are 100 per cent. in excess of those of last year; and, unfortunately, little, if any, further advance in the value of coke can be expected. The greater part of the burden must, therefore, fall upon the gas consumers. To meet the extra cost of coal, not less than 8d. per 1000 feet is necessary; but in the hope that the present extreme price of coal may not be maintained throughout the ensuing twelve months, the Directors have resolved to try a moderate advance of 3d.—making the price 2s. 4d. per 1000 feet. They feel this explanation is due to the consumers because the sliding-scale makes them partners with the shareholders—losses and profits being shared. Every reduction of price entitles the shareholders to an increase, while advances in price entail corresponding reductions, of dividend."

Metropolis relative to matters in regard to which it is considered improvement may be effected. Mr. W. H. DICKINSON, the Chairman, presided; and there were present about 160 delegates, representing 40 different authorities. The agenda paper comprised eight closely-printed foolscap pages. Seven of them contained nothing of special interest to our readers; but on the last page, and close to the end, appeared some references to the opening of roads.

The St. Giles District Board had given notice that they would desire the conference to consider as to whether the time had not arrived when some greater authority should be vested in local bodies to control the operations of the gas, water, and other companies possessing statutory powers of breaking up the public ways. This was referred to a Committee, consisting of representatives of the various Authorities attending, to consider and report to a further conference to be held later.

On behalf of the Holborn District Board, Mr. L. H. Isaacs, the Surveyor to the Board, had given notice of the following motion: "This meeting is of opinion that the time has arrived for concerted action on the part of the Local Authorities of the Metropolis, to remedy the inconvenience, annoyance, and loss of time and money now caused by the operations of the gas, water, telephone, and electric lighting companies, in laying down, renewing, maintaining, and repairing their mains, pipes, services, and wires, and that it be referred to a Committee of this conference to consider and report on the advisability of constructing subways in the leading thoroughfares of the Metropolis with that object." This was also referred to the Committee.

The Vestry of Islington had suggested that the provision of the Metropolis Management Acts respecting the opening of roads, and reinstating after opening, should be made to apply to the London County Council.

The CHAIRMAN really did not think this was strictly within the reference. He did not know that there was any great advantage to be gained in discussing the merits of either one way or the other.

Mr. J. G. WHITE: It might go to the Committee.

Mr. A. C. MORTON: It is a very useful matter.

Mr. HENRY CLARKE said they ought to take some means to show that the London County Council had not done their duty in regard to this.

A REPRESENTATIVE said if they would allow him he would give an example in point. There was a road in his district in which the Works Department of the London County Council had been executing certain works in connection with the Hackney Wick sewer. Had it been done by a contractor, he should have insisted that the roadway should have been kept open the whole time, and then there would have been plenty of room for them to do the work. Instead of that, the Council's Works Manager applied for permission to close a short length of the road. He obtained the permission; but he went on afterwards and said that, acting upon the advice of the Engineer of the Council, he found he had a perfect right to close their roads as long as he wanted. They could keep them closed until they had finished the work. If they did the work in the way that the Local Authority desired, it would cost them a little more; and unless the Engineer would allow him a little extra on that, he could not do it.

It was then agreed to refer the matter to the Committee.

This was all that transpired on matters of interest to our readers.

### GAS, INDUSTRIAL, AND GENERAL ILLUMINATING EXHIBITIONS.

In the "JOURNAL" for Jan. 2 and 9 last, we gave extended notices of the exhibition of gas lighting, heating, cooking, and other appliances which was then being held at the Royal Aquarium. Whatever the general results and effect of that exhibition may have been (and no one can tell the extent of the influence of such a show), as a convenient and attractive presentment of most of the best and latest inventions in the several directions in which gas is now utilized, it was undoubtedly an unqualified success. The benefits of the exhibition, however, were to a very large extent confined to London and the suburbs; and it is therefore pleasing to learn that exhibitions on similar lines are being organized for other parts of the country. This will no doubt be an inducement to a large number of provincial manufacturers to show their goods in friendly competition with the firms who exhibited at the Aquarium, and the greater part of whom, we are informed, have already signified their intention of putting in an appearance at the forthcoming exhibitions. Better testimony of the success of the Aquarium exhibition could not be given. Arrangements for two exhibitions are already being vigorously developed by the management, which includes Mr. T. G. S. Hersey, one of the chief organizers of the display at the Aquarium. The first one is to be held in Manchester; and St. James's Hall has been engaged for the purpose. It is admirably suited for an exhibition of this nature. It is proposed to divide it into six different departments; each having from five to nine sections. Department "A" is to be devoted to gas cooking and heating; "B" to gas lighting (indoor and outdoor); "C" to gas-engines; "D" to gas plant; "E" to gas-plant photos and models; and "F" to a laboratory for gas analysis and light and heat testing, with the necessary equipments. The time of year for the exhibition has been chosen after consultation with former exhibitors, as being the most convenient before the busy winter season commences. It will open on Sept. 9, and terminate on Sept. 30. After this it is proposed to visit Bristol, for which purpose the large Hall known as the Bristol Rifle Drill Hall has been taken. It is understood that special terms are being offered to firms electing to be represented at both. Military bands will be secured for Manchester and Bristol; and this will prove an additional attraction. The exhibitions are intended to be the precursors of a far larger undertaking—namely, an International Gas Engineering Exhibition, which will include exhibits from all parts of the world, to be held in London some time next year. We are not in a position to state the precise locality chosen for this, as negotiations are pending. It is, however, proposed to have gold and silver awards, with the usual diplomas and certificates of merit; and it is hoped to form a strong Committee to adjudicate upon the exhibits. These are the proposals; and it will rest with the manufacturers of gas apparatus and appliances to carry them to a successful issue. Meanwhile, we may state that interested firms who desire further information can obtain it of Mr. T. G. S. Hersey, 39, Seething Lane, E.C., or St. James's Hall, Manchester.



## PLYMOUTH AND STONEHOUSE GAS COMPANY.

The Annual Meeting of this Company was held last Thursday—Mr. J. A. BELLAMY in the chair.

The SECRETARY (Mr. H. B. Heath), having read the notice convening the meeting, the report of the Directors was presented. In the course thereof they stated that, after payment of the authorized dividend in January last, together with interest on the debenture stock, there remained to the credit of profit and loss the sum of £15,622, from which they recommended the payment of a dividend for the half year ending the 31st of March of 6½ per cent. on the ordinary stock, 9s. 9d. per share on the additional shares, and 9s. 3d. per share on the new shares issued under the Act of 1879, free of income-tax; leaving a balance of £7933 to be carried to the credit of the next account. In consequence of the advance in the price of coals—about 100 per cent. over the contract price of last year—and of oil, the Directors found it necessary to raise the price of gas 6d. per 1000 cubic feet from the date of reading the meters for the Midsummer quarter. It had, however, been decided not to alter at present the slot-meter charge for gas. The Directors hoped that the abnormally high price of coals would only be temporary, and, as the slot-meter consumers belonged exclusively to the working classes, it was felt that the Company might probably allow the price of gas to remain unaltered during the present financial year. Mr. G. Henderson, who had been Chairman of the Company for more than twenty years, decided, in consequence of the state of his health and advanced age, to resign his position on the Board. The Directors much regretted this decision, and tendered him their grateful acknowledgment for the invaluable services rendered by him to the Company from the commencement. Mr. J. A. Bellamy had been elected Chairman, and Mr. Joseph Wills Deputy-Chairman of the Company. The Directors recorded with deep regret the loss sustained by the Company through the death of Mr. John Thomas, who for twenty-one years faithfully discharged the duties of Secretary. Mr. H. B. Heath, who had been in the Company's service for thirty years, had been appointed to fill the vacancy.

The CHAIRMAN, in moving the adoption of the report, remarked that during the past year a large amount of capital had been expended on stoves. At the end of March they had 1721 out on hire to ordinary consumers, and 4821 slot-meter stoves. Success of the most exceptional character had come upon them in this new business. This, with the natural growth of the town, had resulted in an increase of gas sold of 14·3 per cent.—the greatest in any one year in the history of the Company. They felt specially proud of this fact, as it was the first year they had had the competition of the electric light. The wages bill per 1000 feet of gas sold was 2·22d., which was the lowest on record. Then the gas produced per ton of coal carbonized—10,546 feet—had also been very satisfactory. During part of the year they had had to use very expensive coal. Owing to the increase in the demand, the coal contracted for was insufficient, and they were compelled to go into the open market for about 6000 tons, which they had to buy at a very high price indeed. Freights also had ruled extremely high throughout the year. Notwithstanding this fact, the balance-sheet was very satisfactory. They had done considerably better than in the previous year; they were declaring their maximum dividend, and had not drawn anything from their reserve fund. With regard to the supply of coal, difficulty was experienced in getting delivery; and they were indebted to the Devonport Gas Company for letting them have half-a-cargo in order to replenish their stores when they had run very low. During the year, 6879 yards of mains had been laid and renewed, and 2642 yards of slot-meter service-pipes put in. A new wharf had been built to facilitate the discharge of coal; and arrangements were being made which would cheapen the cost of labour in that operation. In Plymouth, the Corporation were lighting the town with incandescent burners. Similar work had been carried out by the Company in Stonehouse; and it would be found that this was the better lighted. After alluding to the changes in the directorate, the management, and the secretaryship, the Chairman went on to speak of the increase in the price of gas. He remarked that when coal had to be bought and paid for at a figure 100 per cent. higher than in the preceding year, it was quite evident that gas could not be manufactured at the same price as before; and in fixing the increase at 6d. per 1000 cubic feet, the Directors had taken into account the extra amount they would make out of coke and sulphate of ammonia. He believed the increase of 6d. would not continue more than twelve months. The price of coals, even if not brought down to the former level, would be considerably reduced by the time they had to go on the market again for their contracts. They had not made any alteration in the slot-meter charges for two reasons. One was that the meters were arranged to supply a certain number of feet of gas for 1d., and the expense of altering them now and again when the price of gas went down would be very considerable. Then the Directors thought it was best to sacrifice a little in the charge for the hire of stoves let out to the working classes, rather than interfere with an arrangement which had worked so satisfactorily and become so popular. With regard to capital, the whole of that authorized by their Act of 1894 had been expended with the exception of £20,000 of debentures, for which tenders had been invited. The shareholders would consequently be asked that day to authorize the issue of £30,000 of stock under the Act of 1898. With reference to the future of the gas industry in England, a recent departure had been made which seemed to open a new era of improved prosperity. Legislation had for years always been in the direction of increasing the candle power of gas supplied; but this year for the first time a reaction had set in, and the South Metropolitan Gas Company had promoted a Bill, which had passed the Commons, enabling them to make gas of one candle power less than before. The introduction of the incandescent gas-mantle had brought about a revolution in gas illumination, and it was believed that as soon as the patent for mantles in this country ran out the step taken by the South Metropolitan Company would be followed by others, and gas companies would send out gas of low candle power. Last year they spent no less than £23,000 for artificially increasing the illuminating power of gas in Plymouth. If legislation permitted the supply of low-power gas—and it was done in Germany in most large towns with complete success—he looked forward to the time when gas would be supplied in Plymouth at 1s. 6d. per 1000 feet. He concluded by paying a tribute to the efficiency of the staff and workpeople.

Mr. J. WILLS seconded the motion, and it was carried and the dividends declared.

A special meeting was afterwards held, at which the Directors were authorized to issue £30,000 of ordinary stock.

The proceedings then closed.

## LEICESTER CORPORATION GAS SUPPLY.

## Increase in Price—The Coal Difficulty.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that, owing to the increased cost of coal for the ensuing year, representing a sum of £45,000, they had had under consideration the expediency of advancing the price of gas; and they recommended the Council to increase it 2d. per 1000 cubic feet for all purposes as from June 30.

Alderman LENNARD, in moving the adoption of the report, said he thought it was due to the Council to explain the enormous advance which had taken place in the price of coal. It was quite unprecedented—the leap of 5s. per ton which they were now paying being the largest ever known in the coal trade. From 1896 to 1899 it went up but little. The three first years the price went up 6d.; last year it rose 1s. 6d.; and this year it bounded up 5s.—making a total of 7s. 6d. per ton advance since 1896. The average price they were paying now was 16s., or just double what it was in 1883. The £45,000 mentioned in the report was the advance they would have to pay for the coal alone; the quantity carbonized now being 180,000 tons per annum. In addition to this sum, there was an item, which for the moment he would call “extras,” which he would deal with later; and this would amount to a further £3000. There was a very melancholy satisfaction in reflecting that everybody else had had to do as Leicester was doing. It was not only gas coal that had gone up, but steam coal as well; and the railway companies would be just as hard hit as the gas corporations. He saw that the Great Eastern and Lancashire and Yorkshire Railways had concluded their coal contracts at 5s. 6d. per ton advance. There was no sign at present of any immediate relief; but there were plenty of signs that at the expiration of another year things would be very different. The advance was due to a combination of circumstances which had enabled the colliery proprietors to band together to fix the prices, from which they had never budged an inch, and to make conditions which they had not altered since they stated them. Chief among these they had the extraordinary foreign demand arising during the last two or three years. He thought this took its rise immediately at the close of the American-Spanish war, when Governments throughout the world realized that fleets were no good without coal. Immediately they began filling their naval stations with large stocks. Then, again, they had had great industrial activity on the Continent; and combined therewith came a series of strikes in Bohemia (a large coalfield), Belgium, and France. This followed on the strike in South Wales, which was a large source of supply for Continental markets. This caused a shrinkage of stocks, and a large number of the Continental people came to England, not only for an ordinary, but for an excessive supply. The Russian demand had been exceptionally great—so great, in fact, that Russia had taken off its duty from coal, and had also prohibited the export of oil. But they knew that this extraordinary foreign demand could not continue; and sooner or later, owing to many circumstances which he would not go into, he was afraid there would be brought about, not only a return to normal conditions, but a positive decline from them. Then, of course, they had had extraordinary activity in the iron and steel and shipbuilding trades all round the country; and this also put up the demand at home. But with regard to that, the summit had been passed. Orders were not being booked for new ships; and soon they would have evidence that there was a large decline in this industry. Of course, the present extraordinary advance would force a drop, because manufacturers would not go on buying; they would sooner close down their works. It was not, therefore, likely that after this year they would have to pay prices they were called upon to pay now. The advance in the prices this year meant an increased cost of £48,000. This would be 7½d. per 1000 cubic feet on the price of gas if they were going to ask the consumers for it all at once. There had been a general advance throughout the country, varying from 2d. to 6d. per 1000 feet, and the Committee had hoped that there would be no necessity to ask for an advance; but, after an investigation of all the circumstances, and what they thought might probably happen in the immediate future, they felt they would be justified in asking for 2d. per 1000 feet. This would bring them in £13,000 out of the £48,000, and they hoped to get another £13,000 from extra prices for residuals. From an improved method of manufacture, which they had already instituted, they hoped to get another £8000 or £10,000. The rest must come from the usual amount which had been handed over to the rates. Fortunately, their Chancellor of the Exchequer only estimated £10,000 this year; and they would probably be able to manage this and a little more. They had recommended this plan as being the most equitable division between the consumer and the ratepayer. They did not think it would be right to clap all of it on to the ratepayer, and not right to charge it entirely to the consumer. With regard to what he had said respecting improved methods of manufacture, for years it had been a universal custom, not in this country only, to use expensive enriching materials for gas making, which, while giving very satisfactory photometric tests, had been of no practical value whatever to the consumer, but rather a disadvantage. New methods had now arisen, and in many towns in North Germany they had proved satisfactory beyond the utmost expectation. They would have to be adopted in England; and the Committee had already, to a certain extent, adopted them with good results. But whatever they could do in manufacturing economically, it was as nothing compared with what the consumers could do for themselves. Occasionally they heard complaints about bad gas; but the majority of those which came before them were due to unsuitable burners or to neglect to change them after they had been in use a number of years. If consumers would see that they had good burners, they could help themselves considerably in the matter of improving their gas. The strongest advice he could give the consumers was: “See to your fittings;” and they would find that the incandescent gas-burners would be more economical than the others, and would give greater illuminating power. These burners would be getting cheaper



every year, and would be within the reach of everyone. In many towns in Germany, upwards of 90 per cent. of the lighting, including the street lighting, was done by the incandescent system. He was glad the Council were not led into lighting Leicester streets by electricity, as they now found that in Berlin—one of the most forward and up-to-date cities on the Continent—the authorities had abolished all the electric lights in the streets, and were using incandescent gas-burners. The colliery proprietors had not only put up the prices of coal, but had imposed new conditions as to the methods of purchasing. They had torn off the little slip which required them to observe recognized rates of wages. The Corporation had also had in their agreements a strike clause, which was found so useful in the year 1893. The Corporation did not feel that when there was a strike they ought to impose a penalty, but they did think they had the right to insist on the penalty when there was a lock-out; and in 1893 they insisted on those conditions being observed. Now, however, the colliery proprietors would not hold themselves liable to fulfil their contracts when there was a lock-out. From whatever cause, therefore, the contracts were not fulfilled, the colliery proprietors were free from blame. There were two other conditions which would affect the Corporation materially. They related to the delivery of coal. The Corporation had been in the habit in past years of having coal sent in when they wanted it. Of course, they burned much less in June, July, and August than they did in December, January, and February. The colliery proprietors had laid down new terms; and the Corporation were now compelled to have 40 per cent. in the six summer months, and 60 per cent. in the six winter months. All the coal had to be received in equal instalments; so that they were taking as much from October to March as they were at other times in the winter. This, unfortunately, involved stacking; and they could not stack coal without deterioration. He put it at the lowest figure when he said that this would make a difference of £3000 in addition to the extra cost of coal. Every cloud, however, had a silver lining; and he could see that in the future the present troubles would result in great improvements being made in the manufacture of gas.

Mr. EDWARDS seconded the motion.

Mr. BRUCE, referring to the quality of the gas, said he knew instances where the poorness of the light was caused by the meter, and not by the burners. There was insufficient pressure.

Mr. CHAPLIN said it seemed inevitable that the suggested increase in price should be adopted; but he would like to ask if the time had not arrived when the Corporation should consider whether they could not, with the assistance of other Corporations, have one or more collieries of their own. If they were to be subject to a merciless ring, who were extorting £1000 per week more from the Corporation than they did two years ago for the same quantity of coal, it seemed to him quite time that they ought to consider if there were not other ways of getting over the difficulty.

Mr. MANN said it was not always the burners that were at fault when the full light was not obtainable. In the case of some new houses, within his knowledge the light was bad, although the burners were new.

Alderman COLEMAN remarked that no amount of new burners would give them the illuminating power, if the Committee did not send it out. Their gas used to be 17-candle power; but he understood that it was now 2 candles less.

Mr. HINCKES said he understood that the promise of the Gas Committee was that they would contribute a sum of not less than £10,000 to the rates this year. They were told that this sum would be exceeded, and also that the 2d. increase would produce about £13,000; so that this 2d. was put on in order that the consumers of gas should contribute to the rates just about the sum promised in the estimates.

Alderman LENNARD, replying first to the last speaker, said the figures he mentioned were of necessity approximate. The Committee could not tell quite what they would get for coke and other residuals, nor whether their increased consumption would go on or not. They had tried to equitably, and almost equally, divide the loss between the ratepayer and the consumer, which he thought was the fair thing to do. They felt absolutely certain that this advance was only a temporary one; but it was far better to have a 2d. increase for two years than a 4d. one for a year. With regard to the illuminating power of the gas, he might say they were sending it out of such power that, if properly burnt, the consumers would get better gas than ever they had had in the past. The reason why the gas in new houses was so often unsatisfactory was because of the inadequacy of the pipes, which it should be remembered were not put in by the Corporation. He wished it were possible for builders to have to obtain a certificate of efficiency for their pipes before the gas was turned on. Mr. Chaplin's suggestion was not a new one, and it was not the first time the idea had been mentioned in the Council Chamber. Undoubtedly, if anything like the present condition of things existed for long, they would have to take steps to protect themselves. He did not think they ought to go about it in the manner some had suggested, by putting an export duty upon coal; but there were other ways and means of circumventing the colliery proprietors. He had had interviews with the managers of the largest gas-works in neighbouring towns, and they had their ideas and their plans; but it would not be wise to say what they were. In view of the fact that the Admiralty, the steamship companies, and the gas companies took half the coal that was produced, it would seem easy to protect themselves. It might be taken for granted that the Committee were not losing sight of what they might or ought to do in this matter.

The report was adopted.

## LANCASTER CORPORATION GAS, ELECTRICITY, AND WATER SUPPLY.

At the Meeting of the Lancaster Town Council last Wednesday, the annual report of the Gas Engineer (Mr. Charles Armitage) was brought forward. It showed that the revenue in the twelve months ending the 25th of March was £27,021, and the expenditure £18,632; leaving a gross profit of £8389. This was disposed of as follows: Interest, £3883; sinking fund, £1608; income-tax, £289; borough fund, £1250; reserve fund, £1359. The last-named fund now amounts to £13,359. The working statement showed that the total quantity of gas sold in the year was 153,871,402 cubic feet; being an increase of 4,718,129 cubic feet, or

3.16 per cent., on the previous twelve months. The average cost of coal and cannel was 12s. 5.68d. per ton; but coke contributed in return 5s. 7.90d., and tar and ammoniacal liquor products 4s. 8.87d.; making a return for residuals of 10s. 4.77d., or 83.36 per cent. of the cost of coal. The Gas Committee reported that they had resolved to recommend the Council to advance the price of gas to all consumers by ordinary meters, from the date of recording the meter indexes for the June quarter, and also for the public lamps, by 3d. per 1000 cubic feet. The Electricity Committee reported a net profit of £420, to be transferred to the district fund account. The expenditure amounted in 1899 to £1682 19s. 7d., or 1.92d. per unit, and in 1900 to £2318 1s. 6d., or 1.97d. per unit; the income for the former year being £4007 4s. 3d., as compared with £4503 17s. 5d. in the latter. The Water Committee stated that the Borough Accountant had submitted an abstract of the accounts of the Water Department, with his report thereon, for the past year, and that it showed a net profit of £3288 to be transferred to the borough fund account; being £2046 less than before.

In moving the confirmation of the Gas Committee's minutes, Mr. Helme explained that the rise in the price of gas had been necessitated by the enhanced cost of coal. They would require, if they were to contribute at all to the rates—and they undertook at the beginning of the financial year to hand over £1000—that the price of gas within the borough should be raised from 2s. 6d. to 2s. 9d., or 3d. per 1000 cubic feet on ordinary meter supplies and for public lighting. The Committee proposed to continue the price charged at present for prepayment meters. They were supplying 27 cubic feet for 1d., which was about 3s. 1d. per 1000 feet; and seeing that these meters were in the houses of the poorest class of consumers, they asked the Council to allow them to receive the same quantity in the future as now. They had 1230 prepayment meters fixed; and he was glad to say that the consumption of gas had been steadily going up from the check experienced some time ago, and had reached 153 millions—an increase of 4,718,129 cubic feet on the year, or 3.16 per cent. In face of the increased competition with the electric light, he thought the Corporation were to be congratulated on the fact that the Gas Department, owing to the continual development of the use of gas for cooking, heating, and so on, was clearly growing; and they anticipated the success of the past would be maintained in the future, under the careful oversight of Mr. Armitage, to whom the credit was due. The minutes were confirmed, as were those of the Electricity and Water Committees.

## COLNE CORPORATION GAS SUPPLY.

### The Past Year's Working.

The Chairman of the Gas Committee of the Colne Corporation (Mr. Hartley) has prepared his report on the working of the gas undertaking last year. We learn therefrom that in that period 11,487 tons of coal were carbonized; the yield per ton averaging 11,110 cubic feet, or 94 feet below the previous year. The total quantity of gas manufactured was 127,631,000 cubic feet—an increase of 8,581,000 cubic feet, or 7.20 per cent. The total quantity of gas accounted for was 123,187,000 cubic feet; showing a leakage of 4,444,000 cubic feet, or 3.48 per cent., against 5.45 per cent. The quantity of gas used on the works was 1,339,000 cubic feet, as compared with 1,357,000 cubic feet in 1898-9, and 2,300,000 cubic feet in 1897-8. The number of meters now in use in the district is 5362, of which 1795 are prepayment meters. The increase in the former for the twelve months was 202, and in the latter 329. Cookers increased by 355; the number out on hire at the close of the year being 1130. There were 7,454,000 cubic feet of gas burnt in the public lamps, against 7,801,000 cubic feet in 1898-9. The length of mains in the district now reaches 37 miles; about 1500 yards having been laid during the year. The capital expended during the twelve months amounted to £2979. The principal items included new meters, cookers, boilers, mains, and services. The total outlay on capital account is now £101,288, of which £13,969 has been repaid. The gross expenditure for the year amounted to £18,107, against £16,727. The income from all sources, exclusive of the cost of street lighting, was £21,625, against £19,629; showing a net profit of £3518, as against £2902 the previous year, or an increase of £616. Last year the price of gas was reduced 3d. per 1000 cubic feet all round; the charges now being 2s. 9d., less 5 per cent., for ordinary meters, and 3s. 1d. net for slot meters. The loss to the revenue caused by this reduction amounted to £1238. The profit therefore exceeded that of the previous year by £1854. This was accounted for as follows: The gas saved through leakage amounted to a net gain of £330; extra sales from gas brought in £670 profit; residuals, through advanced prices, gave an increase of £1200; the rents from meters and stoves, £100 more; wages in the coke yard were reduced £100; purification, £70; and maintenance of works, £150. On the other hand, there was an increased expenditure as follows: Gas mains, £260; stokers', lamp-lighters', and fitters' wages, £115; salaries, £60; loans, &c., £100; and sulphate plant, £130. Residuals reached the following advanced prices over the previous year: Coke, 3s. per ton; sulphate of ammonia, £1 8s. per ton; and tar, 10s. per ton. The account for street lighting amounted to £1136, against £1219 in 1898-9, and £1551 in 1896-7. The number of lamps is now in excess of the latter year. The reduction in the account is owing to the fact that all wages, repairs, and gas consumed are now charged at cost price.

## COCKERMOUTH GAS SUPPLY.

### The Increased Cost of Coal—Price of Gas Unchanged.

At the last Meeting of the Cockermouth District Council, the Gas Committee called attention to the serious rise in the price of coal; last year's figure being 11s. per ton, whereas that for the present year is 16s. 6d.—a rise of 50 per cent. It was estimated that there would be an increase of something like £375 in the cost of coal. Coupled with this, was the fact that it was proposed to spend £250 out of revenue on additions to plant and improvements to the works. The Committee pointed out that the working balance, which stood at £1738 on March 31, would, in all probability, be reduced to £1200 on the corresponding day next year. After carefully considering the position, they recommended that no increase in the price of gas should be made now. If, however, present



prices for coals were maintained next year, the question would have to receive the serious attention of the Council. With regard to the salary of the Manager (Mr. Harold Baker), if circumstances had permitted, the Committee were prepared to give the matter favourable consideration. He, however, voluntarily withdrew his application, on account of the great increase in the price of coals. Mr. Stephenson, in moving the adoption of the report, said, with reference to the coal contract, he had looked up the prices paid during the last eleven years, and found them to average 10s. 7d. per ton—the highest being 12s., and the lowest 9s. Now they were paying 16s. 6d. With coal at 11s. per ton, they could sell gas at 3s. 3d. per 1000 cubic feet and make a profit; but it was obvious that, if they had to pay 16s. 6d., the conditions under which they had to work were vastly different. They hoped that the present high prices would not be maintained; but if they were, the Council might rest assured that the Committee were keenly alive to the imperative necessity of the gas undertaking paying its way. They proposed this year, under what he thought would be admitted were exceptional circumstances, to utilize a certain portion of the accrued balance; and he hoped that no objection would be taken to it. After all, this balance came out of the pockets of the gas consumers; and he thought that, under the circumstances, there could not be any very serious objection to a portion of it being applied for the benefit of those from whom it was derived. Another thing they ought to take into consideration was that they were spending, and had spent, a considerable sum on the extension and improvement of the works, which, properly speaking, was capital expenditure; but they had paid it out of revenue. Mr. Jackson seconded the motion, and expressed a hope that when they met this time next year coal would be at a different price. The Council, he said, ought not to forget that since the gas-works were purchased by them they had been put into a state of thorough repair, a considerable portion of the debt had been paid off, and there was a balance in hand—showing that they had been worked at a profit since the Council had been possessors; and the charge had been very considerably reduced. He hoped the Council would agree with the suggestion that, for this year, at all events, it was not desirable to raise the price of gas. The report was adopted.

#### THE GAINSBOROUGH GAS-WORKS TRANSFER.

At an Extraordinary Meeting of the Gainsborough Urban District Council held yesterday week, the question of the purchase of the gas-works was discussed, and the following resolution was agreed to: "That the Gas Committee be authorized to carry on the gas undertaking jointly with the Gas Company's Directors and officials, and make such financial arrangements for the purpose as they may think proper from the 1st of July, 1900, until the payment of the purchase money, when the transfer will be completed. The terms of carrying on the undertaking are set out in a memorandum dated the 21st of May, 1900, and signed by Councillor Cooper, on behalf of the Council, and Mr. R. W. Forrest, on behalf of the Gas Company, and that the same is hereby confirmed." The terms of settlement as read were: The price of the undertaking to be £75,000. The Council to pay in addition £5000, the amount of debentures, and £2000 as compensation to the Secretary for loss of office. The Company to pay all debts and receive all moneys owing on June 30, and the Council to receive all moneys, rents, &c., owing on or after July 1. The Company to manage the undertaking on behalf of the Council from and after June 10, and the Council to pay the maximum statutory dividend up to the date when the purchase money is paid over, and also to pay the Directors' fees, Secretary's salary, and all the working expenses of the undertaking, together with the debenture interest. A resolution in accordance with the terms of settlement was adopted, and it was decided to give three months' notice to the debenture holders to pay off the mortgage of £5000 on or before Sept. 30.

#### HONLEY GAS-WORKS PURCHASE.

##### The Ratepayers' Consent—Financial Position of the Company.

A Public Meeting was held at Honley last Friday week for the purpose of taking the opinion of the ratepayers on the question of the purchase of the gas-works, at present owned by a limited Company. The Clerk to the District Council (Mr. James Sykes) read a statement of what had taken place in the Council with reference to the suggestion, from which it appeared that the question came forward in consequence of a ratepayers' memorial, in November last, asking the Council to take into consideration the provision of a public electric supply. The Gas Company had been approached, and had consented to hand over their works, &c., subject to all liabilities, as from the 31st of December last, for £18,500, with interest at the rate of 4 per cent. per annum, and the payment of all costs by the Council. The present share capital was £8000, fully paid up, with £500 owing on a loan of £2000 borrowed in 1886, and a reserve fund of £587. A new gasholder, erected last year, had doubled the storage capacity. The Directors had practically asked that they be paid at the rate of £2 per share for ordinary shares, and £500 for the reserve fund. The receipts last year were £2398, exclusive of the amount paid for public lighting; and the average receipts from 1891 to 1899 had been £2154. The amount expended in repairs had varied from £99 in 1891 to £912 last year, or an average of £327. The wages bill reached under £300 per year. For the last nine years, the average profits had been £720; and to this it would be fair to add the sum of £1200 in respect of expenditure incurred on capital account, which would bring the average profits to approximately £850. The liabilities owing were only on tradesmen's accounts. The profits for the last three years had been £966 in 1897, £907 in 1898, and £212 in 1899; but during the latter year £911 had been expended on a new holder. The Company had been able to pay a dividend of 7½ per cent. during late years, together with £70 in respect of the loan. They were empowered to pay 10 per cent., and charge 4s. 4d. per 1000 cubic feet, instead of 3s. 9d. Assuming that it would be necessary to borrow £19,000, repayable by way of annuity, with interest at 3½ per cent. per annum, at thirty years' purchase, the yearly payments would be £966. A Sub-Committee of the Council who had reported on the question were of opinion that the money could be

borrowed and repaid in thirty years, without the necessity of a rate-in-aid, as a penny rate would realize £60 per year. The Sub-Committee were of opinion that the works had been conducted with a view not to disposing of them, but making them a paying concern, and recommended that the Council should purchase the works providing an expert held a similar opinion after making a thorough examination of the works, books, &c. Accordingly, Mr. E. A. Harman, the Engineer of the Huddersfield Corporation Gas Department, was engaged, and had recommended the Council to acquire the works. There was some discussion; and a resolution consenting to the purchase of the works on the terms offered was passed by 32 votes to 24.

#### FATAL ACCIDENT AT THE WANDSWORTH AND PUTNEY GAS-WORKS.

A deplorable accident, by which two men instantaneously lost their lives, occurred on Monday last week at the Wandsworth and Putney Gas-Works. The names of the unfortunate men were William Davidson and Frederick Smith; and their ages were respectively 45 and 27 years. It appears that they were engaged in connection with the construction of a new gasholder tank, for which Messrs. Perry and Co., of Bow, are the Contractors. At the time of the accident, they were working in the bottom of the tank; and as a skipful of clay was being lifted by a crane, the wire rope broke, and the skip and its contents fell upon, and instantly killed, the two men below. The skip was only between 10 and 12 feet from the bottom of the tank when the rope parted. It is curious that both on the Tuesday and Saturday previous to the accident, all the ropes on the four cranes engaged on the work were examined and tested. The inquest on the bodies was held last Thursday, by Mr. Braxton Hicks, at the Wandsworth Town Hall. The facts already mentioned were brought out in the evidence. In addition, it was elicited that the rope was purchased from Messrs. Wilkins and Co., of Wapping, in June, 1896; but it had only been used during two-and-a-half years of that period. The maker of the rope examined it in Court, and stated that, when it was supplied, it would stand a strain of 14 tons weight, and that at the time of the accident it had only about 15 cwt. to lift. Notwithstanding this evidence, and the summing up of the Coroner (which conveyed the impression that he regarded the affair as an accident pure and simple), the Jury returned a verdict of death by accident, caused by using an old and defective rope; adding their opinion that, before it was used, it should have been examined by a thoroughly competent person. It should be mentioned that the Gas Company were in no way concerned or involved in the accident, and, in fact, were not referred to in the proceedings at the inquest.

#### THE INTRODUCTION OF GAS INTO PAISLEY.

A correspondent writes: The adoption of the electric light in Paisley recalls the introduction of gas, and the method by which it was taken under municipal control. The first movement made in Paisley regarding the use of gas was in 1819, when Mr. James Wilkinson, china merchant, High Street, and others, applied to the Town Council for permission to convey gas by pipes across the street opposite their premises. The Council willingly gave their consent, and expressed their readiness to afford every facility and encouragement to any measure of the kind. It was in September, 1821, that the first steps were taken for the establishment of a Company in Paisley to make gas. The promoters applied to the Town Council to take shares; but they declined to do so with expressions of regret, alleging that the state of the community's funds did not justify them in taking such a step. They, however, expressed the hope that the undertaking would be beneficial to the public and profitable to the promoters. Sufficient funds having been obtained, the promoters applied to Parliament for an Act for the better lighting of the town. A part of the preamble of the Bill ran as follows: "And whereas inflammable air or gas, coke, oil, tar, pitch, asphaltum, ammoniacal liquor, essential oil, pyroligneous acid, char coal, and other products, may be procured from coal, oil, tallow, peat, turf, rosin, wood, and other inflammable substances; and whereas the inflammable air may be safely and beneficially used for lighting the streets," private houses, &c., "and the coke may be beneficially employed as fuel," and the oil, tar, and other inflammable substances already mentioned, "may be used and applied in various other ways with great advantage," &c. The Act was obtained, and the Paisley Gaslight Company so incorporated was authorized to raise £16,000 in shares of £5 each, and to borrow a further sum of £4000. The Bill received the Royal Assent on May 30, 1823. Operations were commenced without any loss of time; and the Directors applied to the Town Council on the 23rd of August in that year for permission to open some of the streets for laying pipes. In the following year, the greater number of the inhabitants were enjoying all the comforts to be derived from this greatly superior mode of supplying light. In 1832, the Company obtained authority to raise additional capital to the amount of £16,000, in shares of £5 each, with power also to borrow £8000. This money was required for the further extension of the works to meet the increasing demand for gas. At the latter end of 1843, a new Gas Company was formed; and on Jan. 29, 1844, "interim" Directors applied to the Town Council for their consent to operations being carried on in the meantime without an Act of Parliament, and to allowing pipes to be laid in the streets. The Directors of the old Company, hearing of this application, desired the Council to give them an opportunity of stating their objections before coming to any decision. This meeting took place, and the Council afterwards appointed a Committee to confer with the Directors of the old Company on the subject of ceding their whole works to the Council for the behoof of the public, which it had been announced that they were willing to do on terms advantageous to the community. After some correspondence and meetings, heads of an agreement for merging the Paisley Gaslight Company into a public interest in connection with the Corporation were agreed to and signed by both parties. These were to the effect that a Trust should be constituted with a view to secure cheap lighting for the town, that the £5 shares of the Company should be valued at £8, which was the market price at that time, and that the shareholders should receive 4 per cent.



thereon; also that the Board of Management should consist of twelve Trustees, eight of whom should be elected by the shareholders and four by the Council. When one-fourth of the capital should be paid up, the Council should elect five; and when one-half was paid, the Council would elect six Trustees—this system to be continued to the end of the Trust. The Council were also to have power to terminate the Trust by paying the shareholders; and they were entitled to borrow money for the purpose on the security of the works. This arrangement was only to be carried into effect in the event of the new Company not obtaining their Act of Parliament. The subject of this agreement and the prosecution of the new Gas Bill involved many public meetings, and caused much excitement in the town. The new Bill passed the Committee of the House of Commons; but while pending in the House of Lords, an arrangement was made whereby, on payment of £3600 by the old to the new Company towards defraying expenses, it was agreed to except Paisley from the parliamentary limits of the Bill. This was sanctioned by Parliament. Afterwards parliamentary notices were published and a Bill was prepared to carry out the agreement between the Town Council and the old Company. This Bill, establishing the gas-works as a public Trust, passed through both Houses without opposition, and received the Royal Assent on June 30, 1845, just 55 years ago. The price of gas in Paisley in 1844 was 7s. per 1000 cubic feet—the cheapest gas in Scotland at that time.

### ELECTRIC LIGHTING NOTES.

The Leamington Town Council last Friday agreed to make an offer for the purchase of the undertaking of the Midland Electric Light Company for the sum of £17,000, without prejudice.

The Bradford Electricity Committee have resolved to apply to the Local Government Board for sanction to borrow a further sum of £140,000 for the erection of a new electricity generating station at Valley Road, for additions to existing stations, and for further machinery and plant.

In the course of the annual statement of the Chairman of the Finance Committee at the meeting of the Ashton-under-Lyne Corporation last Wednesday, it transpired that there was a deficiency on the electricity revenue account for the year of £1060; and the total deficit from the commencement of the works was £2074.

On behalf of the Local Government Board, Colonel A. J. Hepper held an inquiry last Thursday at Southport into an application by the Corporation to borrow £13,000 for the provision of a destructor at Crowlands, and £9200 for electric lighting purposes. Respecting the electricity loan, it was stated that the Corporation had already spent or committed themselves to spend £138,500; and they desired extra money to meet possible demands.

During the past few weeks there has been an average of 63 fires in London every seven days; and, according to the "Daily Express," many of them have been caused by faulty electric light installations. Several occurred in shop windows, where the hanging incandescent lamps were allowed to touch lace or other more or less gauzy materials with which the window was draped. Our new daily contemporary relates the story of a youth who last winter, during the prevalence of very cold weather, went to sleep with an incandescent lamp wrapped in a handkerchief at his feet. An hour afterwards he was aroused by a burning sensation at his toes, and found the bed-clothes smouldering.

At the last meeting of the Eccles Town Council, Alderman Mellor reviewed at considerable length the accounts of the electric light undertaking for the past year. They showed a deficit of £789; but of this sum, £346 was for the repayment of loans. He estimated the loss on the current year's working at upwards of £800. Alderman Kendall said he regarded the figures as very satisfactory, considering the difficulties the Council had to contend against. Alderman Spary suggested that the Electric Lighting Committee should face the matter, and ascertain whether they could be supplied in bulk with electricity cheaper than the Committee could generate it. Mr. Nuttall pointed out that the amount overspent, and due to the Treasurer, on electric lighting account was £7289. He moved that steps be taken by the Council to obtain borrowing powers to cover this amount. The motion was agreed to unanimously; and the accounts were adopted.

The application of the Devonport Corporation for a loan of £69,727 for the purposes of the electricity undertakings was the subject of an inquiry yesterday week by Colonel Luard, one of the Local Government Board Inspectors. The works are for the supply of current for the working of tramways as well as lighting; and it was stated by Mr. C. Furness, the Electrical Engineer to the Corporation, that they would start with an assured demand of 700,000 units per annum for traction. Particulars have already been given in the "JOURNAL" of the proposed public lighting arrangements, which are to comprise 41 arc-lamps in the main thoroughfares; the intention being to light the other streets with incandescent gas-burners. Of the entire loan, £15,000 is to be spent on the site for the central station; and the Inspector expressed some surprise on learning that this is to be in Stonehouse, and not in Plymouth. A ratepayer opposed the application, on the ground that the Corporation could have obtained land in Devonport.

At last week's meeting of the Driffield Urban District Council, a letter was read from the Northern Counties Electricity Supply Company, giving the Council notice that it was the Company's intention to apply to the Board of Trade in the next session of Parliament for a Provisional Order for the lighting of Driffield by electricity. The letter asked for an appointment with the Council, in order that the representatives of the Company might discuss the Company's proposals for the establishment of electricity works in Driffield. Mr. C. Smith said that the Council having recently, at a very great cost, purchased the gas-works, would never allow a second lighting power to gain a footing in the district. If it was found there was any demand for electricity, the Council would supply it. He moved—"That the Clerk write to the Company named, that this Council does not see any necessity for having an interview with the Company's representatives, as this Council will not consent to the grant of a Provisional Order." This was carried unanimously.

A glowing statement of the success of the Torquay electric light undertaking was made at a Local Government Board inquiry last Tuesday. The Town Clerk said the plant was laid down in 1897. On March 31, 1898, there were 55 consumers, and 4688 8-candle power lamps were in use. On March 31 last the number of consumers was 221, and of lamps

10,070. The income, which in the first year was £2839, was in the second £3699; and the working, which resulted in a loss of £138 on the first year, produced in the second a profit of £67. The Corporation now want to borrow £15,000 for the extension of the plant, which is to be practically doubled, while the cables are to be extended in several directions. At present the plant is being worked to its full capacity. Colonel Luard, the Inspector, suggested that the Corporation might be able to lower the charge of 7d. per unit for the first hour, as they were now working the undertaking at a profit. The Town Clerk said the success of the works had exceeded their most sanguine expectations, but they would have to wait some time before reducing prices.

The original electric lighting scheme of the Lowestoft Corporation only provided for a connection of about 6000 lights; and so far applications have been received for about 5000. The decision to increase the public lighting by electricity, and a hope that the private business will extend, have induced the General Purposes Committee to recommend the borrowing of an additional £20,000 for increasing the capacity of the electricity plant. The matter was discussed at the meeting of the Council yesterday week, when some of the members at first seemed inclined to hesitate in venturing more on this enterprise at the present time. The Committee, however, have determined that every little increment of business they can control shall be brought to the aid of the new department. Among their recommendations was one that the Town Hall should be lighted by electricity, another that electric motive power should supersede the gas-engines now in use on the pumping-stations, and a third that all the public clocks should be lighted by electricity. It is the last straw that breaks the camel's back; and it is just possible that the final recommendation turned the scale in favour of the expenditure of the extra £20,000 on further electrical plant.

The Electric Lighting Committee had the humiliation of appearing before the Coventry City Council at their last meeting with a report which showed a greater loss than in the previous year—that is to say, £1745 has to be charged against the rates, compared with £1619. There has been an increase of business; but this appears to have been gained by an alteration in the scale of rebates which the outcome of the year's working has not justified. The number of consumers increased during the year from 135 to 226; and the lamps connected from 10,699 (8-candle power) to 17,806. The number of units sold advanced from 149,547 to 229,607; and the revenue from the sale of current and meter-rental from £3597 to £4189. The previous year's report, it should be mentioned, covered a period of fifteen months; and during the year which has just expired, electric street lighting has been inaugurated. If the comparison is confined to private lighting only, and the figures taken for the periods of twelve months ending March 31, 1900 and 1899 respectively, the Committee state that the units sold have been 166,057 against 110,106, and the revenue from the sale of current £3500, against £2640. The increase in receipts has not been proportionately so great as the increase in sales, owing, as already remarked, to the alteration in the scale of rebates, which came into effect at the commencement of the year. The profit on working is £785, against £333 for the previous fifteen months; and the net charge on the rates is £1745, compared with £1619 in the preceding year.

The Electrical Engineer to the Colne Corporation (Mr. F. Thorpe) recently submitted to the Electrical Committee detailed estimates of electrical plant to the amount of £28,708 for the town. Provision was made therein for supplying the full amount of current required by the proposed light railway, and also for 12,000 8-candle lamps for inside lighting and a small amount of street lighting. The plant will be put down from time to time to meet the demands of the district. The Committee resolved that the plans and estimates be approved, and that application be made to the Local Government Board to sanction a loan of £39,019 for carrying out the works. The matter came before the Town Council at their last meeting, when Mr. Hewitt, in moving the adoption of the minutes, remarked that they represented the deliberations of the Committee during the past nine months. The Council were asked to sanction an application to the Local Government Board to borrow a sum of almost £40,000. One sentence in the minutes, he thought, practically explained the position of the Committee, and it was the one which set forth that the plant for which they were asking borrowing powers would be put down from time to time to meet the demands of the district. The object which the Electrical Engineer, who was, of course, responsible for the scheme, and the Borough Surveyor, who had been assisting him, had in view, as well as the Committee, was to have a scheme which would readily lend itself to the future development of the town. It was hoped that the consent of the Local Government Board would soon be obtained, so that the Corporation could get the electric lighting system into operation; and as soon as the tramways made a move, the Council would meet that demand in due course. Mr. Riley having seconded the motion, it was postponed until after the Council had inspected the plans in Committee, at the conclusion of their ordinary meeting, when the minutes were confirmed.

Mr. C. F. Botley, the Assistant Gas Engineer and Electrician to the Hastings Corporation, is not relaxing his criticism of the recent decision of the Town Council, alluded to last week, to light a number of streets by electricity. In a letter to a local paper, he combats the statement that the town is likely to experience a saving by supplanting the incandescent gas-light, which, he points out, is now being used for public lighting in all the chief towns. As to the alleged success of electric lighting, he questions whether it has achieved it at Brighton, which is often cited as an example. "How," he asks, "is the so-called profit obtained? And if there is a profit, why is the general district rate not reduced by the amount of such profit?" The reason, he says, is not far to seek. "A careful examination of the figures will show that the ratepayers are such good custodians of the electric light works there that it is but a play on words to say there is profit when, perhaps, £2000 is returned to the rates after some £6000 is taken from them." He gives the following figures to assist his explanation: In 1892, Brighton's public lighting cost £9095, and the general district rate was 2s. 10d. In 1898 the lighting cost £11,937, and the rate was 3s. 3d. He admits that the illumination of the main streets is superior to what it was, and he also agrees that the additional cost of public lighting does not probably account for all the increased rate. The point is that without the additional cost of public electric lighting which the ratepayers have to pay as compared with previous illumination, there would not be any so-called "profit" at Brighton. "Electricity," then proceeds Mr. Botley, "cannot possibly be



produced locally at 1½d. per unit. The cost of fuel is the principal factor. Coal costing 9s. or 10s. per ton at Leeds would cost three times as much at Hastings. Therefore, as the charges are based on the figure of 1½d. per unit, from whence is to come the inevitable balance of cost of current for the new lamps as compared with the estimated cost?

An application by the Pemberton Urban District Council to the Local Government Board for power to borrow £20,000 for electric lighting purposes was the subject of an inquiry by Mr. F. H. Tulloch, M.Inst.C.E., a few days ago. Mr. T. R. Ellis, who represented the Council, said the township had for some years been supplied with gas by the Wigan Corporation—the streets and some of the houses being lighted by gas; but there were a considerable number of houses in which the illuminant was oil. It had been felt for some time that it was very desirable that provision should be made for supplying light to the township; the arrangement with Wigan not being altogether satisfactory. Mr. Salter, the Electrical Engineer consulted by the Council, gave details of the scheme, which he said provided for 5000 lamps of 16-candle power. The dynamos could be utilized either for lighting or traction, and would give 460 volts for lighting purposes, and from 500 to 550 volts for traction. It would be the three-wire system. There would be two 16-candle power lamps where each lamp-post now stood, and the street lighting cables would be separate from the domestic supply. There would be an average of five lamps in each house, which would make about 1200 or 1300 lights for the 251 houses. They intended to charge the consumers 5d. per unit, which was equivalent to the cost of gas. The application met with some opposition; one speaker remarking on the fact that although 1400 papers had been sent out, only 251 had been returned in favour of the scheme. He thought the project would add to the rates. The Inspector remarked that 251 householders had agreed to take the electric light, and the question was, how many of the dwellings were cottages. The Clerk (Mr. Partington) said, strictly speaking, none of them. He might say the number of houses in that particular area was 1700, 1200 of which were under and 500 over £10 rateable value. The majority of the houses were cottages. The lowest rateable value was, he thought, £8. A speaker pointed out that the bulk of the occupants of these cottages burnt oil. Mr. Ellis admitted that this was the case; and he said that one of the objects of the Council was to get rid of the system of oil lighting, because it was dangerous. After further observations, the inquiry closed.

A special meeting of the Lowestoft Town Council was held on Monday evening last week to receive a report of a Sub-Committee of the General Purposes Committee of the Corporation on the subject of the electric lighting of the town. The Sub-Committee had been on a roving commission, accompanied by Mr. F. Fairley, who is in partnership with Mr. W. C. C. Hawtayne, the Electrical Engineer to the Corporation; the places visited being Barking, Brighton, Dover, Harrow, and Hove. They produced a report which for bulk would have done for a place ten times the size of Lowestoft; the details in regard to each town being set out at extraordinary length. A local paper is unkind enough to suggest that the extent of the report is a sort of justification for the money of the ratepayers—about £50—spent in getting the particulars to produce it. However, the long and short of the matter is that the Local Government Board are to be asked for power to raise a further sum of £20,000 for electric lighting purposes. Mr. Jefferies, in moving the adoption of the report, said the borrowing of an extra £20,000 might be considered a very momentous matter to some, and he himself would have been of the same opinion had he not visited the various towns set forth in the report. But it was rendered necessary by the extensions which must be made owing to the increased number of applications for the light. They must go in for it thoroughly and well. They hoped later on, when the electric trams came, to have a day-load. In the discussion, the inevitable reference was made to the cost of the electric light as compared with gas; and Mr. Hawtayne gave, on the authority of Mr. Preece, 2s. 6d. per 1000 cubic feet as equivalent to 5d. per unit. But if Sir W. H. Preece was right when he said 8 units of electricity are equal to 1000 cubic feet of gas, the 5d. per unit works out to gas at 3s. 4d., as compared with 4s. 6d. now charged at Lowestoft. This is for gas consumed in the ordinary way. With the Welsbach burner, gas at 5s. per 1000 feet would be equal to electricity at 1d. per unit. However, the ratepayers are determined to have the electric light, and they will soon be able to ascertain whether or not it is cheaper and better than gas consumed with up-to-date appliances. But if they expect to save to the extent which the supporters of the scheme make out, we hope they may not be doomed to disappointment.

There has been an investigation by a Sub-Committee of the Electric Lighting Committee of the Hanley Corporation in regard to the deficiency on the working of the department during the past year; and the result appears to be a condemnation of the policy pursued by the Committee in the conduct of the business. In the course of the inquiry, the Sub-Committee had before them reports by the Borough Engineer and Electrical Engineer. In the former, it was stated that the loans now sanctioned by the Local Government Board in respect of the electric lighting undertaking were £70,009; and the amount borrowed was £64,990. Application had been made for further borrowing powers to the extent of £4000. During last year the expenditure on capital account was £7044; bringing the total expenditure up to £67,829. The capital outlay amounted to £55 per kilowatt of generating capacity, and out of sixty-six other local authorities with electricity undertakings, there were only three where the cost was lower, while out of forty companies there was only one having a lower capital cost. There was, therefore, in the Borough Engineer's opinion, no cause for apprehension as to the future financial success of the undertaking. The total capacity of the works was 1224 kilowatts, and the maximum demand last year was 550 kilowatts; so that the capacity was amply sufficient for many more customers as well as for reserve in case of necessity. The expenditure on revenue account last year was £7632; and the receipts amounted to £809—leaving a gross profit of £1177. The interest and sinking fund charges amounted to £3446; and as the gross profit was insufficient to meet those charges, the sum of £2269 had to be transferred from the general district fund account. In 1894-6, the gross profits covered the interest and sinking fund charges, and nothing was taken from the rates; but the amount drawn from the rates in 1897 was £188, and in 1898 £377—making the total loss for the last three years £2834. The deficiencies began with the reduction in the charge per unit, but for which the revenue would have been greater by a total of £3600; so that, the Borough Engineer believes,

there would have been a balance in hand, notwithstanding the increased price for fuel, interest, and sinking fund. This fund now amounted to £5638, and might be regarded as a valuable asset to its fullest extent. The Electrical Engineer in his report went into details of the year's working, showing the extra cost incurred in fuel, &c., and pointing out defects which should be remedied, and savings which might be effected. The Sub-Committee reported that, after full consideration, they were of opinion that the deficiency in the revenue account for last year was to be attributed to the following causes: (1) Too early reduction in the price of current before a reserve fund had been formed; (2) increased cost of fuel, wages, and materials; (3) abnormal repairs to generating plant; (4) increased charges to sinking fund and interest on further capital. They decided to recommend the Council to increase the present prices for the supply of electricity of 5d. and 2½d. to 6d. and 3d. per unit from July 1, less discount as before. In addition, the Electric Lighting Committee recommended that the charge for electrical energy to places of worship be increased from 4d. to 4½d. per unit, and for heating and power supplied through separate meters from 2½d. to 3d. per unit up to four hours' consumption per day, and 1d. per unit afterwards.

## SHEFFIELD CORPORATION WATER SUPPLY.

### A Satisfactory Year's Working.

The General Manager of the Water Department of the Sheffield Corporation (Mr. W. Terrey) has lately presented to the Water Committee the report and statement of accounts for the year ending March 25 last. They show a surplus of £17,037 on the twelve months' working. The capital expenditure on the existing works up to March 25, 1899, was £2,275,346; and the outlay during the past year—£11,941—brought this sum up to £2,287,287. On the Little Don Valley works, £95,699 was spent last year; bringing up the total to £284,087, and making the total capital expenditure to the close of the past financial year £2,751,374. The total income derived from water-rates for domestic and trade purposes during the year amounted to £125,106, against £118,093 in the year 1898-9; showing an increase of £3916 from water used for domestic purposes, and £3097 from that supplied for trade purposes by meter—a total increase of £7013, or 5.93 per cent. The receipts from meter-rents, house, land, and mill rents, and plumbing work (less *pro contra* items) amounted to £6108; making the total income from all sources £131,214—being an increase of £7333 over the previous year. The net expenses of maintenance and management came to £26,443. The net revenue was £104,771, on which were the following charges: Annuities, £58,836; interest on Corporation stock and mortgages £21,022; Langsett works, £727—making a total of £80,585, and leaving a net profit of £24,186, against £20,295 before. The twelfth annual instalment set aside out of revenue for the redemption of annuities and the extinction of loan indebtedness amounted to £7149; leaving the surplus for the year £17,037, as already mentioned. The above result was achieved notwithstanding the reduction, from Dec. 25, 1897, of one-half the amount of the 25 per cent. added to the water-rates by the Sheffield Water Act, 1864. This obligation involved a reduction in the water revenue amounting to £25,279. It appears from the special account relating to the sinking fund that the appropriations to Dec. 31, 1899, with the earnings thereon, amounted to £87,599; adding the liability from Jan. 1 to March 25, 1900, £1827, makes the total amount provided from the revenue account to the 25th of March last £89,426. Mr. Terrey gives a table showing the progress which has taken place in the finances of the department since the transfer of the water-works to the Corporation in 1888. The net surplus on March 25, 1899, amounted to £33,658; adding the surplus on the past year's working, £17,037, brings up the total, after discharging all liabilities, including the sinking fund, to £50,695. The number of houses supplied with water is 86,296; being an increase of 3232 during the year. The number of water-closets now supplied is 15,063, and of baths 6402. There are 3485 water-meters in use, against 3380. The grand total of all supplies on the 25th of March last was 122,822, against 114,889 in the previous year.

## THE PROPOSED PURCHASE OF THE FALMOUTH WATER-WORKS BY THE CORPORATION.

### No Decision yet Arrived at.

Considerable difference of opinion still exists in the Falmouth Town Council with reference to the proper course of procedure in the matter of the purchase of the water-works. At a meeting of the Council yesterday week, the Mayor said the members were substantially agreed as to the desirability of having the question settled at the earliest possible moment by putting it before the ratepayers for their decision. It was, however, advisable that they should themselves be unanimous, or nearly so, as to the course to be pursued. With the information before them, many of them were not prepared to pledge themselves to compulsory purchase. If it could be shown by an engineer in whom they had implicit confidence that purchase would be desirable, that the cost would not be prohibitory, and that the prospect of success in Parliament was tolerably good, then some of those who had hitherto stood aloof would be inclined to throw in their lot with the advocate of compulsory purchase. His opinion was that the ratepayers should be placed in possession of fresh information by an engineer approaching the matter free from past controversies or previous ideas. Two resolutions were proposed—one pledging the Council to proceed with the purchase of the undertaking without taking further expert advice; and the other authorizing a Committee to engage another engineer to prepare a report for submission to the ratepayers. It was contended by the supporters of the second proposition that it would strengthen the case of the advocates of compulsory purchase if Mr. Silverthorne's conclusions were supported by another engineer. The reply was that the object of the mover of the amendment was to throw dust in the eyes of the ratepayers, and confuse the real issue. In the end, the amendment in favour of consulting another engineer was carried by 8 votes to 7. One of the members remarked that the attempt to make the Council unanimous would be futile.



Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
590,000	10	Apr. 11	10½	Alliance & Dublin 10 p.c.	17½-18½	-2½	5 13 6	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	12½-13½	-1	5 11 1	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2
800,000	100	Jan. 2	5	Australian 5 p.c. Deb.	102-104	..	4 16 2					River Plate Ord.	10½-10½	..	6 10 3
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	851,070	10	Apr. 27	7	Do. 4 p.c. Deb.	100-102½	+1	3 18 5
40,000	5	"	6	Do. New, £4 paid	4-4½	..	5 6 8	250,000	Stk.	June 28	4	San Paulo, Ltd.	1½-1½	..	6 8 0
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250-260	..	4 12 4	250,000	10	Apr. 11	8	Sheffield A.	242-247	..	4 1 0
270,000	"	"	9	Do. New	185-190	..	4 14 9	185,000	Stk.	Mar. 14	10	Do. B.	244-245	..	4 1 4
50,000	"	"	5	Do. 5 p.c. Pref.	140-145	..	3 9 0	209,063	"	"	10	Do. C.	244-246	..	4 1 4
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	447,427	"	"	10	South Metrop., 4 p.c. Ord.	126-130	-1½	4 2 0
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	210-240	..	4 15 10	5,600,000	Stk.	Feb. 23	5½	Do. 8 p.c. Deb.	97-99	-1	3 0 7
226,320	"	"	8½	Do. A. Ord. Stk.	175-180	..	4 14 5	1,520,000	"	Jan. 12	3	Southampton Ord.	115-120	..	4 3 4
999,500	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	380,940	Stk.	May 16	5	Do. 4 p.c. Deb.	120-125	..	3 4 0
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	70,825	"	Dec. 29	4	Tottenham A. 5 p.c.	120-125	..	4 16 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	120,000	Stk.	Mar. 11	6	and B. 3½ p.c.	93-98	..	4 11 10
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	250,520	"	"	4½	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	9-9½	..	6 6 4	55,100	"	June 14	4	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	182,380	10	Jan. 12	5	Do. 5 p.c. Deb. Red.	101-104	..	4 16 2
150,000	20	Mar. 14	8½	Cagliari, Ltd.	24-26	..	6 6 11	149,900	10	Jan. 2	5				
100,000	10	June 14	8	Cape Town & Dis., Ltd.	14-15	..	5 6 8								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55-57	..	5 5 8								
550,000	Stk.	Apr. 11	13½	Commercial Old Stock.	275-285	-5	4 14 9								
236,425	"	"	10½	Do. New do.	210-220	..	4 15 5								
298,237	"	June 14	4½	Do. 4½ p.c. Deb.	135-140	-1½	3 4 4								
800,000	Stk.	May 31	9	Continental Union, Ltd.	155-165	..	5 9 1								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	780,399	Stk.	June 28	11	Chelsea, Ord.	298-303	..	3 12 7
51,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
173,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 5	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10



been in existence for 29 years. During all this time, in only three years has it paid its way; but the deficits were small, and the Directors were able to carry on. The significant thing is that it is the electric light which has proved to be the burden that has broken its back. Clearly the time has been reached when the electric light is no longer a draw. It is impossible to conceive of the Directors of a moribund institution like this introducing electricity for any other reason than that its novelty would make the place attractive—for of its costliness they must have been well aware. When the shopkeeper or the hotelkeeper comes to realize that it is no longer an attraction to his place to have it lighted by electricity, the age of sentiment will have ended; and when men begin to reason, by means of arithmetic, including the counting of £ s. d., the time will not be far distant when every system of lighting will be considered on its merits. When efficiency and cost come to be the ruling considerations, there can be no doubt as to which light will be adopted. Electricians officiously tell us that there will be a future for gas, in the consumption of it for cooking and heating. Let them take heed to their own prospect, lest in a few years their lighting business may have shrunk so that their chief stay will be the demand for electric supply for motive power—gas being restored to its place as the dominant artificial light of the world.

The other incident is that a new service of trains is to be inaugurated on the Midland route between London and Glasgow on Monday, in which the lighting is to be by gas, "owing to the uncertain working of the electric light on such journeys." Here, again, "lighted throughout by electricity" seems to have failed as an attraction. It will be interesting to see how soon this advertisement will disappear. When we find two great Railway Companies giving up electric lighting, we may be sure it is because they discover that the public have ceased to care for it, and are better satisfied with gas lighting. By the way, why are steamboats on short voyages—coasting steamers, say—not lighted by gas? It would be feasible, and quite safe, to have them so.

This is the season of the year when inspections of water-works are made. The greatest of these in Scotland is that of the Glasgow Corporation. It took place this year on June 21 and 22. On the first day, the party passed over some of the works in the vicinity of the city, and journeyed by Aberfoyle to the Trossachs Hotel, where they spent the night. Next day they devoted themselves to an inspection of the Loch Katrine works, and returned to Glasgow by Loch Lomond and train from Balloch. This is always a most popular excursion; and this year the party, headed by the Lord Provost, numbered about eighty. In a statement which has been prepared by Mr. J. M. Gale, the Engineer, it is stated that, by taking in the waters of Loch Arklet, a supply of 75 million gallons per day would be obtained, and that, if more water were desired, it would have to come from the further valley of Loch Voil and Loch Doine. The present supply is from the head waters of the Forth, and that which is foreshadowed would be from the head waters of the Tay. Thus would a large quantity of water which should naturally fall into the German Ocean be diverted into the Firth of Clyde. In this way, mankind vary throughout the country, if they do not always improve, the face of Nature.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, June 30.

**Sulphate of Ammonia.**—A very weak tone has pervaded the market throughout the week; and quotations have declined to £10 12s. 6d. to £10 15s. per ton, delivered f.o.b. at the ports. Orders have been extremely scarce, and have been easily covered at the decline. The larger makers seem inclined to resist any further drop in values; but the smaller makes are being offered as they become available. A fair amount of business has been done over early autumn months, at a small premium on prompt values; but, at the close, there are no buyers, unless at a discount. Delivery further ahead is altogether neglected.

**Nitrate of Soda** is a shade firmer at 7s. 10½d. to 8s. 3d. per cwt., according to quality, on spot.

LONDON, June 30.

**Tar Products.**—There is not much actual business passing at present in products. Creosote users appear a little more anxious to cover themselves for forward business, concluding no doubt that lower prices are improbable. Benzol buyers also seem more keen to cover some of their requirements at to-day's prices, which are considerably above the lowest. Pitch and carbolic are both steady, although actual business is limited. There is no change in anthracene.

Prices are as follows: Tar, 17s. 6d. to 28s. Pitch, east coast, 37s.; west coast, 34s. Benzol, 90's, 6d. to 8d.; special qualities for gas, 9½d.; 50's, 10½d. Toluol, 1s. 1d. Solvent naphtha, 1s. 1d. Crude naphtha, 3½d. Heavy naphtha, 1s. Creosote, 2½d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 1d.; 60's, 2s. 7d. Naphthalene salts, drained, 33s.; pressed, 75s. Anthracene, "A," 4d.; "B," 2½d.

**Sulphate of Ammonia** is still a weak market, at £10 7s. 6d. to £10 12s. 6d., less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Taking the coal trade of this district all through, the position continues exceedingly strong. It is true that the better qualities of round coal, owing to lessened requirements for house-fire purposes, are beginning to accumulate; but nothing of any real weight has so far been put down, and stocks remain exceptionally low for the time of the year. The inland demand upon the commoner qualities of round coal for steam and forge purposes, is not quite so pressing as it has been; but any falling off in this direction is more than counterbalanced by an increased demand for shipment. For all descriptions of round coal prices are firm at the full rates that have been quoted of late—ranging from 13s. per ton at the pit for ordinary descriptions of steam and forge coals up to 13s. 6d. and 14s. for common house coal, and 15s. to 15s. 6d. for the best qualities. Now, however, that pretty nearly all the important contracts have been settled, both in gas coal and for large manufacturing requirements, there is a general disposition

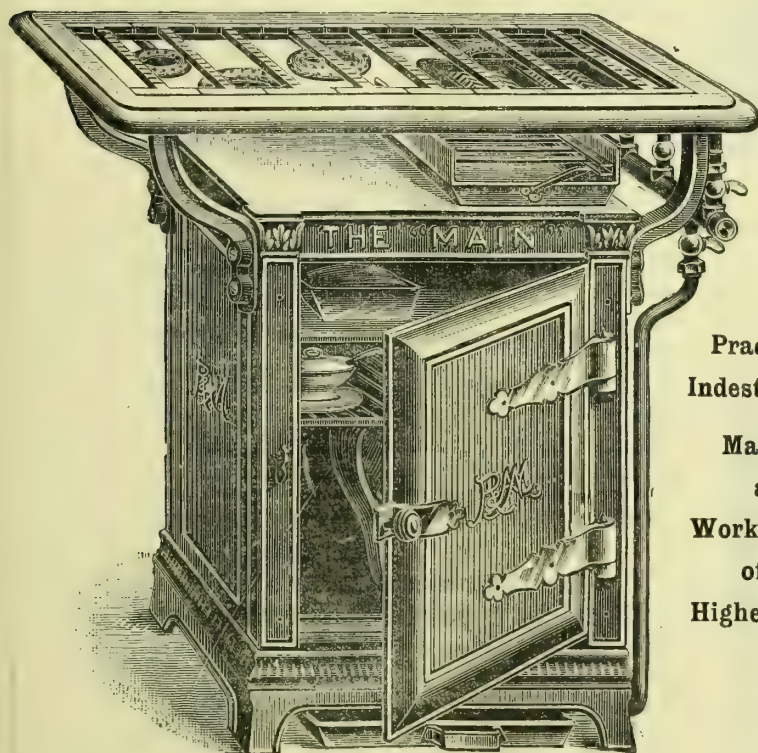
# R. & A. MAIN, Ltd.

214, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

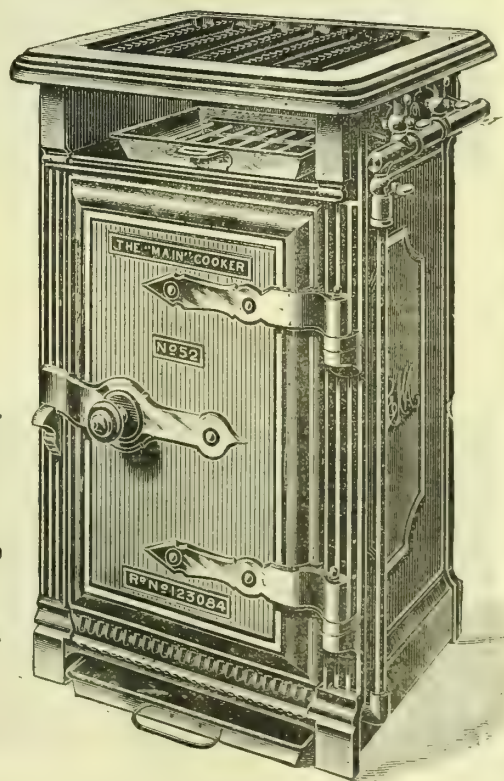
EDMONTON:  
GOTHIC WORKS.BRISTOL:  
28, BATH STREET.MANCHESTER:  
37, BLACKFRIARS STREET.GLASGOW:  
ARGYLE WORKS, KINNING PARK.FALKIRK:  
GOTHIC IRON-WORKS.

## The "Main" Gas-Cookers.

## Prepayment Meter Cookers.



Prices from £4 12s. 6d. to £13 10s.

Practically  
Indestructible.Materials  
and  
Workmanship  
of the  
Highest Class.

Prices from 25s. to 80s.



to buy sparingly at present rates; and the business put through is mostly of a hand-to-mouth character. But with the shortness of supplies, colliery proprietors are not at all eager sellers; and so far as the future prospects of prices are concerned, the only question would seem to be to what extent house-fire descriptions will be further advanced later on in the year. Engine classes of fuel during the last week or two have gradually become more plentiful on the market. Here and there at Lancashire collieries the production of slack is in excess of the demand; while from outside districts—chiefly Derbyshire and Staffordshire—fairly large quantities are coming forward, which are competing on the market here at prices below those that Lancashire collieries are quoting. This does not, however, affect the continued firmness of prices in this district; 10s. 6d. per ton remaining the minimum basis for common sorts, and 11s. to 11s. 6d. for the better qualities. For shipment, as already stated, there is an active inquiry, with slightly improved prices, if anything, being obtained. About 14s. 6d. per ton is the minimum for unscreened, and 15s. 3d. to 15s. 6d. per ton is secured for screened steam coal, delivered at the ports on the Mersey. For coke, the demand is quite as active as ever; and prices continue strong at the full rates—ranging from 24s. and 24s. 6d. per ton for furnace, to 32s. per ton for best foundry cokes.

**Northern Coal Trade.**—Trade has been disturbed by local holidays, which have tended to restrict production, more especially in Northumberland. Prices have, however, not been very materially altered. Best Northumbrian steam coals are about 17s. 6d. per ton f.o.b., and steam smalls are 12s. 6d.; the demand being moderate, and met by the output, which is now nearly normal again. In the gas coal trade, there are still very heavy deliveries; but with the commencement of July, a further part of these are at the newer prices—more remunerative to the coal-owners. For occasional cargoes, the price quoted varies from 16s. 6d. to 17s. per ton f.o.b. for best Durham gas coals; but the demand is relatively limited, so much of the output being taken up by the contracts. In coke, there is a strong demand; and the price is maintained at 35s. per ton f.o.b. for best Durham coke. Gas coke will now show some of the changes in the contracts which are made at the end of the half year, but the exact prices of which have not yet transpired. Stocks of gas coke are somewhat limited, and, of course, the output at this time of the year is very moderate.

**Scotch Coal Trade.**—There is no change to record; but the rumours continue of the enforced closing of public works for some weeks at the holiday time, which is said to be the result of want of new orders, which, again, is the result of the high prices that are being asked by manufacturers. The statement is made that coal-masters are not to advance the price of coal during July. This will be the first break in the upward tendency, and may be the fore-runner of lower prices. The quotations are: Main 14s. 6d. to 15s. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 280,612 tons—an increase of 58,290 tons over the preceding week, and of 64,180 tons over the corresponding week of last year. For the year to date, the total shipments have been 5,025,043 tons—an increase of 1,044,267 tons over the same period of the previous year.

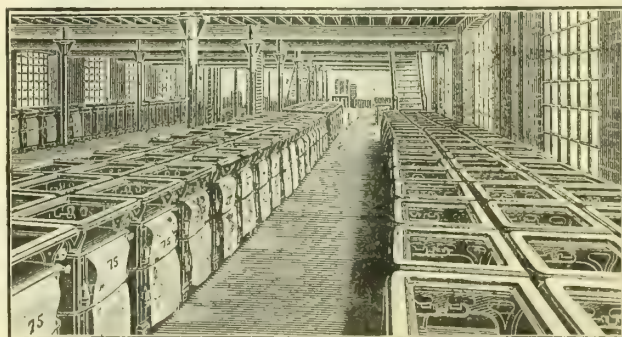
**Bursts in the Vyrnwy Aqueduct.**—Recently there was a burst on the Vyrnwy pipe-line near Delamere Forest; but last Tuesday the Water Engineer (Mr. James Parry) reported that it was not a serious one, and the supply was resumed the previous day. The day that he made this report, local papers recorded that the Cheshire village of Colebrook, near Tarporley, ran some danger of being swamped the preceding Saturday afternoon, when another large main from Vyrnwy burst. Amid great excitement a message was promptly despatched to the reservoir keeper in the locality; and the water was turned off. In the meantime, a tremendous volume escaped, flooding several fields. The flow had been reduced from 14 million to 2 million gallons owing to a burst at Oswestry; otherwise the consequences might have proved very serious.

**The New Water-Works of the Lancaster Corporation.**—On the invitation of the Chairman (Alderman Huntington) and members of the Water Committee, the Lancaster Corporation have paid their annual visit to the water-works. At Blea Tarn the evidences of progress in the greatest and most successful undertaking in connection with the Corporation water supply were most marked. Seven acres of water cover what was not long ago a bog, representing 25½ million gallons, notwithstanding the very dry spring. The shingling of the reservoir has been completed, and also a large part of the broad concrete beach. The valve-tower, already a massive and commanding piece of masonry, has to have some 17 feet added to complete it. The capacity of the reservoir when finished will be 120 million gallons; and its cost has been at the rate of £500 for every million gallons, as compared with £1000 per million gallons expended on the Damas Gill scheme. The work has been carried out at less than the estimate, which does great credit to the Borough Engineer (Mr. J. Cook), who has planned and executed every detail of the work without contracting.

**The Cray Water Scheme of the Swansea Corporation.**—The large water scheme which the Swansea Corporation have in hand does not appear to be moving forward at a rapid pace; and the "Cambrian" has been endeavouring to stir matters up a bit. Remarking that it has reason to believe the contract is not proceeding satisfactorily, our contemporary says: "A little over £11,000 was paid the contractors up to September last. Did this £11,000 (with, we suppose, certain retentions) represent as much work as ought to have been carried out since the contract was signed in June, 1898? What has been paid since last autumn? An examination of the accounts will show that the payments have by no means been in proportion to the contract. The time for the completion of the same, if we remember aright, does not exceed, if it comes up to, four years; and the contractors have already taken more than a quarter of the time to do work which represents a very small part of the amount they tendered for the contract—viz.,—£255,747. It is most important from every point of view that the contract should be completed within the stipulated period. The town cannot afford any delay involving, over the period longer than was at first intended, the payment of substantial salaries to the Resident Engineer, inspectors, and so forth, the interest on capital borrowed and lying idle, the putting off of the financial return from the scheme, and the adequate supply of water which is needed in Swansea."



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Pericles V., 1.

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TOVES.....WARRINGTON  
OGEN.....LONDON

"Fetch forth the stocks, ho!"—Lear II., 2.



**The Cleckheaton District Council and the Bradford Corporation Bill.**—At a meeting of the Bradford Corporation Parliamentary Committee last Thursday, it was stated that the Cleckheaton District Council had undertaken to withdraw their opposition to the gas clauses of the Corporation Bill on an undertaking being given in regard to the price to be charged for gas.

**The Cape Town District Water-Works Undertaking.**—The works of the Cape Town District Water-Works Company, Limited, are about to be transferred to the Local Authorities. The Company supply the four suburban districts of Claremont, Woodstock, Rondebosch, and Mowbray. The Councils of the two first-named places were the movers in the purchase scheme; and, after arbitration, the undertaking has been handed over to them for the sum of £223,000. Rondebosch and Mowbray have the option of coming in as partners, and the ratepayers of both districts have decided to join in the purchase. The undertaking will in future be managed by a Water Board on which all the four Municipalities will be represented.

**Dorking Councillors and a Rise in the Price of Gas.**—The Dorking Gas Company have recently issued a notice to the consumers to the effect that the price of gas is to be raised by 6d. per 1000 cubic feet. As is usually the case when there is a rise in any commodity, this has produced a great deal of indignation—especially among the members of the District Council. A resolution was moved by Mr. Tebbs at the last meeting, to the effect that the Council had learnt with regret that the Company had decided to raise the price of gas; and “as this prosperous Company have just declared a full dividend, and carried a large sum to reserve,” the Council hoped the Directors would reconsider their decision. Mr. Tebbs, in moving his resolution, paid a great compliment to the business capacity of the Directors: and then, presuming (it is to be supposed) that he knew more about their business than they did themselves, he gave them a little advice. Having done this, he threatened them with the electric light; and then made an appeal to their sense of honour and justice. Mr. Tebbs was hardly diplomatic in his method of reasoning with the Directors. Concluding his speech, he said: When Parliament granted the Company their Act, it was expressly laid down that in no year should the average dividends amount to more than 10 per cent. Surely Parliament meant that, whenever a sum of money was earned in any one year, or succession of years, over and above that sufficient to pay the shareholders 10 per cent., the consumers should have the benefit of the surplus amount. What was the fact? At the last meeting of the shareholders, they paid the maximum dividends on all shares, which absorbed £1038, and left a balance of £1534 to be carried to the next account. This meant that, after paying the 10 per cent. dividend, they had actually in hand sufficient money to pay another year-and-a-half's dividend at the same rate. Instead of raising the price of gas, they ought to lower it. The resolution was passed, with a rider instructing the Clerk to examine the Company's last balance-sheet, and advise the Council whether the Directors were justified in carrying large sums to a reserve account, and in purchasing property and extending their works, without first reducing the charge to consumers of gas throughout the district.

**New Water-Works for Taunton.**—The Taunton Town Council have recently paid a visit to their Leigh Hill water-works for the purpose of laying, with due formality, the keystone of the culvert of a large reservoir about to be constructed at Luxhay. The Council already have two storage reservoirs—one at Leigh and the other at Blagdon; the total storage capacity being about 38 million gallons. The town, however, is growing so rapidly, and its manufactures are increasing at such a rate, that, although the last reservoir was finished as recently as 1894, it is now found necessary to construct another. For this purpose a large quantity of land has been purchased at Luxhay; and extensive additional water rights have been secured. The storage capacity of the new reservoir will be 120 million gallons; and the water area when the reservoir is full will be about 18 acres. In laying the keystone of the culvert, Alderman Adams, the Chairman of the Water Committee, made an interesting speech, tracing the history of the undertaking from the time that the property was purchased from the old Water Company by the Town Council, upon the re-incorporation of the borough in 1877.

**The Leamington Gas-Works Purchase Question: An Expert's Engagement Cancelled.**—This is an extract from the “Warwick Advertiser” of last Saturday's date: “Under the arrangement for promoting the transfer of the Leamington gas undertaking to the Corporation, it will be remembered that the Corporation recently appointed Mr. Thomas Newbigging, of Manchester, as their Arbitrator. In this capacity he will have to meet the arbitrator appointed by the Leamington Gas Company. The latter are advised by Mr. George Livesey, the Chairman of the South Metropolitan Gas Company. In the event of these gentlemen disagreeing, they will, under the terms of the Lands Clauses Act, have to appoint an Umpire, and an arbitration will follow to decide the value of the undertaking. In connection with this contingency, we have it on good authority that the Gas Purchase Committee met on the 23rd inst. and appointed three Engineers as expert witnesses—viz., Mr. Hunt (the Engineer of the Birmingham Gas Corporation Department), Mr. E. H. Stevenson (son of the late Mr. George Wilson Stevenson), and Mr. Arthur Silverthorne (the pioneer of gas purchases in this country and a well-known supporter of ‘ratepayers’ interests). From what we have been able to gather, for two days last week a most notable contest has been waged in the House of Lords over the Morecambe Gas Bill. . . . Mr. Silverthorne was examined at great length on behalf of the outside authority of Heysham, and confirmed the opinion generally entertained throughout Lancashire, that it was an improvident purchase that would necessitate a considerable increase in price in addition to any increase following the rise in value of coal. The Bill passed through the Lords, although its passage through the Commons established the fact that the Committee regarded the bargain with considerable suspicion. Mr. Silverthorne's outspoken evidence must have caused deep umbrage to the supporters of the alleged bargain, as it is an open secret that pressure has since been brought to bear on the Leamington Committee, and the ‘ratepayers’ expert's’ appointment has since been cancelled. We should expect the ratepayers would like to know at whose instigation?” And it would be interesting to “JOURNAL” readers to know who is the author of this paragraph.

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	Cubic Feet Daily.		Cubic Feet Daily
BLACKBURN . . . . .	1,250,000	BUFFALO, N.Y. . . . .	2,000,000
WINDSOR ST. WORKS, BIRMINGHAM . . . . .	2,000,000	WINNIPEG, MAN. . . . .	500,000
SALTLEY WORKS, BIRMINGHAM . . . . .	2,000,000	COLCHESTER (Second Contract) . . . . .	300,000
COLCHESTER . . . . .	300,000	YORK . . . . .	750,000
BIRKENHEAD . . . . .	2,250,000	ROCHESTER . . . . .	500,000
SWINDON (New Swindon Gas Co.) . . . . .	120,000	KINGSTON, ONT., . . . . .	300,000
SALTLEY, BIRMINGHAM (Second Contract) . . . . .	2,000,000	CRYSTAL PALACE DISTRICT . . . . .	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.) . . . . .	2,000,000	DULUTH, MINN. . . . .	300,000
HALIFAX . . . . .	1,000,000	CATERHAM . . . . .	150,000
TORONTO . . . . .	250,000	LEICESTER . . . . .	2,000,000
OTTAWA . . . . .	250,000	ENSCHEDÉ (HOLLAND) . . . . .	150,000
LINDSAY (Remodelled) . . . . .	125,000	BUENOS AYRES (RIVER PLATE CO.) . . . . .	700,000
MONTREAL . . . . .	500,000	BURNLEY . . . . .	1,500,000
TORONTO (Second Contract; Remodelled) . . . . .	2,000,000	KINGSTON-ON-THAMES . . . . .	1,750,000
BELLEVILLE . . . . .	250,000	ACCRINGTON . . . . .	500,000
OTTAWA (Second Contract) . . . . .	250,000	TONBRIDGE . . . . .	300,000
BRANTFORD (Remodelled) . . . . .	200,000	STRETTFORD . . . . .	500,000
ST. CATHERINES (Remodelled) . . . . .	250,000	OLDBURY . . . . .	300,000
KINGSTON, PA. . . . .	125,000	TODMORDEN . . . . .	500,000
PETERBOROUGH, ONT. . . . .	250,000	SALTLEY, BIRMINGHAM (Third Contract) . . . . .	2,000,000
WILKESBARRE, PA. . . . .	750,000	YORK (Second Contract) . . . . .	750,000
ST. CATHERINES (Second Contract) . . . . .	250,000	ROCHESTER (Second Contract) . . . . .	500,000
		NEWPORT (MON.) . . . . .	250,000



**Newbury Gas Affairs.**—The Newbury Corporation have, on the recommendation of the Gas Committee, resolved to apply for a loan of £2500 in connection with the gas undertaking. The Committee have had tenders for coal under consideration at an average price of £1 2s. 1½d. per ton. It is expected that the advanced price of coal will cost the undertaking £800 more than under the last contracts.

**Gas-Works Profits at Stoke-on-Trent.**—At last Wednesday's meeting of the Stoke Town Council, Alderman Geen, in moving the adoption of the Gas Committee's minutes, said the make and sale of gas for the year ended March 31 was the highest on record; and after meeting all charges (including instalments of principal and interest on loans), the profit was also the highest on record—viz., £3881. As regarded £2390, it had been applied to relieving the rates by making no charge for public lighting and cleaning and repairing the lamps. The balance of the profit had been expended on extensions. The minutes were passed.

**Leeds Gas Coal Contracts.**—In response to their advertisements, it is reported that the Leeds Corporation Gas Committee received tenders for about four times as much coal as they will need during the nine months October to March next. Referring to the meeting of the Gas Committee last Tuesday to consider the tenders, the "Yorkshire Post" says: From a casual glance at the tenders, it was apparent that the average advance in price on last year's rates is at least 5s. a ton. As to the conditions—in reference to which, it will be remembered, representatives of West Yorkshire coalowners and of various Corporations recently endeavoured, but in vain, to come to an agreement—they vary a good deal. Some of the tenders specify the coalowners' new terms of contract; others are filled in on the Gas Committee's form of tender; while some of the firms (to quote a member of the Committee) name conditions of their own. The Committee will meet shortly to examine the tenders, with special reference to the conditions, before coming to a decision.

**Queen's Birthday Entertainment at the Port Elizabeth Gas-Works.**—The employees of the South African Lighting Association, with their wives, children, and friends, according to custom, celebrated the Queen's Birthday with a most enjoyable entertainment at the Mutual Hall, Port Elizabeth, on Wednesday, May 23. The hall was brilliantly illuminated by two incandescent gas clusters each of 1000-candle power, costing about 4d. per hour—a striking illustration of the efficiency and economy of gas. A capital programme, comprising music and gymnastic displays, entertained and amused the large audience; and during an interval light refreshments, tea, and coffee were handed round. Mr. W. Arnott, the energetic Manager, was untiring in his attention to the comfort and entertainment of the guests. In addition to taking the chair and looking after things generally, he gave an interesting lantern exhibition of photographic views, including a unique series depicting the devastation wrought by the flood some years since, and other subjects of local and general interest. During the evening, he mentioned that eight men from the works were serving the Queen in the Boer war. He expressed the hope that Her Majesty's next birthday would be celebrated under one united flag of South Africa. He referred with gratification to the fact that the gas-works were now as well equipped as any at home.

**The Middlesex Gas-Meter Testing-Station.**—The new meter testing-station erected by Messrs. T. Glover and Co. at Edmonton has now been completed, and work was commenced yesterday. The County Council of Middlesex last Thursday passed a resolution putting in force the Sale of Gas Acts, and providing for ten 10-feet and two 20-feet gasholders.

**The Price of Gas at Cleckheaton.**—The Gas Committee of the Cleckheaton District Council find that their new coal contracts represent an additional charge of £2160 for the year. But it is expected that £800 additional revenue will be derived from the sale of residual products at increased prices; and the Committee deem it prudent to sacrifice profits to the extent of the remaining £1300, if necessary, rather than advance the charge for gas. The profits have amounted in recent years to from £1300 to £1500 annually; and the consumption of gas is constantly increasing, with a corresponding margin of profit.

**The Prospect of Dearer Gas at Birmingham.**—Reference has already been made, says the "Birmingham Daily Post," to the possibility of the increased cost of coal affecting the price of Birmingham gas. Coal-owners throughout the country have announced their intention of demanding an increase of 5s. per ton as compared with the contracts of last year; and this on Birmingham's annual purchase (based on last year's figures) of 527,221 tons, means an increase of £131,805 on the city's gas bill. The amount of the actual increase demanded has not been allowed to transpire; but we understand that at Thursday's meeting of the Gas Committee, when tenders were considered, it was apparent that "an early and substantial advance" in the price of gas is inevitable. The amount of the increase which will be necessary has not yet been settled; but, as bearing on the point, it may be mentioned that, though coke and tar prices remain at a high figure, other residuals tend to decrease.

**The Price for Public Lighting in Stockport Out-Districts.**—The Stockport Gas Committee recently intimated to the Heaton Norris District Council that, on and after June 24, the additional charge for public lighting would be 1s. 6d. per lamp per annum for every penny extra per 1000 cubic feet of gas charged to private consumers. The increase in the charge to private consumers is 4d. per 1000 cubic feet; so that the additional cost for public lighting will be 6s. per lamp. The matter came before the Heaton Norris Council at their last monthly meeting, when it was mentioned by Mr. Barton that there were at present in the district 300 lamps, which cost £1 6s. 9d. for gas, and £1 4s. 3d. for lighting and repairs; making a total of £2 11s. He considered the notice from the Corporation to be peremptory. If 6s. per lamp were added, it would bring the amount for gas, lighting, and repairs to £2 17s. per lamp, which was excessive. Last year the Stockport gas profits were something like £6000; and in these profits Heaton Norris did not participate at all. If a 2d. increase in price would pay Salford, it would pay Stockport; and therefore to make a profit over and above the extra cost of coal and cannal was not fair to the consumers. He found that Reddish was only charged 11s. for lighting and repairing, while Heaton Norris had to pay £1 4s. 3d., and Levenshulme only 11s. 9d. Other members supported Mr. Barton's remarks; and a deputation was appointed to wait upon the Corporation Gas Committee relative to the matter.

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**The Water Supply of Birkenhead.**—The Birkenhead Town Council were privately engaged for several hours last Friday discussing the question of the water supply of the borough. At the close, two resolutions were passed. The first requested the Gas, Water, and Electrical Committee to make full inquiry and report upon the matter, and authorized the obtaining of expert advice. The second resolution approved the laying of mains from the Vyrnwy aqueduct through the borough to the Wallasey district, subject to the necessary protective conditions.

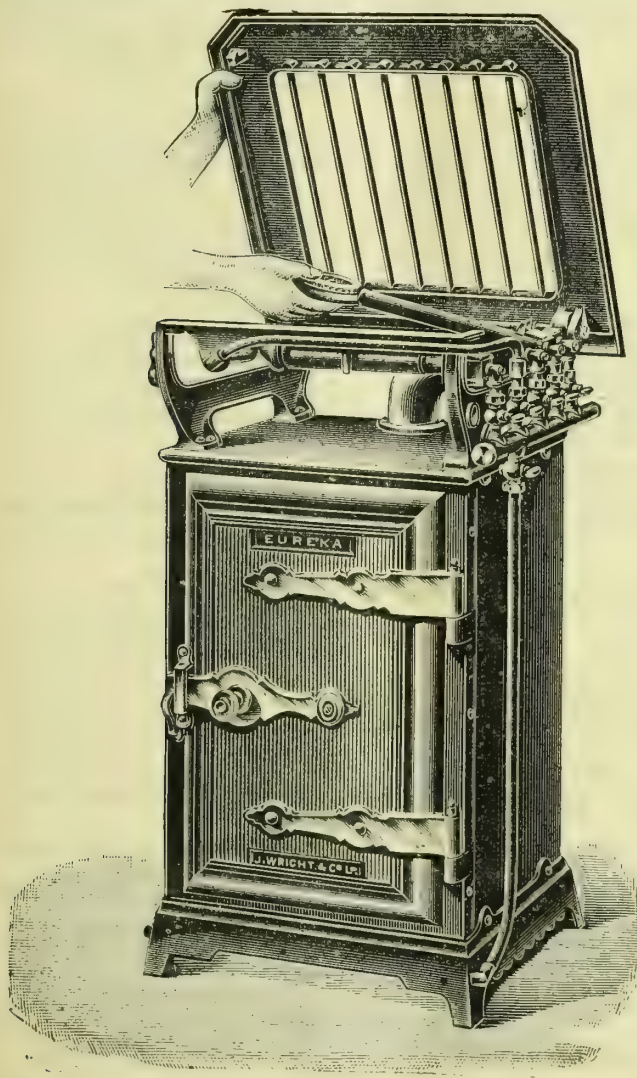
**The Halifax New Water-Works Contract.**—At last Tuesday's (special) meeting of the Halifax Town Council in Committee, the tenders for the construction of three new reservoirs at Walshaw Dean were considered. Five firms had sent in tenders. Members of the Labour Party urged that the new works should be constructed by direct labour; but the Council resolved that the work should be done by contract. The tender accepted was that of Mr. Enoch Tempest, of Manchester; the amount being £170,766. The highest tender sent in was for £353,567. It is anticipated that the new reservoirs will be completed within about four years.

**Budleigh Salterton Water Supply.**—Mr. F. Hammond has presented a report to the Budleigh Salterton District Council on the condition of the water-works. He expresses the opinion that the leakage of the Sherbrooke reservoir is caused by the fracture of a wash-out drain which passes under a portion of the floor of the reservoir. It will, however, be necessary for a careful test to be made before a remedy can be found. As to the consumption of water, he advised the Council to put into working order a Deacon waste-water meter which they have fixed, but do not use. He believes that with the waste kept under control, and the works in proper order, they have ample supply for the present. The collection of information as to the yield of the present sources and the consumption of water may save the town from blundering into a costly and unnecessary undertaking.

**Coventry Water-Works Accounts.**—The annual report of the Coventry Corporation Water Committee has been before the Council. It stated that the receipts during the financial year were £9569, as against £10,594. The decrease, however, was only due to the alteration of the date of collection; and the collection for the current year would restore the balance. The expenses had increased by £449. The balance of revenue over working expense was £2955; and the interest allowed by the bank, £233, made a total of £3189. The capital charges were £1975; the net profit £1213. There was a balance in the Treasurer's hands of £5236, of which £1500, representing half the sum of £3000 appropriated in aid of the rates last year, would be handed over to the borough fund in the course of the current half year. This left £3736. The profits for the current year were estimated at £4712. The Committee were of opinion that, after making full provision for repairs, and all other outstanding liabilities, the Council would be justified in making an appropriation in aid of the rates. They accordingly recommend that £3000 be so appropriated and paid over to the borough fund in aid of the next two borough rates, in equal moieties. On the motion of Alderman Road, the report was adopted.

Messrs. Richmond and Co., Limited, have been showing at Aberdeen a representative collection of their stoves in connection with the Northern Exhibition Syndicate; and the result was the receipt of orders for 640 of their best grade "Model" cookers (no "slots" being included) in seventeen days. They consider this establishes a "record" for any exhibition, and it was due to the systematic application of unique methods of advertising, interviewing, and canvassing which were inaugurated at Aberdeen; and they believe similar results are possible elsewhere, by a careful study of the best points to be put before consumers.

Though the International Tramways and Light Railways Exhibition which was opened at the Agricultural Hall, Islington, on the 23rd ult., and will close to-morrow, does not furnish any example of the application of gas to the propulsion of tramcars, it contains several gas-engine and other exhibits which may be briefly noticed. The largest gas-engine is shown by the British Westinghouse Company—having a maximum capacity of 125 brake horse power when operating with illuminating gas of good average quality. This engine is specially adapted for direct driving in electrical work; and it is shown connected to a Westinghouse 500-volt 75-kilowatt compound-wound engine-type generator, supplying current for the Westinghouse apparatus. Close by is the track which the Company have laid down for running a car the length of the hall. The conduit is laid centrally between the rails, and contains two conductors—one for the supply and the other for the return current. The car picks up the current from one and gives it back to the other. One point in the Westinghouse system is of importance to gas and water engineers—the current cannot get away through gas and water pipes; the conduit being completely insulated. While on this subject, it may be mentioned that Messrs. Doulton and Co., Limited, have a fine show of their hard-burnt glazed stoneware conduits, which have been largely adopted since their introduction in 1892. Messrs. Crossley Bros., Limited, have two gas-engines of 12 and 19 horse power (the former driving a dynamo), and an oil-engine of 2½ actual horse power. Messrs. Lawton and Parker exhibit two of their engines, of 2 and 7 brake horse power respectively. Tangyes Limited have among their exhibits a gas-engine of 8½, and an oil-engine on the Otto principle of 7½ brake horse power and also a show of pumps. A "Stockport" engine with two fly-wheels and all the latest improvements is shown by Messrs. Bilbie, Hobson, and Co., and several others are in use in the basement of the hall in connection with the electric lighting installation. Messrs. Meldrum Bros., Limited, have on view their "Koker" mechanical stoker and a model of their "Simplex" destructor, as working in connection with the Darwen electric supply station, where the town's refuse furnishes all the power for the works. They also exhibit their econometer—an instrument for testing chimney gases, and facilitating the discovery and remedy of defective combustion. Türr's Acetylene Gas Syndicate, Limited, show how their gas is generated and employed for lighting purposes; and the exhibit of the Matchless Gas Lighting Syndicate, Limited, represents their system of lighting gas without the aid of tapers, matches, or a pilot jet, and its application to incandescent gas lighting, gas-fires, &c. Two of Messrs. Richmond and Co.'s stoves are used to illustrate the adaptability of the principle to the lighting of such appliances.



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#### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,

182, Palmerston Buildings,

Old Broad Street,  
London, E.C.

"Volcanism, London."

#### BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS.  
Correspondence invited.

##### HYDRATED OXIDE OF IRON.

#### PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no Back Pressure.

The Cheapest in the Market.

Can be Lent on Hire.

Can be Exchanged for Spent Oxide.

READ, HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

#### AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

##### TO GAS AND WATER OFFICIALS.

#### HIGH-CLASS Cycles at reasonable and

low Prices. Guaranteed for Twelve Months.  
Sent on approval. For Cash or Gradual Payment  
System. Send for Catalogue, Post Free.  
MELROSE CYCLE COMPANY, COVENTRY.

#### SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

##### SPECIAL PAINT FOR GAS WORKS.

#### JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS,  
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

#### GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

#### JOHN RILEY & SONS, Chemical Manu-

facturers, Hapton, near Accrington, are MAKERS  
of SULPHURIC ACID, from Brimstone, for Sulphate  
of Ammonia Making. Highest percentage of Sulphate  
of Ammonia obtained from the use of this Vitriol.  
References given to Gas Companies.

#### PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered  
Patent Agents, ADVISE ON ALL MATTERS CON-  
NECTED WITH ABOVE.

Information and Handbook on application,  
70, CHANCERY LANE, LONDON, W.C.

#### ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At to-  
day's Price of Benzol, ILLUMINATING POWER costs  
less than ONE-THIRD OF A PENNY PER CANDLE.  
Apply to SADLER and CO., MIDDLESBROUGH.

##### PRACTICAL RETORT SETTERS.

#### GEORGE NUTTALL & CO., 32, Have-

lock Road, Salfley, Birmingham.  
Regenerator or other Furnaces erected to Engineers'  
own Designs. Best Work Guaranteed. Please write  
for Estimates.

##### SULPHATE OF AMMONIA SATURATORS.

#### JOSEPH TAYLOR & CO., Chemical

Plumbers, &c., and Makers of every description of  
Solid Plate Lead and Timber Cased Saturators, &c.,  
CENTRAL PLUMBING WORKS, TOWN HALL SQUARE,  
BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.

Telegraphic Address: "SATURATORS, BOLTON."

#### PORTER & CO., Gowts Bridge Works,

LINCOLN, Engineers, Ironfounders, and Con-  
tractors for the erection of Gas-Works for Towns,  
Villages, Mansions, Manufactories, Collieries, and  
Isolated Buildings at home and abroad. Manufac-  
turers of Retorts and Fittings, Condensers, Scrubbers,  
Purifiers, Valves, &c.; also of Girders, Wrought and  
Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."

[For illustrated Advertisement, see p. 53.]

#### J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM; and  
45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for  
WET AND DRY GAS-METERS, STATION ME-  
TERS, AND GOVERNORS, PRESSURE-GAUGES,  
STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:

"Braddock, Oldham." "Metrique, London."

##### SULPHURIC ACID.

#### JOHN NICHOLSON & SONS, Limited,

Chemical Works, Leeds, specially produce this  
ACID from SULPHUR, for making SULPHATE OF  
AMMONIA of high quality and good colour. Delivery  
in our own Railway Tank-Waggons or Carboys. Highest  
references and all particulars supplied on application.

##### CANNEL, COAL, ETC.

#### JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved  
SCOTTISH CANNELS; also FIRE-CLAY GOODS,  
CAST-IRON PIPES, and other APPARATUS for  
GAS and WATER WORKS.

Prices, &c., will be forwarded on application.

No. 30, ST. ANDREW SQUARE, EDINBURGH; } SCOTLAND.  
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

#### TRAVELLER, with old and extensive

connection among Gas Companies, is open to  
REPRESENT a Firm of Fire-Clay Retort and Brick  
Manufacturers and General Gas Plant Contractors.

Address No. 352L, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

#### FITTER, good all round, wanted.

Apply to the MANAGER, Gas-Works, KNOWLE.

#### WANTED, a Young Man as Gas-Fitter.

Good character. State Age and Wages.

Apply to Mr. LANE, Gas-Works, Aylesbury, Bucks.

#### WANTED, immediately, a steady,

reliable, and competent Man (married man preferred)  
as RENTAL and GENERAL CLERK in a Gas  
and Water Office. Must have held similar appointment,  
and be able to produce Testimonials as to Character  
and Ability. Salary 28s. per week.

Applications, with Testimonials, to be made to the  
MANAGER, Gas-Works, BEXHILL-ON-SEA.

#### WARE GASLIGHT AND COAL AND COKE COMPANY, LIMITED.

##### GAS MANAGER.

#### WANTED, a competent Gas Manager to

take charge of Gas-Works in a Provincial Town  
20 miles from London. Must thoroughly understand  
his business in all its Branches. Salary £120 per  
annum, with House, Fuel, and Light.

Applications, with copies of recent Testimonials,  
which will not be returned, to be sent to the under-  
signed, from whom Particulars may be obtained on  
application, on or before the 31st of July, 1900.

GEO. H. GISEY,

Secretary.

#### WANTED, a Carbonizing Foreman for

the Royal Arsenal Gas-Works, Woolwich.

Applicants must thoroughly understand the proper  
working of Regenerative Settings, and have been in  
charge of Works using this method of Carbonizing.  
Experience of Inclined Retorts would be considered an  
advantage. Make of Gas between 200 and 300 millions  
per annum. Wages £3 10s. per week, or £3 if House  
be provided.

Apply, by letter only, in own Handwriting, to the  
Superintendent, Building Works Department, Royal  
Arsenal, Woolwich, not later than the 10th of July,  
giving Age, Qualifications, and References.

Particulars of the Duties may be had upon appli-  
cation.

C. O. BOOTH,

Manager B.W.D.

for Colonel (Ret.)

Superintendent Building Works.

#### ENGINES and Exhausters combined

"Waller," to pass 30,000 cubic feet per hour  
DITTO to pass 7000 feet per hour, overhauled and  
complete. Cheap to clear. Also BOILERS.

J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

#### GASHOLDER, 50 ft. by 20 ft., with Six

Columns, 15 inches diameter, Wrought Lattice  
Girders, &c., complete and perfect. About Fourteen  
Years old.

Price, erected, on application to J. FIRTH BLAKELEY  
AND CO., Thornhill, DEWSBURY.

#### FOR SALE—Two small Boilers, 6 feet

long, 3 feet diameter, each fitted with two 9-inch  
Flue Tubes. Equal to new, with Fittings and Furnace  
Doors and Frames. Price £12 10s. each, or £22 the  
pair.

Also two 8-inch FLANGED T-PIECES and ELBOW  
CONNECTIONS, for Exhauster Bye-Pass, with Cockey  
and Smith's Patent Bye-Pass Valve, 4-inch Branch, and  
Throttle Valve and Compensator.

For further Particulars apply to the MANAGER, Gas-  
Works, Sandown, ISLE OF WIGHT.

#### GAS PURIFICATION.

##### OXIDE OF IRON BOG ORE.

#### BALE & CO.'S Oxide of uniform quality.

SPECIAL FIRE CEMENT, OXIDE PAINTS,  
OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

#### SADLER & CO., Ltd., Middlesbrough,

Tar Distillers and Tar Colour Manufacturers.  
BENZOL specially prepared for Gas Enrichment free  
from Sulphur. Pure Hydrated OXIDE OF IRON for  
Purifying Gas either for Sale or Lent on Hire. Always  
Buyers of GAS TAR and AMMONIACAL LIQUOR.

#### FOR SALE—Five splendid Tanks, about

7 feet in diameter, 25 feet deep, Wrought-Iron.  
Twenty Pounds each, f.o.r. Exeter. Useful on Gas-  
Works for Tar, Ammoniacal Liquor, Scrubber, &c.  
Subject unsold, net cash.

Apply WILLEY and Co., Engineers, EXETER.

#### FOR SALE—Two Lancashire Boilers,

each 6 ft. diameter by 20 ft. long, with Mountings.  
Been in use only a short time. Made by the Yorkshire  
Engine Company, Limited, Sheffield.

Apply to NEWTON, CHAMBERS, & CO., LIMITED, Thorn-  
cliffe Iron-Works, near SHEFFIELD, where the Boilers  
may be seen.

#### GAS PLANT for Sale—I can always offer

NEW and SECOND-HAND GAS APPARATUS,  
including Retorts and Fittings, Condensers, Exhausters,  
Scrubbers, Washers, Purifiers, Gasholders, Tanks,  
Valves, Connections, &c. Also a few COMPLETE  
WORKS. Compare Prices and Particulars before  
ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

#### FOR SALE, very cheap—

WROUGHT-IRON SCRUBBER, 3 ft. 6 in. di-  
ameter by 27 ft. high, with 8-inch Bye-Pass  
Valves and Connections.

Five-inch Cast-Iron Vertical CONDENSER,  
Twelve Uprights, 20 feet or 29 feet high.

CORNISH BOILER, 4 ft. diameter, by 12 ft. long.

Apply to SAM'L. WHITE AND SON, 60, Queen Victoria  
Street, LONDON, E.C.

#### CONDENSERS, Washer-Scrubbers,

"Cutler" patent CONDENSERS (14 6 in. to 12 in.  
PIPE CONDENSERS, Patent WASHERS by  
"Livesey," "Holmes," and "Cockey" EXHAUSTERS  
up to 40,000 Cubic Feet per hour. ENGINES,  
BOILERS, &c. Several TOWER SCRUBBERS,  
PURIFIERS, METERS, GOVERNORS, PUMPS,  
TANKS, VALVES, &c.

J. FIRTH BLAKELEY AND CO., Gas Engineers,  
DEWSBURY.

##### TO COLLIERY PROPRIETORS.

#### THE Corporation of Haverfordwest in-

vite TENDERS for the supply of about 1600 Tons  
of Double Screened GAS COAL, of the very best  
quality, to be delivered either at the Haverfordwest  
Railway Station, or at the Gas-Works Quay, Haverford-  
west (by Water communication), in quantities as re-  
quired by the Gas Manager during the Year com-  
mencing on the 24th of July, 1900.

Tenders by Friday, the 13th of July, 1900.

Forms and further Particulars of

R. T. P. WILLIAMS,

Town Clerk,

Council Chamber, Haverfordwest,

June 26, 1900.

##### COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

##### GENERAL STORES.

#### THE Gas Committee invite Tenders for

the supply of the following Materials in such  
quantities as may be required during the Twelve  
Months ending Aug. 31, 1901.

1. WROUGHT IRON and STEEL.
2. LEAD PIPE, BLOCK TIN, TUBING, PEN-  
DANTS, &c.
3. BOLTS, NUTS, and RIVETS, &c.
4. IRON CASTINGS, CAST-IRON PIPES, &c.
5. GUN-METAL METER TAPS and KEYS and  
BRASS LAMP TAPS.
6. WROUGHT-IRON STEAM and GAS TUBING,  
and SUNDRY FITTINGS.
7. GAS-METERS.
8. PAINTS, WHITE and RED LEAD, &c.
9. OIL and TALLOW.
10. TIMBER.
11. ROPE YARN and TWINE.
12. STEEL SHOVELS, GALVANIZED IRON  
SCOOPS and BUCKETS.
13. BRUSHES.
14. TESTING and REPAIRING WEIGHING-  
MACHINE.
15. GUN-METAL FITTINGS for METERS.
16. INDIA-RUBBER RINGS, TUBING and  
SHEETING, &c.

Forms of Tender and all Information may be ob-  
tained, and Samples may be seen, on application to the  
Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Stores," ad-  
dressed to the Chairman of the Gas Committee, Town  
Hall, Salford, to be delivered to me not later than  
Three p.m., on Thursday, July 12, 1900.

L. C. EVANS,

Town Clerk,

Town Hall, Salford.



GLASGOW CORPORATION.  
(GAS DEPARTMENT.)

TENDERS FOR METERS.

**THE Corporation invite Tenders for the** supply of such METERS as may be required by them for Twelve Months from date of acceptance.

Forms of Tender may be obtained on application to Mr. Foulis, the Manager, at the Gas Office, 45, John Street, Glasgow; and sealed offers, marked "Tender for Gas-Meters," addressed to the Subscriber, will be received by him on or before Tuesday, the 17th prox.

The Corporation do not bind themselves to accept the lowest or any offer.

J. D. MARWICK,  
Town Clerk.

City Chambers, Glasgow,  
June 30, 1900.

BOROUGH OF ROCHDALE.

TO IRONFOUNDERS AND OTHERS.

**THE Gas Committee of the above Cor-**poration invite TENDERS for the supply and erection at their Gas-Works, in Dane Street, of a CAST-IRON AMMONIACAL LIQUOR CISTERN (Covered), 30 ft. by 25 ft. by 10 ft. deep.

Particulars may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works.

Tenders, endorsed "Liquor Tank," must be sent in to me not later than noon, on Wednesday, July 18, 1900.

By order,  
JAMES LEACH,  
Town Clerk.

Town Hall, Rochdale,  
June 29, 1900.

BOROUGH OF HEYWOOD.

**THE Gas Committee invite Tenders for** the supply of LIME, TUBES and FITTINGS, and SULPHURIC ACID.

Specification and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.

Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of Work for which the Tender is sent in.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, July 17, 1900.

By order,  
J. H. BALDWIN,  
Town Clerk.

Municipal Buildings, Heywood,  
June 20, 1900.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL, CANNEL, AND LIME.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COAL.

**THE Gas Committee of the above Council** are prepared to receive TENDERS for the supply of 400 Tons of CANNEL and 2600 Tons of well-screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Town Stations (Midland or Great Northern Railways), Sutton-in-Ashfield, in such quantities as the Manager shall from time to time direct between July 12, 1900, and June 30, 1901.

LIME.

Also for the supply of about 200 Tons of LIME, to be delivered, at either of the above Railway Stations, in such quantities as the Manager shall from time to time direct between July 12, 1900, and June 30, 1901.

The Lime is to be hand picked, and clear from Refuse and Ashes.

TAR AND LIQUOR.

Tenders are invited for the surplus TAR and AMMONIACAL LIQUOR produced at their Works from July 12, 1900, to June 30, 1901, to be delivered in Purchaser's Tank-Waggons at the Great Northern Railway Station, Sutton-in-Ashfield.

Tenders for Coal to state price per ton of 20 cwt. at the Works or above Railway Stations.

No Tender Forms provided.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed, to be addressed as under so as to arrive not later than the 10th day of July, 1900.

By order,  
JOHN D. FIDLER,  
Clerk.

Council Offices, Sutton-in-Ashfield,  
June 29, 1900.

CROWBOROUGH DISTRICT WATER COMPANY.

SALE BY TENDER OF 500 NEW ORDINARY SHARES OF £10 EACH.

MINIMUM PRICE £10 PER SHARE—PAR.

**NOTICE is Hereby Given, that it is the** intention of the Directors of the Crowborough District Water Company to SELL BY TENDER FIVE HUNDRED NEW ORDINARY SHARES OF £10 each in accordance with the provisions of the Crowborough District Water Act, 1899. These Shares may rank for Dividend up to 7 per cent. per annum.

Particulars, with Conditions and Form of Tender, may be obtained on application to the undersigned; or to Messrs. Verrall and Borlase, Solicitors, 4 and 5, New Road, Brighton; or to the Company's Bankers, Messrs. Barclay and Company, Limited, Union Bank, Brighton, or at their Head Office, 54, Lombard Street, E.C.

Tenders must be received not later than Twelve o'clock noon, on Friday, the 27th of July, 1900.

The Shares will be allotted to the highest bidders at or above the minimum price.

By order,  
HERBERT SPROTT,  
Secretary.

Offices: Crowborough, Sussex,  
June 26, 1900.

URBAN DISTRICT COUNCIL OF ELLESMERE.

CONTRACT FOR GAS COAL.

**THE above Council are prepared to re-**ceive TENDERS for the supply of COAL for their Gas-Works during the Year ending the 24th of June, 1901.

The Coal must be a good Gas Coal, screened and delivered free at Ellesmere Railway or Canal Wharves.

Sealed Tenders, endorsed "Tender for Gas Coal," accompanied by Analysis, to be sent to me not later than Friday, the 6th of July next.

R. E. LLOYD,  
Clerk to the Council.

Ellesmere, June 12, 1900.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF ORDINARY STOCK.

**THE Directors have instructed Mr.** ROBERT MACK to SELL BY AUCTION, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 11th day of July, 1900, at Twelve o'clock noon,

TWENTY-FIVE THOUSAND POUNDS  
ORDINARY STOCK

of the Company, to be issued under the Powers of the Company's Act of 1896.

For Conditions of Sale and further Particulars, apply to the undersigned.

THOMAS WADDOM,  
Secretary.

Offices: 35, Grainger Street West,  
Newcastle-upon-Tyne, June 11, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MR. ALFRED RICHARDS begs to** notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

**MR. ALFRED RICHARDS will Sell** THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 10, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
EAST GRINSTEAD GAS AND WATER COMPANY.

NEW ISSUE OF 500 £10 CAPITAL "C" SHARES.

**MR. ALFRED RICHARDS will Sell** THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 10, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of Executors and Others.

STOCKS AND SHARES

IN THE

BARNET DISTRICT GAS AND WATER COMPANY,  
HARROW AND STANMORE GAS COMPANY,  
WOKING WATER AND GAS COMPANY,  
HEMEL HEMPSTEAD DISTRICT GAS COMPANY.

**MR. ALFRED RICHARDS will Sell** THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 10, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Now Ready. Price 6s.

LAW

OF

LONDON GAS COMPANIES

A SYNOPSIS of Public Acts affecting Gas Companies and of the Special Acts of the Metropolitan Companies, with Comments and a Short History: Including a Statement of the effects of the Conversion Acts of the GASLIGHT and COKE COMPANY, and of the SOUTH METROPOLITAN COMPANY, and an Examination of the Capital and Loan Accounts to date of the three London Companies and of the Bills now before Parliament.

BY

T. J. BARNES,

OF THE MIDDLE TEMPLE Barrister-at-Law.

WALTER KING,

OFFICE OF THE "JOURNAL OF GAS LIGHTING," &c.,  
11, BOLT COURT, FLEET STREET, E.C.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £30,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £97 PER CENT.

**NOTICE is Hereby Given, that it is** the intention of the Directors of this Company to SELL BY TENDER £30,000 of THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Acts, 1882 and 1896.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Tuesday, the 10th day of July next.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than at the rate of £97 for money for each £100 Debenture Stock.

By order,  
FRANK BUSH,  
Secretary.

Offices: 709A, Old Kent Road,  
London, S.E., June 9, 1900.

By order of the Executors of the late W. J. Bryan, Esq.  
SALE OF GAS STOCKS.

**MR. GODFREY C. LAMBERT has re-**ceived instructions to SELL BY AUCTION at the Greyhound Hotel, Croydon, on Thursday, July 12, 1900, at Six o'clock precisely, in Lots—

£1722 5 per cent. ORDINARY STOCK and £198 PERPETUAL 5 per cent. DEBENTURE STOCK of the CRYSTAL PALACE DISTRICT GAS COMPANY; also

£500 "A" ORDINARY STOCK of the MITCHAM and WIMBLEDON DISTRICT GASLIGHT COMPANY, paying 10 per cent.

Particulars and Conditions of Sale may be had of GEORGE A. MARTIN, Esq., Solicitor, 6, Guildhall Chambers, E.C.; at the PLACE OF SALE; and of the AUCTIONEER, 10, BASINGHALL STREET, E.C.

Demy Octavo, 172 Pages, Bound in Dark Blue Cloth, Lettered, Price 6s., post free,

THE

"POWERS OF CHARGE"

of the

METROPOLITAN GAS COMPANIES:

A HISTORY OF THE QUESTION OF PRICE IN LONDON

FROM THE INTRODUCTION OF GAS LIGHTING TO THE PRESENT TIME.

By

LAURENCE W. S. ROSTON,

M.A., B.C.L.,

Of New College, Oxford, and Lincoln's Inn,  
BARRISTER-AT-LAW.

WITH A PREFACE BY

GEORGE LIVESEY, M.Inst.C.E.

LONDON

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.



HOT WATER INSTANTLY.

NIGHT OR DAY.

Hot Bath when wanted.

Boiling Water in a Minute.

EWART'S

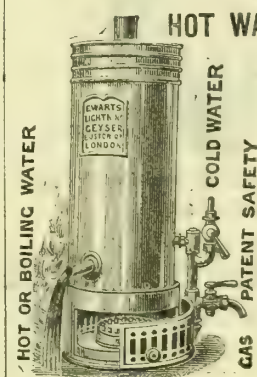
"LIGHTNING"

GEYSER

For Gas or Oil.

346, EUSTON ROAD,  
LONDON.

Illustrated Price List Free.





**UNEQUALLED.**

Gas Companies are solicited to try Samples of the

**MIRFIELD****BLACK BED GAS COAL.***Prices and Analysis on application.***MIRFIELD (GAS-COAL) COLLIERY COMPY.****RAYENSTHORPE, NEAR DEWSBURY.****NEWBATTLE CANNEL.**

Highest Results in Gas, &amp; Excellent Coke.

QUOTATIONS ON APPLICATION TO

**THE LOTHIAN COAL COMPANY,**  
LIMITED,

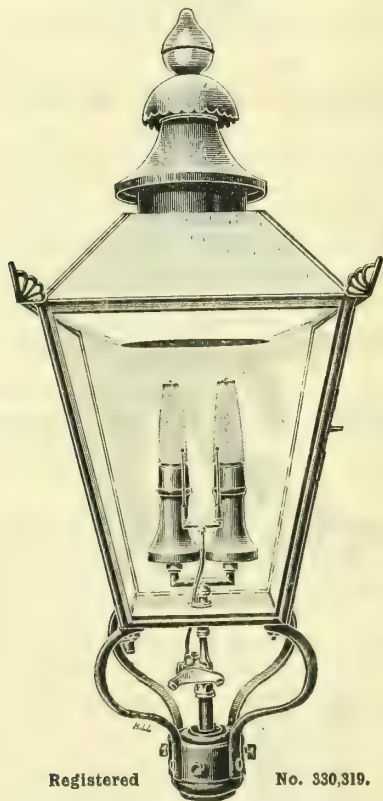
NEWBATTLE COLLIERIES,

**DALKEITH, N.B.****HEATHCOTE GAS COAL.**

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality  
of Coke.

Maintains a High Standard in Residuals.

**THE GRASSMOOR CO., LD.,**  
**CHESTERFIELD.****THE****"KILBURN" LANTERN.**

Registered No. 330,319.

Fitted with Steel Enamelled White  
Reflector.**H. GREENE & SONS, LTD.**

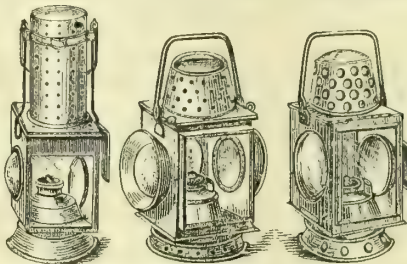
19, FARRINGDON ROAD, E.C.

Telephone:

1215 HOLBORN.

Telegrams:

"LUMINOSITY."

**NITRATE of Thorium and Cerium.**  
FABRIK CHEMISCHER PRAEPARATE VON STHAMER,  
NOACK, AND CO., HAMBURG.**ARMSTRONG'S PATENT  
CANDLE SAFETY LAMPS.**

No. 1.

No. 2.

No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

**LONDONDERRY GAS COALS**

FROM THE

**LONDONDERRY COLLIERIES,****COUNTY OF DURHAM.**

Available Output up to 5000 Tons per day.

Yield of Gas 11,000 cubic feet per Ton of Coal  
as per Analysis by

Mr. John Pattinson, F.C.S., F.I.S.

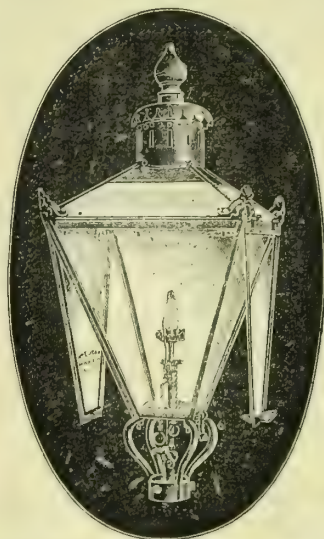
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GAS COALS.**

Present Daily Produce over 5000 Tons.

Latest Analysis—By **CHARLES PHILLIPS**, Gas  
Examiner to Rotherham CorporationYield of Gas per Ton . . . 11,205 Cubic Feet.  
Illuminating Power 16 $\frac{7}{10}$  Stand. Sperm. Candl.  
Coke (of good & pure quality) 13 $\frac{1}{2}$  Cwt. per Ton.  
Sulphur . . . . . A little over 1 per Cent.  
Ash . . . . . Under 1 per Cent.  
Tar . . . . . 163 lbs. (Avoir.) per Ton.  
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.HOLMSIDE GAS COALS are supplied to the  
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about half the produce.**SOUTH MOOR****PELTON GAS COALS.**

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and  
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Home and Abroad.Both descriptions are shipped at Tyne Docks,  
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Principal Merchants in England, or direct from**MR. MARK ARCHER,**  
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CANNEL.**Yield of Gas per ton . . . . . 13,155 cub. ft.  
Illuminating Power . . . . . 38.22 candles.  
Coke per ton . . . . . 1,301.83 lbs.**EAST PONTOP  
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Illuminating Power . . . . . 17.8 candles.  
Coke . . . . . 70 per cent.**SOUTH PELAW MAIN  
GAS COAL.**Yield of Gas per ton . . . . . 10,500 cub. ft.  
Illuminating Power . . . . . 16.3 candles.  
Coke . . . . . 73.1 per cent.

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Every genuine Sunlight White Mantle now bears indelibly stamped upon the Mantle itself our Trade Name **SUNLIGHT**, plainly visible before the mantle is used, and afterwards whenever the light is turned low.

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Coke (of good quality) . . 67.5 per Cent.

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Sulphur . . . . . 0.86 Sulphur.

Ash . . . . . 2.04 Ash.

As per Analysis by

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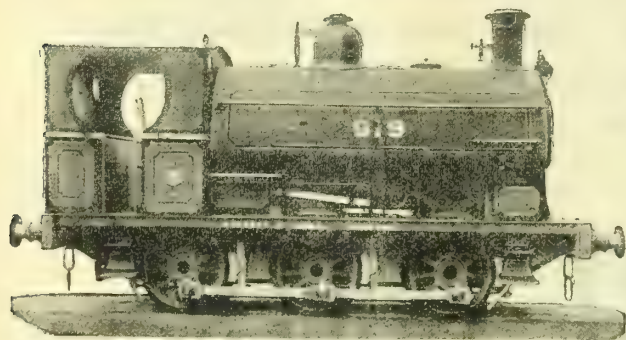
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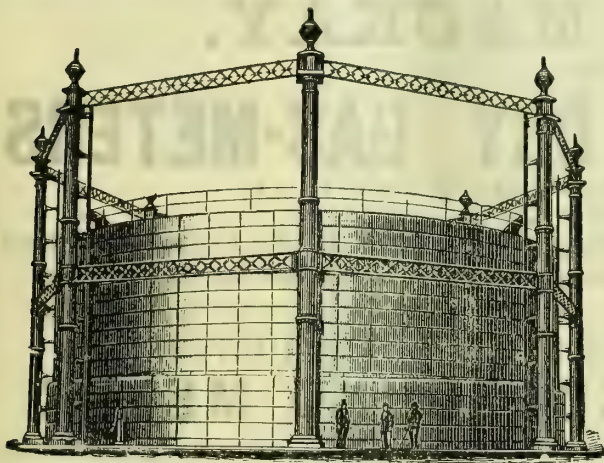
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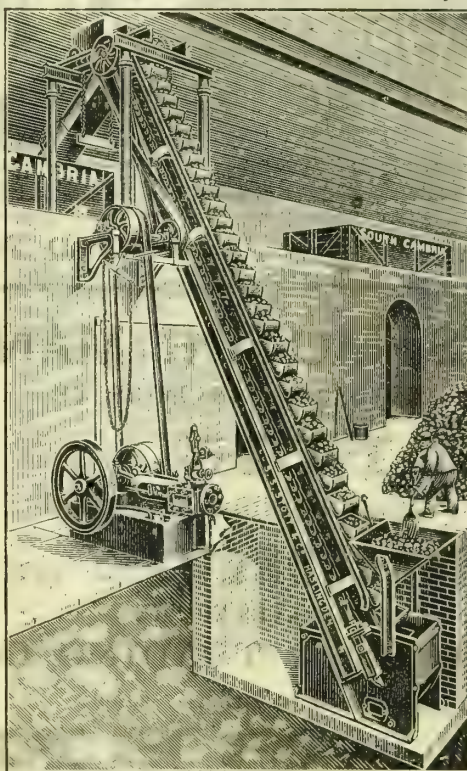
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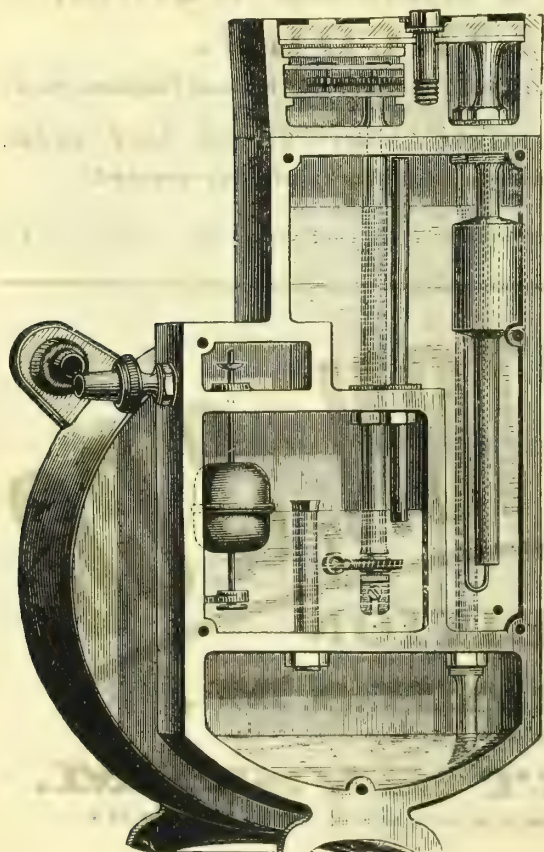
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Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures  $6\frac{1}{2}$  inches by  $3\frac{1}{2}$  inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

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**METROPOLITAN**

**GAS COMPANY—**

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**COMMERCIAL**

**GAS-WORKS—**

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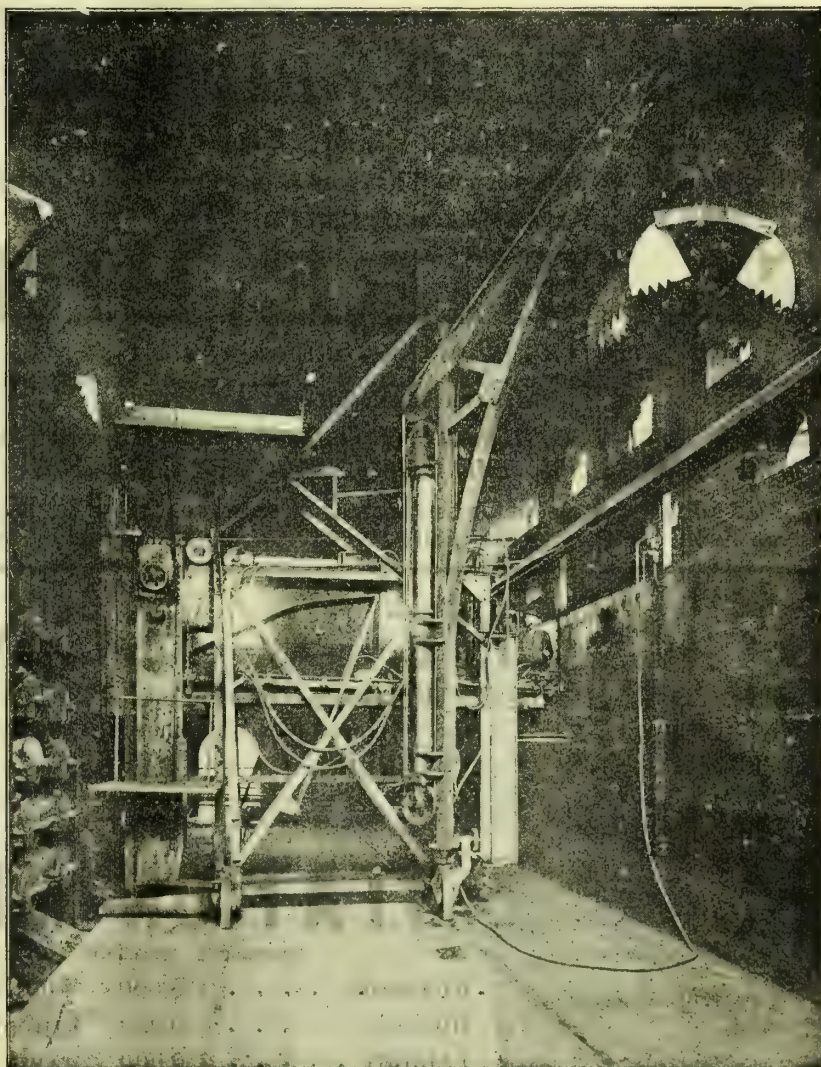
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Amsterdam.  
Vienna.

**HAGUE**

**CORPORATION**

**GAS-WORKS—**

Hague.

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**CLEVELAND**

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Cleveland, Ohio,  
&c., &c., &c.

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ARE AT

WORK OR IN COURSE  
OF CONSTRUCTION.

WAPPING GAS-WORKS.

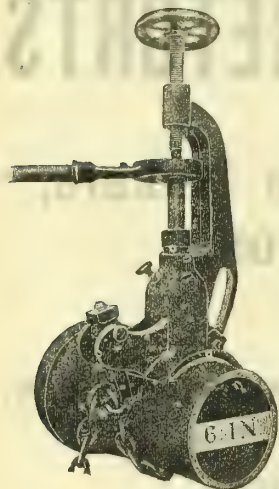
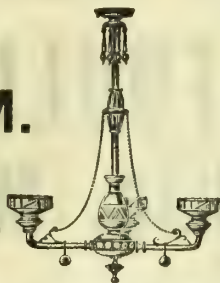
THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE  
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**ONE MINUTE.**



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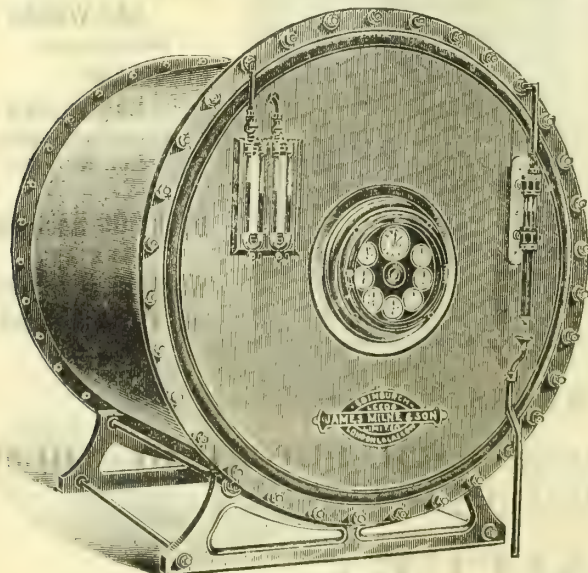
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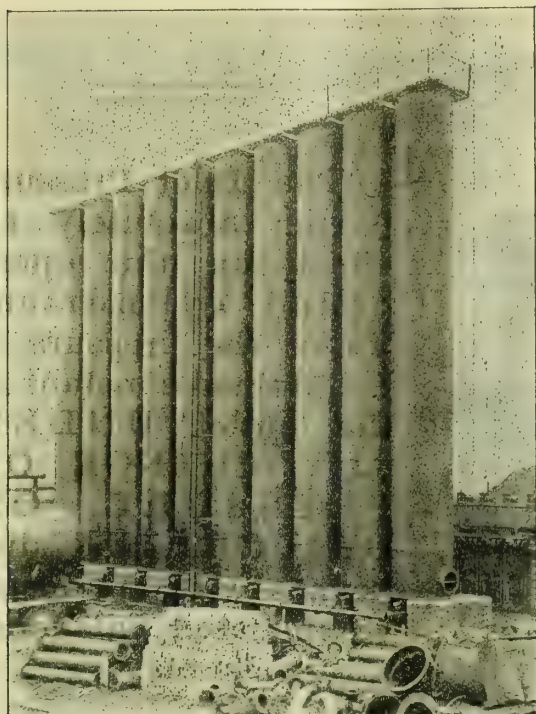
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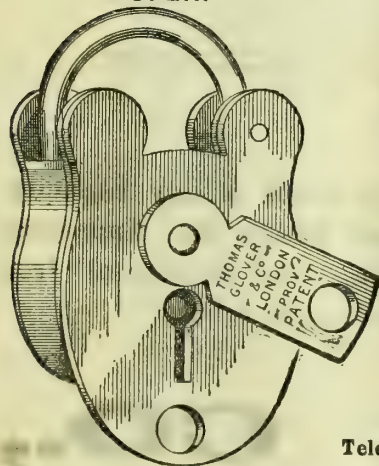
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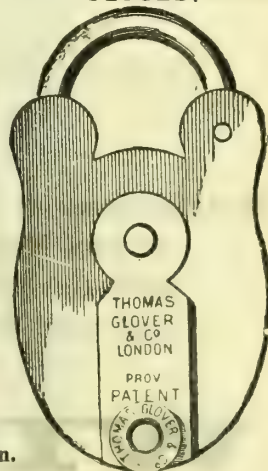
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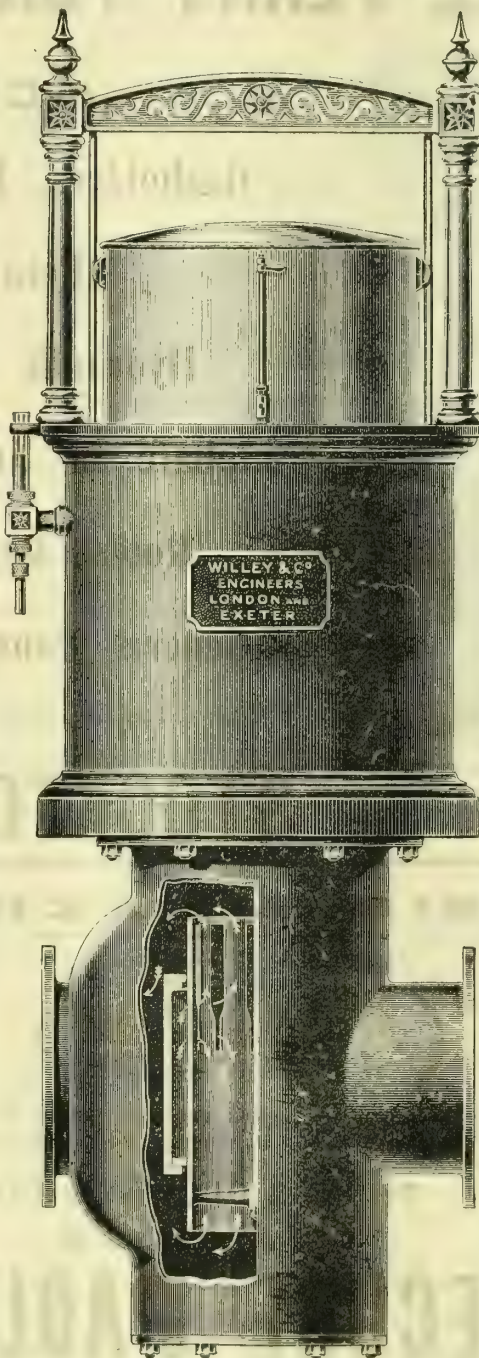
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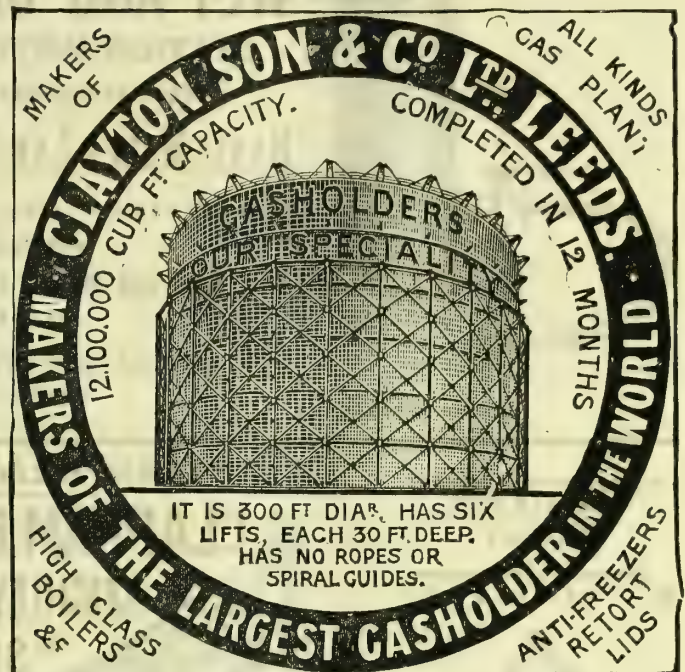
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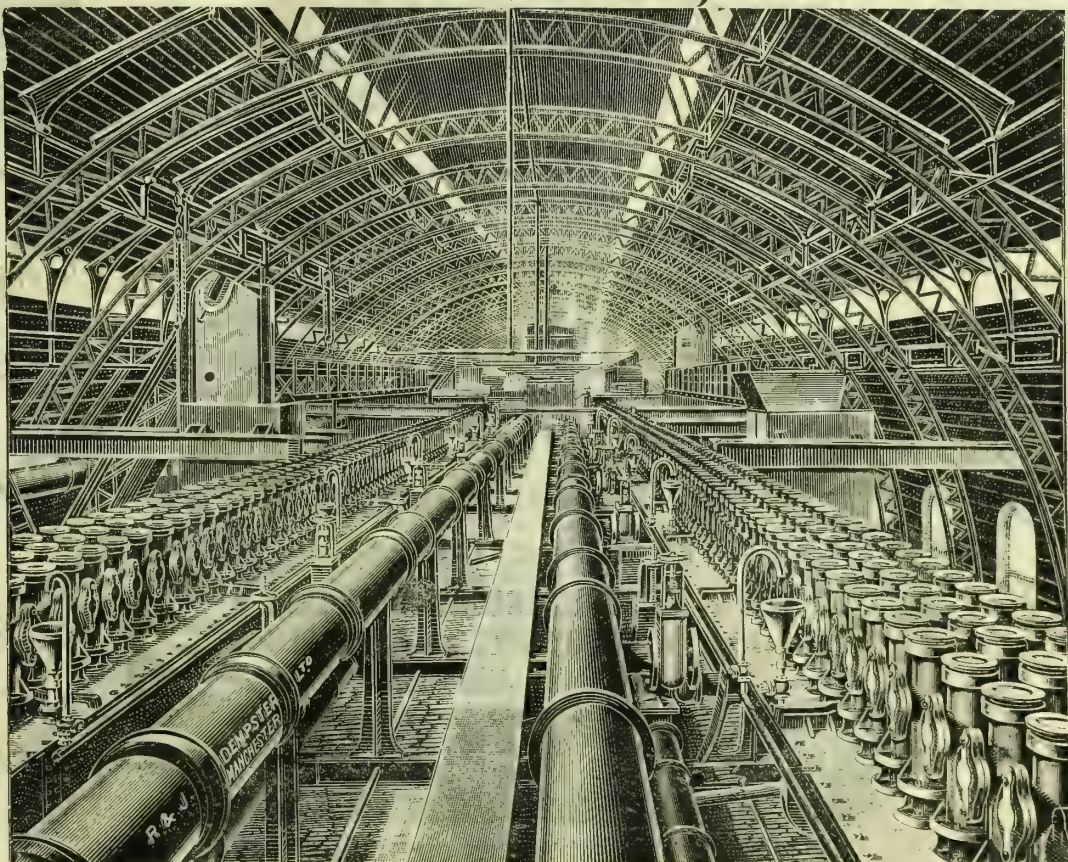
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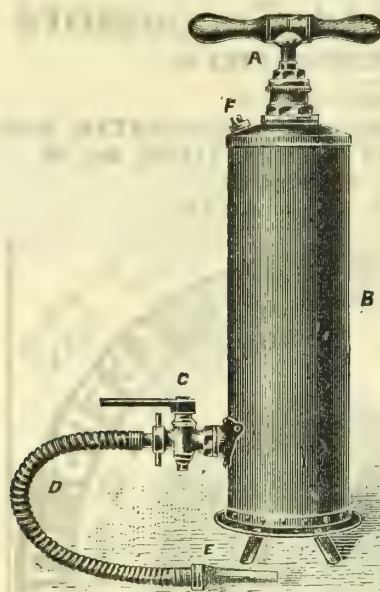
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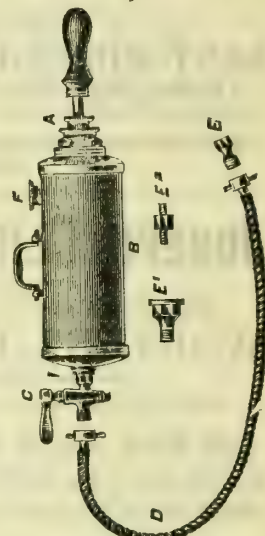
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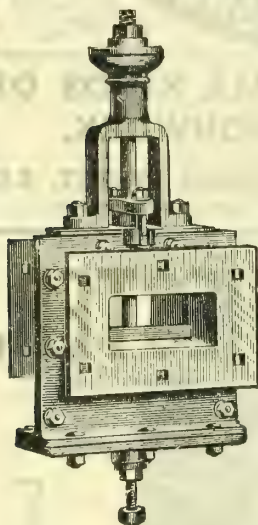


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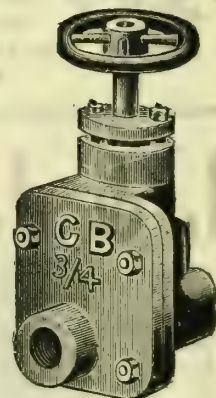
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## EDITORIAL NOTES.

## Action on the Kern Burner Patent.

WHAT will probably prove to be the last but one of the big patent actions over the incandescent gas-light system was heard last week by Mr. Justice Buckley in Queen's Bench Court No. 1, which was converted for the time being into a hall for the demonstration, *sub judice*, of the characteristics of various and sundry patented forms of incandescent burners. The action was, in form, a petition on behalf of the New Sunlight Company for the revocation of the Kern patent for an improved bunsen burner, on the grounds of an alleged anticipation by De Mare, and also of a lack of proper subject-matter for a patent, misleading directions in the specification, and bad claims. It thus appears that, from the point of view of the petitioners, this celebrated patent, which has cost the Welsbach Company £80,000 in cash, and has been reputed to do wonders in respect of raising the lighting efficiency of the incandescent mantle, had almost all the defects that a patent can possibly exhibit to the discerning eye. It is a peculiarity of actions for revocation of patent that they require the respondent's case to be heard first. He therefore has the considerable advantage of being able to tell the presiding Judge what his invention is, and of showing just how his patent covers it. First impressions are regarded as valuable in these patent cases, because the Judge, who begins with a mind perfectly blank, naturally looks at the matter for the first time in the light in which it is presented to him. Still, of course, a Judge would not be worthy of his office if he had not the power of resisting the temptation to form an opinion before hearing both sides of the story.

This Kern burner case will be memorable in the annals of the Chancery Division for one strange circumstance attending the hearing. Early in the proceedings, Mr. Bousfield, Q.C., for the petitioners, informed the Judge that it was the desire of his clients to fight the case out strictly upon the merits; and that, in accordance with this wish, they proposed to do all the necessary elucidatory experiments under the eye of the Court. There was to be as little relying as possible upon the mere word of expert witnesses; everything being done that could be done to base the arguments upon indisputable facts. The immediate result of this way of stating the respective cases was to nearly kill the Counsel and the experts engaged; because, as fast as any important point arose in Court, an engagement was given that the question should be tried experimentally. The consequence was that, after the day's talking, the night had to be dedicated to experimental observations, open to both parties. It was hard upon the professional men engaged, who all looked sadly "stale" by the end of the week; but the parties reaped the benefit of having the issues very clearly brought out and placed before the Court. We shall not attempt here to summarize the evidence. The Kern burner and the De Mare burner both utilized the principle of the Venturi tube; and the contention of the petitioners was that there is no such substantial difference between the two applications of this well-known principle as to form fit subject-matter for a patent. If anything, Kern's forms and dimensions were slightly better than De Mare's; but mere differences of form, order, or dimensions, even of considerable range, are legally debarred from being patentable. Counsel for the petitioners declared that this objection of anticipation was so well founded as regards Kern's patent, that they might have claimed its revocation on this ground alone.

In addition, however—and this contention gave rise to most interesting experiments—it was urged that Kern had committed himself to a mistaken theory of the cause of the efficiency of his burner. He pinned himself to an ideal which was demonstrably mistaken; and accordingly in his directions he misled those who might trust him as the guide to the manufacture of the best burner for use with an incandescent mantle. Kern imagined that what was required of a burner was the production, at normal pressures of gas and air, of a mixture of the two in the equivalent ratios for complete combustion of 1 to 6. Against this, it was asserted that the idea is erroneous, and that in any case the Kern burner does not, in fact, produce such a mixture. Positive evidence was offered to show that the best mixture for the purpose is 1 of gas to about 4 of air, when the combustion is completed by access of the air surrounding the mantle, which is then subjected to the most intense heat that can possibly be spread over so large a surface as that of a mantle. It was contended that this is, in fact, the very mixture with



which the Kern burner does its work. The contention shows the danger of putting theory into a patent specification. It is useless to do so, in any case, because one cannot patent a theory. The chances are that, while the practical result may be all right, the theory is wrong. This will not necessarily invalidate a patent, if the hypothesis is indulged in as a mere "aside," so to speak, and is not allowed to govern the patentee's prescription, or to appear in any of his claims. If it does, the patent is lost.

Such, recounted as briefly as possible, were the issues upon which this most interesting technical case was tried by Mr. Justice Buckley for more than a week. Mr. Moulton began his reply on the whole case, for the respondents, late on Friday afternoon. He spoke all Saturday, and for the greater part of yesterday; this fine forensic effort being one of the most brilliant pieces of advocacy ever employed in a gas patent case. But, unfortunately, the extremely elusive nature of much of the evidence—consisting as it did of references to the dimensions and performances of "exhibits" put in on both sides—renders reporting extremely difficult. Everyone who followed the hearing agreed that it was one of the hardest-fought cases on record, and also that the points at issue were extremely perplexing. Even as late as yesterday, Mr. Moulton invited the Court to order further experiments; but the Judge declined, on the ground that he already had ample material upon which to base his judgment. At the conclusion of Mr. Moulton's reply, there was a small final dispute between Counsel as to the points of certain cited cases; and the Judge then announced that he would give judgment in a few days.

It is expected that the last, and even more important, action—that on the Welsbach Company's 1893 mantle patent—will be tried before the Long Vacation, so as to save the winner the trade for the ensuing lighting season.

#### Coal Miners' Wages and their Policy.

THE resolutions upon the questions of old-age pensions, the nationalization of coal mines, and other small matters of a similarly general and practicable nature, passed by the Miners' International Congress recently assembled in Paris, are of no importance to practical work-a-day men. But a pronouncement made in the course of the debates by one of the English delegates—a Mr. Haslem—is sufficiently significant, and, if it is to be taken as reflecting the general attitude of the Miners' Federation of Great Britain, sufficiently important, to be noted. Mr. Haslem, referring to the rates of wages now ruling in this country, said: "The agreement was that in England the increase should not be more than 60 per cent., and not less than 30 per cent., above the wages paid in 1888. Yet, to judge from the price the public were now paying for coal, the miners should get 100 per cent. more than in 1888. As they were not sharing proportionately with the present inflation of prices, they must not be expected to participate in any future depression of trade." This, if it be the feeling current among the miners, spells mischief in the near future. We have before now, when discussing the troubles in the South Wales coalfields last autumn, which were patched up rather than settled—the old sores still lying below the surface—expressed the opinion that (much as we should like to believe that the tendency which was to be observed last year for disputes between masters and men to be settled without recourse to strikes or lock-outs really evidenced the existence of a more reasonable spirit on the part of the men) the absence of any serious labour troubles in recent times has been mainly due to the upward movement of wages generally. We said then that the real test of the spirit existing among the men would be when wages had to come down with the inevitable reaction in trade, and that when this reaction came we should not be surprised—much as we should regret—to see a recrudescence of labour troubles. It is not, perhaps, a graceful thing to recall one's own words and prophecies; but the ominous remark we have quoted from the debates at the Miners' Congress strikes the very note that nine months ago we heard in anticipation. "It is the absence of any sufficient guarantee that men will be content to give as well as take that largely accounts for the unwillingness of employers to grant an advance of wages in times of prosperity. The tendency to regard such enhanced rates of pay as an irreducible minimum, not unreasonably makes employers chary of granting a temporarily, but possibly not permanently, justified increase." If the Miners' Federation seriously think of making 45 per cent. above the 1886 standard as the "irreducible minimum,"

the gas industry will not find the heavy fall in coal prices which is certain to come before a great while an altogether unmixed blessing; for it is certain that the owners would strenuously contest any such proposed minimum, and when masters and men fall out coal is to seek. We do not wish to croak unduly; but it is as well to remember that the industrial millennium has not yet arrived, and that the Miners' Federation are steadily accumulating considerable funds.

#### Dearer Gas Everywhere.

FROM reports that have poured in upon us of late, we find that, roughly speaking, fully 250 gas undertakings in the United Kingdom have begun the current quarter with increased prices to private consumers, ranging mostly from 6d. to 9d. per 1000 feet. This is an unprecedented state of things. Perhaps some clever Professors and heaven-sent Town Councillors can tell how it might have been avoided, with coal at ruling rates; but the difficulty of continuing to supply gas at old prices has evidently been too great for the majority of gas companies and municipal gas departments to overcome. It appears that in many places it is not proposed to increase the rates for public lighting; and generally there is great reluctance to alter the cost of slot-meter supplies. Where the advance is made general, it is chiefly by municipal undertakings, which have no reserve funds to help them to tide over the hard times. Nobody can blame them for acting in this way. On the contrary, we have consistently maintained that gas companies ought not to draw upon their regular reserves in the vain endeavour to sell gas for less than it costs to make, when the adverse conditions are otherwise than obviously temporary. The point of the present difficulty is that nobody can yet see the end of it. House and all sorts of industrial coals are dear, and likely to remain so for an indefinite period. Any relief that might naturally have been expected from the expiration of the troubles in South Africa is more than set off by the outbreak of worse mischief in China. The long-dreaded "Yellow Terror" is upon the whole civilized world at last; and it is impossible to forecast the immediate or the distant consequences of the outbreak. Still, gas companies are more amenable than municipalities to the argument for making the best of the situation. Where the companies have contracts with local authorities for public lighting, the latter are, of course, on the right side. As regards the prepayment consumers, present circumstances prove the wisdom of those gas-works administrators who set the price well above the minimum, and preferred returning a trifle from the box to anything like a precise adjustment. It is easy to understand that nothing tended more to give the small consumer a good opinion of the slot-meter arrangement than the habitual receipt of a few coppers as "overs" from the collector. It was a complete guarantee of good faith on the part of the gas authorities. Now the times have altered; and it is not the poor cottager who will dispute the justice of the cessation of these returns, especially when it is further explained that really the meter ought to be set to deliver a little less gas for the pennies, but that the company will for a time try to do without the additional money.

#### American Engineers in Westminster.

AN interesting episode in the history of the growing brotherhood of the best humanity of all nations, was the holding last week, at the Institution of Civil Engineers, in Westminster, of the Annual Convention of the American Society of Civil Engineers. Sir Douglas Fox, the President of the Institution, welcomed the Americans, whose President is Mr. John F. Wallace. The party includes many engineers whose names are familiar to English readers of American technical publications. Mr. Wallace's Presidential Address was an eloquent plea for full recognition of humanism in civil engineering. Profound study of precedents, mathematical skill, command of all the tools of the profession, and high personal character to boot, are not enough to make an engineer. In the technical schools of the day, materials and forces are studied; but no attention is paid to "the mental and moral constitution of man, which is the live material that engineers must use in fitting Nature's raw product to the work in hand." There is too great a tendency on the part of engineers to regard their profession as essentially materialistic, to the exclusion of the mental and spiritual. "The prevailing law of matter is inertia. The prevailing principle of the engineering profession is life." The successful engineer is the man who can do



things. He is one "who, seeing a necessity arising in the onward march of civilization, can think out its solution, conceive a project, design the necessary works connected therewith, and carry out the scheme as a whole to a successful issue; at the same time convincing his fellow-men of the necessity for the work, the efficiency and economy of his design, and his own ability to accomplish the desired result." These be inspiring words.

The whole address, indeed, is well worth reading as an example of good nervous English. It furnishes additional proof, if more were needed, that there is no American language, as the term is usually employed to characterize the barbarous lingo of the quarter-educated denizens of the United States whom one meets in the show-places of England. This is also the language in which most American newspapers are written; but men of the quality of the President of the American Society of Civil Engineers do not use it. There is not a single "Americanism" in the whole of his address, which is of the severest diction that ever came out of Oxford. This, however, did not prevent the speaker from tempering his more serious observations with a lambent humour, ever and again bubbling up into downright fun. Nothing could be smarter, for example, than the reference he made to Joshua as an early engineer who utilized his talents "in the overthrow of Jericho by means of the theory of rhythmic oscillation."

Such re-unions as that of last week are the most helpful, hopeful form of Internationalism. Experience goes to show that, up to the present hour, the long-thought-of Brotherhood of Man can only be realized between men of different nationality who meet on the common ground of Science or Art. The Free Traders tried to put it on the ground of an enlightened self-interest; but the foundation was not stable enough. The religions of the world, of course, are hopeless sunderers. All attempts to internationalize Labour politics have failed owing to the preponderance of the element of locality. The artist is the more advanced Internationalist, because Art speaks all languages. Science, however, is one in her aim, which is the pursuit and the expression of Truth, albeit she must speak in various tongues. Yet there is one language in which the most practical branches of Science, which run at last into Technics, find the widest expression; and that is the noble tongue which is safely buttressed by the Authorized Version of the Bible on the one side, and by Shakespeare on the other. This is the language spoken by the President of the American Society of Civil Engineers in Westminster—think what this event implies!—last week; and he found it adequate to the enunciation of his lightest as well as his most impressive thoughts. If for this good speech alone, Mr. Wallace deserves to be honoured by English-speaking engineers the world over.

#### The Amelioration of the Lot of the Workman.

It is remarkable how slowly the industrial world adapts itself to the suggestions of enlightened experience in respect of those apparently minor and subordinate matters which make so much difference to individuals. Work and wages, wages and work—the changes ring quickly enough in these principal matters; but it takes some special event to prove the importance of the ancillary conditions of labour. An illustration of this is given by the abortive dockers' strike. One of the conditions sought to be imposed by the Trade Union leaders was that men should only be taken on for dock work outside the dock walls. This was the original custom; and, on the face of it, there would not appear to be a great principle involved in the perpetuation of the practice. It came out, however, that there was more in the demand than met the eye. Of course, the advantage to the men themselves did not enter into the leaders' calculations. Outside the dock gates there is no shelter, and no place for the men to go to besides the public-houses. But the leaders could "boss the show." They could mark every man who offered himself for work, and in many ways make their power felt by both interests. Moved by these considerations, the employers have taken the not altogether amazing step of erecting a sufficiency of "taking on" sheds inside the docks. These are shelters and employment agencies, all in telephonic communication with one another. Here the men will gather at fixed hours, and receive their orders, without having to tramp all over the docks in search of jobs. How extremely simple and obvious—and what a long time, and how much trouble, it has taken to bring about this con-

venience! It is the little things, as they may appear to those who do not suffer from them, that make the lot of the working man unnecessarily hard. Some of them are mere superstitions—remanets from an earlier order of things industrial—which irritate men to the point of rendering them susceptible to the wiles of the agitator, who puts in one word for them and two for himself. In the army of industry, thanks to the absence of any hard-and-fast line of demarcation between the officers and the men, and to promotion from the ranks being frequent, most employers know what the men feel, and what they have to suffer. Where this common experience is missing—as in some of the rougher occupations in which employers are, generally speaking, of a totally different caste from the workpeople—minor ameliorations of the employment are long on the road. A convulsion is required to betray the need for them. So it is in the gas industry. It is the duty of the manager to penetrate through the screen that separates his ideas of what is befitting the state of manhood, from those in which the rough material at his hand has grown up in brickfields and all manner of lowly places. He has to do this unknown to the objects of his study, or he will be misled, and will fail to accomplish any good. He must also avoid everything savouring of patronage or fussiness; and he must often be thankful if he does not get kicked for his pains. Nevertheless, the duty is a duty, and it must be done. A little here, and a little there; so the original curse is lightened, and the wage-earner is helped to discover himself as a responsible being.

#### WATER AND SANITARY AFFAIRS.

WHEN referring last week to the progress of the Staines reservoirs scheme, and its value in connection with the future water supply of the Metropolis, we confessed to not sharing the opinion enunciated by Sir Alexander Binnie, on the occasion of his becoming a Turner, that resort to a distant watershed will be necessary in the near future; and we ventured to suggest that the untapped sources of water in the valleys of the Thames and Lea should be utilized to their fullest extent before enormous expense is incurred in going to Wales. In using the words "untapped sources," we had in mind the conclusions arrived at by Lord Balfour's Commission, that in dry years a quantity of water up to a maximum of 40 million gallons daily might be derived from wells in the Lea Valley; that from the existing wells of the Kent Water Company, and others which might be sunk within their district, about three-fourths of that quantity might be safely taken; and that from the tract of chalk country in the valley of the Medway, and the larger area farther eastward towards the coast, a very considerable addition was also undoubtedly procurable. The Commissioners had the assistance of the most eminent geologists of the time to guide them in coming to a right conclusion on this matter; but they do not seem (nor do their successors under Lord Llandaff) to have been made acquainted with what the Americans would call the "bottom facts." To have been quite up to date, they should have had before them Mr. Walker Moseley, who, while our remarks last week were being printed, was telling the residents of Camberwell assembled in the Vestry Hall, some most astounding things in regard to London's underground stores of water. If the statements he made can be supported, the London County Council may carefully pack up the plans for their Welsh scheme, which they have prepared at so much cost to the ratepayers, and lighten their parliamentary expenses by abandoning its prosecution.

According to Mr. Moseley, we Londoners are living over a great subterranean lake which is capable of furnishing an enormous quantity of pure water for our use, if we only take the trouble to draw it. His theory is that there flows from the hills of Hertfordshire a great stream which enters the chalk strata below the London clay; and he thinks we shall be on the safe side in reckoning that the water always in reserve there amounts to something like 50,000,000 million gallons. This underground water he says does not belong to anybody; and if London could not obtain from this source all that it required, it could procure sufficient for the next fifty or a hundred years. He advises that systematic quantity tests should be made by some responsible public body—say the London County Council—by sinking twenty wells, which would, he says, furnish absolute proofs as to whether an additional 100 or 200 million gallons of water



could be relied upon, from the source he has indicated, for the service of the Metropolis. The net advantages he claims for this scheme (compared with the Council's Welsh project) are that an auxiliary supply of absolutely pure water would be obtained at a saving of somewhere about £20,000,000, while there would be no risk of interruption in the service, as would be the case in the event of damage to the aqueduct by a hostile force. If there is in existence beneath us the great store of water which Mr. Moseley makes out, it might be advisable to incur the expense of sinking a few borings to procure some of it, as at present only a little more than 20 per cent. of the total quantity supplied to London is obtained from springs and wells. But before operations are commenced, some special investigations should be carried out with the view of ascertaining how nearly Mr. Moseley's estimate of the available supplies approaches to accuracy. Boring for water is not always attended with the success originally contemplated. Work of this kind has been going on for some years at Richmond; and it might be well for Mr. Moseley, before he and the Committee formed to carry out his idea begin preparing any scheme for London, to procure the latest available information in regard to that undertaking. Meanwhile, he has received some sharp criticism from Sir Alexander Binnie, who disputes Mr. Moseley's figures; and we shall probably hear more from him. We may safely leave the question in Sir Alexander's hands.

The subject of the rating of water-works was so fully discussed in this column last week, in connection with the paper read by Mr. F. J. Bancroft at the recent meeting of the British Association of Water-Works Engineers, that we only revert to it now in order to call our readers' attention to the letter from Mr. H. Wilkins, the Secretary of the Lambeth Water Company, which appears in our "Correspondence" columns to-day. It will doubtless be remembered that at the close of his paper Mr. Bancroft alluded to a proposition put forward by Mr. Wilkins for placing on a simple and intelligible basis the system of rating public undertakings. The suggestion was made in a memorandum prepared by him for the Royal Commission on Local Taxation in 1897; and by his courtesy we are able to give it in another part of the "JOURNAL." It will be seen therefrom that, as mentioned last week, it consists in calculating the gross annual value of the property at a specified percentage on the rateable capital outlay, varying according to the amount of the gross profits, and making an all-round deduction of 15 per cent. in order to arrive at the rateable value. Mr. Wilkins puts a hypothetical case to illustrate the application of his suggestion; and it must be acknowledged that it has the merit of simplicity. He points out that the term "gross profit" means for his scheme the "divisible profit"—that is to say, the amount available for paying dividends on ordinary and preference shares and interest on the debenture and loan capital. In considering the application of his plan to undertakings earning only a small amount of profit, Mr. Wilkins points out that the works are rateable as long as they are occupied, though the business may not be remunerative. Occupation, not profit, is the proper test of liability to rates, and rental value is the measure of such liability. We may again commend Mr. Bancroft's paper and the report of the discussion thereon to the consideration of our readers, in conjunction with the addition to the literature of the subject which we are now able to present.

Among the members of the British Association of Water-Works Engineers, there are not two opinions as to the wisdom of preventing and detecting waste of water; and therefore Mr. A. J. Jenkins did not, by reading his paper on "The Relationship between the Cost of Water Wasted and the Cost of Detection and Prevention of Waste," secure any new converts to what is a settled tenet of the true water-works engineer. However (while some of the figures which the author presented were a little out of date, and appear somewhat familiar), the paper has done good, first in placing upon record what has been accomplished in Cardiff in the direction of counteracting waste, and secondly in eliciting the latest experiences in other towns. Armed with the report which appears elsewhere in this issue, the water manager who is manacled by an indolent Board of Directors or Water Committee should have little difficulty in convincing them that there is such a thing as being "penny wise and pound foolish" even in the administration of the affairs of a water undertaking. On the general question, only a few words need be said.

We should prefer to place in the forefront the prevention of waste, and advocate towards this end the best work in the distribution system and the best household fittings—regarding the system of detection as a necessary supplement for accidental and wrongful waste. Of course, in towns where the water authority have little or practically no power over internal water-fittings, or have not exercised the powers they do possess, this order of things cannot immediately be; but "prevention" being "better than cure," that is the proper end to aim for. We may give Leicester as a model; and, in doing so, we anticipate the retort that Leicester and a few other fortunate towns possess powers which are now denied to water undertakings. But in reply to that we would ask, Have proper steps been taken to prove to the Legislature, as has been proved to water engineers, that the large powers conferred upon Leicester years ago have wrought beneficial results—results of a character that cannot be obtained by any other means? Steps have not been taken to show Parliament that these large powers would be generally advantageous; but, if there is a common desire for them, we fail to see any sound reason why, in the face of such evidence as Leicester can furnish, they should be refused.

There is another point that the discussion brought into prominence, and it is that water engineers have different views as to the value of the water saved by a system of detection. Some seem to think that only the bare cost of pumping and filtration should be estimated; while others are of opinion that the entire cost, such as sinking fund, interest, and working expenses—in fact, the exact expense of delivery to the consumers—is the sum for which credit should be taken. Both, under certain circumstances, would be fair methods of computing the value; and, to a certain extent, under other circumstances, both would be wrong. The whole matter resolves itself into a question of supply and demand. If the source yields a superabundant supply of water, then the value of the water wasted in the distributory system can hardly be worth more than the naked cost incurred in putting it into the mains; while if the supply is only safely adequate to meet the demand, then we should say the whole expense of delivery to the consumer would be the value of the water saved. But there are districts in which Nature seems to have been unmindful of the requirements of the inhabitants in respect of water; and in such places frugality has to be practised, and the water has to be sent out after a brief season of dry weather with a very sparing hand. In such places, we should say that water saved by a system of detection would possess a value far beyond its mere cost at the consumer's tap. Thus, in estimating the value of the water saved, it seems to us that no hard-and-fast basis can be adopted; the water engineer of each town must have regard to his own circumstances in making a computation. At the same time, whatever the value—whether it be large or small—let there be no waste.

The American Society of Civil Engineers held their annual convention in London last week; and they were the honoured guests of the Institution of Civil Engineers. Very naturally, the greater part of their stay was spent in pleasure; and yet they did not neglect altogether the more prosaic work of their organization. On two subjects of technical importance, the visitors exchanged views with their English compeers. In only one of them are readers of the "JOURNAL" intimately concerned, and that was the question of the filtration of public water supplies. There was nothing in the discussion calling for extended comment. It was chiefly interesting from the fact that it brings the information on the subject up to date; and it also gives us an insight into some of the difficulties which water engineers of other countries have to contend with in connection with the purification of water. America has lagged far behind in this important matter. But there has recently been an awakening; and there are signs that we may yet see the water engineers of that great country entering into filtration with all the enthusiasm of new-born converts. There is one lesson that they will have to learn, and that is that filtration and the terrible waste of water which now goes on in all parts of America will not go hand in hand. Information as to the best English, and the latest Continental, practice was given to the visitors; and in obtaining this, the object of introducing the subject was no doubt gained. Upwards of three hours were spent in discussing the question; but our report—necessarily much condensed—is unavoidably held over



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 109.)

THE unfortunate Stock Markets have gone from bad to worse; and last week was one of the gloomiest that Capel Court has seen for a considerable time. The state of things in China has upset everything; and black as it is, it really seems to be painted blacker than it need be. Of course, business was reduced to very small proportions; and dealers were chary of making prices. And when complete dislocations of the Berlin markets supervened, things here came pretty well to a standstill. That prices have had a material drop need scarcely be said; but it may be noted in illustration that on Thursday Consols touched 98½, and the War Loan fell to a discount. However, there was a slight recovery the next day; but the Exchange being closed on Saturday for a holiday, the rally had no time to proceed far. The Money Market ruled easy in the earlier portion of the week, but showed a disposition to harden later on when things began to look more awkward. Business in the Gas Market was noticeable for its irregularity more than anything else. On most days it was extremely quiet; but it broke out fitfully into some degree of activity now and then. And variations in quotation were irregular too—there being almost as many ups as downs; but none of them were of any considerable value. Taken all round, the general tendency was fairly steady. Gaslight ordinary was conspicuously so, changing hands daily at about 98½, which was the figure at which the opening and the closing transactions of the week were marked. In the secured issues, the preference was very steady; but the maximum had to give way a point. South Metropolitan was quiet. The quotation was advanced a point-and-a-half; but there was nothing in the actual dealings to indicate any great access of strength. Nothing at all was marked in Commercials; but the debenture was put down two points. The Suburban and Provincial group were nearly torpid; but a low-priced bargain in Brentford new sent the quotation down. Among the Continental Companies, flatness was apparent in Imperial, which had the novel experience of being dealt in several times at a level 200. Of remoter undertakings, Oriental Gas was advanced; but Cape Town and River Plate were lowered. Business in the Water Companies was about as usual; and prices remained unchanged, except that there was a fall in West Middlesex.

The daily operations were: Business opened very sluggish in the Gas Market on Monday; but the tendency was pretty good. South Metropolitan rose 1½, and Oriental old ¼; but Commercial debenture receded 2. Transactions were livelier on Tuesday; but they were almost wholly in Gaslight issues. Brentford new fell 3, and Cape Town ¼. Business became quiet again on Wednesday; and quotations did not move. On Thursday also, there was general inactivity, coupled with some further reductions. Imperial fell 2, Gaslight maximum 1, and River Plate ¼. Friday was by far the most active day in the week, but with no change in Gas prices. In Water, West Middlesex dropped 5. The Exchange was closed on Saturday.

## ELECTRIC LIGHTING MEMORANDA.

Dublin Again—The Corporation Victorious—Scandalous Tactics—The Case of Marylebone.

LAST week we mentioned the parliamentary squabble over the electric lighting of Dublin, which resulted for the time being in the discomfiture of the Corporation at the hands of Mr. T. M. Healy, M.P., who is understood to have a particular interest in the opposition to the Corporation Bill. Meanwhile, however, it appears that a political convention, in which Mr. Healy had no part, was being held in Dublin to signalize and ratify the reunion of all the Irish Nationalist Members of Parliament in one party. A reunited party with a number of individuals left out is, obviously, in strict accordance with Irish ideas. Anyhow, the leader of the so-called united party had the disposal of a number of votes in the House of Commons, simply by reason of his being in possession of the funds without which his followers could not travel to Westminster. The story goes that this puissant personage agreed, for a consideration, to convey his commando to Westminster for the third reading of the Bill which had the advantage of Mr. Healy's support, and therewith defeat it. At any rate, when the third reading came on there were many more Irish members in the precincts of St. Stephen's than had been seen there for a long time; and the Bill was lost on the division by a majority of six. Next day Mr. H. W. Lucy informed the readers of his "Pictures in Parliament" in the "Daily News," that the "lobbying" against the Bill exceeded anything in recent experience. But there seems to have been something more afoot than what is commonly understood by this term. Mr. Lucy goes on to state that "it is said that one prominent advocate of the privileges of the Corporation and the interests of the Gas Company received a fee of 200 guineas for his attendance in the lobby."

The guarded nature of the above allegation is to be noted. The astute reporter does not say that any member was paid for his vote; but only for attending in the lobby, which, of course, is no part of his parliamentary duty. The distinction, however, is

a very thin one, as it was doubtless meant to be. The real point to be noted is that something material happened between the report stage and the third reading to change the fortunes of the Bill promoted by the extra-Corporation interests. It will be observed with some surprise by our technical readers that the lobby hand of the "Daily News" has linked the name of the Alliance and Dublin Consumers' Gas Company with that of the Corporation as party to the resistance to the Bill, which, without serious error, may be described as the Bill of the Tramways Company. This conjunction must appear remarkable and unaccountable to those who only know the same parties as irreconcilable foes, for ever fighting in the Irish Courts over questions arising out of the public lighting of Dublin. What is the reason, it may be asked, for joining these inveterate enemies as being in the same galley on this memorable occasion? The answer is that it is all a point in the interminable, wearisome game of Irish Nationalist politics. Mr. Healy, in his genial way, told the House of Commons that the Gas Company own the "Freeman's Journal," which supports the Corporation; and he argued that, consequently, there must be some immoral compact in existence between these interests, with the object of keeping the electric lighting of the city in the hands of the Corporation, who will do it badly, and of preventing it from being undertaken by the Tramways people, who would do it well. He himself, as a matter of fact, is interested on the tramways side; but that is a detail. The noteworthy point of all this yea and nay business in the House of Commons is the unblushing way in which interested motives are ascribed and admitted on all sides. Municipal trading, when thus mixed up with professional politics, does not present an inviting aspect. In this Dublin case, the last thing to determine the issue seems to be the interest of the inhabitants and ratepayers of Dublin.

Another parliamentary fuss, not quite so odorous, arose over the second reading stage of the Marylebone Electric Lighting Order Confirmation Bill. This measure would have confirmed an Order admitting into the parish of St. Marylebone a second Electric Lighting Company to compete with the existing one. The circumstances are peculiar, and illustrate how difficult it is to arrange this class of business upon general principles. The Company in possession of the area is the Metropolitan Electric Supply Company; and it is alleged that the Company has not dealt fairly with the Marylebone district, which is only a portion of their wide dominions. Two years ago, the Marylebone Vestry offered to go into electric lighting on their own account; but this project was rejected by Parliament on the general plea that a local authority should not compete in business with a private undertaking. The practical results of this decision, sound enough in principle, were decidedly awkward. Limited competition in electricity supply is expressly encouraged by the Electric Lighting Act, without distinction of persons. All experience goes to show, moreover, that in competition lies the only real protection for the public against monopolistic greed or incompetency. It would have been quite in accordance with the spirit of the Electric Lighting Act if the Vestry of Marylebone had been allowed to compete with the Metropolitan Company; and so the House of Commons thought, for the Bill of the Vestry passed the second reading. It was thrown out by the Committee, however; and there the matter rested. Meanwhile, the service performed by the Metropolitan Company went from bad to worse; and the only possible remedy seemed to lie in the admission of a rival Company working a different system. This expedient, however, did not commend itself to the Vestry; who objected to having a second private undertaking thrust upon the district at the very inopportune juncture when the Vestry itself is about to disappear and make room for a Municipal Corporation of Marylebone. This objection pretty plainly showed that the complaint against the local Company was merely a preliminary to the launching of a new and enlarged scheme of municipal action, and that the alleged necessities of local users of the electric light are not a principal consideration in the counsels of the Vestry. If better lighting had been all that is desired, this Bill was the way to procure it. But that was not what the Vestry wanted; and accordingly they managed to get the Bill rejected on the second reading.

## JUDGE PARRY ON THE WORKMEN'S COMPENSATION ACT.

THE modern, and by no means admirable, practice of judges criticizing as well as administering the laws of the country—and especially the Workmen's Compensation Act—appears unfortunately to be growing. We are constantly seeing in the Daily Press that His Honour Judge So and So, of such and such a County Court, expressed the opinion that the Workmen's Compensation Act is the "worst drafted measure in the Statute Book," &c., &c.; and now we find His Honour Judge Parry, of the Manchester County Court, contributing an article to the "Fortnightly Review" condemning the Act in no gentle terms. Leaving on one side the question of the propriety of judges taking upon themselves to express their opinions upon the utility or otherwise of the laws they are appointed to administer, let us see what there is in these judicial criticisms when they are put into writing, and not merely confined to generalities from the bench. It might well be asked, in passing, whether there may not be some connection between these criticisms (or mere swearings at large as they frequently are), coming as they do



from county court judges, and the fact that the passing of the Act necessarily imposed a considerable amount of extra work upon these functionaries?

Judge Parry commences his article, which is entitled "The Workmen's Compensation Act: What it Was to Be, and What it Is," by quoting some words of Mr. Asquith as stating, with sufficient clearness, the principle which the Legislature has sought "to crystallize into the form of statutory perfection." This principle is that, "When a person, on his own responsibility and for his own profit, sets in motion agencies which create risks for others, he ought to be civilly responsible for the consequences of his own acts." This is what Parliament, with the best of goodwill, intended to enact; and, according to Judge Parry, Parliament has failed so to do. His Honour repeats the favourite, and somewhat hackneyed, taunt of that section of the Press that loves not Mr. Chamberlain, about the Act which was to obviate the necessity for litigation having already given rise to so many actions and appeals—the unfairness of which allegation we have more than once demonstrated—and founds his other main criticism of the drafting of the measure upon the contention that, as interpreted by the Law Courts, the Act really retains what the Legislature meant to abolish—namely, the defence of "contributory negligence" as a plea enabling the employer to evade payment of compensation. This is said to arise from the interpretation by the Court of Appeal of the first section of the Act. The section provides that a man shall be compensated for accidents "arising out of, and in the course of, his employment." "It is clear from the debate," says Judge Parry, "that this was supposed to be a legal and periphrastic way of saying 'during the employment,' or 'while in the service of;' but the Court of Appeal construed the words to mean strictly what they said. . . . This is, of course, a serious blow to the Act as a Compensation Act. It really introduces something very like our old friend 'contributory negligence, in a new dress.' But does it? That is just the point.

The defence of contributory negligence was one which pleaded that the injured man, while in the performance of his duty, met with his accident owing, in part, to his own negligence in the manner of his performance of that duty. The first section of the Workmen's Compensation Act, as literally construed, merely provides, on the other hand, that to be entitled to compensation, the injured man must be proved to have met with his accident while performing his duty. If that be proved, the only defence that can avail to prevent him receiving compensation is that he was guilty of "wilful and serious misconduct." Judge Parry would have us believe that Parliament intended that if a man met with an accident while doing something which he had not been told to do, or had been told not to do by his employer—something quite apart from the duty for which he was engaged by his employer—he should unquestionably be compensated by the employer. That, His Honour apparently thinks, is a true interpretation of the principle he enunciates at the beginning of his article, and which we have already quoted, that, "when a person sets in motion agencies which create risks for others, he ought to be civilly responsible for the consequence of his own acts"! Is it really suggested that if an employer engages a man to do one thing in his workshop, and that man chooses to do another (in the course of which proceeding he is injured), that that accident is a "consequence of the act of the employer"? It would be as sensible to argue that the man who planted a tree should compensate another who, of his own accord, climbed up it, and then fell down and broke his leg, on the ground that the accident to the second man was a consequence of the act of the first.

The Judge's contention is that Parliament meant to pass a "Compensation" Act, but that the measure as interpreted is only a "liability" Act, and that the alleged immoderate bulk of litigation which has arisen out of the interpretation of its provisions is due to this fact. He is of opinion that the ideal—of an universal compensation for all accidents in certain trades, automatically paid to all except those guilty of serious and wilful misconduct—is most nearly realized in Germany, where the Accident Insurance Act "provides for compensation for all disablement or death arising from any accident which may occur during work from any cause, even when occurring through negligence (not for accidents when away from work)." But does this provision bar all chance of litigation? When is a man away from his work, or when does he reach it?

It has been a subject of remark that most of the critics of the Act and its authors, so far from condemning it *in toto*, make it one of their chief points of criticism that the Act, faulty as they declare it to be, does not extend to all trades. Not so, however, Judge Parry. "I have," he says, "the gravest doubt if the present Bill can be in any useful way amended, except in so far as abolition is amendment. However it were simplified, I fear words would be left in it giving the Courts a chance of construing a contributory negligence defence into the amended Act; and if there were such words, the original sin inherent in all lawyers would ensure their coming to the surface and being judicially considered by minds trained to discover defences." Without sharing in the pessimistic view of the value of the Act, expressed in the foregoing, it is possible to appreciate the truth of the Judge's estimate of the ingenuity of the legal fraternity.

It is but fair to the writer to remark that his criticisms are not all of a negative character, nor his opinions hostile to the principle of accident compensation. He wants, he says, greater

certainity of its assurance to the injured; and he outlines, though very vaguely, a scheme of his own for effecting that assurance. "I should like to see the whole machinery taken away from the Law Courts altogether. What is wanted is a scheme rather than an Act of Parliament—a scheme in which, if the County Court machinery is used, it is only to be used for the purpose of fixing compensation, and then calling in the Post Office to aid in distributing the funds. A scheme in which the appeals, if any, are to be to some body like the Railway Commissioners, business-like as well as technical. . . . No scheme will succeed that does not abolish the form and spirit of litigation, and is not governed in its ultimate Court of Appeal by men desirous of assisting to form a working scheme, rather than by lawyers whose duty it is to ingeniously construe what may be put before them. . . . A small Committee, consisting of a colliery manager, a works manager, a Trades Union official, an insurance manager, and a County Court Registrar, could, among them, thrash out something workable. If this was not choked by departmental rules and orders, and if Parliament would accept it, and it were kept out of the hands of the lawyers afterwards, it would be found possible to realize the ideal set forth in the debates on the Workmen's Compensation Act."

We have quoted somewhat fully, because, in spite of the subjunctive and nebulous character of his proposals, there is some force in Judge Parry's plea for the decision by men of business, rather than by lawyers, of questions arising between employer and employed over the right to, or amount of, compensation. But a very strong case would have to be made out before Parliament would consider the question of recasting a system which is only just shaking down into working order—the obvious need for such a period of shaking down is what partisan critics deliberately ignore—and Judge Parry does not make out such a case. He, moreover, takes no account of the provision in the Act whereby masters and men can, by mutual agreement, do just what he proposes to do—namely, substitute a scheme for the provisions of the Act.

The whole explanation of Judge Parry's altogether mistaken views on the value and workability of the Compensation Act lies, we think, in a failure on his part to appreciate the true perspective of the question. His Honour, sitting in the Manchester County Court, naturally sees little but the litigious side of the Act; and he fondly imagines it to be the only side. Otherwise, he could not make such statements as he does when he speaks of the Act as one the passing of which "has been so unfortunate to all classes of the community, except lawyers." Let him take a piece of paper, write down on one side the total number of accidents (fatal and non-fatal) in the course of a year, and on the other the number of cases of litigation under the Act in all the Courts—not including, of course, County Court arbitrations, which are not of the nature of litigation, merely of administration—and then ask himself whether the existence of the Act is really an unmitigated misfortune to the working-classes. What should we think of the magistrate who judged all the world to be no better than the samples submitted daily for his inspection? Yet, apparently, Judge Parry takes no broader view of the Act he has to administer and thinks fit to criticize.

#### MR. T. W. ALDWINCKLE ON VENTILATION—A WORD FOR GAS LIGHTING.

DURING the present season the members of the Architectural Association Discussion Session have had before them a paper by Mr. T. Wilson Aldwinckle, entitled "Warming and Ventilation." It is always a matter for congratulation when members of the architectural profession deign to take cognisance of practical subjects affecting the conditions under which people live, and thus prove that the soul of the architect is not wholly absorbed in the consideration of elevations, sky-lines, and mouldings. The subject chosen for Mr. Aldwinckle's discourse is, of course, far too large to be thoroughly treated in a single paper; but the limits of a paper are quite sufficient for setting out the main lines of the most improved practice in this regard. It must often strike the assiduous reader of technical papers, that the proper character and uses of this class of literary compositions are not always understood by the professional men who occasionally write them—especially when this task happens to be undertaken by request, and to oblige the author's good friend, "the Secretary." It is perhaps because of this misunderstanding that so many papers written to order seem to partake so much of the nature of the boiled-down text-book. Now text-book information is very well in its place, and it may often be used very properly as the datum for a paper; but it is out of place in the paper itself. Speaking very generally and broadly, a technical paper may permissibly, and properly, be of the nature of a supplement to the text-book and to any previous publications dealing with its subject. When a professional man undertakes to write a paper upon "Gas Lighting," or "Warming and Ventilation," as in the present instance, it is never worth his while to hash-up a mass of old matter, much of which has probably never been experimentally verified. That kind of exercise is only fit for students, who should not attempt anything more than abstracting. It is essential to a good professional paper that the author, if he has nothing original to put



forward, should at least bring his matter up to date—which, by its very nature, a text-book cannot do.

With this standard of criticism in view, therefore, we approach Mr. Aldwinckle's paper with all the respect owing to the Architect of the Brook Green Hospital. Those who follow us in the study of this excellent little memorandum on a great subject, will not regret their trouble. The text was published in the "Builder" for April 21 last. The author's initial definitions of good ventilation and good warming are unexceptionable. He defines the former as "the efficient, constant, and uniform change of air without draughts, by which pure air is substituted for foul;" and the latter as "the efficient, constant, and uniform maintenance of temperature, whatever may be the temperature of the atmosphere." This is very engaging, to start with, impressing the reader with a sense that the writer knows what he wants, which is the first stage towards getting it. When Mr. Aldwinckle gets at the general conditions of ventilation, also, he shows that he is well grounded in the physics and chemistry of the subject. He lays hold of the carbonic acid as the chief impurity of vitiated air to be dealt with by ventilation; and he observes that, although this gas is about half as heavy again as air, by the law of diffusion of gases it is equally diffused throughout the atmosphere. The usual run of ventilating engineers are accustomed to assume that the carbonic acid, being heavier than air, will always fall to the bottom of an occupied apartment. Mr. Aldwinckle, moreover, does not overlook the fact that carbonic acid gas, as it comes off in exhaled air or in the products of combustion of gas used for lighting, is so much warmer than the atmosphere that it rises, and if it can be carried off before it cools and falls, or by diffusion gets mixed with the general atmosphere of the room, the air in the room will not retain more than its normal proportion of carbonic acid gas, and of the organic matter in suspension and excess of aqueous vapour always associated with it. He therefore quickly sums up by saying that efficient ventilation has to remove the various impurities which come into the air, and to supply fresh air to take the place of the foul, to the extent of between 2000 and 3000 cubic feet per hour for every person, which is the amount required by a person in full health. The question of warming is naturally bound up with that of ventilation.

Mr. Aldwinckle makes the usual and necessary division of ventilation into the natural and the mechanical systems, and further subdivides the former into automatic and assisted natural ventilation. The first comprises the normal operation of all inlets and outlets. The second includes the natural current of air through inlets and outlets, assisted by some mechanical means, though by no means "mechanical ventilation" in the full sense. Of such are the gas-jet burning at the bottom of an exhaust air-flue to induce the upward current of the vitiated air, or small fans working near the ceiling to cause a quicker travel of smoke or fumes towards the outlets. The author remarks that there is almost another subdivision of natural ventilation—the cases where permanent arrangements, such as louvres, are relied upon to provide the constant access of air to interiors. It is not obvious, however, why this common device should be erected into a distinct class.

With regard to mechanical ventilation, whether by the plenum or the vacuum system, with the regulated admission, washing, warming, and distribution throughout the building of the requisite volume of air, Mr. Aldwinckle observes that, while the theory is excellent, the practice leaves much to be desired. He dislikes the principle, because he has great faith in the open window in a climate like ours, and an open window would destroy any such system. Besides, the few leading instances of complete mechanical ventilation in this country are not altogether successful. The Houses of Parliament and the Royal Courts of Justice are awful examples of "how not to do it" in the matter of ventilation. This business is better done in the United States; but there it is a sheer necessity. For this country Mr. Aldwinckle's advice is to avoid both plenum and vacuum systems of mechanical ventilation, unless circumstances compel. Oddly enough, he has been constrained to accept the inevitable himself in the provision to be made for ventilating the first-class swimming baths of the public baths and wash-houses now being erected for the Vestry of St. Pancras.

In the case of what is usually posed as the simplest exercise in ventilation—that of a private dwelling-house—Mr. Aldwinckle takes the contrary view that this is an exceedingly difficult problem, owing to the morbid dread so many people entertain of draughts. His first prescription is the familiar one of the deep inside bead on the wood sill of all double-hung sashes, so as to enable the lower one to be raised slightly and air admitted in most weathers at the meeting rail. He recommends the addition of tobin tubes, and of air-shafts in the chimney breast, with admission from the top of the room. Mica flaps leading into the smoke-flue he will not have, on account of their noisiness and invariably going wrong after a few weeks' use. Unfortunately, the author was obliged to hurry over this branch of the subject; and accordingly his treatment of it is very inadequate. He wisely recommended the use of a warm-air stove in the hall, which is really indispensable if a house is to be kept from being downright chilly, in hard weather. He did not even mention the enormous difficulty of avoiding cutting draughts along the floor when roaring fires are kept up in open grates. The consideration of the case of sleeping rooms led the author by an easy transition to the venti-

lation and warming of hospitals, which he advised should be treated as far as possible on the principle of the open window. The same with schools. Of course, in the case of large wards and school-rooms additional air-inlets are required to supplement the windows; and these Mr. Aldwinckle would always place at the floor-level. The air would pass over radiators put in action in cold weather. The air-outlets, opened out from the ceiling level, are to be kept going by means of gas-flames. The extraction of air at the floor-level is at the same time to be provided for by the open fireplaces. Churches, theatres, and public halls are to be dealt with in practically the same way, by radiators and fan-driven currents of air, because they share the common characteristic of not having the help of fire-place ventilation. Lastly, Mr. Aldwinckle recognizes the extreme value in difficult cases of fans driven by electric motors. These appliances have cured many cases of bad ventilation previously regarded as hopeless. These fans are used to ventilate the Royal Courts of Justice; and those who have had business in the Courts this year, must have gratefully noticed the very great improvement that has been effected in their atmosphere. Whereas under the old system the air of the Courts became simply poisonous by the middle of the afternoon, now they are quite breezy—as the careless bystander will be apt to discover if he loiters too long by the end of the benches, where the fresh air is being driven in at the floor-level.

Mr. Aldwinckle is to be congratulated on his avoidance of the hackneyed commendation of electric lighting for crowded interiors as a means of remedying imperfect ventilation by diminishing the fresh air requirements. He probably knows full well that, where there are crowded assemblies, the need for adequate ventilation is independent of the method of artificial lighting. On the other hand, he might have said with truth that the general adoption of the incandescent gas-burner in private houses has revolutionized the conditions of aerial sanitation wherever the system of lighting has penetrated. Where the householder habitually used a three-light gas-pendant, with flat-flame burners consuming gas at the rate of 5 or 6 cubic feet each per hour, in a little, close room 11 or 12 feet square, and under 10 feet high, he now gets a better light from a single incandescent burner consuming less than 3 cubic feet of the same gas per hour. Not only does he spare his pocket thereby, but he also avoids spending his evenings in a gas-oven. Whereas the temperature and the condition of the air near the ceiling of such a room were, under the old system, obnoxious to the health of all the inmates, the single incandescent burner consumes so little gas that the sanitary objection to all "lights of combustion," on account of their competing for air with the human occupants of the room, sinks into insignificance. So far as the heat and the "fumes" are in question, nobody would detect the existence of such a gas-light in any ordinary room; and the gain to health from this cause alone must be very considerable.

#### DEVELOPING THE BENEFITS AFFORDED BY THE PATENT OFFICE TO INVENTORS.

AMONG the various and sundry questions which the "JOURNAL" has a habit of treating upon independent lines, occasionally running counter to the popular opinion of the hour, that of the merit of English Patent Law and the practice of the Patent Office is conspicuous. While freely admitting that both the law and the office practice, being mere human devices, are open to improvement in several respects, it has been persistently and consistently maintained in these columns that most of the condemnation sometimes very freely poured out in the newspapers upon the English patent system is undeserved. Not to go further into this argument for the present, it is, at least, only doing common justice to the Board of Trade to recognize the willingness with which this Department entertains all reasonable suggestions for the development of the work of the Patent Office. There is a Committee now inquiring into certain suggested extensions of the work of the Office, for the benefit of patentees; and within the last week or two the report of an earlier Committee, appointed so recently as last November, "to consider various suggestions which have been made for developing the benefits afforded by the Patent Office to inventors," has appeared as a parliamentary paper. Although the labours of this Committee were directed to investigating questions of detail in connection with the routine work of the Patent Office, and had not, like the present one, to consider and advise on questions of principle, the interest of the report is considerable. The suggestions dealt with relate to the acceleration of the completion of the classified illustrated abridgments of specifications anterior to 1884; the sub-division and re-arrangement of the matter in the volumes of abridgments so as to facilitate searches; the issue of reminders for payment of renewal fees; the reprinting of specifications of expired patents; the opening of deposit accounts for Patent Office publications; and the increase of the annual allowance for the purchase of books and for binding for the Patent Office Library. These are all matters of high practical importance.

Taking the question of abridgments first, it is estimated that by the end of the year there will be about 340,000 British specifications of patents, ranging from the year 1617 to date. Most of this enormous crop is the growth of recent years. In



1856, when the specifications only numbered 25,000, the practice was commenced of preparing short abstracts of selected specifications, called abridgments, which were classified with reference to their subject matter. Collections of these abridgments, which were never illustrated, were published; but the work was partial, and otherwise incompletely done. Under the Act of 1883, the duty of publishing an Illustrated Patent Office Journal was laid upon the Controller; and five years later the present system of illustrated abridgments was established. For the sake of convenience, the work of making these abridgments has been divided so as to deal with the specifications by periods of seven years. As searchers among old patents know, the work as regards different periods is in different stages—that for the earliest being the most backward. The later abridgments, covering the periods from 1884 to 1892, are completed and published; and the still more recent ones are being finished in accordance with the newest office rule—that publication of the illustrated abridgments shall be as nearly as possible concurrent with the acceptance of the specifications themselves.

The suggestion that the Committee had to deal with was for the accelerating of the illustrated abridgments of about 95,000 old specifications. The first question to be settled was as to the existence of a demand for this information, which was easily answered in the affirmative. The Committee were assured that many of the old specifications are of great practical interest, and that a large amount of useful information would be much more readily accessible to the public if the old specifications were abridged on modern lines. And, of course, in searching for anticipations the old specifications are of as great importance as any. Moreover, some of the old unillustrated abridgments are of little value; and the subject-matter indices are, in some years, very poor. Consequently there was a strong case made out for the uniform treatment of all the old specifications in the style of the later abridgments, the utility of which was warmly acknowledged by the witnesses heard on this point by the Committee. Having regard, therefore, to the general expediency of giving the fullest facilities to searchers, the Committee recommend that illustrated abridgments of all the old specifications from 1617 to 1883 inclusive should be put in hand and completed with all reasonable despatch. It will be the end of 1906 before the last division of this work—that embracing the period from 1617 to 1866—will be finished.

When the abridgments are all published, for their respective periods, in separate volumes for all the 146 classes into which the subject matters have been divided, these will constitute an unexampled technical library of 1022 volumes, the existence of which may be expected to very considerably influence the nature of the historical portions of future text-books. More than this, the reproach of ignorance of the subject ought to be very materially removed from the meritorious poor inventor of the future. Few persons who know enough to make application on their own account for a patent, are absolutely devoid of some technical instruction. It should be a standing order for those responsible for imparting this instruction not to fail to impress upon their classes the desirability of correcting any notions for inventions that might occur to them by consultation with the old patent specifications. The volumes will be cheap to buy, and handy for home use; and, in addition, there are already about 300 places in the United Kingdom where these books are daily accessible to the public for reference or copying free of charge. It is not asking too much of the poor inventor to suggest that he may often save his money, and spare himself and others a vast amount of unnecessary trouble, by taking advantage of this means of instruction.

But this copious source of information is to be made yet more accessible to the home-student, and more convenient for the specialist, by further sub-division of the classes and a tentative rearrangement of the subject matter. At present, some of the classes are rather too comprehensive, which makes them unwieldy. For example, Class 28 includes inventions relating to "cooking and kitchen appliances, bread-making, and confectionery." One scarcely knows what to expect to find in such a grouping. Consequently, the Committee have had an experimental sifting out of these inventions, arranged not in septennial periods but ranging over the entire period for which the abridgments have already been prepared. The idea is that if it were feasible to sub-divide each of the present 146 classes into seven sub-classes, and publish in one volume all the abridgments belonging to every sub-class from the beginning down to 1900 inclusive, this would put the purchaser of one volume in possession of all he wants to know about a particular line of inventions. Otherwise, he must consult seven volumes, and pick out his speciality from numerous (to him) indifferent abridgments.

All the experts consulted favoured this proposal. They thought it would be valuable for a rough search before making an application. This was the patent agents' view of the suggestion. It was also remarked that such special publications should be of great utility to a would-be inventor with an "idea." If he knew next to nothing of what had already been patented in the same class—the normal condition of the amateur, and often the case with the instructed—he would have in such a book the best of mentors. But, of course, the expense of such selections and publications would be great; and the Committee were neither prepared to go into this question of the cost nor to recommend such publication. All they recommend, therefore, is a proceeding in this sense by way of experiment. The

Comptroller-General is to make a selection of a limited number of leading subjects of invention, and the volumes of collected abridgments are to be placed in the Patent Office Library, but not reprinted without further consideration of the subject. The Comptroller-General will then, in the course of a few years, be able to readily gauge the quantum of the use which is made of the volumes. It is greatly to be hoped that his judgment will be favourable to the extension of the system.

On the question of official reminders for payment of patent renewal fees, the Committee give a negative answer. On the whole, they consider that the grievance sought to be remedied in this way is not far-reaching, and that the objections to the suggestion to send out reminders are more weighty than was at first realized. In regard to the reprinting of specifications of expired patents, the Committee think it would be of public benefit if the Comptroller-General had authority to reprint specifications for which there may be a demand. Steps are also to be taken, as far as possible, to guard against the abuse of buying up all the remaining copies of a particular specification for private reasons. The other recommendations of the Committee are not of a public character.

Altogether, therefore, it must be allowed that the appointment of this Departmental Committee was well justified. All their recommendations go to strengthen the hands of the Comptroller-General, and to make the Patent Office staff still more useful to the public. Throughout the report there is in evidence an implied confidence in the establishment which must be in the highest degree grateful to the able public servants who constitute the staff, and who are by no means too well paid for their difficult work. Whatever may be urged against the system, efficiency and regard for the public interest are a tradition of the Office. Unlike the Post Office, as to which it is frequently observed that the heads of departments seem doubtful whether the service exists for the public, or the public to maintain the service, the Patent Office has always kept in view the principle that all the officials from the highest to the lowest are public servants; and there have rarely been instances of arbitrary or inconsiderate official interpretations of the rules and regulations. Consequently, the large trust which the report of this Committee reposes in the discretion of the Comptroller-General is not misplaced. It is certain that no other national patent office is worked with so little friction between the officials and the public with whom the business of the office is done as that which is now under the control of Mr. C. N. Dalton, C.B., who succeeds a line of equally capable and devoted administrators.

#### THE GAS SUPPLY OF BOSTON (MASS.).

THE strange vagaries—the financial manipulation of gas undertakings at the hands of the "boss"—that have characterized, and do characterize, American gas politics, have often received attention in the columns of the "JOURNAL;" and it has been the subject of surprise on the part of English managers that the gas industry should be able to exist, and even thrive, in the atmosphere of glorious uncertainty which surrounds its conduct on the other side of the Atlantic. The condition of affairs in the States generally, may be described as unlimited competition, *plus* municipal corruption. The one State in which any serious attempt to put the gas supply upon a reasonable basis, by providing the investor with a fair amount of security, is that of Massachusetts. In that State, however, affairs are even now in a by no means perfectly satisfactory condition; while in the past they have been very specially the reverse. In recent numbers of the "Quarterly Journal of Economics"—published by the Harvard University—Mr. J. H. Gray has traced, with the utmost fulness of detail, the history of the Gas Supply of Boston; and the story he unfolds is, to English readers at least, so illuminative in respect of American financial methods as applied to gas undertakings, that we propose to give an abstract of the more important particulars set out in the articles.

The essence of the difficulties besetting the gas industry in the United States is explained at the outset. The belief that competition works advantageously in the supply of gas and similar services has, we are told, long been abandoned by careful observers on the other side of the Atlantic; but the general economic ignorance of the mass of voters, played upon by interested promoters and speculators, has prevented the legislative world from accepting the doctrine of monopoly in this industry. The fact that the gas business is highly technical, gives, according to American practices, an excellent opportunity for the companies conducting it to keep their accounts secret, and then make vague claims as to the cost of manufacture, and as to the importance of new inventions or processes. From these, and from the evils of municipal corruption, the city of Boston—though one of the most enlightened communities in America—has by no means been exempt. Indeed, its experience thereof has been extensive, if not exactly peculiar. This is how that experience is referred to by Mr. Gray: "So far," he says, "as my observation goes, no other single portion of municipal experience shows in such glaring light the weakness of American Governments, and at the same time illustrates so many important phases of the problem of the management and control of private corporations, as the history of the Gas Supply of Boston, and the manipulation of the stocks and debts of the Companies engaged in it." That, by anyone acquainted with American



municipal history, will be considered a pretty sweeping condemnation. Mr. Gray, as we shall presently see, certainly supports his assertions by some remarkable evidence. He proceeds: "The handling of Boston gas securities by foreign (*i.e.*, extra-State) corporations, organized expressly for that purpose, makes a distinct and remarkable chapter in the development of the business corporation and trust. The history of the financing of these Companies, with all their evasions and circumventions of law, is doubly interesting in view of the fact that Massachusetts is recognized as second to no State in the Union, either in the intelligence and high character of her citizenship and her legislature, or in the care with which she drafts and enforces her laws. The fact that these things go on in Massachusetts, is noteworthy also from the fact that she alone of all the States has established an able, honest, and permanent State Commission, whose duty it is, not only to see that the Gas Companies conform to all the laws of the State, but also, with a very wide discretion, to protect the consumer against wrong and injustice where no law protects him." Mr. Gray adds that it is only fair to say that the events which he relates in his articles began before the Gas Commission was established in 1885; but they have continued, and mostly happened, since that date. The attempts of the State to make the control of the Gas Companies effectual, are, however, admitted to include "not only some of the most interesting, but also some of the most promising experiments in the annals of the American commonwealths."

From these introductory remarks, Mr. Gray proceeds to recount and discuss the most noteworthy points in "this exceptionally unique history;" and we propose to summarize his account of the development of the gas supply of Boston. The Boston Gaslight Company was incorporated by Special Charter in 1822, with a capital of \$75,000, and commenced to supply the city proper with gas in 1836. The undertaking grew until, in 1874, it had a paid-up share capital of \$2,500,000, at which figure the capital stands to-day; the further authorized sum of \$1,000,000 remaining unissued. In 1861, the office of State Gas Inspector was created, and official examination of gas for illuminating power and purity was commenced in the State. By a general law, of 1868, Gas Companies in America are required to sell new issues of stock for cash, and not below par, and to pay dividends in cash. By the Act of 1873, all Companies are obliged to sell new stock by auction.

From time to time, new Companies were chartered by the State with the right to supply gas in Boston and its suburbs, subject to the consent of the Local Authorities controlling the streets; but, up to 1884, no actual competition took place—the new Companies, by mutual arrangement with the original Boston Company, leaving the latter in possession of the city, in return for the privilege of buying up its mains and taking over its business in the suburbs. This continued until, in 1874, the gas supply was in the hands of the following Companies:—

	Paid-up Share Capital.	Miles of Main.
Boston Company . . . . .	\$2,500,000 . . . . .	105
Charlestown Company . . . . .	500,000 . . . . .	25
Roxbury Company . . . . .	600,000 . . . . .	48
South Boston Company . . . . .	440,000 . . . . .	21
East Boston Company . . . . .	220,000 . . . . .	10
Jamaica Plain Company . . . . .	173,000 . . . . .	18
Dorchester Company . . . . .	400,000 . . . . .	33
	<hr/> \$4,833,000	<hr/> 260

There was also in existence, but not in operation, the Brookline Company, with a capital of \$350,000. The Boston Company were selling 612 million feet of gas at an average price of \$2.39 per 1000 cubic feet; the others, in the aggregate, 231 millions, at from \$3 to \$4 per 1000 cubic feet. All the Companies were paying from 8 to 10 per cent. dividend; and the Boston Company, in particular, were year by year increasing their plant out of revenue.

The cheapening of manufacture, through the introduction of improved methods and the growth of the population, about this time brought other would-be competitors into the field; and, in 1874, a Company was actually organized, with a capital of \$1,000,000, and applied for the right to supply. After very lengthy public hearings—preceded by loud denunciations of "monopoly," and a promise of two-dollar gas if the petitioners were allowed to compete with the "ultra conservative and antiquated" Boston Company—the aldermen of the city refused the petition of the new Company. As the result of continuous agitation for the admission of competitors, however, a Commission was appointed in 1877, to consider the whole question of the city's gas supply. This Commission, in their report, "showed the impossibility of effective competition, set forth the necessity of monopoly, and recommended control of the monopoly, through strict publicity of accounts, by means of an independent and impartial Commission. While not endorsing public ownership as a desirable solution of the problem, the Commission recommended that the city should seek authority from the State to establish its own gas plant, as a menace to bring the Companies to terms and keep them in check until permanent and effective means of control could be perfected."

Matters remained as they were for the next seven years—during which period the process of water-gas manufacture was discovered—until, in 1884, Mr. J. E. Addicks, of Philadelphia,

turned his attention to the Boston gas supply, appeared upon the scene "fairly loaded down with water-gas patents," and formed the Bay State Gas Company of Massachusetts, with a capital of \$500,000. This Company were granted leave to supply gas in the city, conditionally upon their undertaking to actually parallel all the mains in Boston. This condition the Company accepted, without the slightest intention of fulfilling it; the whole aim of the promoter being to consolidate all the existing Companies, and supply water gas. This was clearly proved by the fact that, as soon as ever they had obtained the right of supply, the Company began to erect enormous water-gas plants, and to lay mains designed to couple up the existing distributing systems; and this in spite of the fact that, in 1880, the State had passed an Act prohibiting the sale of gas containing more than 10 per cent. of carbonic oxide, and that such a combination as that contemplated was prohibited by the general laws of Massachusetts. They also continually petitioned the Legislature for power to increase their capital to \$5,000,000, amalgamate with the existing Companies, and supply water gas.

The old Companies, fearing the competition of the cheaper water gas, and not desirous of amalgamation, used all their influence to defeat the projects of the new Company; and, finally, in 1885, they carried through the Legislature a Bill for creating a Board of Gas Commissioners, "with greater powers of inspection and control over these Companies than any other State Commission in any State has ever been given over any kind of corporation." Regardless, however, of any new or previously existing laws, and of the terms under which they were granted the right of supplying gas to Boston, the Bay State Company pursued the tortuous tenour of their way; the concern being entirely controlled by Mr. Addicks. Mr. Gray describes, at much length, some of the most involved financial manœuvring we have ever tried to comprehend. Our feeling after reading the details is similar to that experienced on witnessing an expert conjurer's display. It is wonderful; but it is impossible to follow all the moves. The proceedings may, however, be summarized somewhat as follows.

So far as practical operations were concerned, the Company altogether—by their assignees, the Beacon Construction Company, owned by them—only constructed plant to the value of about \$750,000, and acquired patents equal to another \$250,000; making their total addition to the value of Boston gas undertakings, say, \$1,000,000. They were chiefly concerned with financial evolutions, in the course of which they formed the Boston Gas Syndicate, which bought up stocks of some of the Boston Gas Companies of the nominal value of \$3,987,000, for \$8,571,645. These were again transferred to the Boston United Gas Trust (floated by yet another Company), with a capital of \$10,000,000; and this Trust was absorbed by the Bay State Company of Delaware, whose capital was \$17,000,000. (These operations involved also the formation of various other Companies, which we need not name.) In short, "the promoters of the Bay State Gas Company of Massachusetts formed this multitude of corporations, limited partnerships, trusts, syndicates, and contracts with themselves, in five States—to the Legislatures (and in some cases to the city councils) of which they had to make numerous and expensive appeals—all in the attempt to make the property which before paid 10 per cent. on less than \$5,000,000 of capital, by the addition of about \$1,000,000 to the investment (including patent rights), pay interest and dividends on \$17,000,000 of capital." The history of the attempts to pay dividends on the inflated capitalization forms another chapter in that of the gas supply of Boston.

(To be continued.)

The new oil-pipe line from Baku to Batoum, 560 miles long, has been completed for a distance of 145 miles. The 8-inch wrought-iron pipe is to run parallel to the Trans-Caucasian Railway. The first section has three pumping-stations, each being equipped with two compound high-duty engines, with 21-inch and 42-inch steam cylinders and 24-inch stroke. These pumps work against a pressure of 650 lbs. per square inch, with a steam pressure of 150 lbs.; and the duty of each pump is fixed at 416,275,200 gallons per annum.

M. Henri Le Chatelier has been communicating to the Paris Academy of Sciences the results of some experiments on the development and propagation of the explosive wave. They show the application of the photographic method to the study of the subject. He has given measurements for various mixtures of acetylene and oxygen, acetylene and nitric oxide, acetylene and nitrous oxide, and carbon monoxide and oxygen. In the last case the velocities depend upon the mode of ignition, and upon the quantity of the fulminating substance used to start the explosive wave.

The formal opening of the new physical laboratory at Owen College, Manchester, took place on the 29th ult. The new building contains about forty rooms. The site measures 100 feet by 60 feet, and of the total cost of £33,000 the subscriptions fall short at present by from £9000 to £10,000. The Principal (Mr. Alfred Hopkinson) stated that the erection of the laboratory was due to munificent donations from two anonymous subscribers—one of £10,000 and the other of £5000. He was of opinion that for some time to come this would be the largest physical laboratory in the world.



## PERSONAL.

The managership of the Athy (Co. Kildare) Gas Company has been obtained by Mr. G. W. YOUNG, of Carlow.

There appears to have been some misunderstanding in connection with the proposal to confer upon Sir J. J. HARWOOD the freedom of the city of Manchester, of which suggested distinction we have previously made mention. In a letter to the Lord Mayor, Sir John has declined the honour, and withdrawn his name. Political feeling seems at the bottom of the matter.

The members of the office staff of the Derby Gas Company were entertained to tea at the New Bath Hotel, Matlock, on Saturday, the 30th ult., by Mr. RICHARD FISHER, who has relinquished the position of Secretary of the Company. The occasion was chosen to present Mr. Fisher with a life-size platinotype portrait of himself, surrounded by portraits of each member of his staff. To the picture was attached a silver plate bearing the following inscription: "Presented to Mr. Richard Fisher by the office staff, on his retirement from the Derby Gas Company after fifty years' service, June, 1900." Mr. Kirk, the oldest member, in making the presentation, spoke feelingly of the good relationship which had existed for so long between Mr. Fisher and the staff, and of the sorrow with which he personally and all present contemplated the severance of the connection. He trusted Mr. Fisher would be spared for many years to enjoy health and happiness. Mr. Bullivant, the newly-appointed Secretary, said he should not like the opportunity to pass without expressing his gratitude to Mr. Fisher for the many kindnesses he had shown to him during the 27 years he had worked with him. Mr. Fisher, in accepting the portraits, thanked the staff for their kindness, and acknowledged his indebtedness to them for the loyalty with which they had served him during his official connection with them. A vote of thanks was accorded to Mr. Fisher for his hospitality, which was suitably responded to.

## OBITUARY.

We have to-day to record the rather sudden death, on Monday evening last week, as the result of a ruptured blood-vessel, of Mr. H. S. EDMOND, who for about twenty years had been Manager of the Kenilworth Gas Company. Deceased was only in his 47th year. He leaves a widow and a large family.

We regret to announce that Mr. JOHN CHALMERS, Manager of the Greenock Corporation Gas-Works, died there on Thursday last, after a short attack of rheumatic fever. It may be remembered that he was only appointed Manager on the 20th of March last, on the retirement of Mr. Samuel Stewart. He had, however, been employed in connection with the Greenock gas undertaking since 1866. After twelve years' service, he was made collector, and held that office till he was promoted to the post of Manager. It was stated at the time that his appointment, which was a somewhat strange one for so important a works, was temporary. It has proved to be so, but unfortunately in a different way from that which might have been contemplated.

## NOTES.

## Exothermancy and Endothermancy.

Dr. Geoffrey Martin, of Bristol, writes to the "Chemical News" to discuss the classification of chemical combinations into the two great orders, endothermic and exothermic. In endothermic compounds, the atoms are held together in such a way that energy is stored up in the molecule. Consequently, when the molecule is decomposed, this stored-up energy is liberated, principally in the form of heat. Endothermic compounds are usually explosive, and for the reason that, in separating the atoms of the molecule, work is done with, not against, the internal atomic forces. In exothermic compounds, however, the contrary is the case; and the coming together of the atoms which compose them is attended with the evolution of energy. In order to decompose such a molecule, work must be done against the atomic forces within the molecule. Such compounds are therefore usually stable. The heat of formation of a compound may be either positive or negative, according as it is exothermic or endothermic. Now it is well known that the heat of formation of a compound is not a constant, but varies with the temperature. In a great many cases it diminishes with the increasing temperature. The dependence of the heat of formation upon the temperature has been investigated in the case of a very few endothermic compounds. Victor Meyer, in 1893, studied the case of hydrogen iodide. He found that this is an example of an endothermic compound gradually changing into an exothermic compound. Is the principle reversible, so that by heating an exothermic compound beyond the temperature at which its heat of formation is zero, it would become an endothermic compound? If so, here is the key to some very remarkable phenomenon of work at high temperatures. Dr. Martin meanwhile fails to see the necessity for drawing an arbitrary distinction between endothermic and exothermic compounds. He regards them as only

the different stages of the physical alteration of a compound with the temperature. The fact that a compound is at ordinary temperatures endothermic or exothermic, as the case may be, is, according to his way of looking at the matter, a mere accident of the temperature.

## An Automatic Fire-Alarm.

A description is given in the "Ironmonger" of May's automatic fire alarm, which is also calculated to be useful in giving warning of any dangerous rise of temperature in coal stores and other enclosed places. It depends upon the principle that if a fine copper wire is stretched along a wall near the ceiling, the amount of its sag at the middle will depend upon, and be proportional to, the temperature of the room, which is highest at the top. If in the middle of this span wire a short piece of wire is fixed, pointing downwards, it is obviously easy to so adjust this attachment as to make it touch an electrical contact piece and ring a bell, when it is caused to drop by the dangerous heating of the room acting on the sag of the span wire. This is the scheme of the apparatus; but, of course, it needs a little careful working out in detail, which the inventor has done. Clearly, some safeguard is needed to prevent the alarm being given (say) in exceptionally hot weather or when the temperature near the ceiling of a room is raised by ordinary heating and lighting. This is provided in an arrangement called the compensator, which consists of a light brass frame to carry the span wire and itself suspended upon studs in the wall. In case of any gradual rise of temperature to any moderate range, the brass frame would expand at about the same rate as the thin wire, so that there would be no increased sag, and consequently no contact. In case of fire, however, or abnormal rise of temperature, the thin wire responds more quickly to the influence than its supporting frame, and duly gives the alarm. The arrangement is reported to have proved of practical use in New Zealand, where it originated.

## The Cost of Power in Bulk.

Some useful information relative to the question of the cost of electric power production has been published in "Engineering" by Mr. Philip Dawson, who has wisely depended on recorded facts, and eschewed estimates. Generally speaking, his data support the views of Mr. Parshall on this subject. He offers as reliable the conclusion that there is every reason to anticipate that power can be produced in very large well-designed stations, all charges included, such as interest on capital and sinking fund, for little over half a farthing per Board of Trade unit at the switchboard. The largest items in the cost of generating power are fuel and labour. On average American results, the fuel costs from 50 to 70 per cent. of the whole; wages coming next with from 13 to 26 per cent. The cost of the plant proper is, on the average, from one-half to three-fourths of the total cost of the complete installation, including land, buildings, and mains. Consequently, any little additional capital expenditure calculated to permanently reduce the cost of producing the power is well worth favourable consideration, especially when the plant runs practically continuously, as in the case of traction and power transmission. Continuous employment for the plant is the one essential condition for securing the greatest economy in production; but it does not yet appear what size of plant best realizes the ideals of the mechanical engineer. Mr. Dawson is emphatic, however, upon the point that a station which runs for lighting purposes only will not generate power cheaply, and *vice versa*. To design an economical station for traction or power transmission, is special work requiring a great deal of knowledge and experience which practice in the lighting branch of electrical engineering cannot supply.

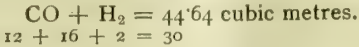
## The Latest Blast-Furnace Gas-Engine.

The performance of a blowing engine at Seraing, driven by blast-furnace gas, has been recorded in this column. It is reported in "Engineering" that one of the really important novelties in the Paris Exhibition is a still later and more improved gas-motor of the same character, the joint invention of M. Delamare-Deboutteville and the John Cockerill Company. Of course, this engine cannot be shown working with blast-furnace gas; but it was very thoroughly tested with this fuel before leaving the works of the Cockerill Company. It is the first of the special type that has been constructed; and the blowing mechanism also shows special details. The engine is rated at 600-horse power, and has a single cylinder over 51 inches diameter. It occupies a space 36 feet long by 19 ft. 8 in. wide; and the flywheel weighs 33 tons. At the works, the engine took the gas from five blast-furnaces making Bessemer pig, which was collected in a chamber, where it was thoroughly cooled and washed with water. The best result that was obtained during the trial was 900 indicated horse power, giving effective work of 725-horse power in compressed air, for a gas consumption of 100.8 cubic feet per hour. M. Hubert, Director of Mines in Belgium, prepared the report on these trials, and remarks on the progress made in the direct utilization of blast-furnace gases for generating power since the first tentative experiments at Seraing in 1895. It was then considered necessary to provide extensive apparatus for cleansing and scrubbing the gas; and M. Hubert pays a high compliment to the ability and perseverance with which M. Delamare-Deboutteville and the engineers of the Cockerill Company have met and overcome all the difficulties that attended a complete solution of the problem.



THE FUTURE OF WATER GAS IN FRANCE.\*

The system of blowing up, with the production of carbon monoxide, in the manufacture of water gas, always means recuperation of the heat of combustion of this oxide—heat which will be utilized in accordance with requirements, but which unfortunately complicates the apparatus. Side by side with this system for producing water gas, there is another which is more important for French gas managers, who cannot think of carburetting water gas by means of the extremely dear petroleum which are alone available; and that is the system of producing carbonic acid by blowing. This system is based upon technical considerations of which the writer will give some indication. It is well known that the production of a molecule of water gas—



requires a certain expenditure of heat—

			Cal.
H <sub>2</sub> to produce H <sub>2</sub> O in vapour	= 2 ×	28,780	= 57,560
C " " CO " "	= 12 ×	2,400	= 28,800
			28,760

The operation of blowing, therefore, should produce 28,760 calories in order to make 30 kilos. of water gas. Now, 1 kilo. of carbon transformed into carbon dioxide at the expense of air requires 2½ kilos. of oxygen, to which correspond 8·834 kilos. of nitrogen contained in the necessary volume of air. Under constant pressure, the specific heats are: For CO<sub>2</sub>, 0·2164; for N, 0·2440. The following is a table of specific heats under constant pressure:—

	Air = 1.	Aqueous Vapour = 1.
Air	1·0000	0·2377
Vapour of ether	2·0235	0·4810
Alcohol	1·8986	0·4513
CO <sub>2</sub>	0·9104	0·2164
CO	1·0793	0·2479
O.	0·9180	0·2182
CH <sub>4</sub>	—	0·3280
C <sub>2</sub> H <sub>4</sub>	—	0·4210
N.	1·0265	0·2440
H	14·3231	3·4046

If the blowing-up gases contained only carbonic acid, and escaped at *t*, each kilogramme of carbon would carry away, for its transformation into carbonic acid—

$$K' = t [(2\frac{1}{2} + 1) \times 0\cdot2164 + 8\cdot834 \times 0\cdot2440] \text{ calories}$$
$$\text{or } t \times 2\cdot9669 \text{ calories.}$$

Now, a kilogramme of carbon transformed into carbon dioxide produces 8080 calories; so that, in reality, there will remain in the coke only 8080 — 2·9669 *t*. If we calculate also what goes on when this quantity of carbon monoxide is produced instead of carbon dioxide by blowing up, we see that to produce the 30 kilos. of water gas we require 1 kilo. of carbon transformed into carbon monoxide, and 1·33 kilos. of oxygen, corresponding to 4·417 kilos. of nitrogen. The specific heats, as shown by the table given above, are: CO, 0·2479; N, 0·2440. We arrive, therefore, at eliminating under this form—

$$K'' = (2\frac{1}{2} \times 0\cdot2479 + 4\cdot417 \times 0\cdot2440) t$$
$$K'' = 1\cdot6553 t \text{ calories,}$$

the heat required for producing hydrogenated gas. And inasmuch as the transformation of carbon into carbon monoxide gives 2400 calories, there remain in the coke 2400 — 1·6553 *t* calories. But *t* is different in the two cases, according to whether by blowing up we produce carbon dioxide or carbon monoxide. If in the latter case we make 2400 — 1·6553 *t* = 0—that is to say, that there is no available heat for the production of hydrogenated gas—then *t* = 1450° C., or about the melting-point of nickel.

In order that, in the first case, there should be no heat available for the production of hydrogenated gas, it would be necessary to have a temperature (if 8080 — 2·9669 = 0) of *t* 2740° C.—one never realized in practice. In one volume of air we have 21 per cent. of oxygen and 79 per cent. of nitrogen. One volume of oxygen combining with a like quantity of carbon produces two volumes of carbon monoxide; and the same bulk of oxygen combining with one volume of carbon monoxide produces a volume of carbon dioxide. If in 100 volumes of blowing-up gas there is a certain quantity of oxygen which we will call *x* combined with CO and CO<sub>2</sub>, we shall have a volume—

- (1) *V* of CO<sub>2</sub>.
- (2) 2 (*x* — *v*) of CO.
- (3)  $\frac{79}{21} x$  of N.

Whence—

$$V + 2 (x - v) + \frac{79}{21} x = 100 \text{ vols. of blowing-up gas.}$$

From this we obtain the value of *x*—

$$21 V + 42 (x - v) + 79 x = 2100,$$
$$21 V + 42 x - 42 v + 79 x = 2100,$$
$$121 x = 2100 + 21 v$$
$$(1) x = \frac{2100 + 21 v}{121}$$

If the volume of carbon dioxide is the same as that of carbon monoxide—in other words, if *V* = 2 (*x* — *v*), we have—

$$3 V = 2 x, \text{ and } x = \frac{3 V}{2}$$

Transposing, we get in equation (1)—

$$\frac{3 V}{2} = \frac{2100 + 21 v}{121} \text{ or}$$
$$363 V - 21 V = 4200 + 42 v, \text{ and}$$
$$V = \frac{4200}{321} = 13\cdot08 \text{ per cent.,}$$

the volume of air required for blowing up.

In the preceding processes, 13·08 per cent. of carbon dioxide is never reached; and in the Lowe process 9·7 per cent. is never exceeded.

Representing the carbon passed to the generator by *y*, the quantity of carbon transformed into carbon dioxide by blowing, 1 — *y* will be that which is transformed into carbon monoxide. But we have—

$$(2) \frac{y}{1 - y} = \frac{V}{2 (x - v)}$$

as 1 cubic metre of carbon dioxide contains as much carbon as a like quantity of carbon oxide.

From (2) we obtain—

$$2y (x - v) = v (1 - y)$$
$$2y (x - v) = v - vy$$
$$v = 2y (x - v) + vy$$
$$v = y [2 (x - v) + v]$$
$$\text{and } y = \frac{v}{2 (x - v) + v}$$

But we can replace the volume of carbonic oxide—2 (*x* — *v*)—by *V*<sub>1</sub>; and then we have—

$$y = \frac{V}{V_1 + V} \left( \text{or } y = \frac{1}{\frac{V_1}{V} + 1} \right)$$

If *S* represents the heat available to produce the hydrogenated gas, we have—

$$\frac{K' \times y}{\text{Heat liberated by the transformation into CO}_2} + \frac{(1 - y) K''}{\text{Heat liberated by the transformation into CO.}} = \frac{S}{\text{Available heat.}}$$

Replacing *y* by its value  $\frac{V}{V_1 + V}$ , we have—

$$K' \frac{V}{V_1 + V} + \left( 1 - \frac{V}{V_1 + V} \right) K'' = S$$

Whence—

$$\frac{K' V}{V_1 + V} + K'' - \frac{K'' V}{V_1 + V} = S \text{ and}$$
$$K'' - \frac{V}{V_1 + V} (K' - K'') = S$$

We have seen that, in order to get a molecule of water gas, it is necessary to produce 28,760 calories in blowing up, by the combustion of the carbon. On the other hand, a molecule of water gas, as already shown, contains 12 C. In order, therefore, to produce 44·64 cubic metres of water gas, the quantity of carbon to be expended will be—

$$12 + \frac{28\cdot760}{S}$$

Then 1 kilo of carbon will produce a certain number *N* of cubic metres, equal to—

$$N = \frac{44\cdot64}{12 + \frac{28\cdot760}{S}}$$

Replacing *S* by its value in the function of *K'* and *K''*, we get an expression for *N* into which only *V*, *V*<sub>1</sub>, and *t* enter. We have besides *V*<sub>1</sub> = 2 (*x* — *v*) or—

$$V_1 = 34\cdot71 - 0\cdot653 v$$

Starting with *V* = 13 in 100 cubic metres of blowing-up gas, varying by one unit its value up to 21, seeking the corresponding values of *V*<sub>1</sub>, and drawing up the table of variations corresponding to those of *t* comprised between 600° and 1000°, we obtain the following results:—

Percentage in the Blowing-up Gases of		Yield of Water Gas, in Cubic Metres, per Kilogramme of Coke (C).				
CO <sub>2</sub> .	CO.	600°.	700°.	800°.	900°.	1000°.
13	13'22	2'27	2'22	2'16	2'10	2'03
14	11'57	2'33	2'28	2'23	2'16	2'10
15	9'91	2'39	2'31	2'29	2'23	2'17
16	8'26	2'44	2'39	2'35	2'29	2'23
17	6'61	2'48	2'44	2'40	2'35	2'29
18	4'95	2'54	2'50	2'46	2'41	2'36
19	3'30	2'59	2'55	2'51	2'46	2'42
20	1'65	2'64	2'60	2'56	2'52	2'47
21	0'00	2'69	2'65	2'62	2'58	2'53

In practice, we can exceed 18 per cent. of carbon dioxide (theoretically, according to Jaeger, 21·3 per cent.); and consequently we can easily obtain 2·50 cubic metres of water gas for 1 kilo. of carbon. In the systems in which blowing-up produces carbonic oxide, this yield cannot be reached. In the Lowe process, the quantity of carbonic acid does not exceed 9·7 per

\* The previous article on this subject appeared in the "JOURNAL" for April 17 last (p. 997).



cent. Starting from there, we can easily calculate the possible yield of water gas. If instead of 9·7 per cent. we assume 10 per cent., we get 1·03 cubic metres as the yield at 600°.

From the preceding considerations we are able to draw the following general conclusions: The blowing-up process, with the production of carbon monoxide, which may be called the Anglo-American, and its combustion in fixing chambers, yields a smaller quantity of water gas than that with direct production of carbon dioxide, which may be designated the German process. However, it is difficult to decide absolutely as to the special merits of each of these processes, as upon the question of yield depends a second, and very important, one, though it is of a purely economic order—viz., the selection of the raw material for carburetting the water gas. Consequently, so far as we are compelled by the taxes put upon petroleum to exclude this product or admit it for the purpose of carburation, so shall we be forming two opposite camps, in one of which will be found the countries where petroleum is not burdened with duty, such as America, Great Britain, and Belgium, and in the other those in which this illuminating agent is subject to heavy Customs imports, such as Germany, France, &c. In the former group, the Anglo-American process can be employed with advantage; the diminution in the yield being compensated for by the complete gasification of the petroleum utilized for carburation. In the latter, the German process only, in which another carburetter—benzol—can develop with some chances of success. In the first process, the phenomenon of carburation is a chemical one—a veritable dissociation of the petroleum at high temperatures. In the second, carburation by benzol is a phenomenon of a physical character—simple vaporization—and as such is more delicate and less perfect than the other.

However, the utilization of water gas as a calorific agent only brings these two situations to about the same level; as with the Auer burner there is no need either of the light-giving hydrocarbons of the paraffin series or of benzol vapour. The simple mixture of carbonic oxide and hydrogen constitutes a gas eminently suited for the production of superb incandescence, which is all the more beautiful because it requires only a small quantity of secondary air. It is, in fact, this difference in the consumption of air which enables us to say that the Auer burner, consuming pure water gas (blue gas) is more hygienic than any other system of gas lighting. This is shown by the following table\*:

Kind of Light.	Results for 1000 Candle-Hours.			
	Heat Emitted.	Carbonic Acid.	Aqueous Vapour.	Oxygen Employed.
Acetylene . . . . .	Calories. 7,200	Cub. Met. 1'200	Cub. Met. 0'600	Cub. Met. 1'500
Electric arc . . . . .	2,490	..	..	..
Coal gas . . . . .	40,000	4'240	11'000	9'760
Coal gas and Auer burner .	10,500	1'113	2'900	2'560
Water gas . . . . .	3,600	0'640	0'725	0'665

\* "Journal für Gasbeleuchtung" for 1899, p. 94.

The objection raised to water gas that it is odourless exists no longer when there has been imparted to the gas the very unpleasant smell which characterizes the thioaldehydes; and therefore, freed from the reproaches which have been heaped upon it, the water-gas industry is assuming formidable proportions outside France. A single English firm—that of Messrs. Humphreys and Glasgow—have witnessed their installations increase from 80 million cubic feet per day in 1892 to 230 millions up to the middle of last year. This shows in a very striking way the interest taken in this very important question. It is in the power of Frenchmen also to give a similar impetus to the industry. The road has already been marked out for them; all they have to do is to follow it.

J. A.

**"Field's Analysis" for 1899.**—The analysis of the accounts of the principal gas undertakings in England, Scotland, and Ireland for the past year, prepared by Mr. John W. Field, Secretary and General Manager of the Gaslight and Coke Company, has been issued in the usual form. This is the 31st year of publication; and the value of the work is so generally acknowledged that no words of commendation are needed for it. It presents a mass of statistical information which may be utilized with advantage in the engineer's office, the Law Courts, or the Parliamentary Committee-rooms.

**Report on Factories and Workshops.**—The annual report of the Chief Inspector of Factories and Workshops for the year 1899 has just been issued. It shows that accidents reported under the Factory Acts were more numerous in 1899 than in any previous year; but the rate of increase was much less than in 1898. The total number of accidents reported in 1898 was 57,562, and in 1899 70,760; being an increase of 13,198, or 22·9 per cent. So far as accidents reported to the certifying surgeons are concerned, the increase was again relatively greatest among adults and males. While the minor accidents reportable only to the inspectors increased 25·2 per cent., from 38,335 to 47,989, the number reported also to the certifying surgeon advanced 18·4 per cent., from 19,227 to 22,771, and the fatal accidents 19·8 per cent., from 727 to 871.

## TECHNICAL RECORD

### WESTERN (U.S.A.) GAS ASSOCIATION.

(Concluded from p. 22.)

Mr. Donald M'Donald, of Louisville (Ky.), read a paper entitled "The Systematic Location of Gas and Other Mains in the Streets, as Opposed to the Popular Idea of a Subway." He said that but few of those who had advocated a subway as a means of avoiding the disturbing of the surface of the roads, had appreciated the enormous difficulties in the way of constructing such channels, and of arranging all the pipes and wires in them when completed. The question of levels would necessitate going to a most inconvenient depth in some localities; and even with the best construction and ventilation, there would be the risk of one service interfering with another—such as water leaking into the telephone cables, of escapes and explosions of gas, &c. Two-thirds of the digging in the streets was for the purposes of servicing; and if it was necessary to have extra deep excavation, the trouble from disturbing the roads would be greater than before. It would be unwise, as a general rule, to combine the subway with the sewer system; but apart from its use as a sewer, there would be the necessity for being able to inspect and repair each system independently of the others; and some of the trunk mains would be 5 feet or so in diameter. A tunnel 10 feet wide and 10 feet high would be the very smallest section possible; and the cost of this would be over £5 per lineal foot, not including anything for laying the mains. Then the roof of the tunnel would be riddled with outlets for service-pipes. He proceeded to outline a plan that would accomplish all the good results of a subway, and avoid most of the objections. The pipes in streets running north and south should be laid about 2 feet deep, and those in streets running east and west about 4 feet deep; the actual depths, of course, varying with the climate and depth of the frost line. Each pipe should have a given locality from the curb line—for instance, gas 2 feet, water 3 feet, natural gas 4 feet, telephone 5 feet, and so on. Where connections were necessary, all pipes should join each other by openings at the top and bottom, instead of side openings as at present; and service-pipes should be attached at the top with a swinging elbow. All lines of pipes could thus be kept at the same level, instead of having to dodge each other as at present; and the extra disturbance and excavation due to deeply laid pipes would be avoided. At present there was a great deal of useless digging in searching for the required main, mistakes in tapping the wrong one, &c., which would be entirely obviated by his system. Several lines of main could be laid at one operation, by arrangement between the various companies concerned; and the low level would be entirely unimpeded and available for sewerage works. Each line could be got at for repair without interference or risk to the others; and there would be no undermining. As to services, the companies should be required to provide, at each house, or at convenient intervals, a service-channel 18 inches wide and 2 or 4 feet deep, covered with strong iron plates; and the various service-pipes would lay in the bottom of these channels. Long services, and those to the other side of the street, could be laid in terra-cotta tubes. The whole system could be controlled and inspected for leakage whenever required. This system could be enforced in all its entirety in new streets, and gradually introduced into old ones as circumstances permitted, by requiring that all new conduits should be laid in their legal position, and that all obstructions should be removed by the owners. The form of service-channel he had described would only be necessary in busy localities, and could be modified and cheapened in the country or suburbs. By means of this system, an ordinary street would accommodate eighteen rows of mains, each averaging 1 foot in diameter; and it might, by a little management at the crossings, be practicable to adopt an even depth—say, 3 feet—all over the city.

The President said that the author had certainly submitted a novelty for the consideration of the Association. Mr. Mayers thought that the service-channels would be objectionable. The public would not stand rows of iron plates at every 100 feet or so; and the services would not be protected against frost. Combined action in the way of running services in the same trench would call for a greater sympathy between the different companies than at present existed; and he questioned whether it would be a good plan to run gas and water pipes in the same trench. Combined action on the part of all the companies concerned, on the lines indicated in the remainder of the paper, would be a move in the right direction. He proceeded to read a letter from Mr. Julian Griggs, City Engineer of Columbus, who stated that it would be impracticable to combine subways with the sewerage system; and apart from this, on account of cost they would only be possible in wealthy populous neighbourhoods, where the importance and magnitude of the service rendered would be equal to meeting the cost. The annual rental charged in Chicago for a 3½-inch telephone conduit was £160 per mile, and in New York £200 per mile; so that a subway 10 feet by 10 feet, and costing £5 10s. per foot run, need not be prohibitive on account of cost. But if subways were provided, it was possible that many companies would prefer not to use them, or find them unsuitable. The suggestion to keep the mains in one plane was valuable; but the use of service-channels covered with iron plates would be neither satisfactory nor economical. The providing a definite location in the street for each



line of pipe was a much needed reform. Special connections would be required at the crossings, of a rather more complicated character than those at present used, which would lead to slightly increased trouble from leakage, &c., at those spots. He suggested combined action with the American Society of Municipal Improvements, and the appointment of a Committee comprising representatives of the whole of the interests concerned. Mr. Addicks said that in new roads at Boston the rule was to lay gas-mains at a uniform distance of 6 feet from the curb, and at least 3 feet deep, and the water-main on the opposite side of the streets. He approved of the suggestion to tap the mains at top or bottom only, and not at the sides; but he thought that services for different purposes should be at least 1 foot apart. It was no uncommon thing for escaping currents of electricity to cause fires by melting the gas-pipes. With regard to the presence of gas in electrical conduits, which was invariably blamed to the gas company, he mentioned an instance where a conduit was found to be full of oil gas, manufactured by electricity from the oil used for insulating in the transformer chamber. Mr. Witherby said he would not care to have to lay a line of main between two other existing lines only about 3 feet apart. Mr. Steinwedell preferred to take measurements from the property line, and not from the curb, which was liable to be changed. Mr. Norris said that the plan mentioned in the paper assumed one constant width of street. It would be better that the pipes should be located in proportion to the width of the street; and in one place this had been done. Something of this sort would be necessary where narrow and wide streets had to be dealt with.

Mr. McDonald, in replying to the discussion, said that with his system it would be possible to inspect and keep the services sound and in good order. Most of the objections urged against the service conduit applied to the condition of services as at present laid. He could not follow the suggestion that his system would lead to increased leakage at crossings. As to possible danger from electrolysis, he looked forward for the time when gas men would refuse to sit idly by and see their structures destroyed in this way. Why one concern should suffer enormous loss, just because another did not choose to put one more wire into its distribution system, was really more than he could understand.

Mr. T. D. Miller, of Dallas, read a paper on "The Hygienic Use of Coal Gas." He referred to Professor Tyndall's experiments proving the presence of germs in the atmosphere, that would propagate when deposited upon suitable material; and to the fact that large numbers of diseases were ascribed to bacterial origin. The atmosphere of an ordinary living-room would be comfortable, in cool bracing weather, even with several occupants and no special means of ventilation; but in warm dry weather it would be insufferable in a few minutes, unless a fan or ventilator was adopted to keep the air in motion. For hygienic reasons, a moist atmosphere was preferable to a dry one; and it was also a fact that heating apparatus would accomplish its work better, and more economically, if it furnished a moist heat or atmosphere. He quoted from an article by Professor Arche, of Vienna, in "Der Gastechniker," on "Moisture in Gas-Heated Rooms," to show that the moisture should not fall below 40 or rise above 75 per cent. of complete saturation, or discomfort and even worse might follow. A room with damp air needed to be warmed, and one with dry air might require to be cooled. The Professor used in his experiments an instrument known as Lambert's Polymeter, which would indicate, in addition to the temperature, the percentage of moisture, the saturation pressure of the water vapour, the maximum quantity of moisture the air would carry, and the difference between the actual temperature and the dew-point. Observations were conducted in a living-room, and in a school-room unwarmed, and also heated by a close stove. The latter made the air too dry; and therefore the effect of using gas-stoves for warming was tried. They were found to have a beneficial effect as far as the moisture in the air was concerned. He next quoted a paragraph from "The Chemistry of Illuminating Gas," by Mr. Norton H. Humphrys, to show that ordinary living-rooms required a degree of ventilation far in excess of that necessary for the combustion of gas, and that the fact of a gas-burner causing discomfort was of itself evidence of insufficient ventilation. Mr. Thomas Wills had remarked that the carbonic acid in the atmosphere should not exceed 6 parts in 10,000. This was not on account of the poisonous nature of carbonic acid, but because it was an indicator of the presence of organic matter exhaled from the lungs. The object of ventilation was to remove, not only carbonic acid and water, but also organic matter; and any process that destroyed the latter would be beneficial. A gas-flame was of great service in this respect, as shown by the dark deposit upon the ceiling above it. These sooty deposits were simply charred and destroyed organic germs; and it is possible that many millions of deadly disease germs are cremated in this way, for Professor Tyndall had proved that air was sterilized by contact with red-hot surfaces. Argand and incandescent burners in particular must, therefore, be valuable air-purifiers. In a room heated by a gas-stove, the odour of a volatile oil, sprinkled on paper and held in the ascending current of hot air, was diffused into every part of the room in less than a minute; but in a room heated by a coal-fire, the diffusion of the odour was much less rapid. Diffusion through ordinary walls was more rapid as the difference between the inside and the outside temperature

increased; and therefore the use of gas increased diffusion in the upper parts of rooms, and thus assisted ventilation. Some persons objected to the employment of bath-heaters in which the water came in contact with the products of combustion from the gas. But he contended that, so far from being injured, the water was benefited from a sanitary point of view. Where warming was done by steam or close stoves, and lighting by electricity, contagion was certain to be more prevalent in the absence of some new microbe-extermination process.

Mr. Ferrier, being invited by the President to speak on the subject, quoted some figures to prove that, unless provision was made for the exit of the products of combustion, heating by gas was not likely to be a hygienic success. As to lighting, he asserted that the Welsbach burner was the most healthful of all methods. The progress of hygiene meant a great increase in the use of gas; and in the future they would see gas-burners in or near the ceiling drawing away the vitiated air, with suitable arrangements for throwing down either the heat or the light as required. Gas Associations would do well to get these things demonstrated by well-known scientists.

A paper describing a central station electrical plant operated by a gas-engine was submitted by Mr. J. C. Small, of Aurora (Ind.). It was in the summer of 1890 that he undertook to supply electricity; and as at that time gas-engines were considered to be too unsteady for successful working, an intermediate shaft 14 feet long and 4 inches in diameter, with a 2000 lb. balance-wheel in the centre, and the usual driving-pulley at one end and clutch pulley at the other, was a part of the plant. This arrangement secured steady working. He used Second Pool Pittsburg coal for gas making, and had an average yield of  $4\frac{1}{2}$  cubic feet per pound. About 900 cubic feet of this gas consumed in his engine per hour, furnished electricity for sixty 6.8 ampère 45-volt arc lamps, over 12 miles of wire. After ten years' use, the engine was in excellent condition. He went on to urge that, as gas-engines could do more conveniently and economically anything that a steam-engine could do, gas companies should employ them to a greater extent on their own works. For a gas company to employ a steam-engine, was almost an admission that a gas-engine would not answer. He had fixed two engines—one of 40 and the other of 20 horse power—for running machine-shops, and a dynamo and electric light installation with each. They had been in operation two or three years, and gave thorough satisfaction. But in fixing arrangements of this sort, it was very necessary to send an experienced man to start the working, and show the consumer the proper way. This applied, not to engines alone, but to every form of gas apparatus.

The President said some letters had been received relating to the working of gas-engines, which the Secretary would read. The first was from Mr. J. M. Rusby, describing a gas-engine plant operated by producer gas. There were eight engines, 384-horse power in all, which furnished electric light for the station and yard, compressed Pintsch gas, and operated elevators, a small machine-shop, and air-compressors. They were all Otto engines; and the largest, which was 90-horse power, had two cylinders in tandem, and ran at 168 revolutions per minute. The producers were each 7 feet diameter inside and 15 feet high. Small anthracite was used as fuel; and the fuel bed was 6 feet deep, supplied with air by a steam-jet blower. Some of the engines were originally made to work with coal gas, and were adapted for producer gas by enlarging the inlet-ports and increasing the compression. The second letter was from Mr. A. M. Jones, the Superintendent of the Sistersville Electric Company, who had one 125-horse power, three-cylinder Westinghouse gas-engine operating a 90-kilowatt Westinghouse generator; also two double-cylinder 110-horse power Otto gas-engines, operating a similar generator of 120-kilowatt power. The regulation of speed was excellent, varying only 1 or 2 per cent. with changes from one-fourth to maximum load. The cost of operating was much less than with steam. They sold current at 3d. per unit; and during the month of April the plant earned £165, and the gas bill was £12 10s. This included the cost of pumping water for cooling from their own wells. Repairs had been very small; and the engines they had would be very suitable for operating a street-car plant, as they could throw on 400 lights without making over 2 per cent. fluctuation on the voltage. The gas used was natural gas; the cost being 6 $\frac{1}{2}$ d. per 1000 cubic feet, and the power 966 units per cubic foot. Mr. W. Wallace, of Lafayette (Ind.), strongly supported the author of the paper, and described an electrical plant consisting of two alternating dynamos and a rotary transformer, operated by two 125-horse power gas-engines, supplied to natural gas, costing 3 $\frac{1}{2}$ d. per 1000 cubic feet. One engine supplied 300 to 1400 16-candle power lamps, and the other furnished an average of 25-horse power to motors. The engines had not proved at all successful. Within a year one or two cylinders, the main crank-shaft, and nearly the whole of the small gear, had to be replaced. Mr. Egner knew something of the last case, and believed the cause of the trouble was the use of very hard water for cooling, which deposited scale on the outside of the cylinders, and thus caused overheating. He was glad to see considerable progress in the use of gas-engines of late. Much trouble arose from not having the engines properly adapted to the kind of gas to be employed. There was a great difference between the properties of natural gas and producer gas. Engines were now built that would not consume more than 15 cubic feet of water gas per horse power.



Mr. Howard said it was too late in the day to speak of gas-engines not working successfully. Any trouble arose from want of common sense on the part of the "engineers" who operated them—such as using castor or other unsuitable oil. For intermittent power, there was nothing to equal the gas-engine. Mr. A. S. Miller said that the gas-engines which gave so much trouble were either defective in design or else not properly cared for. Steam-engines were, for similar reasons, frequently a failure; but that was no discredit to the principle. Mr. Steinwedell said the advantages of gas-engines were: Small water requirements, no need for being close to a railway or for rail connection, no smoke nuisance, small ground space, less cost for conducting mains, and ability to accurately gauge the consumption of gas and to adjust the power at a minute's notice. One lamp-hour of 55 watts required  $3\frac{1}{2}$  cubic feet of gas.

Mr. Doherty repeated the arguments in favour of a National Bureau for advertising that were urged at the recent meeting of the Ohio Association, and moved that the President name a delegate from this Association to confer with other Associations and to report at the next meeting. Mr. Diall seconded, and Mr. Roper eloquently supported the motion, and it was adopted.

A report from the Committee on Cyanides was read by Mr. E. E. Eysenbach. It included a description of the manufacture of cyanide of potassium, and stated that the average quotation in New York during 1899 was 1s. 2d. per pound; while that for yellow prussiate was  $9\frac{1}{2}$ d. No doubt the recovery of cyanogen at present was very remunerative; but the demand was limited, gold extraction being almost the only application for it. If all gas companies at once took up the recovery of cyanogen, it would be a drug on the market.

Mr. F. H. Shelton, the Editor of the "Wrinkle" Department, next submitted his annual report. He described a neat device for showing the strength of liquor at the outlet of a scrubber or washer, comprising a perpendicular tube, in which the hydrometer floats, and a glass shade cover, through which the indications of the instrument can be read. Another ingenious device was intended to ease down the speed of the blower engine in connection with water-gas apparatus, at the conclusion of each "blow;" thus avoiding the strain and jerking due to a sudden stop. A regulator steam-cock, with scale and pointer, was also suggested for use on the steam supply to the generator. The employment of a weather board, supported by brackets attached to the curb of the tank, and having a rubber strip to make contact with the holder, was recommended for the annular exposed space of gasholder tanks, as tending to retard freezing and prevent snow from the top from lodging therein. For indicating the proportion of gas going each way, in the case of two purifiers or other apparatus worked in parallel, a light flap-valve was arranged, fitted in a cast-iron box on the line of pipe, and having a pointer and scale outside, so that the position of the valve could be seen. At the conclusion of the report, it was decided, on the suggestion of Mr. Shelton, to collect and print the "wrinkles" in pamphlet form.

After conducting some routine business, the Committee on "Final Resolutions" presented their report, which included votes of thanks to the President, the Secretary, and the Committee of Arrangements.

#### AMERICAN CIVIL ENGINEERS IN LONDON.

Last week the engineers of Westminster were very busy entertaining some 180 members of the American Society of Civil Engineers and Colonial Engineering Societies, as well as the ladies accompanying them. The visitors' principal object in crossing the Atlantic is to attend a conference in connection with the Paris Exhibition; and last week's events were the outcome of an invitation by the President (Sir Douglas Fox) and the Council of the Institution of Civil Engineers that they should visit London *en route*. Unwilling that the whole of their time should be given up to the detestation which their English colleagues freely provided, the Society determined to hold their annual convention at the same time under the roof of their hosts in Great George Street. Hosts and guests first gathered in the Library of the Institution on Monday afternoon; and there some of the distinguished heads of the engineering profession of this country extended a very cordial welcome to their American brethren. In such a throng of engineers, it would have been strange if the gas industry had been unrepresented; and it was not. Moving among the visitors, we noticed Mr. H. E. Jones, Mr. James W. Helps (the President of the Institution of Gas Engineers), and Mr. T. B. Younger, aforetime the Engineer of the Georgetown (British Guiana) Gas Company. Several interesting objects were on view for the inspection of the company; among them being the choice collection of valuable plate presented to Mr. James Forrest during the forty years he was Secretary of the Institution, and which bore silent, yet eloquent, testimony to the estimate of English engineers of Mr. Forrest's worth and work.

The welcome which Sir Douglas Fox addressed to the visitors was expressed in language which convinced the hearers of the pleasure it gave the Institution to receive their American friends, and of the great regard which English engineers possess for the brilliant engineering work which has been accomplished on the other side of the Atlantic. Having, in his remarks, referred to

the cosmopolitan character of the Institution, a few words of sincere regret fell from Sir Douglas's lips that the health of their old Secretary, and now Hon. Secretary (Mr. Forrest), did not permit him to be present. A reference to the bonds which bind America and Great Britain led to the observation that, if the people of the United States, of Great Britain, and our Colonies would only stand together for what was right and true, the whole world could not prevent the progress that we all desire. It was, said the speaker, one of the great advantages that men of science and men of industry had, that they could sometimes approach the consideration of questions with a calmer mind, and with a more resolute determination to pull together, than was always possible in the political world. All through, and even in the past few years, there had been a most hearty feeling between the scientists and engineers on the Continent and those of this country; but that was only a distant feeling compared with what English engineers entertained for their brethren of America. Sir Douglas also alluded to the friendly competition which existed in the engineering industries of the two countries. A little historical information concerning the Institution concluded with the statement that it was now composed of a body of men scattered all over the British Empire and other parts of the world, numbering some 6000, and with students above 7000. Acknowledgment of the cordial welcome was made by Mr. John F. Wallace, the President of the American Society, Colonel Haines, and Mr. Jesse M. Smith.

Tea and friendly conversation occupied the time between the reception and the delivery of Mr. Wallace's Inaugural Address in the Lecture Theatre. To the technical business of the convention, Monday evening and the mornings of Tuesday and Thursday were devoted; but the only portion which directly concerned any of our readers was a discussion which took place on "The Filtration of Water for Public Use." The programme of pleasure arranged by the Institution included a visit to Windsor Castle on Tuesday afternoon, a reception by the President and Council at the Guildhall on Thursday evening, and an excursion to Warwick Castle and Stratford-on-Avon on Friday. At Windsor Castle, the large company were received very graciously. Tea was served, and Her Majesty visited her guests on the East Lawn. The entertainment of the visitors throughout the week was of a very liberal character; and in their recollections of their journeyings from home, the hospitality and cordial reception of their English colleagues will no doubt be one of the brightest.

#### THE RELATIONSHIP BETWEEN COST OF WATER WASTED AND COST OF DETECTION AND PREVENTION OF WASTE.

The second paper read at the meeting of the British Association of Water-Works Engineers at Cardiff was by Mr. A. J. JENKINS, Assoc.M.Inst.C.E., who was formerly Assistant Water Engineer in the town. The subject dealt with is stated in the title above; and the following is an abridgment of the communication.

In the opening paragraphs, Mr. Jenkins attributed the establishment of the now almost universal system of constant water supply in this country to the detection and prevention of waste. It can be proved, he said, that the cost of an efficient system of waste detection and prevention is amply repaid by the value of water saved. The main object of the paper was to show the value of the results obtained in Cardiff; and, when it is considered that the average pressure throughout the town is but 35 lbs. per square inch, it may safely be inferred that where pressures are higher, greater saving may be expected.

Before dealing with Cardiff, the author gave this brief review of what has been accomplished in some other towns: As early as 1859, the Norwich Water Company obtained an Act to enable them to prescribe in detail the nature of all fittings and pipes, and the work connected therewith, and to interdict the use of existing fittings and pipes which, in their judgment, might tend to waste, with the result that, within a few years, the consumption of water was reduced from 40 gallons per head per day (intermittent supply) to 15 gallons (constant service). In the following year (1860), the Manchester Corporation obtained similar powers, and quickly reduced the domestic consumption under constant supply from 35 gallons per head per day to 14 gallons. The system of inspection and supervision of fittings employed at Norwich and Manchester, however, proved abortive in Liverpool; and in 1874 Mr. Deacon introduced the waste-water meter system, with immediate beneficial results—the domestic consumption being reduced by about 6 gallons per head per day, and the intermittent supply (averaging  $12\frac{1}{2}$  hours a day) converted into a constant supply. The "Deacon" water-meters have been very generally adopted with excellent results, notably in Southampton, where a consumption of over 60 gallons per head per day has been reduced to less than 30 gallons; Carlisle, from 40 gallons to  $23\frac{1}{2}$ ; Portsmouth, from 35 gallons to  $18\frac{1}{2}$ ; Bradford, from 27 gallons to below 20; the Lambeth Water Company (London), 34 gallons intermittent service to 20 gallons constant; and the Southwark and Vauxhall Company, 38 gallons intermittent to  $22\frac{1}{2}$  gallons constant.

Two cases where excellent results have been obtained without the use of waste-water meters may also be cited. In Leicester



the total consumption of water for all purposes was reduced from 25.5 gallons per head per day in 1879 to 17.56 gallons in 1892. At Sheffield a consumption of 41 gallons per head per day was reduced in two years to 22 gallons; and it was stated by Mr. Eaton "that they did the work regularly year by year for a population of over 350,000 for £1005 per annum."

Coming to Cardiff, Mr. Jenkins said: The daily consumption for all purposes averages about 20 gallons per head per day in winter; and it has run up as high as 28 gallons in the hottest days of summer—25.5 gallons being regarded as the average hot weather consumption. Of this the quantity registered by meter, almost wholly for trade purposes, is between 7 and 8 gallons per head per day. It may be well to note that Cardiff is entirely a water-closet town, of which 15,400 are supplied directly through cisterns. There are also 10,200 baths directly connected; no additional charge being made for either. The system of inspection described costs £500 per annum for a population estimated at about 200,000; but this does not include any repairs, except the gratuitous renewal of tap washers.

The cost of water to the Corporation is about 7.5d. per 1000 gallons. But the works are capable of giving a larger supply if increased filtration area is provided; and it is probable that the cost will ultimately be reduced to 6d. per 1000 gallons. In comparing the cost of water saved with the cost of detection and prevention of waste, 6d. per 1000 gallons is adopted by the author as being a fair average.

The staff of waste inspectors employed within the borough numbers six; the whole being under the direction of the chief inspector. Two outside districts are looked after by their district inspectors, who act also as turncocks and meter inspectors in those districts, with occasional help from the town staff. The borough is divided into six districts; and each is periodically examined by means of a house-to-house inspection, when every fitting is examined, and every service sounded for hidden leakage. In nineteen years the number of inspections has been 14, 13, 17, 16, 15, and 16 respectively, which gives an average of one inspection of each district in 15 months. The number of houses within the borough is about 29,700. Six sub-districts have been provided with "Deacon" waste-water meters, of which one is a 6-inch meter controlling 1091 houses; the others are 4-inch meters—the number of houses on each being 874, 821, 481, 190, and 166 respectively. Some of these districts are larger than are usually to be found on 4-inch meters; but they can be subdivided if necessary, and the part cut off supplied from another direction. These meters are, with one exception, fixed directly upon the line of main, and when not in use the disc is allowed to drop to the bottom of the meter chamber.

In the meter-controlled districts, a test is made once in six months. If the waste-line shows a loss of less than 2 gallons per head per day in a district made up of cottage property, or 3 gallons per head per day in a district of villa property, the district is considered to be in a satisfactory condition. It is found, however, that one test in two (average) indicates a loss greater than the above, and a house-to-house inspection is proceeded with. But under no conditions is a district allowed to go for more than two years without such an inspection—the increased revenues resulting from the discovery of chargeable items being about £50 per annum.

It is a simple matter to arrive at the relationship between the cost of these inspections and the value of water saved in the meter-controlled districts; and as, with the exception of the measurement of the consumption, the inspection of the other districts is carried out on similar lines by the same workmen, a reliable estimate can be formed of the saving of water effected there by calculating it proportionately to the number of leakages discovered and repaired. Referring to the leaks discovered as the result of waste inspection, and calculating the probable amount of leakage on the figures ascertained from the meter-controlled districts, a daily waste is found of more than 544,000 gallons, or one-tenth of the total supply of the district, detected and remedied at an annual cost to the Corporation of £500. This quantity is sufficient for the supply of 20,000 people; and the value of it is £4964 per annum.

Since the year 1890, the Corporation have introduced the use of outside stop-taps. All new services have been provided with them; and the existing services are being fitted as opportunity occurs. In all, about 2400 are fixed annually; so that at the present time, of the total of 29,700 premises within the borough, about 24,000 are provided with these useful fittings. The advantage of outside stop-taps for temporarily shutting off the supply from empty houses as a preventive of waste, will be appreciated from the fact that no less than 1628 were closed last year in consequence of removals, non-payment of rates, and temporary closing of houses during absence from home of the occupiers. The advantage, too, of being able to shut off one house for repairs, instead of a number, is considerable. The cost of providing and fixing a ½-inch stop-tap of first-class make, with guard and cover complete, is 11s. 6d. on an old service, and 7s. 6d. on a new.

The stethoscope used in Cardiff is one of straight-grained ash 24 inches long for inside work (house inspection), and 36 inches for street work, conveniently shaped at the top to place against the ear. The results obtained are excellent; and the inspectors have, by sounding along the ground and without direct contact with the pipes, located leakages so small as to be almost invisible when uncovered. Waste may be classified under three

heads: (1) That due to overdrawing and leaving taps running after use; (2) defects in mains and service-pipes; (3) inferior taps of all kinds and syphon cisterns. For the first of these there appears to be no remedy. It must always happen that a certain proportion of the community will be careless in the use of what appears to them to be, save on very rare occasions, an unlimited supply. Self-closing taps cannot be regarded as a satisfactory cure. An instance may be quoted of some large premises containing 250 self-closing taps, where inspection disclosed the fact that about two-thirds of them were leaking. Defects in mains and service-pipes are a great source of waste, though in point of number they amount to less than one-fifth of the total leakages; and, being for the most part hidden from sight, they may be expected to remain longer undiscovered. Inferior fittings are probably the most fruitful source of waste; and the system of control in this respect exercised by the Corporation only partially mitigates the evil. No system of testing and stamping each fitting has yet been introduced, though it has been under consideration; but all fittings and syphon cisterns must be those of approved makers who have previously deposited sample fittings with the Corporation. It is the duty of a turncock to examine the fittings on a new service before the water is turned on, to see that they are by an approved maker, and that they are equal to the deposited approved sample; but this examination is necessarily very superficial, and therefore unsatisfactory. The requirements of the Corporation with regard to bib or stop taps were quoted by the author, who also referred to some small points which, if carefully observed by the makers, would, in his opinion, immediately result in the number of leaking taps being immensely reduced. It has been the practice in Cardiff for many years to renew the washers of all leaky drawing-taps free of cost to consumers, with the result that, on the average, 11,000 have been repaired annually at a cost not exceeding 2d. per tap. When anything more than the renewal of the washer is necessary, the owner has to do the repairs.

The amount of water sold by meter in Cardiff is nearly 500 million gallons per annum; and all the inferential and positive meters up to 1½ inches are taken out for testing—the other positive meters being tested in position. Estimating the loss that would accrue to the Corporation if the meter-testing were discontinued, and neglecting the loss from stopped meters which would be discovered by the meter reader in the ordinary course of his duties, it would be 12 million gallons per annum, which, at the average price of water sold by meter—9d. per 1000 gallons—represents a sum of £450. This, of course, would be a rapidly-increasing amount if testing were continuously neglected. The annual cost of meter inspection, testing, and repairing, including the renewal of all worn parts, has not up to the present exceeded £350. But this item is now increasing, as further help is required to keep the plant in good order.

The author's conclusions were: (1) That to keep the supply of a district within reasonable bounds, an efficient system of inspection is necessary. (2) That a regular and systematic inspection can be carried on at a very reasonable cost, which will certainly be repaid in the value of the water saved. (3) That the prevention of waste will be facilitated by the introduction of a system of testing and stamping of all fittings. (4) That within certain limits the expenditure incurred by the execution of "free repairs" is warranted by the saving of water resulting.

#### Discussion.

Mr. W. WATTS (Sheffield) pointed out that Mr. Jenkins had put down the average pressure of the water in Cardiff at 35 lbs. per square inch. For such an important town, this did not appear to him (Mr. Watts) to be sufficient to give the force necessary to send a jet of water on to the highest buildings. It might be said that a low pressure induced less waste; but if they had good fittings, properly supervised, a much higher pressure could be maintained without great loss. He was a little surprised that stop-taps were not introduced before 1890, as they gave a much better command over the supply to individual houses or clusters of cottages. If he could have his own way, he would make it compulsory upon corporations to register the water not only in the separate districts, but more particularly as it left the source of supply. As to the cost of water to the Cardiff Corporation, he supposed the 7.5d. per 1000 gallons included the cost of construction. [The PRESIDENT: Everything.] Still he thought that 7.5d. was rather heavy. Works could be cheapened, where there was a large drainage area, by having a great storage capacity. If the storage capacity was insufficient to bottle up the water coming from the drainage area, then the cost per 1000 gallons must necessarily run up. He did think the time had come when water-works engineers should not only consider the site for reservoir embankments, but also very seriously the storage capacity of the reservoir relatively to the drainage area it controlled. Many reservoirs were constructed inadequate to deal with the water flowing from the drainage area. The results were a terrible waste, and a rush to Parliament every now and again for an increase of drainage area when really the applicants were allowing water to run to waste at their own doors. To this he should put a stop.

Mr. H. PRESTON (Grantham) was not quite satisfied with the method the author had adopted in reaching his conclusions. He had put down the value of the water saved at 6d. per 1000 gallons.



It seemed to him (Mr. Preston) the value of a thing was what they could get for it. If Mr. Jenkins was thinking of a water-works undertaking such as many of the members were in charge of, where if the water was not wasted in the town it was wasted elsewhere, or before the water authorities took it, then the 6d. per 1000 gallons was hardly a proper method of calculating its value. In such cases, or under such conditions, he should only estimate its value as the cost incurred in filtering and pumping; so that possibly the value of the water saved by inspection was not more than 1d. per 1000 gallons. Of course, where an undertaking had reached its limit, and extensions had to be considered, then 6d., or whatever the cost of these extended works might be, could be used as an estimate of the saving by inspection. He did not, however, think it was quite a safe basis; but still the value of inspecting was, as the author had said, extremely great. He agreed that free repairs paid a water undertaking up to a certain extent.

Mr. W. G. KENT (London), referring to a report dealing with the subject by Mr. John R. Freeman, of New York, said in England they had no conception of the waste that the American engineers seemed to think not only permissible but really the right sort of thing. In ten of the principal American cities, the average consumption ran from 60 gallons per head per day in 1870 to about 138 gallons in 1899. The maximum in that period was reached by Buffalo—viz., 280 gallons. Mr. Freeman in his report dealt particularly with the waste in New York. The daily consumption per head there was about 116 gallons; and of this, Mr. Freeman thought, some 70 to 80 gallons represented waste pure and simple. The 70 to 80 gallons was divided in this way: From 30 to 50 gallons were due to defective plumbing, from 15 to 20 gallons to leaky and abandoned service-pipes, and something more than 10 gallons to leaky mains. As to the measurable waste, this, it would be seen, was largely attributed to bad fittings; and it exemplified the great advantage that attached to the English system of having fittings passed and stamped by the water authority of the district. Then, again, in England they might congratulate themselves upon the use of stop-cocks, when they found 15 to 20 gallons per head attributed to leaky and abandoned service-pipes. At the end of his report, Mr. Freeman gave some startling figures. He estimated that the consumption in New York would gradually go up. After doing all that could be done to keep it down, it would not be brought within 150 gallons per head per day; and, using only ordinary means of checking waste, the consumption in 1930 would, he calculated, be 200 gallons per head per day. In New York proper, there were some 833 miles of mains; and in Paris there were 1600 miles. The consumption in Paris was 34 gallons per head per day, as against the 116 gallons in New York. He (Mr. Kent) thought this fact worth mentioning as illustrating what was possible in decent and "indecent" main laying. Mr. Jenkins recognized the importance of dealing with waste; and Mr. Freeman advocated much the same system, only he went a little further. He measured the water at the beginning, measured it through to each district, and he wished to measure it to the consumer. This was a proposal that might not be feasible in England. In most things, Americans did not lack courage and resource; but directly the water engineer in America approached the question of waste, he seemed to be in a position of paralytic impotence. But the English engineer said to the consumer: "Thus far may you go, but no farther." Of course, in America there were more baths than in English houses of the same size; and if in England they approached the American condition of luxurious fittings, they would increase the opportunities for waste.

Mr. W. INGHAM said in Torquay, they had, he believed, dealt with the detection of waste in a manner different from any other town in the country. They had only three meters to a population of about 51,000; and they were situated close to the service reservoirs. The principle of the meters was really the Deacon cone; but the method of registering was altogether different. By the ordinary Deacon meter, 500 gallons was represented on a very small scale, and naturally it often meant that small leaks were overlooked; but with their present system, they could tell if there was a leak of 5 gallons per hour going on. Very great difficulty had been met with in constructing these meters. To get rid of the friction of the piston connected to the disc, the pipe was carried up to the level of the service reservoir, so that there was practically no friction whatever in the movement. This was a very desirable thing; and those who worked Deacon meters knew only too well how, when perhaps they had got nearly through a test, they would find the piston had stuck. The cost of his system of testing was about £270 per annum; and every district was tested once in ten weeks. The leakage was about 200,000 gallons per day; and this was 73 millions per annum, which, reckoned at 7d. per 1000 gallons, came to £2149, less the cost of £270. He commented on the large amount this waste, if permitted to continue, would represent in capital outlay. Gardens were a source of considerable waste. He had had a series of tests made for three or four years; and he found that the sum they should receive in excess of what was already paid ran to about £4 10s. per house—£4 10s. less was paid than would be if the water was measured.

Mr. JOHN SHAW (Boston, Lincs.) also thought Mr. Jenkins was wrong in taking credit for all the money he did for the water saved. They were told that in Glasgow the cost of the water

was slightly above 2d. per 1000 gallons; and in regard to Cardiff, although the saving was charged out at 7½d. per 1000 gallons, he questioned whether the President was lucky enough to get that price from the Corporation. As to the differences in waste in different towns, he (Mr. Shaw) thought a great deal of that might be accounted for by the habits of the people. Eight years of his life were passed in an old-fashioned town, where the works were then getting on for 50 years old. There was scarcely a stop-tap in the place; but there was everything that would tend to waste. Yet, with 6 gallons per head passed through meters for trade purposes, the consumption at that time only ran to about 14 gallons per head, and in the summer to 15 gallons. The town at one time had been very short of water; and the trouble there was then had impressed itself upon the minds of the people, who ably assisted the Water Company in keeping down waste. Then, some fifteen years ago, a new industry was introduced into the town, and a comparatively new quarter was built and inhabited by importations from another town. This particular district was put on meter; and the consumption ran to 23, 24, and 27 gallons per head per day, while the consumption in the old district remained almost the same as before.

Mr. C. GILBY (Bath) questioned the accuracy at the present day of several of the figures given in the paper as to the consumption of water in various towns; and he thought that the number of water-closets supplied accounted to some extent for the divergencies in the consumption per head. Regarding Bath, he said that unfortunately they had to supply a great proportion of their water at a pressure of 80 to 120 lbs. per square inch; and this had a great effect upon the amount of waste. As to the use of the stethoscope, his men complained that in streets lighted by electric arc lamps it was impossible, owing to the hissing, humming, and dancing of the lights, to detect anything less than a considerable waste of water. For the last twelve years, they had had 24 Deacon meters in use; and now they had 26—25 being in constant use. A diagram was taken from each one every day; and by this means they were enabled to see how, when, and where the water went. He did not know how it was possible by any mere system of night inspection, without the aid of some recording apparatus, to get so readily information every morning as to whether anything had gone wrong. He also referred to the wonderful effects that had resulted in Leicester from the unlimited powers the Corporation obtained many years ago in regard to fittings, which enabled them to specify exactly the kind that should be used. So far as he knew, no one had been able to obtain these powers for many years past. Whatever powers they could get now were subject to the approval of the Local Government Board. They gave them little or no power over existing fittings—in fact, they now obtained nothing more than the General Act gave them. Consequently, they had to put up with fittings that they would like to have swept away. He added that in 1885, when they had an intermittent service at Bath, the consumption exceeded 30 gallons per head. This was reduced in 1894 to a little under 20 gallons; and last year it was 21·86 gallons for all purposes. The trade supply was about 2·8 gallons.

Mr. F. Griffith (Leicester) said that in his town the pressure varied from practically 120 lbs. to about 20 lbs., according to difference of level. In the higher districts the pressure gradually became less; but in the lower districts it was certainly 120 lbs. per square inch. It was quite true they had powers to make regulations. They made them, and they used them; and he should recommend everybody else to do the same. They had no meters of any sort for the detection of waste. The water was simply measured as it came from the reservoirs; and upon that statement they based the consumption per head. The total consumption for all purposes at the present time was about 19½ gallons per head per day, with a constant supply. The water consumers numbered 250,000; there were practically 50,000 houses; and there were between 44,000 and 45,000 water closets. They had night inspection, followed by day inspection. They had authority, after giving the owner six days' notice, to enter and repair fittings if they were not done, and charge the cost of the repairs in due course. If they were not paid, they had power to obtain payment through the County Court. As to the testing of meters, in 1880 he constructed a system of books for the purpose of registering the testing of every meter in the town, and changing the meters every three years whether they wanted it or not. He also had a statement by which he could show the cost of the meter in the first instance, the amount spent on repairs, the position in which the meter had been placed, the work it had done, and the rent received for it. This information was very valuable, as they had six or seven different classes of meter in use. In 1890, he also adopted a system of testing and stamping every water-fitting in use. Their average now exceeded 17,000 fittings tested and stamped per annum; and they allowed no fitting to be used unless it was so stamped. He had had 21 years' experience of the system; and he could strongly impress upon the members the importance of insisting upon the very best class of fitting they could get.

The PRESIDENT (Mr. C. H. Priestley) said the powers they possessed in Cardiff were limited by the Local Government Board; and something like twelve years were occupied in trying to get these regulations passed by the Board. Commencing in 1881, they succeeded in getting them passed (he believed) in 1892; and then they were not much better off. Personally, he



should like to have the fittings in the town tested and stamped by the Corporation. He had asked for this on more than one occasion; but his Committee did not seem inclined to impose any restrictions of that sort. With reference to the interesting information Mr. Kent had given them, he (the President) did not think the maximum average legitimate consumption had been reached in England; and, while they did all that was possible to prevent waste, legitimate consumption ought to be encouraged up to a certain extent. He should like to see the pressure in Cardiff higher than it was. If they had an average working pressure of 20 lbs. additional, it would be a great convenience to them on many occasions. Owing, however, to the configuration of the surrounding country, and the fact of the old Lisvane reservoir being at the elevation that it was, it was impossible to construct the filter-beds at any higher level, and, of course, the pressure in the town was taken from the filter-beds.

Mr. C. SAINTY (Windsor) thought that water authorities were bound by the Water-Works Clauses Act to provide sufficient pressure to take the water to the top of any building in the district.

The PRESIDENT replied that, whether they were bound or not, they could not do impossibilities. He believed by their Local Acts they were only bound to supply to the tops of the houses in the two old parishes of the town; but they could not do it in one or two instances.

Mr. JENKINS, in reply, said he did not see there was any other way of calculating the saving of water than by basing it on the money that had been paid to obtain it. With an increasing town like Cardiff, it meant that, if water could be saved, so much less increased storage would be required eventually. If inspection was neglected, the consumption would go up 10 per cent. per annum at least. The 7½d. included the interest and sinking fund on the money borrowed, together with the cost of maintenance. Mr. Ingham had said the Deacon meter would only show a flow of 500 gallons per hour. It was true the first line on the diagram indicated 500 gallons. But it was easy to see a consumption as low as 50 gallons per hour; and he (Mr. Jenkins) did not think anything more accurate was required for a large district. In his experience, it was not often the Deacon meter stopped; and he did not think sufficient reason was given by Mr. Ingham for condemning it. Every fitting in Cardiff was examined once in eighteen months. He admitted that the consumptions for various towns as given in the paper were not quite up-to-date; but he had them on pretty good authority. As to his statement that Cardiff was entirely a water-closet town, and that 15,400 were supplied directly through cisterns, he should add that there were 13,000 or 14,000 closets flushed by hand. It would be very interesting if they could get particulars as to the cost of the system of protection adopted in Leicester; he had an idea it was likely to be more than the meter system.

This concluded the discussions at the meeting; and we have now to finish our report by giving some extracts from the lecture by Dr. Elliott on "The Strength of Bricks and Brickwork."

**The "New Gas" v. the Electric Light.**—The "Electrician" offered last week a few observations on the lecture delivered by Mr. W. H. Y. Webber before the Gas Institute on "The New Gas." Our contemporary thinks that if the proposal put forth by the lecturer were carried into effect, "the ordinary gas-burner would be even less economical than it is at present; and though the competition of the incandescent gas-burner with the incandescent electric lamp might be keener, the electric light would then, without a doubt, be 'the poor man's light.'"

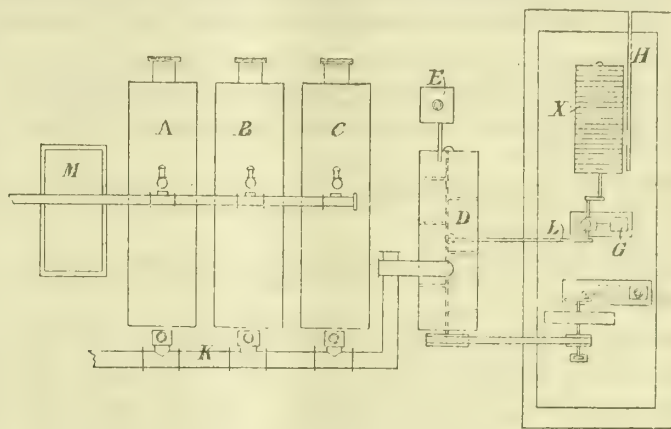
**The Lighting of Small Towns.**—At the recent meeting of the Municipal Electrical Association at Huddersfield, a paper on the above subject was read by Mr. G. M. Harris, Electrical Engineer to the Bray (Ireland) Urban District Council. The conclusion arrived at by the author was that where gas has been well established, the outlook for a private consumption of electricity will be in inverse proportion to the price charged for gas. Where a high price prevails, the inhabitants will, he said, be found educated to the closest economy in its use; and he added that it is surprising how far economy can, at certain times, be carried.

**The Value of Water-Meters.**—The use of water-meters, says the "Engineering Record," has caused a saving of \$7800 in coal in three years at one of the pumping-stations of the Atlantic City (N.J.) Water-Works, according to the Superintendent, Mr. W. C. Hawley. During this time the population supplied has increased 40 per cent., which makes the saving all the more noteworthy. About 77 per cent. of the services are metered. The value of meters is shown by a case mentioned in the annual report of Mr. John B. Heim, Superintendent of the Madison (Wis.) Water-Works. In a tenement in that city which would be charged \$10.50 annually at schedule rates, the meter bills ranged from \$2.25 to \$6.45 for periods of six months. Another family moved in, and the water bill in one month was run up to \$23.40. The family had come from Chicago, where everything was left wide open, and the presence of the tell-tale meter proved a shock. The water was intentionally allowed to run in the water-closet for a part of the time after the first reading of the meter, with the result that the bill was raised to \$30.25 for four months.

## REGISTER OF PATENTS.

**Clarifying the Spent Liquor from Sulphate Plant.**—Diamond, W., of Pye Bridge, Derbyshire. No. 15,543; July 29, 1899.

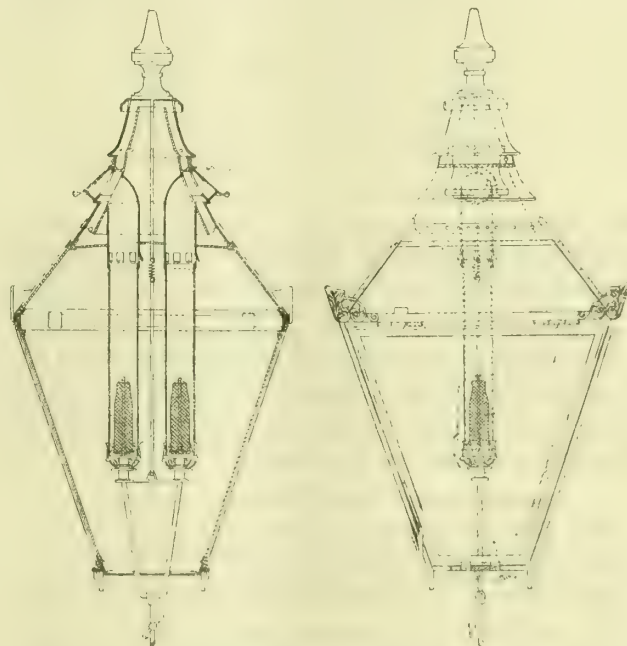
The patentee proposes to conduct the spent liquor into a square brick tank M, below the level of the sulphate plant. Conveniently situated is a pump, the suction-pipe of which is in the tank, and the delivery connected to several large iron tanks A, B, C—the pipe running along the top, with branches leading into each tank; while fitted in the centre of the end of each tank is an outlet-pipe connected to one main K. This main is attached to a tank D, in which is fixed an agitator, worked by a belt and driving engine. Erected above the agitator tank is a small tank E (connected to the agitator), in which is dissolved "aluminoferric cake." To the bottom of the agitator is connected the suction-pipe of a pump G, by means of a pipe L, and the delivery to the filter-press X. The filtrate is conducted by the trough H into the drain.



The spent ammoniacal liquor is run into the tank M, out of which it is pumped into the tanks A, B, C. As one tank is filled, the spent liquor is turned into the other—thus allowing insoluble substances to deposit. When the spent liquor is cool, it is conducted by a tap out of each tank into the main K, which carries it to the agitator D, where it is mixed with a quantity of aluminoferric solution, to clarify it. The whole is then agitated—the mixed liquids being pumped through the filter-press X (where the deposit remains), and the clear liquid running away down the trough H.

**Street Gas-Lamps.**—Jackson, J., of Leeds. No. 21,457; Oct. 27, 1899.

This invention relates to a lantern for street gas-lighting purposes, provided with an inner lining of smaller size than, but of the same contour as, the top to which it is fixed, whereby an annular or other space is provided for the escape of the products of combustion—the lining



having fixed to its underside a number of pendant tubes corresponding with those of the burners employed, and in independent communication at one end with the chimney of each burner and at the other end with an opening (closed by a weighted door—or its equivalent) in the top of the lantern for igniting each burner separately.

As shown, the lantern is of the usual shape and construction—that is, a metal framework in the form of (say) two truncated pyramidal or other cones placed with their bases towards each other, or provided with any desired number of sides or angles, and glazed in the usual manner, and hinged (if wished) at its top for cleaning and other purposes, as well as for providing access to its interior. The bottom of the lantern is practically closed to the interior, except at the points where one or more gas supply-pipes pass through it to the burners. The top of the lantern is provided with rows of perforations for the admission of air, and for the exit of the products of combustion; also, if so required, it may terminate in a cowl for ventilation purposes, so arranged as to prevent any direct current of air entering the lantern.

Any desired number of incandescent burners are suspended from the



top of the lantern, and each burner is separately connected to the branch of the ordinary supply-pipe. In order to ignite each burner separately, and without passing the torch into the lantern, within the top of the lantern is fixed an inner lining or casing of the same shape as, but smaller than, the inner contour of the top; so that, when fixed in position, there is a space between it and the inside of the top. The inner lining is made to extend some distance above the upper row of ventilation holes in the top, as well as to project below the lowest row of air inlet-holes, but above the tops of the chimneys of the burners.

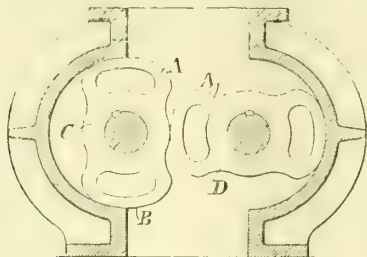
To the inside of the inner lining is also fixed a chimney or tube for carrying away the products of combustion from each burner and mantle without allowing them to pass within the lantern. The tube is made of such a length as to permit the top of the chimney of the burner to pass easily within it; while the upper portion of the tube is so arranged as to be at some distance from, but opposite to, an opening specially provided for it in the top of the lantern. Each of these openings is covered by a weighted door, hinged at its top to the outside of the lantern, so as to prevent any inrush of air down the chimney to the burner, though the lids are so arranged as to be capable of being opened with the igniting torch.

The products of combustion are carried away by the tubes (with which the chimneys of the burners are in communication) into the space between the inside of the top of the lantern and inner lining, and out through the ventilation holes and cowl, without passing into the inside of the lantern below the reflector.

**Rotary Pumps and Exhausters.**—Allison, C. A.; a communication from the P. H. & F. M. Roots Company, of Connersville, U.S.A. No. 7528; April 24, 1900.

This invention has for its object to increase the strength, tightness, smoothness of working, and durability of pumps or blowers of the Roots pattern.

The usual type of casing is employed, elliptical in cross-section of chamber, and having flat heads, and opposite openings for the inflow and outflow of the liquid or fluid. There are two parallel impeller shafts journaled in the heads, and having their axes at the centres of the arcs of the casing; the shafts being arranged for driving by power in the usual manner. The two lobed impellers A are each fast on its appropriate shaft; the ends of the impellers engaging against the inner faces of the heads of the casing. The outer extremities B of the lobes of the impellers are formed by circular arcs struck from the centres of the shafts, with a radius equal to the distance from the centre of the shaft to the circular arc defining the nearer inner side wall of the casing. The hubs of the impellers C surround the shafts and extend from head to head of the casing; their diameter being substantially equal to the transverse width of the outer extremities of the lobes. The peripheries of the hubs are formed with convex curves concentric with the shafts. There are minor convex curves D at each end of the curves B, forming the side extremities of the lobes. Concave curves join the convex curves; and chambers E extend longitudinally through the lobes, for the purpose of lessening the weight of the impellers.



This peculiar form of impeller is said to result: In a large hub or waist, giving great strength and extended bearing-surface around the shaft-openings through the heads of the casing; in a very extended bearing between the outer extremities of the lobes and the curved inwalls of the casing; in a prolongation of the unchanging character of bearing between the outer extremity of a lobe of one impeller with the waist of the other impeller; in peculiarly smooth and noiseless operation; and in enhanced maintenance of tightness between the extremities of the lobes and the inwalls of the casing, and between the lobes of one impeller and the co-acting surfaces of the other impeller. But the greatest advantage is said to be found "in the unbroken continuity and progressiveness of contact between co-acting impeller surfaces."

#### APPLICATIONS FOR LETTERS PATENT.

- 11,465.—FRENCH, E., "Mantle supports." June 25.
- 11,506.—PRESCHER, H., "Self-ignition of gas." June 25.
- 11,517.—ARCHER, D. J., "Self-igniting gas mediums." June 25.
- 11,525.—BRIERLEY, R., "Improvements relating to gas lighting." June 25.
- 11,545.—HAMILTON, J. H., "Internal combustion engines." June 26.
- 11,614.—JACOBS, O., "Acetylene gas apparatus." June 26.
- 11,615.—HIMMEL, G., "Appliances for gas lamps, lanterns, and the like for exposed or inaccessible positions." June 26.
- 11,702.—BROOKS, J. B., and HOLT, J., "Governors for gas and other motors." June 28.
- 11,762.—DAW, Z. W., "Compressing air and gases." June 28.
- 11,766.—GLOVER, J. W., "Gas lighting torches." June 28.
- 11,788.—SCULTHORPE, J., "A means of producing an inflammable gas." June 29.
- 11,799.—MOODIE, R., "Cooling gases and the like." June 29.
- 11,809.—BOULT, A. J., "Burners." A communication from R. Thayer. June 29.
- 11,810.—MILLER, T., "Burners." June 29.
- 11,858.—BONNET, J. E., "Guiding gasholders." June 30.
- 11,865.—BIHELLER, S., "Burners for incandescent gas-lights." June 30.
- 11,874.—THOMPSON, W. P., "Lighters for gases or vapours." A communication from A. Simonini. June 30.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Rating of Water Undertakings.

SIR,—The present method of rating water undertakings is admittedly uncertain and unsatisfactory. Perhaps a full discussion of this very important subject might result in the adoption of principles tending at least to uniformity of practice. I therefore venture to send you a copy of a Memorandum which I prepared for the Royal Commission on Local Taxation in April, 1897, in the hope that you will be able to find room for some extracts therefrom.\* The Memorandum, with additions suggested by comments from various quarters, appears on pp. 322-327 of Part II. of the Appendix to Vol. I. of the Minutes of Evidence taken before the Royal Commission.

It seems to me that the one idea to be kept in mind is that the question to be determined is what rent a tenant may reasonably be expected to pay. A rating surveyor now, on the figures of a single year, not unfrequently brings the gross value—i.e., the hypothetical yearly rent—to an amount exceeding the average gross profits of a period of three or five years. Would any responsible tenant pay a rent based on anything but average results? Corporation water-works apparently present a difficulty in applying the method suggested in my Memorandum; but would not their case be met by taking a simple percentage on the structural cost, with the addition of a specified proportion of any profit derived from supplying water to outlying townships?

Lambeth Water-Works, Brixton Hill, S.W.,  
July 4, 1900.

H. WILKINS.

### The British Association of Water-Works Engineers and the Standardizing of Cast-Iron Water-Mains.

SIR,—I have read with much interest the President's remarks on the above subject, and your comment on same in the "JOURNAL" for June 24 last. There can be no doubt that the standardizing of pipes is a great necessity, and should be undertaken by this Association of practical engineers. I have collected drawings of a large number of different styles of joints—most of them being of a similar type; and one is unable to discover where the difference can be, or how a patent can be claimed for the many shaped grooves or recesses in the faucet.

I have used the ordinary spigot and socket pipe, without bead or groove, for the last thirty years, under pressures from 150 feet to 400 feet, and have never seen the joint blown or even shifted. In a pumping main, if the bends are made as straight as possible, laid in a good concrete bed, the faucet filled with lead, and set up perfectly solid, and the work is done by a good joiner, my experience shows that the numerous devices patented are not necessary. The dimensions of the faucets of all sizes of main pipes have been determined for many years; and a departure from this standard, making the socket less in depth, has sometimes been chronicled in the "JOURNAL" as a leaky main, causing great loss and inconvenience.

If the British Association of Water-Works Engineers should undertake the inquiry on this subject, and publish the result of their conclusions in the "Transactions," I am certain such report would be beneficial to the members, and tend to advance the interests of the Association.

I shall be pleased to exchange my standard list with any reader of the "JOURNAL."

July 6, 1900.

SUPERINTENDENT.

**The Price of Gas Carbon.**—A correspondent writes: There is evidently at the present time a keen demand for gas-works carbon, the bulk of which undoubtedly finds its way into the hands of "our friend the enemy" for making electric brushes and pencils. The price has recently risen; but it must again rise to a very much higher figure in the near future. Gas managers have it in their own hands to force up the price of carbon for electric purposes by holding their stock until such times as the dealers are prepared to give £4 or even £5 per ton for it.

**The Water Supply of Burnham.**—Last Thursday week Colonel Slack held a Local Government Board inquiry at Burnham relative to a proposal of the District Council to borrow £4500 for the extension of the water-mains and erection of new water-works in the parishes of Brent Knoll, Compton Bishop, East Brent, and Loxton. There was no opposition.

**How the Lincoln Gas Committee Propose to Meet the Increased Cost of Coal.**—The Gas Committee reported to the Lincoln District Council last Tuesday that they had entered into contracts for the supply of 25,000 tons of coal; and in consequence of the increased price, they recommended that the charge for gas to consumers be raised from 2s. 1d. to 2s. 3d. per 1000 cubic feet from Mid-summer. In moving that the Council agree to the recommendation, Alderman Wallis mentioned that he had obtained statistics from 68 other towns, and found that in every case the price of gas was being increased. In one instance an additional 9d. per 1000 feet was being charged, at another town 8d., at a third 7d., at twenty places 6d., at nineteen 5d., thirteen 4d., and eleven 3d.; only two being satisfied with 2d. He therefore thought the Lincoln Council were dealing very fairly with the consumers. They had just entered into contracts for 25,000 tons of coal; and for this they were having to pay no less than £6500 more than last year. The profit last year, but for extraordinary expenditure, would have been about £3000; and the Committee were looking forward to obtaining that sum this year, and also £1500 or £2000 from the sale of coke. This would make a total of £4500 or £5000; and the 2d. extra which it was proposed to charge would bring in about £2000, so that the £6500 extra which was being paid would just be cleared. It was obvious that unless the 2d. was charged, there would be a loss on the year's working. Mr. Horton seconded the adoption of the recommendation, which was agreed to.

\* The Memorandum is given, practically in its entirety, in our "Miscellaneous News" columns to-day, p. 106.—ED. J.G.L.



## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress was made with Private Bills last week :—

Bill read a second time and committed : Oldham Corporation Bill.  
Bill reported, with amendments : St. Albans Water Bill.  
Bills read the third time and passed : Airdrie, Coatbridge, and District Water Trust Bill, Bedford Gas Bill, British Gaslight Company Bill, Hartlepool Gas and Water Bill, Morley Corporation Bill, Wolverhampton Gas Bill, Woodbridge District Water Bill.

The Lambeth Water Bill, Mid-Kent Water Bill, Portland Urban District Gas Bill, South Metropolitan Gas Bill, and Wandsworth and Putney Gas Bill were referred to a Select Committee, consisting of Lord Brougham and Vaux (Chairman), the Marquis of Zetland, the Earl of Denbigh, the Earl of Mayo, and Lord Plunket; to meet on Tuesday, July 10.

The Rickmansworth and Uxbridge Valley Water Bill was referred to a Select Committee, consisting of Viscount Portman (Chairman), the Marquis of Winchester, the Earl of Romney, Lord Tredegar, and Lord Monckton; to meet on Monday, July 9.

### HOUSE OF COMMONS.

The following further progress was made with Private Bills last week :—

Bill read the first time and referred to the Examiners : Morley Corporation Bill [Lords].

Bills read a second time and committed : Bury and District Water (Transfer) Bill [Lords], Gas Orders Confirmation (No. 1) Bill [Lords], Water Orders Confirmation Bill [Lords].

Bills reported, with amendments : Barnsley Corporation Bill [Lords], Glyncorrwg Urban District Council Gas Bill [Lords], Rotherham Corporation Bill [Lords].

Bills read the third time and passed : East Stirlingshire Water Bill [Lords], Perth and Paisley Gas Provisional Orders Bill.

On Tuesday, the Gas Order Confirmation (No. 2) Bill [Lords]—the Dugannon Gas Order—was down for second reading by order; but Mr. P. C. Doogan, the member for East Tyrone, opposed the motion, on the ground that the Order applied for was only intended to strengthen an already too powerful monopoly. As the Local Authority are endeavouring to purchase the gas-works, the President of the Board of Trade (Mr. Ritchie) recommended a fortnight's delay in order that mutually satisfactory terms might be come to. This course was adopted.

On Thursday, a little trouble arose over the consideration of the Lords' amendments to the Spalding Urban District Council (Water) Bill, the object of which is to obtain power to purchase the undertaking of the Spalding Water Company. The question in dispute is as to the compensation of the Engineer and Collector. It is sought to have a clause inserted in the Bill giving them compensation in case of voluntary retirement; but the Council object to this, though they are willing to allow it in case the officers are not retained. The debate was adjourned.

Sir Albert Rollit has placed upon the paper a notice that he intends to call attention to the increases in the prices charged for the supply of gas for public and private purposes in North London by the Gaslight and Coke Company, and to move a resolution.

### THE OSSETT CORPORATION AND THE GAS SUPPLY OF ALVERTHORPE.

A Bill to confirm Provisional Orders of the Local Government Board extending the boundaries of the boroughs of Lancaster and Ossett and the city of Wakefield came last Friday before a Select Committee of the House of Commons, presided over by Sir T. Godson. The only opposed Order was that of Ossett; the petitioners being the Wakefield Gas Company. Mr. Wedderburn, Q.C., and Mr. Vaughan Williams appeared for the promoters; Mr. Honoratus Lloyd for the Company. Mr. Wedderburn, in opening the case, said that between Ossett and Wakefield there was a parish called Alverthorpe, for which the two towns competed. Wakefield last year promoted a Bill to extend the boundaries so as to include Alverthorpe; but it was rejected. Afterwards both the towns applied for Provisional Orders; and as the result of an inquiry, the Local Government Board gave a portion of the district to Wakefield and the remainder to Ossett. In the Order it was recited that the whole of the area included in such extension should, for the purposes of the Municipal Corporations Acts and all others, be the borough. In the present session, the Ossett Corporation had promoted a Bill to purchase the undertaking of the Ossett Gas Company. It had passed both Houses, and at present was awaiting the Royal Assent. The position was that when this Bill passed, the Corporation would become the gas authority for the borough; and the extended portion was at present within the limits of supply of the Wakefield Gas Company. This Company was founded in 1822, and in 1847 obtained powers to supply the parish of Alverthorpe. The learned Counsel read the petition of the Company, and contended that they had no monopoly of the gas supply of the district, and that it was in every way desirable that the Corporation should have full powers within its own borough. If the Company desired a protective clause, they should have asked for it when the Corporation Gas Bill was in Committee. Though the Company obtained their powers in 1847, it was not till 1891 that they did anything in the district of Alverthorpe. In that year, after some pressure, they laid a main to supply Roundwood House, the colliery, and brick-works; and so negligently had they performed their duty, that a portion of the area allotted to them had been lighted by the Ossett Company for twenty years. Evidence was given in support of Counsel's statement by Mr. W. Brook, the Town Clerk of Ossett. In cross-examination, he admitted that at present the Corporation had no power to compete with the Wakefield Gas Company. The Chairman said it appeared to him that the whole thing was a "storm in a tea-cup." The entire gas supply of the district only came to £102 per annum, and it was steadily decreasing. Mr. Wedderburn offered to give up all their present customers on the understanding that the Corporation should have power to purchase the Company's interest at some future time. Mr. Lloyd said the Company opposed on the question of principle. The whole point was whether, by an extension of the

borough, the Corporation should be empowered to come into their area and compete with them. He went at length into the rights conferred on corporations by the Public Health Act, and instanced Huddersfield. In that case, Ravensthorpe extended its boundaries, and commenced to lay mains to supply water in the added area, which was within that of the Huddersfield Corporation. The Corporation applied for an injunction, which was refused by Mr. Justice North, but granted by the Court of Appeal. He asked that a proviso should be put in the Order to clearly define the Company's rights. The Chairman said the Committee would agree that Ossett should not supply gas within a line drawn from the outside of the present mains of the Company. Mr. Lloyd said in that case he would take no part in the discussion of the clauses, and reserved his right to oppose in the other House. The Bill was then ordered to be reported.

### ROTHERHAM AND THE RAWMARSH WATER SUPPLY.

The Rotherham Corporation Bill (which was an Omnibus Bill dealing with an extension of the borough, the construction of tramways, street improvements, gas, water, and finance) was, on the 2nd inst., considered by a Committee of the House of Commons presided over by Sir F. Godson. The only opposed portion was that relating to the water undertaking of the Corporation, and was contained in Clause 95. This reads as follows :—

(1) Notwithstanding the terms of the agreement dated the 17th day of December, 1869, and made between the Local Board of Health for the district of Rotherham and Kimberworth and the Local Board of Health for the district of Rawmarsh (which agreement was scheduled to, and confirmed by, the Act of 1870), the Corporation shall, on and from the 25th of December, 1901, be under no obligation to supply to the Rawmarsh Council water from the water-works authorized by the Act of 1863. (2) If before the 25th of December, 1900, the Rawmarsh Council, by notice in writing under the hand of their Clerk, so required, the Corporation shall, after such 25th of December, 1901, supply to the Rawmarsh Council water of the same quality, and from the same sources, as that used in the domestic supply of the borough, at the cost price to the Corporation; such price in case of dispute to be determined by an Arbitrator appointed by the Local Government Board.

Prior to 1863, the only supply of Rotherham was from the Wellgate spring in the centre of the town. In that year, the Local Board obtained powers to impound the waters of the Dalton Brook and of the Ulley Brook, and construct a reservoir of a capacity of 150 million gallons to supply the town. Both these watersheds were outside the limits of Rotherham and Rawmarsh; but they were on the Rotherham side of the Don. In 1870, the Local Board again went to Parliament for gas powers, and for an extension of time for the construction of the works authorized by the Act of 1863. Attached to the Bill was the agreement to supply Rawmarsh with water in bulk at a charge of 6d. per 1000 gallons; and the Bill at the same time made Rawmarsh a Water Authority, and gave it the usual powers of supply. At that date, Rotherham was constructing this large Ulley reservoir; and it was anticipated that they would be able to supply Rawmarsh for many years. What had really happened could not have been then foreseen. In 1891 and 1892, the sources of the water supply became open to suspicion. There was an epidemic of typhoid fever in the district; and, on the complaint of Rawmarsh, the Local Government Board in 1893 sent down an Inspector—Dr. Theodore Thompson—who condemned all the sources of supply, and recommended that as soon as possible, the Ulley reservoir should be discontinued. It thus became a public duty for Rotherham to get a new source of supply; and they obtained temporary assistance from Sheffield. In 1896, they went to Parliament with Sheffield, who sought powers to construct the Langsett reservoir in the Little Don Valley. By agreement under that Act, Rotherham was entitled to a supply of water rising from 500,000 gallons to 1,600,000 gallons daily. This water they got from Sheffield at cost price, plus  $\frac{1}{2}$  per cent. Last year Rotherham joined Sheffield in applying for the Derwent Valley Water Scheme, and secured the right to a share of the portion allotted to that city. When Sheffield obtained the supply, Rotherham would be entitled to an extra quantity of water at a charge of 7 $\frac{1}{2}$ d. per 1000 gallons. The change in the water supply had been a great cost to Rotherham; and in selling to Rawmarsh at 6d. per 1000 gallons, they had sustained considerable loss. The average deficit for the last thirteen years had been £2000 per annum, which had to be met by the profits of their gas undertaking and by the general rates. The question was whether they were bound to go on supplying Rawmarsh with water from sources not in existence or contemplated at the time of the agreement. If they had to continue to supply water, they sought that the price should be revised. They had asked in the Bill that the price should be 9d. per 1000 gallons; but in the other House they had agreed to accept the cost price. It was inequitable that they should incur any loss from circumstances entirely beyond their control. Evidence in support of the opening of Counsel was given by Mr. H. H. Copnall, Town Clerk of Rotherham, and Mr. C. H. Marsk, Borough Controller. Mr. W. Terrey, General Manager of the Sheffield water undertaking, said since 1892 there had been a great change in the Dalton gathering ground, in consequence of the extension of agriculture and the opening of a large colliery. The whole cost of water supply had during the last thirty years increased from 30 to 40 per cent. The cost of the water at Sheffield had risen from 6d. to 8 $\frac{1}{2}$ d. per 1000 gallons. He estimated the Little Don Valley water would cost 5 $\frac{1}{2}$ d. per 1000 gallons; and to this must be added 2 $\frac{1}{2}$ d. per 1000 gallons for interest and sinking fund on the existing mains and works—making the price to Rotherham 8d. per 1000 gallons. Sheffield was at present supplying the Wortley Rural District Council at 7 $\frac{1}{2}$ d. per 1000 gallons; and the Parliamentary Committee fixed the price of the Derwent Valley water to Rotherham at this figure, plus 4 per cent. on the cost of the mains and pipes. Mr. James Mansergh, who had assisted in carrying out the works under the Act of 1863, said at that time the sources of supply were considered good. The price of water had risen immensely since the time the agreement was made. He considered the offer to supply Rawmarsh at cost price was a very fair and liberal proposal. It was only reasonable that they should take the burden as well as the benefit of the water undertaking. Mr. Moon contended that Rawmarsh was entitled to have the agreement continued, and that in any case they should not be required to pay the cost of any sinking fund. The Committee agreed to allow the clause, deferring the date of the proposed revision of price till Christmas, 1903. The remaining clauses were then gone through, and the Bill was ordered to be reported.



## THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons who are inquiring into the subject of municipal trading (see *ante*, p. 33) continued their proceedings on Tuesday last, under the presidency of the Earl of Crewe.

The first witness was Sir Thomas Hughes, Alderman of the Liverpool City Council, who stated that, as a result of his 23 years' experience and observation of municipal trading in the city, he had come to the conclusion that there were many concerns, called by some people "commercial undertakings," which were best promoted and carried out by a corporation. He made this statement on the ground that a public body could obtain their capital at a much cheaper rate of interest than a private one. They practically made the people they represented partners in the concern, and therefore they became interested in its welfare, and supported it. A corporation had no dividends to declare; and he believed there were many men who devoted their public life to carrying on these undertakings rather than ally themselves with private enterprises. He had himself served the public for 23 years, although he had had many inducements to become a director of private concerns. The undertakings conducted by the Corporation which came within the scope of the Committee's inquiry were tramways, electric lighting, water supply, public baths, workmen's dwellings, and open spaces. Asked if he saw any danger in allowing corporations to transfer profits from their undertakings to the relief of the general rates, he replied: "I think that no municipality ought to look to assisting its rates out of undertakings of this sort until they are on a thoroughly sound basis. There ought not to be too great a temptation to create these undertakings simply to make profits for the relief of the general rates. Directly your undertakings are making steady profits, and the accumulation for the reserve fund is sufficient, then I see no harm in a municipality being allowed to devote the profits for the relief of other rates; but I would not allow this when the undertakings are in what I may call a speculative position." Dealing with the electric light undertaking, witness stated that the Corporation purchased it in 1896 for £400,000; buying for this sum what had cost the selling Company £250,000. He made no complaint, however, in this particular. They had greatly reduced the prices to consumers; and being able to work the two businesses of tramways and electrical supply together, they were in a position to obtain energy for the trams at less than 1d. per unit. They realized a profit of £11,000 last year, in spite of the reductions made in the charges. Under no circumstances could they allocate more than 5 per cent. of the profits to the reduction of the rates. If they showed a profit of more than 5 per cent., they must reduce the prices. Questioned with regard to the water supply, witness said the total debt of the Corporation on this account was £4,569,590. The amount was about equally divided between the Rivington and Vyrnwy schemes. There was a fixed water-rate of 3d. in the pound on the rateable value of houses, in addition to a water-rent of 7d., which might vary according to the necessities of the undertakings. They were debarred from levying rent which would do more than meet their actual needs. Liverpool would compare favourably with London, not only in the supply of water to private consumers, which was unlimited, but also for trade and shipping purposes. One great consideration in giving a municipality control of the water supply was the necessity of preserving its purity. In Liverpool, the poorer citizens were encouraged to use water as freely as possible, on sanitary grounds. The realization of a profit was no object with them. He would not mind incurring a loss on the water supply, as water-works and baths were undertakings on which they might face it in the interests of the community. Asked how he drew a distinction between making a profit on the supply of electricity and not of water, he replied that water was an essential of life; it was consumed by everybody—rich and poor alike. Gas or electricity was a commodity consumed only by a portion of the ratepayers. The Chairman questioned if this was absolutely so. He thought that when electricity became cheaper, there was every possibility that the poor would use it. Witness said one would have thought the same of gas; but a large part of the poor had never used it, and still depended for their light upon candles and oil. He would certainly not uphold municipalities undertaking public bakeries, though this had been advocated. He thought certain things had been asked for which were ridiculous. He was bound to admit, however, that one could not lay down a hard-and-fast line as to what ought and what ought not to be allowed, because the circumstances of each community must be borne in mind. He considered the best authorities would be, first of all, the permanent officials; and then the Houses of Parliament should say, when a municipality had made application through a Bill, and all the evidence had been heard, whether or not, under all the circumstances, the undertaking was one they should carry on. He would certainly not allow the ratepayers to be the judges. Having referred to the markets and baths and wash-houses, witness gave some particulars of the work done by the Corporation in the clearance of insanitary areas and the erection of workmen's dwellings. The Corporation had, he said, avoided becoming builders themselves wherever they could get private enterprise to undertake the work. But the Municipality would always have to supplement private enterprise; and this was one of the subjects which they might very well be left to deal with, having regard to their obligations to those whom they represented. Replying to general questions, witness said he had always foreseen the danger arising from the growth of the number of municipal employees who had votes. For this reason, he had never cared to encourage municipal undertakings beyond what was actually necessary. He should not regret to see it part of the conditions upon which men took employment under municipalities that they did not exercise their votes while so employed. He did not see that there would be any great hardship if, when a man became an employee of a corporation, he should cease to have a vote in the choice of his master.

Alderman J. W. Southern, of Manchester, who was the next witness, described the position of the water supply in that city. He said the capital invested, inclusive of money borrowed, was £6,009,357. Of the borrowed capital, £1,156,869 had been paid off. The balance of capital outstanding on March 31, 1899, was £4,908,490. The average annual income for the five years ending March 31, 1898, was £273,327; the average annual working expenses for the same period being £70,300.

There was an annual gross profit of £203,027, out of which a sum of £199,929 was taken in respect of principal and interest. While the combined water-rates (public and domestic) had never exceeded 1s. in the pound on the assessment, and the water-rents outside the city had never been more than 1s. in the pound on the rental, the surplus revenue in 1899 reached a sum which justified the Committee in remitting water charges to the extent of £35,000 per annum. The water-works had never involved any charge upon the city rate. On the other hand, no profits had been handed over in relief of the rates. The supply of water under hydraulic pressure to small manufacturers, started in 1891, had been attended with gratifying results. The Local Authority of Manchester had supplied gas since 1817. The total amount expended on these works was £2,037,966. There was a balance of borrowed capital outstanding on March 31, 1898, of £1,058,988. There was an average annual income of £555,597 for the five years ending on that date; the average amount of the working expenses was £450,085; and the gross profit, £105,512. The surplus profit had been for many years carried to the credit of the city rate. The Corporation had statutory power to manufacture and deal with the residual products, and were erecting plant for the manufacture of sulphuric acid and sulphate of ammonia. They also sold, hired, and dealt in apparatus for using gas for cooking, heating, and motive power, under statutory authority. This was attended with considerable advantage. A large quantity of gas was supplied for motive power. The gas-engine had been a useful agent in reducing the pollution of the atmosphere by smoke. During a period of fifteen years, £788,319 of gas profits had been applied to city improvements, while £631,494 had been written off. The price charged for gas had been 2s. 6d. per 1000 cubic feet within the city, and 2s. 9d. in places beyond it; but it would be raised, owing to the increased price of coal. The average price had been 3d. per 1000 feet less than in Liverpool. The differential charge in Manchester was justified on various grounds.

At the meeting of the Committee on Friday, Alderman Southern continued his evidence. He explained that the Corporation, who had constructed the tramways, had determined to work the undertaking themselves by electricity upon the expiration of the existing Company's lease in 1901. They had also made arrangements for working the tramways of certain urban districts adjacent to Manchester with the city tramways—the Corporation to pay a rent to the urban authorities. They had expended a capital sum of £787,600 on the markets, abattoirs, wharves, and lairages, the revenue from which had always exceeded the expenditure. The surplus had been transferred to the city fund in aid of the rates. The Corporation had erected cold-air stores at a cost of £80,718, and these had resulted in the preservation of food which would otherwise have become unfit for consumption. They had also made a loan of £5,000,000 to the Manchester Ship Canal Company, which had involved a rate of something over 1s. in the pound. This had been ungrudgingly paid; and it would, he thought, gradually diminish and ultimately vanish. The electrical undertaking of the city was owned by the Corporation, and last year the gross profits accruing were £36,292, equal to 6.41 per cent. on the capital invested. The charges to consumers had been greatly reduced. There was an impression that electrical power was chiefly sought by the large manufacturers. They found it was precisely the other way, and that it was the small consumer who wanted and obtained it. He should say that, wherever an enterprise involved interference with the streets, it was very desirable that it should be in the hands of the Local Authority. Beyond this, he should say that every application for powers should be tested upon its merits, because the character of towns differed in such a degree that any rigid rule would be inapplicable to all. Alderman D. G. Ward, of Harrogate, and Mr. Davis, Secretary of the Chesterfield Chamber of Commerce, also gave evidence, and the Committee adjourned.

## CORPORATIONS AND THE SUPPLY OF ELECTRIC POWER.

The Select Committee, presided over by Sir James Kitson, who have had before them the Durham, Tyneside, Lancashire, and South Wales Electric Power Supply Bills, met again last Tuesday to consider the clauses drafted to carry out their decision of the previous Thursday (*ante*, p. 32). After they had deliberated in private for nearly two hours, the public were admitted and the Chairman said: I have to make a statement which is an expansion of the previous declaration of the Committee on the South Wales Electrical Power Distribution Bill. It is as follows: "(1) The Company to be authorized to supply electrical energy for power purposes anywhere within the area of supply, subject to the consent of the local authority in certain cases as set out below. (2) The Company to have no general lighting powers—i.e., distribution to ordinary consumers—within the area, except in pursuance of a Provisional Order obtained in the ordinary way. (3) Where a local authority are now authorized to supply electricity within the area, their consent is to be required for the supply of electricity by the Company; the Board of Trade to be empowered to override the refusal of the local authority to give consent, if the authority are not prepared to provide the requisite supply on reasonable terms and within a reasonable time. (4) Any local authority which hereafter gets statutory powers for supplying electricity within the area to have, in ordinary cases, the option of taking over the Company's supply in its local area on terms to be laid down by the Provisional Order or Act by which the statutory powers are given. (5) A company having statutory powers to be in the same position as a local authority not having statutory powers; a company to whom powers are hereafter granted to be placed in the same position as a local authority to whom statutory powers are hereafter granted." That is the decision of the Committee, and it is suggested that the Government Draftsmen should meet the Parliamentary Agents and go through the clauses of the Bill; and the Committee will meet to-morrow in the hope of being able to settle clauses finally.

The Committee met again on Wednesday, when the Chairman announced that, in principle, the clause drawn by the Board of Trade carried out their declaration. Counsel addressed the Committee on the clause, and suggested various amendments. The Committee consulted in private for upwards of an hour, and the public having been admitted, it was stated that the clause had been drafted finally as follows: "The powers of the Company for the supply of electricity under this Act shall



be subject to the following provisions: (1) Electricity shall be supplied under this Act only (a) for supply in bulk to authorized distributors and (b) for the purpose of providing power and for the lighting by any person to whom it is so supplied for power of any premises in any part of which the power is utilized. (2) Electricity shall not be supplied under this Act by the Company in any area being at the passing of this Act the area of supply of any authorized distributors, except with the consent of those distributors; but that consent shall not be unreasonably withheld. If any question arises whether that consent is unreasonably withheld or not, the question shall be determined by the Board of Trade. The consent shall be deemed to be unreasonably withheld if the authorized distributors are not willing and in a position to give the requisite supply upon reasonable terms and within a reasonable time; and, in considering what are reasonable terms and what is a reasonable time, the Board of Trade shall, amongst other things, have regard to the terms upon which, and the time within which, the Company are willing and in a position to give the supply. (3) If at any time after the passing of this Act any local authority or company become authorized distributors in any area within the area of supply under this Act, the Company shall be subject to any provisions which may be made by the Act or Provisional Order under which the distributors become authorized as to the taking over of any supply then given by the Company for use exclusively within the area of supply of the distributors. (4) Nothing herein contained shall prevent a company from applying for Provisional Orders under the Electric Lighting Acts of 1882 and 1888. (5) Nothing in this section shall authorize a company to supply electricity for lighting other than the lighting specially mentioned in this section. In this section the expression 'authorized distributors' means any local authority, company, body, or person authorized by Act of Parliament or Provisional Order confirmed by Parliament to supply electricity within the area of supply."

When the Committee assembled on Thursday, the chief matter considered was the maximum dividend to be paid by the several Companies. Mr. H. Lloyd, on behalf of the Local Authority of Barry (South Wales), asked the Committee to amend the clause adopted on the previous day so as to provide that a company should not lay distributing mains in any area, which at the passing of the Act was the area of supply of any authorized distributors, except with the consent of those distributors. The Chairman said the Committee declined to amend the clause. Mr. Lloyd said his clients regarded this as a question of principle; and after the decision of the Committee they would take no further part in the proceedings. Mr. Fitzgerald, Q.C., then raised the question of dividend. He explained that by the South Wales Bill a dividend of 10 per cent., with a sliding-scale, was provided for. His proposal was that, whenever during any year the price actually charged by the Company for energy should have been, on the average of the year, above the standard price, the dividend should, in respect of each 1-20th of a penny per unit by which the actual average price should have risen above the standard price, be reduced by 5s. for every £100 of paid-up capital. The Chairman said the learned Counsel need not argue the question. The decision of the Committee was that the maximum dividend payable should be limited to 8 per cent. cumulative, without a sliding-scale. There would be a clause embodying this decision, and giving the Board of Trade power of revision at the end of ten years. If the fuller knowledge and experience then gained justified the change, the Board would have power to sanction a sliding-scale if it were found necessary. Mr. Moon, who at a late period appeared before the Committee in reference to the County of Durham Bill, said that, if this was the final and irrevocable decision of the Committee, the promoters would have seriously to consider whether the Bill would be worth taking. Mr. Ram, Q.C., said the retention of the sliding-scale was absolutely vital to the South Wales Bill, and the promoters were convinced that without it there would be no possibility of raising the necessary capital. Mr. Pollock, Q.C., pointed out that in the case of the Lancashire Bill none of their opponents objected to the adoption of the sliding-scale principle. The Committee consulted in private, and subsequently announced that they would hear further arguments on their proposal. These having been adduced, and the Committee having again deliberated in private, Sir James Kitson said the Committee adhered to their decision that the standard dividend should be fixed at 8 per cent.; but, having heard the arguments of Counsel, they agreed that a sliding-scale should be adopted, its principle being 5 per cent. discount from the amounts charged on the rise of the dividend by 1 per cent.—the sliding-scale and standard prices charged to be subject to revision by the Board of Trade after a period of ten years.

On the re-assembling of the Committee on Friday, one of the first questions raised was with reference to the decision come to that the standard dividend and the standard price should be subject to the revision of the Board of Trade in ten years from the passing of the Act. It was urged by Counsel for the South Wales Bill that the Board of Trade clause should be so amended as to provide merely for the revision of the standard price, leaving the standard dividend as fixed by the Committee at 8 per cent. A long argument ensued upon the following clause, drafted by the Board of Trade, for insertion in all the Bills: "If within one year from the date of the passing of this Act the Company have not substantially commenced their works for the purpose of carrying out their powers under this Act, and if within three years after the date of the passing of this Act the Company have not erected a generating station or generating stations sufficient in the opinion of the Board of Trade, and are not in a position to supply therefrom, the Board of Trade may order that the powers of the Company under this Act shall cease; and on any such order being made these powers shall cease accordingly." Counsel for the three promoting Companies expressed their willingness to accept the clause, if the one year was altered to two years and the three years to five years. Other points having been discussed, the Committee had a long deliberation in private. When the public were re-admitted, the Chairman said the decision of the Committee was that the standard dividend in the case of the South Wales Bill should not be subject to revision, but that the relation between price and dividend fixed by the Committee on the previous day should stand. With regard to the cesser clause, two years and four years would be substituted for one year and three years. In the South Wales Bill the maximum price would be reduced from 4d. to 3d., in accordance with the offer that had been made by the promoters.

The further proceedings were adjourned.

## THE LEA CONSERVANCY BOARD AND THE LONDON WATER SUPPLY.

The Bill promoted by the Lea Conservancy Board to sanction the reconstitution of that body and the provision of further funds to enable them to carry out more efficiently the duties entrusted to them, has lately been under consideration by a Committee of the House of Lords presided over by the Earl of Rosse. The measure was considered at great length by a Committee of the House of Commons early in the session; there being seventeen petitioners, representing a variety of interests, against it. A summary of the proceedings, so far as they bore upon matters with which our readers are concerned, was given in the "JOURNAL" for May 1 (p. 1134). The result of the inquiry was the passing of the preamble of the Bill. As it left the Commons, the contributions of the New River and East London Water Companies to the funds of the Conservators had been increased to £8000—£3750 from the former and £4250 from the latter; while the total representation of the Companies on the Board was reduced from four to two members. Intimation was given that the Bill would be further opposed on these points in the Upper House; and accordingly when it was in Committee Mr. Claude Baggallay, Q.C., for the New River Company, asked for a decision on two points—first, whether, in view of the fact that the promoters' witnesses had admitted that the change in the Board was unnecessary, the Committee would not dismiss the reconstitution portion of the Bill; secondly, as to whether, in view of the statutory arrangement come to with the Water Companies years ago, there was now any right to reopen the question of their payments to the Board. Mr. Worsley Taylor, Q.C., for the promoters, protested against the action of the Companies in seeking to stop the Bill. The Committee, however, decided to hear the opponents. In support of the Companies' case that they ought not to lose any portion of their present representation, or be called upon to contribute any further amount to the expenses of the Board, the evidence of the Engineers to the two Companies was heard, and Mr. Pope, Q.C., and Mr. Claude Baggallay, Q.C., addressed the Committee. In the end, the preamble of the Bill was passed.

**Bursting of a Reservoir in Michigan.**—According to a telegram received through the Central News Agency, the water reservoir at Grand Rapids, Michigan, burst on Monday last week, and upwards of 100 million gallons of water rushed down the valley, carrying everything before it. Hundreds of dwelling-houses were entirely destroyed, and many of the inhabitants had miraculous escapes. But despite the fact that the population numbers over 9000, only one life was lost.

**Bangor Gas Profits.**—The fact that the Bangor gas undertaking earned a net profit last year of £1080, in spite of the increase in the price of coal, appears to have given a great deal of pleasure to the members of the City Council; for, in a report to hand, we are told that when the Mayor made an announcement to this effect at a meeting of the Council on Wednesday, the members heartily cheered. The price of gas is not to be increased, although the tenders already accepted for coal amount to £1000 more than last year.

**Gas and Electricity Finances at Blackpool.**—Dealing with the finances of the borough for the past year at the meeting of the Blackpool Town Council on Tuesday, Alderman Heap stated that for the Electricity Department a profit of £2295 had been estimated, but only £1176 had been received, or nearly 100 per cent. less. The gas profits were exceedingly creditable, when it was remembered how coal had increased in price. He thought it should be mentioned to the credit of the Gas Committee that they foresaw the rise and covered their requirements almost wholly by contracts. It was estimated that they would make £10,000; and they actually handed over £12,000, with a handsome balance for the rates of the present year.

**The Nitrate of Soda Market in the Past Six Months.**—We learn from Messrs. W. Montgomery and Co.'s half-yearly nitrate of soda report that the actual consumption in Europe for the six months last closed amounted to 848,000 tons—almost precisely the same quantity as last year, without taking into account the fact that the interior stock on the Continent in the hands of dealers at the beginning of the season was at least 20,000 tons more than was the case twelve months previously. The visible supply to-day amounts to 298,000 tons, as compared with 326,000 tons last year. The market opened in January with the spot value for cargoes at 7s. 9d. per cwt.; it closes firm at 7s. 11d. to 8s. for due cargoes, with summer and autumn shipments at 8s. 1d. to 8s. 3d.

**Comparative Cost of Illuminants for Village Lighting.**—The question of public lighting for the parish of Mangotsfield has been considered at a meeting of the Parochial Committee; and the following figures as to the cost of installing the various competing systems of illumination were presented: Oil, initial cost, £256 10s.; rate per annum (all night lighting), 4½d. Acetylene, initial cost, £651 12s.; rate per annum, 6d. Gas (old burner), initial cost, £269; rate per annum, 4d. Gas (incandescent), initial cost, £331 4s.; rate per annum, 3½d. Electricity (gross), initial cost, £640. Electricity (net), rate per annum, 4d. It will be noticed that incandescent gas lighting would commit the parish to the lowest rate per annum; but the matter, so far as we have seen, has not yet been settled by the Committee.

**Gas Affairs at Loughborough.**—Reporting at the meeting of the Loughborough Town Council yesterday week on the affairs of the gas undertaking, the Parliamentary Committee stated that they had considered the charge for gas for public lighting in the borough, and had decided that it be increased 6d. per 1000 cubic feet as to other consumers and as would be the case under the agreement hitherto existing with the Gas Company. The Committee had also mutually agreed with the Company to the appointment of Mr. Thomas Berridge, of Leamington, to value the gas, coal, and other tenant's stores which had to be taken over by the Corporation on the transfer of the undertaking. Regarding the transfer, the Committee had entered into an agreement, subject to the necessary sanction, to pay the purchase money for the gas undertaking on Sept. 29 next, and to take over, and enter into possession of, the works as from June 30—the Corporation to pay interest on the purchase money at the rate of 4 per cent. per annum from June 30 to the actual date of payment. The report was adopted.



## LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Monday, July 2.

(Before Mr. Justice BUCKLEY.)

In re Kern's Patent No. 294 of 1897.

On the resumption of the hearing of the above-named case, which was commenced on the 29th ult. (see *ante*, p. 34),

Mr. Dugald Clerk was further cross-examined. He said his Assistant had tried, by means of a meter, some further experiments as to the velocity with which a self-burning mixture passed through a burner, and he understood that they supported his previous statement; but he could not speak to them personally. The best explosive mixture was 1 to 5; but this did not give complete combustion. There was an advantage in dispensing with the chimney; but he could understand that a chimney might improve the light by steadying the flame, especially with a low pressure. The Kern burner without the chimney gave 25 candles per cubic foot, against 18 candles from an ordinary Welsbach. The witness was then examined as to the action of drawing in the air in the two cones. He did not agree that anything was due to friction, or that the length and angle of the upper or mixing cone was not of great importance. The perforated box or colander which surrounded it had a great effect on the mixing, causing eddies in the mixture. He was aware that in Paris the ordinary gas pressure was much higher than in London; but he did not think this would materially affect the length of the cone, because the jet would require to be smaller. It would affect the length of the cone to some extent. De Mare's reference to a batswing burner showed that he contemplated burning a mixture very poor in air. Similar language in Kern's specification did not indicate this, because he referred plainly to the use of a self-burning mixture. It was quite true that De Mare described a method of producing the requisite mixture and velocity. His experiments showed that the angle of the upper cone was important, and that the angle of 10° specified was the best. He judged by the character of the flame; he had not tested the illuminating power. Some further questions on the results of Professor Smithells's experiments on self-burning mixtures concluded the cross-examination.

Re-examined by Mr. MOULTON, witness said he had had large experience in questions connected with gas, both theoretical and practical. There would be no difficulty about a competent workman following out the descriptions in Kern's specification. By following these descriptions, the results claimed were fully obtained—an increased illumination for the same combustion of gas, and without a glass chimney or other means of producing a current of air. It gave a higher degree of incandescence in the mantle. As worked in practice, the residual gases which burned at the tip or exterior of the flame were very small in proportion to the total quantity. The light evolved from an incandescent mantle rose rapidly with increase of temperature. Prior to Kern, he knew of no paper pointing out the advantage of having a larger proportion of air in the mixture than that present in the ordinary bunsen flame (about 2·4 to 1). The heat of the flame in the Kern burner did not depend on the supply of oxygen externally. The hottest part was just inside the exterior surface; and this was just where the mantle was placed. The re-examination was continued for some time, but mainly to the same effect—that the specification was clear in its directions and accurate in its statements of the results produced.

An experiment was shown of a Kern burner placed inside a tall chimney fitting air-tight round it at the bottom, so that no external air could reach the flame. At the top the chimney was closed, except for a short brass tube through which the residual gases passed, burning with an almost invisible flame. The light emitted was very brilliant; and a small mantle held in the residual flame was scarcely heated at all.

Mr. BOUSFIELD pointed out that the burner employed was improved in several respects, and that the mantle used was not suitable for the size of the burner.

Mr. MOULTON replied that the experiment was only shown for a specific purpose, with which the considerations mentioned had no connection.

Re-examination continued: He had made many experiments besides those he had described, and they all gave similar results. He for various reasons took the drawings attached to De Mare's specification to be full size. The model produced by the petitioners was four times the size, and such as no workman would think of making. Such a broodnagian burner ought to consume 12 cubic feet an hour; whereas it only burned 4½ feet. The other model also was quite out of proportion, and even then did not produce a satisfactory result. De Mare said nothing about a chimney one way or the other. There was nothing to show that he intended to work with anything but an ordinary bunsen flame, of about 1 part gas to 2 parts air. A batswing flame was supplied freely with air on both sides; and if it were a self-burning mixture to start with, it would get so much additional air from outside as to be very much reduced in temperature. It would therefore be useless. There was no real mixing-cone in the De Mare burner. Witness did not find any anticipation of Kern in Horvitz or Moul. The latter did not use a self-burning mixture at all, but supplied air to the interior of his flame. In his comparative experiments, he had used the best available mantle for the particular burner.

By Mr. BOUSFIELD: He was not aware that the drawings to De Mare's specification in the Patent Office were only half the size of the French originals. The blue print shown him appeared of exaggerated size.

Mr. Matthew A. Adam, B.Sc., Assistant to Mr. Dugald Clerk, was the next witness. He said he made a series of experiments on Saturday as to the passage of air and gas through the long glass tube. He found a slight error in the previous results of about 18 per cent. The true ratio was about 5·6 to 1, instead of 6 to 1 of air; there being an arithmetical error on the other side which partially corrected it. This measurement was arrived at with an aspirator. Other experiments made with a meter gave the proportions as 5 to 1 and 5·2 to 1. The illuminating power he found to be 60 candles and 57; the consumption being 2½ cubic feet per hour. In a third experiment, using air in the proportion of 3 to 1, the candle power fell off to about 10 per foot. He had attempted to repeat

the experiment with the De Mare burner which had been shown, with a Kern burner, with a tall chimney surrounding the mantle so as to prevent the access of air; but he could not succeed.

Cross-examined: There were slight inaccuracies in the original method of estimation; but all possible means were taken to eliminate them. He should think they were reduced to 3 per cent. He could not say the tests were absolutely accurate.

Mr. BOUSFIELD suggested that some experiment should be made under joint control, so as to obtain figures which would be beyond dispute, to establish what was the proper mixture of gas and air for producing the best illuminating result.

After some discussion, it was agreed that such experiments should be made in the petitioners' consultation-room in the presence of his Lordship and Counsel and experts on each side.

Mr. MOULTON suggested that the experiments should be first rehearsed before the experts, so that each side should know what points were supposed to be established.

It was then arranged that the case should be adjourned for this to be done; and that the experiments should be repeated in his Lordship's presence the following morning.

Tuesday, July 3.

When the Court sat this morning, it was announced that the experiments were very nearly ready. At the request of the Judge,

Mr. BOUSFIELD stated, in general terms, the nature and object of the experiments—viz., to prove that with a Kern burner under normal conditions, with 2 inches pressure and consuming 3 cubic feet of gas per hour, the maximum illuminating power (about 40 candles) was obtained with a proportion of air of 3 and a fraction to 1—either more or less reducing the light. Another experiment would show a great drop in illuminating power in a Kern burner when the access of oxygen from the external air was cut off. In another one, a Kern burner had been constructed exactly according to the measurements given in the specification, to burn 80 litres of gas per hour, and different shaped cones had been constructed to fit it; and it would be found that a considerable difference in the angle made no appreciable difference in the result. Lastly, he should prove that a burner on the end of a long glass tube, as shown by Mr. Dugald Clerk, would not burn at all with as much air as 6 to 1.

Mr. MOULTON said his experiment would show that the petitioners did not know how to use the Kern burner, because the maximum illumination was not 40 candles but 60 or 70, and that was obtained with a proportion of over 5 to 1 of air. If it were reduced to anything like 3, the light fell off tremendously.

The Court here adjourned for an hour or two to witness the experiments. When the sitting was resumed,

Mr. Adam was re-called, and further cross-examined. He produced his notes of the results of the experiments. Roughly speaking, they showed that the burner was at its brightest when the proportion of air was about 4 to 1. He did not think the mantle was quite in the hyper-incandescent zone; and that if it had fitted better, a larger proportion of air would give the best results. In the respondent's experiment, the mantle gave 63 candles with a ratio of 4 to 1 of air—about 23 candles per cubic foot. He had seen better results with a higher proportion of air. He could not agree therefore that about 4 to 1 gave the best results. With a proportion of 6 to 1, it was more difficult to exactly fit the mantle to the hyper-incandescent zone, or better results would be given. It was not essential to the best results that less than the full equivalent of oxygen should be supplied in the mixture, and the remainder obtained from the atmosphere. In another experiment with a larger burner, giving a light of 95 candles, the illuminating power fell to 13 when the oxygen was shut off by a surrounding chimney. The alteration was due to a change in the shape of the flame. If a larger chimney had been used, the light would not have been so much affected, if at all. For the best results, the supply of air should have been larger in the first place; it only gave about 18 candles per cubic foot. Witness went on, in answer to questions, to state the results of some of the other experiments, which he said did not agree with his own, which he could not repeat that morning owing to an accident, but would do so next day. The hyper-incandescent zone was very narrow; and the higher the proportion of air, the narrower it became. There was always one place in a bunsen burner which was hotter than any other; but the position of it would vary with the proportion of air. In the ordinary bunsen, the hottest place was outside; in the Kern, it was not at the surface, but just inside. Mantles were generally made slightly larger than the burner. Everybody knew that the mantle should be put in the hottest part of the flame; but it was not known where the hottest part was—viz., close to the green cone. He could not agree that the hottest portion of it was close to the surface.

Re-examined by Mr. MOULTON: The best burner in common use for mantles before the Kern was the Welsbach "C" burner. It had to be employed with a chimney, and gave 16 to 18 candles per cubic foot of gas. He had constructed burners exactly in accordance with Kern's specification. They did not require a chimney; and he had seen a yield of 26 candles. This improvement was due to the construction of the burner, which caused it to take in a larger amount of air; the best proportion being 5·2 to 1—nearly twice as much air as with the old type. He never saw a burner before which consumed so much air. He had prepared a table of the results of the experiments shown by the petitioners the previous afternoon. The highest light in them was given with a proportion of 3·6 to 1 or 4 to 1. The highest yield per cubic foot was about 17 candles. With 5·2 to 1, he had obtained 26 candles. The best yield with a high ratio was better than the best with a low ratio. Kern's object was to have a small flame, and to have the mantle in the hottest part. He gave a method for ascertaining that part which could easily be employed. If one had too large a mantle, it would not fit; by reducing the proportion of air, the flame would expand and fill the mantle, but would not give quite so high a duty as if the mantle and flame were properly adjusted.

A minute discussion of some passages in the specification followed.

Wednesday, July 4.

Mr. Dugald Clerk was re-called to state the result of the experiments which had been made, both by the petitioners and the respondents. The



peculiar small blue cone at the base of the flame was characteristic of the Kern burner; and to produce it there must be just the due proportion of air. The more air one injected into a gas-flame, the shorter it became; and ultimately, with the true explosive mixture, one had the minimum flame and the maximum temperature—about 2000° C. In a bunsen flame, there was practically no combustion within the internal blue cone; it was the cool gas and air meeting in non-explosive proportions, ready to light when it got sufficient oxygen. In the Kern flame, this portion was reduced to the smallest possible amount. He had explored the flame with asbestos, and found the hottest part was very close to the little blue cone; and there was another hot part just inside it. In a Kern burner, the lower part of the mantle was more intensely incandescent than near the top. In an ordinary bunsen burner, the luminosity was more evenly distributed. To get the Kern effect, one must have a self-burning flame—not necessarily absolutely self-burning, but the nearer one got to it the better, if the mantle were made to fit the flame. If the mantle were too long or too loose, the maximum effect would not be produced. The lower the pressure, the less air one could introduce. With a pressure of 2·2 inches, he found he could only introduce  $4\frac{1}{2}$  volumes of air to 1 of gas; but with 2·5 inches pressure, he could introduce  $5\frac{1}{2}$  volumes. Mixtures varying from 4 to 1 to 14 to 1 would explode in a closed chamber; but beyond these limits they would not. With the lower proportion, the whole of the gas would not be consumed. The best results with the old Welsbach burner were 18 candles per cubic foot; the best he had obtained with the Kern burner was 25·8 candles. The best results the petitioner secured was 40 candles per 3 feet of gas, or only about 13 candles per cubic foot. If the proportions were right to give the Kern flame, the mantle could not have been properly fitted. The proportion of air was 3 to 1; at 4 to 1 they obtained 50 candles. In the respondents' experiments, with a pressure of 2·3 inches, 63 candles were obtained from 2·7 cubic feet, or 23 candles per foot. At York Street, in the evening, with 2·5 inches pressure, he got slightly higher results; the ratio was 5 to 1. By forcing the air through more rapidly, and using more—5·6 to 1—he obtained 29·4 candles per cubic foot. In order to get this, he had to use a smaller mantle. Witness then described an experiment in which a glass cylinder was put over the burner, closed at the bottom so as to prevent access of outside oxygen. He found the light improve. The burner was made according to the specification. He had not experimented at all with what was called the commercial Kern. Water gas, which was largely used now in combination with coal gas, only required 2 volumes of air to consume it; and this lowered the proportion required to produce a self-burning mixture when it was present.

After some little discussion, in which Mr. Bousfield complained that his witnesses had not been present at some of these later experiments, and therefore could not criticize them, it was arranged that they should be repeated at York Street, and all parties should attend.

Further cross-examined: He understood Claim 1 to be for a method of producing a self-burning mixture without the use of an artificial draught. The flame produced was quite different to anything known before. Kern was the first to attempt to burn a self-burning mixture at so large a nozzle as was shown. He did not know the Bandsept burner, but had heard of it. [A Bandsept burner was produced, and lit.] When water gas was used with London gas, it was carburetted; and such gas required as much air to consume it as ordinary gas. It was easy to analyze gas, and find out how much air it required for its complete combustion; but he had not done so. The proportion was a little under 6 to 1.

Mr. Moulton said he had Sir Frederick Bramwell and Mr. Inray present; but as there had been no cross-examination as to the sufficiency of the directions to produce the effects described, he did not propose to call them, and that would be the respondents' case, subject to Mr. Clerk being re-called for further cross-examination as to the experiments.

Mr. Terrell then proceeded to sum up the case for the respondents. He pointed out that there was nothing in the particulars of objection addressed to the questions of the mantle being made exactly to fit the flame; and he then went to the question of a self-burning mixture. The inventor nowhere prescribed any particular proportion of air—in fact, he intimated that the proportion would vary according to the quality of the gas and the pressure—but he said he wanted a self-burning mixture, and told one how to get it. He (the learned Counsel) hoped to show that his theory about this was correct; but even if it were not, but the directions given produced the effect described, any error in the theory would not invalidate the patent. By "self-burning," he meant a mixture which would burn in a closed chamber from which the internal air was excluded; he said so in his specification. He did not mean completely burn.

Justice Buckley asked if Mr. Terrell understood that it was better to have an absolutely self-burning mixture or not.

Mr. Terrell said he took the theory to be an absolutely self-burning mixture, and that, practically, the nearer one got to it the better. For different qualities of gas and different pressures, different proportions were required. The learned Counsel went on to deal with various passages in the specification dealing with the hyper-incandescent zone, and the length and proportions of the cones; and he submitted that the descriptions given were amply sufficient. If there was any mistake in the description of the exact position of the hyper-incandescent zone, it could not deceive anyone acquainted with the subject, and would not affect the patent. He then went on to discuss the claims, and concluded by a detailed criticism of the particulars of objection—especially the statement that "a self-burning mixture is useless and undesirable in incandescent gas lighting."

Justice Buckley remarked that that obviously meant an absolutely self-burning mixture.

Mr. Terrell said the question for the Court was not what was a self-burning mixture, but what was meant by the term in this specification. In any case, the inventor had provided a means for introducing twice the proportion of air to that found in an ordinary bunsen flame; and this was a self-burning mixture in the sense in which he used the words.

Mr. Bousfield then opened the case for the petitioners. There were six claims in the patent; but the real purpose of the petition was to attack Claims 1, 5, and 6—the others being, he understood, absolutely immaterial

to either party. The patent was being used to stop the manufacture of the improved De Mare burner. After giving a short history of the previous litigation with regard to the De Mare patent, in which the mantle was held to be an infringement of Welsbach's patent, and of the action to acquire the De Mare patent from the Sunlight Company (as to which an appeal to the House of Lords was still pending), he said there was a striking similarity between the two; the great point in each being the obtaining of greater pressure by the use of two cones. The description in Kern aptly described, in almost identical language, what De Mare discovered. Having quoted the passages from each, the learned Counsel pointed out that the only difference was that De Mare did not expressly mention the fact that the quantity of air was increased, though he spoke of providing a supply of air under pressure, and said this was necessary to complete combustion, and also that it prevented lighting-back. In the actual apparatus, the only difference was one of dimensions; and he should show from decided cases that one could not have a patent for mere directions of that sort. As far as he could see, they only amounted to this—making the bottom cone a little longer and the gas-nib a little smaller. In fact, Kern gave no directions at all about the size of the nib; and De Mare claimed "any form of burner suitable, while retaining the two cones," or ejector. De Mare suggested doing without a chimney long before Kern; and Bandsept also devised a burner for use without a chimney. He did not put this as an anticipation, because it was a different form of burner—having three lower cones—but it prevented Kern saying he invented the notion of doing away with a chimney by increasing the pressure. The learned Counsel then passed on to criticize the theory of Kern as to self-burning mixtures, which he contended was erroneous; and he quoted figures from Professor Smithells's paper to show that even when a larger proportion of air was forced through the flame than the experiments showed could normally occur in a Kern burner, the consumption of the gas was still incomplete. Kern misled them by indicating that one ought to aim at getting a sufficient quantity of air in the mixture to effect complete combustion of the gas; leaving nothing for the oxygen of the air to deal with. Then came a question of fact, as to what was the proportion of air requisite for the complete combustion of London gas. Mr. Dugald Clerk had put the proportion of 6 to 1 as giving the best results from experiments with a long glass tube. But he had not metered the air; and he admitted that his figures were somewhat too high. Mr. Swinburne's experiments would show that a still greater deduction had to be made; and practically it would be found that 4 to 1 gave the best results at ordinary pressures. This was considerably below what he should term an "equivalent" mixture. Another experiment showed the necessity of having a supply of oxygen at the outside of the flame. [This was surrounding a Kern burner with a glass chimney, so as to cut off the external air, when the light was enormously decreased.] This experiment had been criticized by Mr. Adam, who suggested that the diminution was due to an alteration in the shape of the flame; but on repeating the experiment, without the mantle, his Lordship would see that the shape was not visibly altered. If anything, it appeared rather fuller in the upper part; but in the region of the incandescent zone there was no change at all. The same experiment had been made with a much larger chimney; and when the top was left open, the light was not much affected—air coming in down the sides. But when it was covered, all but a small aperture, the same effect as before was produced.

#### Thursday, July 5.

Mr. Dugald Clerk was this morning re-called for further cross-examination with regard to his experiments, which had been repeated the previous evening at the Welsbach Company's premises. After some readings had been taken, it was discovered that there was a leak in the air-supply pipe, which was remedied. The result then was 69 candles with 3·2 feet of gas and 13·2 air; in a second experiment, 12·75 air, or about 4 to 1. There was then a little more air added, which gave a reading of 63 to 64 candles. Then a little more air was added, giving readings of 61 candles, 64 candles, and one at 76 candles, which was found to be due to an error in the photometer. He thought this occurred suddenly. Throughout the experiments afterwards the pentane flame had to be carefully watched. On correcting it, the reading was 70 candles; the mixture being 3·1 gas to 14·5 air. Further air was added, and the candle power fell to 49 (the proportion being 5·89 to 1), and after a few minutes it was 55·5. He agreed there was then too much air. The results obtained at York Street were better than at the Courts, because the pressure was higher. With a rise in gas pressure, the ingress of air increased both absolutely and relatively, and the flame also passed more rapidly through the meshes of the mantle. The statutory minimum pressure in London from sunset to midnight was 10·10ths, and from midnight to sunset 6·10ths. In practice, the pressure was better than that. In his own office, it had varied from  $1\frac{1}{2}$  inches up to 3 inches; and in the Courts he had found it 2·3 and 2·4 inches. In his experiments, the pressure was  $2\frac{1}{2}$  inches. He had declined repeating his experiments with a pressure of  $1\frac{1}{2}$  inches. The experiments with a brass box under the burner were then discussed; but witness said the results were not satisfactory, owing to the box not being of the right proportions. A light of 65 candles was obtained with a proportion of 5·1 to 1. Another experiment, with the normal supply of air and a gas consumption of 3·1 feet, gave 70 candles. Experiments with a shortened mantle were then given, which gave readings of 76 and 78 candles; the ratio being  $5\frac{1}{2}$  to 1. With the ordinary mantle there would have been a drop. There was no suggestion in the specification that the mantle should be any particular length.

Re-examined: The room was rather crowded; and this to some extent interfered with the success of the experiments. One experiment—with the chimney—which could not be performed in the presence of all the parties owing to an accident, was shown later in the evening, when there were no Counsel present; and the results were the same as he had previously found. He produced the figures as found by Mr. Swinburne and himself, which were fairly concordant. The best illuminating power was obtained with a ratio of between 4·75 and 4·91 of air to 1 of gas; the consumption of gas being 3·1 feet and the pressure  $2\frac{1}{2}$  inches. Shortening the mantle simply had the effect of making it fit the flame better. In this way a good fit could easily be obtained. A gas pressure of  $2\frac{1}{2}$  inches was not at all abnormal. The Kern burner gave good results with any ordinary pressure; but with high pressures more air could be introduced, and better results attained. He found 5 to 1 about



the best ratio. At  $5\frac{1}{2}$  to 1, the candle power dropped; but this was because the flame was smaller, and the mantle was too large.

Mr. BOUSFIELD again cross-examined shortly with reference to the experiments made late the night previously; and witness admitted that Mr. Swinburne's readings did not quite agree with his own. A list of the principal towns in England with the actual pressure at the gas-works showing an average of 16-10ths was handed to witness; and he said he had no reason to disagree with it, though he was surprised to see some so high and some so low.

Mr. MOULTON asked leave to put in an analysis showing the actual amount of air required for complete combustion of London gas.

Mr. BOUSFIELD said he might require to make a similar analysis; but it took some time.

Mr. Horatio Ballantyne was then called. He said he had carefully conducted the experiment, and found that the proportion was  $5\frac{1}{2}$  volumes to 1.

Cross-examined: The proportions varied slightly from time to time. The test was made by measuring the volumes of air and gas, exploding the mixture in a closed chamber, and analyzing the residue to see if there was any excess of oxygen or any unburned gas remaining. The gas used was taken from the consultation-room in the Courts.

Mr. BOUSFIELD then resumed his speech for the petitioners; taking up the point at which he left off—that an absolutely self-burning mixture was not the best, but that the flame should draw some portion of its oxygen from the outside air. This was borne out by the experiments of the previous day, when he was present, as well as by the experiments he should show. The results obtained by the Kern burner were got in this way; the proportion of air being 4 to 1, which was considerably less than that required for complete combustion. On this ground, he submitted that the specification was misleading. The portion of it which was correct was old, being found in De Mare; though it was quite possible that Kern had improved on De Mare's results by slightly varying the size and shape of the cones. The claims they were principally concerned with were Nos. 1, 5, and 6, which dealt with the cones; the other claims, which referred to the form of the tip or jet of the burner, being a separate branch of the subject, and of very little importance, because no one thought of using now the particular form of tip shown in the drawings. The learned Counsel went on to discuss the language of the various claims; submitting that Nos. 1 and 5 were practically the same, though No. 5 might be slightly narrower, introducing certain dimensions and angles. Claim 6 was practically the same again, and would equally prevent the petitioners making and selling De Mare burners with slight alterations in the dimensions, which experience showed to be desirable; and this was contrary to patent law. Mr. Terrell said a mistake of theory, if there were one—which he did not admit—would not vitiate a patent. To some extent that was so; but if the theory formed part of the claim, it did. This was shown by the case of *Mormet v. Beck*, a chemical patent, and by Owen's patent for the manufacture of artificial stone. Passages from this last case were cited; and also from *Patterson v. The Gaslight and Coke Company*, the well-known case relating to gas-purifiers. One or two other cases were cited; and the learned Counsel then concluded his speech.

Mr. James Swinburne was the first witness for the petitioners. He said he was familiar with the De Mare specification. It was necessary for the complete combustion of the carbon in gas that a certain quantity of air should be supplied; this was well known before De Mare. He provided means for securing the access of air by two cones united at their summits—what was called a Venturi tube. The best proportions of cones and sizes of the orifices would be arrived at by experience or trial, and would differ with the pressure and composition of the gas, and the mantle used. Kern's burner and De Mare's were the same in principle. Bandsept also had cones similar in character, for the purpose of drawing in a large quantity of air; but he was not familiar with this arrangement. Kern gave exact dimensions for a burner to consume 80 litres of gas per hour. He said nothing about pressure, except that it was to be ordinary. Eighty litres could be passed at  $1\frac{1}{2}$  inches pressure, with a proper-sized orifice. The size of the orifice would vary with the pressure. The proportion or design of the Kern burner was, he thought, rather better than De Mare's. High incandescence had been obtained by the use of high pressure. It was the usual practice to use 8 or 9 inches pressure to produce it in the manufacture of mantles. The high pressure produced a larger relative inlet of air; it also caused a more rapid rush past the mantle, and increased the temperature. Kern suggested that the air should be supplied in such proportion as to give the due equivalent of oxygen to consume the whole of the hydrogen and carbon. Mixtures of air and gas would burn in a closed chamber in very variable proportions. He had burned a little over 3 to 1 in a lamp chimney, with the air excluded from the bottom. He took Kern to mean an equivalent mixture by a self-burning mixture, needing no addition of oxygen from the atmosphere. His experience showed that the best results were obtained with a much less than the equivalent proportion of oxygen in the mixture. A commercial Kern burner was here lit, and then covered with a wide glass chimney closed at the bottom, which produced very little effect while the top was left open so that oxygen could get in; but when the top was covered with a cardboard disc, the light was reduced from 95 to 14 candles. The base of the mantle was still fairly luminous. If by the hyper-incandescent zone was meant the small region just near the light blue cone, the mantle was not in it at all. [The chimney was then removed, and the burner again regained its former luminosity.] In his opinion, the conditions for producing the best light, with normal pressure and mantles, were to have less than the equivalent of oxygen in the mixture. With an equivalent mixture, one would have a very small flame, and would require a special mantle. In domestic use, one could only secure a definite pressure by employing a governor; and this would necessarily reduce the pressure to about 1 inch. Practically the burner should be made suitable for varying pressures, of which  $1\frac{1}{2}$  inches might be taken as the average. The directions in the specification did not give an equivalent mixture. Witness was then taken through the results obtained in the experiments of petitioners. In most of them the quantity of gas consumed was about 80 litres per hour; and the maximum power was 50 candles with a 4 to 1 ratio. When the air supply was increased,

the candle power fell considerably. On gradually decreasing it, the light improved up to a certain point, and then fell again. The experiments were fairly conducted in every way. The respondents' experiments were then gone through in the same manner, as already stated by their witnesses. The later experiments did not, in his view, alter the conclusion that a 4 to 1 proportion gave the maximum results. Kern's specification stated that the angle of the section cone should be between  $5^\circ$  and  $7^\circ$ , and that the action almost ceased beyond  $10^\circ$ . This was not correct, according to his experiments. He had tried angles varying from  $5^\circ$  to  $12^\circ$  and found no appreciable difference.

Cross-examined: The conditions were more favourable at 11 o'clock last night than earlier in the evening. In those experiments, the maximum effect was produced with ratios of 4.75 and 4.91 to 1. In some of the experiments, the yield was 22 candles per cubic foot. In others, they only got 40 candles for 3 cubic feet, instead of nearly 70. The Welsbach people, from their long experience, might be better able to fit the mantle to the burner. There were often discrepancies in results, even by the same observer. Two mantles out of the same batch would frequently give different readings. An absence of fit in the mantle was the most likely cause of bad results. If a mantle were too large, a smaller proportion of air would improve the result by increasing the size of the flame. His idea was that in the course of this case the respondents had discovered the advantage of slightly shortening the mantles.

#### Friday, July 6.

Mr. Swinburne, further cross-examined by Mr. MOULTON, said he did not agree that the Kern mantle was in the hottest part of the flame, which was close to the whitish zone. The shape of the double cone in the commercial Kern burners, which were largely used for outdoor lighting, was different to anything shown in De Mare's drawings. He did not know of a burner without a chimney being used before Kern's.

Re-examined: The Bandsept burner gave similar results to Kern's, and substantially in the same way. It produced a very high degree of aeration. [An experiment was then shown to prove that the ratio of air to gas increased with an increase of pressure in a burner made according to De Mare's patent.] There was no difference in principle between the De Mare and Kern burners; but in the latter, the cones were better proportioned. Referring to the experiments at York Street at 11 o'clock at night, he said they were taken rather at random, and there was nothing in them to lead him to alter the conclusions he drew from the previous experiments. Taking any given burner, a higher pressure gave more aeration and better results; but a smaller mantle was required. Closeness of texture was also important. The Kern mantles were very open. He believed the principal reason why the petitioners' experiments showed lower results than those of the respondents was that they worked with a lower pressure. There might be a difference in the mantle, but he did not think so. The lower average did not in any way vitiate the experiments.

Professor Vivian B. Lewes was next called. After stating his qualifications and experience, he said the models of the De Mare burner were made at his request, exactly in accordance with the specification—one small and one large, in order to take the sized mantles which were available for experimenting with. The Kern models were also made carefully from the specification. He had used the same mantle in testing the two burners. The large Kern burner gave a light of 14.4 candles per cubic foot; and the large De Mare 15 candles. The small burners gave practically the same result. The principle of the De Mare patent was the same as the Kern; the only difference was in the proportions of the cones. Witness then described in detail the appearance of the flame in an ordinary bunsen burner, and in De Mare's and Kern's. In Kern's specification, the essence of the patent was to get an equivalent mixture of gas and air in a burner for incandescent lighting, without using abnormal pressure. The result of experiments showed that an equivalent mixture of London gas would require from 5.5 to 6.3 of air to 1 of gas; the variation being due to the way in which the gas was made and the proportion of carburetted water gas contained in it. A burner made according to the dimensions given in Kern's specification, to pass 80 litres of gas per hour, did not give anything like an equivalent mixture. It was very difficult to ascertain the exact proportion it did take; but the best results were obtained with a proportion of from 3.7 to 4 of air to 1 of gas, according to the pressure. By increasing the proportion of air, the candle power at once tumbled down, either with the model Kern or the commercial Kern, working at normal pressures. Witness produced a chart showing the results of a number of experiments he had conducted himself, in which the maximum light was obtained with a proportion of air of 3.65 to 1. With either an increase or diminution of air, the light fell. He had tried suction cones of different angles— $5^\circ$ ,  $7^\circ$ , and  $12^\circ$ , which was the largest angle he could get without altering the proportions of the burner; and he found they all gave similar results, both as to the suction and the light produced. The hyper-incandescent zone was simply the phenomenon of a bunsen burner concentrated in a very small space, where the temperature was very high; but it was so small and so low down, that it could not properly heat the mantle. There was hardly a Kern burner in the market which could not be improved by cutting off some of the air supply. There were two extremely hot portions in a bunsen flame—one corresponding to the Kern hyper-incandescent zone, and the other where the flame completed its combustion with the oxygen of the air; and it was the combination of these two, as nearly as possible on the surface of the mantle, which was the secret of successful incandescent lighting. With regard to pressure in London, one might get 2 inches or more near a main; but the average pressure over London would not exceed  $1\frac{1}{2}$  inches. Burner makers always worked to 1 inch pressure, because it could be always relied on. Witness produced a Bandsept burner which he had had since 1896. It was well known to people connected with gas lighting before 1897. At the 1897 meeting of the Gas Institute, at Bath, it was exhibited in large clusters. It was a chimneyless burner, and was also made to use with a chimney. It was employed by the Paris Welsbach Company. No doubt it had undergone modifications and improvements since 1896. The specimen he produced gave a very high degree of aeration. He had several De Mare burners, and recognized one produced as that which the De Mare people used. It gave a magnificent aeration, and produced a batswing flame which could be turned down without



firing-back. The experiment with the wide cylinder surrounding the flame, fairly indicated the effect of depriving it of external oxygen.

Cross-examined: In 1897 he was giving attention to the question of burners for incandescent mantles. At that time, ordinary gas took from 5.5 to 6.2 volumes of air for complete combustion. He made hundreds of experiments. He also tested the effect of aeration on the combustion of gases; and in 1897, he came to the conclusion (as stated in the "JOURNAL OF GAS LIGHTING") that more aeration was required to get a good light, especially if one wanted to do without a chimney. The ordinary bunsen burner would have 1 to 2.2 or 2.4. Increasing the aeration improved the effect. The Kern burner increased the aeration, and would therefore give a better incandescence than the ordinary bunsen, if stopped at the right point. As a general rule they over-aerated. In 1897, the bunsen gave 16 to 18 candles with a Welsbach burner. In one of his experiments in this case, the model Kern burner gave about 12 candles. He did not admit that this was a bad experiment. He did not doubt he should have got a better result with the same mantle on a "C" burner. The best mantle for one flame was not the best for another. Witness was then cross-examined in detail on the results of some of the experiments, none of which, in his opinion, were worth very much, on account of the differences in mantles and other conditions. He considered the experiments at York Street when all the parties were present were a farce. Those made later, when only four persons were there (of whom he was not one), were performed under better conditions; but the pressure employed—2½ inches—was abnormal. In 1897 he mentioned 18 candles per cubic foot at 2½ inches pressure as a very good result. In one of the experiments at York Street, over 22 candles were obtained. No doubt, it was a very good mantle. In that case, there was pretty complete aeration; and the result might have been improved by cutting off some of the air. He could not say for certain, because he did not see the experiment. There was nothing to prevent 4.8 air to 1 being a good proportion of aeration, provided there was sufficient pressure. One-tenth of an inch pressure would sometimes make a considerable difference. With regard to one of the results, his opinion was that there must have been something wrong with the conditions. On its being suggested that the intellect of man was capable of adjusting the mantle to fit the flame, witness said he did not know it was allowable to use intellect in patent matters; one was bound by the specification and the drawings. The high reading might have been caused by a variation in the standard. He had many charts of results in his own laboratory, similar to the one he had put in; and the results were fairly concordant. They were made with gas at the ordinary pressure. He knew of no burner before Kern's having the same amount of aeration, which did not employ gauze. A passage from an article in the "JOURNAL OF GAS LIGHTING," with regard to the necessary conditions for success in incandescent lighting, being read, witness said that was exactly what he had been trying to say all the morning. It would be better if one could get the whole mantle to the same temperature; but in practice the first ½ inch gave 60 per cent. of the light—not the first ¾ inch. With regard to the Bandsept burner, it was in 1896 known to him as a chimneyless one. The first patent was in 1895. The 1896 patent referred to a chimney; but this was a subsequent modification. He made Mr. Bandsept's acquaintance in 1893.

Re-examined: The Bandsept burner he put in had no provision for a chimney. A self-burning mixture was produced, as was shown by the fact that he made a burner to burn under water. It was not enough to make the mantle fit the head. It must fit the flame also; and this was the most important point. Bandsept used gauze after having tried a perforated metallic thimble similar to Kern's. With regard to the last experiments at Palmer Street, at 11 o'clock at night, witness had no idea they were going to be made. He was satisfied that the results he had obtained in his own experiments, as indicated on the chart, were correct; and they were concordant with what had been shown his Lordship. He could not criticize the experiments which he did not see. There were many points which might affect them—in particular the pentane used in the photometer. With regard to the former experiments, he did not think they were worth the paper they were written on.

Mr. Swinburne was here re-called, and stated that he had tried a further experiment with the long glass tube employed by Mr. Dugald Clerk, and found that Mr. Clerk's figures were 40 per cent. wrong. By the method he employed, the reading would be 100 when it ought to be 60. He (witness) employed ammonium chloride.

Mr. Moulton said Mr. Clerk tried ammonium chloride, but found it so unsatisfactory that he abandoned it.

This concluded the petitioners' evidence.

Mr. NEILL then proceeded to sum up the case. He commenced with a short history of previous attempts in the same direction—such as the limelight, the Clamond, Fahnehjelm, &c., coming down to Welsbach's invention of the mantle. All these things were well known to De Mare. The problem he sought to solve was getting a larger admixture of air, passing with a sufficient velocity to prevent firing-back. He read and commented on certain passages in De Mare's specification to bear out this contention. With regard to Kern, the case as opened was that Kern meant what he said—that the chemical equivalents necessary to complete combustion, or 6 of air to 1 of London gas, were to be obtained as nearly as possible. This could be obtained with an ordinary bunsen burner; but it could not be burnt, because it would fire-back. Mr. Dugald Clerk's evidence in the first place was that a 6 to 1 mixture was actually used in the Kern burner; but this was afterwards shown to be an entire mistake. Then the respondents turned round and said that Kern did not mean an "equivalent" mixture at all, but anything over 4 to 1. The experiments clearly showed that the best results were obtained when the combustion was perfected at the surface of the flame; and therefore the patent was bad, because the claim was really for an "equivalent" mixture. Even if he were right in this, the patent would be bad, because it was merely an improvement of De Mare. On this point, Counsel cited the case of *Nichol v. Sears and Wells*, a patent for a riding habit. According to the construction now sought to be put on Kern's patent, the making of De Mare's burners would be an infringement. He then reviewed the experiments that had been made, which showed that the best results were obtained with a proportion of about 4 to 1, employing the normal pressure. No doubt, higher results were realized with a larger proportion of air at greater pressures; but that was common knowledge. The patent was intended to be used with gas at the

normal pressure. In conclusion, he submitted that the petitioners had made out their case.

Mr. MOULTON, on rising to reply, was reminded by his Lordship that the two points made against him were anticipation and a misleading specification. Mr. Moulton said the only anticipation relied on was De Mare's specification. There was no suggestion that it had been used in practice. The question as to the specification consisted of two allegations—one that a self-burning mixture was not used for incandescent lighting, and the other that such a mixture could not be obtained by the means shown. "Self-burning" in the objection, of course, meant what had been called absolutely self-burning. No evidence had been given on the plea of non-utility; but this only applied to the claims which had not been practically dealt with. He then gave a description of the bunsen burner, the quantity of air it consumed, and the defects attending its use.

#### Saturday, July 7.

Mr. MOULTON, resuming his speech, said the utility of the Kern burner was shown by its extensive employment; while the De Mare had practically never been used.

Justice BUCKLEY said it was suggested that the use of the De Mare burner had been prevented by the injunction against the employment of the mantle.

Mr. MOULTON said the Sunlight Company purchased the De Mare patent, and could have used it with their own mantle, which was held not to infringe. Kern showed how to make a burner without a gauze top, such as was necessary with Bandsept's, and which was very inconvenient. The three points achieved by Kern were the improved light, absence of chimney, and absence of gauze at the tip. As a rule, when a man had really made a great practical advance, his patent was valid; though, of course, it was possible that the specification might be drawn so as to be open to attack. The main lesson of the patent was that one wanted higher aeration and a smaller flame, concentrated so as to give a higher temperature. He admitted that Kern and Professor Lewes were totally at variance; but Kern's accuracy was shown by the practical success which attended the following out of his directions. The central question was this: Was Kern right in saying that perfection in incandescent lighting was approached, as one approached complete or equivalent aeration?

Justice BUCKLEY said the condition of ordinary pressures must also be introduced, by which he meant from 1 inch to 2 inches or at rifle oven, but not above 2½ inches.

Mr. MOULTON said he did not think the introduction of this qualification affected his proposition. He then went on to discuss the importance of the mantle fitting the flame; pointing out that such fitting was necessary with any burner, and interposed no difficulty. The real problem was to get a very hot flame—one could easily adapt the mantle to it. He entirely joined issue with Professor Lewes when he said that the Kern burner would be improved by diminishing the air supply. Discussing the question of what was meant by a self-burning mixture, he thought 5.5 to 1 was a really equivalent mixture; and what the patentee meant was that the nearer one got to this the better. Criticizing the experiments of the petitioners, the learned Counsel suggested that there was one consideration which deprived them of all possible weight—viz., the results obtained being all far below those usually found, it was evident that the conditions were not properly observed; and therefore not only the positive, but the comparative results were not to be relied on. He asked his Lordship to be guided by the experiments performed at 11 o'clock at night in the presence of Mr. Swinburne, when a light of 22 candles per cubic foot was obtained; the pressure being 2½ inches, and the proportion of air 4.8 to 1. He was perfectly willing that Mr. Dugald Clerk and Mr. Swinburne should be asked to conduct any series of experiments his Lordship might suggest, and abide by the result; although he submitted that the evidence already given was sufficient.

Mr. BOUSFIELD said the proportion of air in the experiment referred to was, according to his calculation, less than 4.8.

Mr. MOULTON proceeded to discuss some of the other experiments.

Justice BUCKLEY said the whole evidence seemed to be that the proportion of air which yielded the best result varied from 3.75 to 4.8—nothing like 5.5, the theoretical equivalent.

Mr. MOULTON then went to the specification, which he analyzed and paraphrased at considerable length. He contended that De Mare only gave a general suggestion, which proved quite barren of useful results; but Kern gave directions which no one could go wrong about. There was nothing which could mislead anyone. He did not think it was material that the patentee was absolutely right in his theory of a self-burning mixture, though he thought he was. Even if he were mistaken to a slight extent in his theory, that would not affect the validity of his patent, when he had properly described the means to attain the results he had described. Incidentally, he reverted to the question of a self-burning mixture, and submitted that such a mixture did not imply that there should be no residue left after combustion, either of carbon or oxygen, but that combustion should go on freely without the aid of external air. It was possible that Kern had over-estimated the effect he produced, especially under English conditions; but still the result he described was achieved, and no one could be misled by the theoretical error.

#### Monday, July 9.

Mr. MOULTON this morning resumed his reply on behalf of the respondents, and dealt first with the question of pressure, saying he had only realized on Saturday that his Lordship drew any distinction between the effect of aeration at pressures below 2 inches and above it. The pressures Mr. Clerk had employed were simply those obtained in his own laboratory. There had been no attempt to obtain good results by employing high pressures. Since Saturday, experiments had been repeated which showed that the effect of complete aeration was the same whatever the pressure, from 1.3 to 2.5 inches; and he therefore reiterated the suggestion he had previously made that his Lordship should direct further experiments to be made.

Justice BUCKLEY said Mr. Moulton had better deal with the case on the evidence as it stood. He thought that there had been quite enough experiments.

Mr. MOULTON considered there was no evidence to show that the lower



pressures affected the result. He proceeded to cite passages from the evidence of Professor Lewes, and contended that they were useless because the same mantle was used for different degrees of aeration, whereas the mantle best suited to each particular mixture should have been employed. The only experiments in which the full power of the burner and mantle had been produced were those of the respondents. The petitioners all through admitted that Kern's burners gave an improved result, and yet in none of their experiments had they reached the result obtained by an ordinary burner. His submission was, on the evidence that provided the mantle properly fitted the flame, the higher the aeration the better the illuminating power, whatever pressure was employed. In reply to his Lordship, he admitted that one of the experiments showed that in the Kern burner there was not complete aeration, and that the oxygen of the surrounding air played a part in the combustion. But he could not admit that the experiment was of any value quantitatively. He contended that the meaning of the term "self-burning" in the specification was freely self-burning—not absolutely self-burning. He then discussed claims Nos. 1, 5, and 6, and the alleged anticipation by De Mare, which, he contended, was a totally different thing; the air being admitted in a different place, and the evidence showing that De Mare only aimed at a mixture similar to that in an ordinary bunsen. The De Mare patent was published in 1894; and nothing was made of it until Kern's came out in 1897. In some cases, as in the present, the right dimensions and proportions meant all the difference between success and failure. The last question he would deal with was one of law—viz., whether the patent was invalid, because he had claimed a self-burning mixture, which, in the absolute sense, was not at any rate under all circumstances attained. His submission was that a patent would be supported if the directions were sufficiently full to produce the effect described, even though the patentee might be mistaken in his theory of the exact physical causes which conduced to the effect. He maintained that the cases cited on this point by his learned friend had really no application.

Mr. BOUSFIELD added a few comments on two of the cases referred to, to which Mr. MOULTON replied.

His LORDSHIP said he would give judgment in a few days.

### THE DUBLIN STEAM-ROLLER CASE.

#### Text of the Judgment of the Irish Court of Appeal.

In the "JOURNAL" for the 26th ult. (p. 1733), we briefly noticed the result of the appeal by the County Council of Dublin against a judgment of the Master of the Rolls, restraining them from using, or causing to be used, a steam-roller to the detriment of the mains or pipes of the Alliance and Dublin Consumers' Gas Company. In view of the importance of the judgment of the Court (composed of Lords Justices Fitzgibbon, Holmes, and Walker) which was commented upon in our editorial columns last week, we give the full text of it to-day.

Lord Justice FITZGIBBON, by whom the judgment of the Court was delivered, said: It is remarkable how similar this case is to the St. Mary Abbott's case, not merely in the question which we have to decide here, but in the evidence by which a right is sought to be supported, and also by the course which the case took in the Court in the first instance, and also in the Court of Appeal. The question of right first and of proved liability secondly, and the question of costs in the third place, must be separately considered; and, taking them in that order, it appears to us that each of the questions is reasonably clear. There is one of them with which I have had some little difficulty; but it is not a question of principle and evidence. Now, as regards the principle, the road authority unquestionably has a right to maintain the roads under its charge by all reasonable means, having regard to what reasonable means are at the time at which they are doing the work. It would be a monstrous thing to say that the road authority was not to advance with the times in the mechanical and economical methods of dealing with the discharge of their duties. They are entitled to advance with the times; and they have duties to discharge towards other people in so advancing. You might just as well contend that the road authority now was discharging its duty by keeping the roads in a proper state for the passing of the sledges of our forefathers, as to say that they are not bound to provide for the increasing and altered traffic which the roads have now compared with what they were obliged to carry when they were made. On the other hand, the Gas Company, and, indeed, all persons who have rights over those roads concurring with the rights of the road authority, are entitled to protection in the enjoyment of what they have got, provided they have got it properly, lawfully, and reasonably at the time they were originally acquired. And where such work is done as that of laying gas-mains, which is work that at the time it is executed is reasonably expected and intended to last for a considerable number of years, it is bound to be done properly and with reasonable skill and reasonable care and expense at the time it is done, for the purpose of meeting and overcoming the difficulties that may be thrown on it by the user of the place in which it is laid at the time the works are carried out. And if changes do take place which it is for the advantage of other parties to adopt, they can only adopt them with due regard to the rights already acquired in the subject matter over which their powers extend—by people like the Gas Company in the present case. In regard to this Company's rights, what is the evidence? The present case upon the main issue really divides itself into two parts—first, as to the affirmative pieces of evidence to sustain the action brought by the Gas Company, were any of the pipes (and I do not trouble about the differences between mains and service-pipes at present), were any of the pipes belonging to the Gas Company broken by the steam-roller; and, secondly, if they were, was that breaking due to the fact that they had not been properly laid, because the duty of properly laying was a duty that fell on the Gas Company when they laid the pipes, with the modification, and with the condition, which I have had regard to, that the measure of propriety was the measure of the circumstances of the time. In this case, the case is that five pipes were broken. One of these pipes was broken under circumstances merely special and exceptional, and which were undoubtedly such as to make the road authority responsible. Money was paid, and

liability admitted; and it is out of the case entirely. I do not think it can be relied on, as it seems to have been by either side, though each side seems to have made some capital out of it when it was before the Court below. The second of these cases was one in which the Master of the Rolls found, and apparently on sufficient evidence, that the immediate cause of the mischief which was done was the way in which the pipe itself had been laid, because, as I understand, it was a vertical structure of a metal character put on the road to reach the pipe below, and it was driven in like a nail or a spike driven into wood—it was driven into the pipe at the bottom by the passing of the steam-roller. The Master of the Rolls was satisfied that they had not based it on a sufficiently solid foundation, and that they allowed it to project, and anything passing over it was liable to do injury. That is out of the case on the plea that the pipe was not properly laid, or rather that the thing that damaged the pipe was not properly laid. That leaves three injuries still—one an injury to a main, and the other two injuries to service-pipes. The injury to the main occurred at a very exceptional place, because it was where the main was crossing over a bridge, and where there was no substratum for it except the masonry or the substance of the bridge itself—a place where cover of any depth would be impossible, and where the thing immediately under the pipe was so rigid as to make a fracture more easy, and where the pipe was not level. Therefore, it was a place in which every condition tended towards making it easy to injure the pipe by the passing of a great weight over it. Mr. O'Shaughnessy, in opening the case, with his usual emphasis, said his case was that they did not do it at all; that it occurred, if at all, some time shortly before, I think, the 24th of June, on which it was detected; that it was not caused by the roller, for which he sought to prove an *alibi*, going back to the 3rd or 4th of June previously.

Mr. PM: October.

Lord Justice FITZGIBBON: October. Upon that it is a mere question of evidence. I think all the probabilities are in favour of its having been broken by abnormal pressure; and the roller having been in the place, it was not unreasonable to suppose that it was broken by the roller. In no view of the case could the breaking of the pipe, situated as it was, be justified by the use of a steam-roller, unless we can go to the full extent, which we are not going to do, of the law which Mr. Collen tried to make out—that gas-pipes were to exist only at their peril on the roads under his control. A very exceptional thing would make it necessary to bring the steam-roller there at all; and if it could not be brought without breaking the pipe, it should not be brought there; and if it could be steered over the bridge without breaking the pipe, there would be no cause of action. That is the case in which it appears to me that the defence of the County Council fails. There is evidence they did the mischief—that the pipe was properly laid originally, having regard to the circumstances of the case; and therefore it gave a cause of action. Before considering whether it gave a cause of action sufficient for an injunction, we should consider what the other cases are. The two other cases are cases in which it was not the main that was injured but a service-pipe at right angles, as far as the roller is concerned, to the position of the main. These were pipes coming out of the top of the main. They are then necessarily at a higher level than the main from which they are taken. They have to cross the road transversely, and are nearer the surface. They are smaller in diameter, and they have to cross over to wherever the gas is wanted. In one of the cases, the service-pipe was not supplying gas to the house. That was the Overton case. But it was in connection with the main; and therefore damage to it would damage the main, and lead to an escape of gas. The other one appears to have been in actual use. It only requires to see them to see that each has been subjected to pressure by something with a flat surface like a roller; and I also say, from the length of the pipe, and its being perfectly straight before you come to the bend, that it was something like a steam-roller. I have no doubt that these two pipes were, one pulled out and the other practically broken by the steam-roller. There is no question at all that at the sides of the road they were improperly laid for any purposes of resisting pressure. But where they were crushed there is no evidence to lead to the conclusion that they were not well enough laid to survive a long number of years; and I think there is no possibility of doubt that there is affirmative evidence that they were injured by the steam-roller. Nor is there sufficient evidence to sustain contributory negligence by being improperly laid. We think these are three cases in each of which, *prima facie*, there is a cause of action. Then we come to the question, Is that a foundation for an injunction? In the St. Mary Abbott's case, a single instance was held to be sufficient to maintain an injunction as distinguished from damage. The question whether such an instance, or such instances, or any number of instances, is sufficient, depends on the question whether it proves that there is a likelihood of further damage. An injunction is a precautionary measure, resting on jurisdiction, to prevent future injury. I do not think it is possible reasonably to doubt that all pipes similarly situated to this main and these service-pipes would be likely to be injured by similar use of the steam-roller; and therefore the question is whether the circumstances in which they were found were of such general application as to justify so general a remedy. The question is a very definite one, and has been fully argued. It was raised in a different form. It really was whether the protection of an injunction should be given to pipes of the Gas Company that had been laid before steam-rollers were thought of—properly laid as regards the circumstances of the time, but laid under circumstances that now made it impossible to use steam-rollers without the likelihood of doing damage. On that issue our opinion, supported and sustained by the St. Mary Abbott's case, and by the judgment of the Master of the Rolls, in which I concur, must be against the defendants. They had the duty I have already defined, before they introduced any novel mode of repairing the road, to have regard to, and to respect liability to, injury of pipes which existed previously, and which were laid without reasonable anticipation that the great strain would be put on them which the new instruments introduced. For these reasons, the injunction must, I think, be sustained which was obtained in the Court below. I wish to be extremely emphatic as regards what it will not give the Gas Company. The use of the steam-roller is expressly recognized as a thing which this County Council is entitled to avail itself of. Without Acts of Parliament at all, the evidence of experts and engineers would always be admissible to show what, at a particular time, was reasonable or ordinarily accepted as a means of repairing the road. At present, having regard to Acts of



Parliament, and to what we see going on every day, roads must be made and may be repaired, if they are done economically, by means of steam-rollers; and the Gas Company must be aware, as far as my opinion can go, in the clearest language, that in everything they do now, and have done for some time past, with reference to laying gas-pipes or dealing with gas-pipes, they must do that with the knowledge, and with the consequence of knowing, that the roads are roads that are likely to be repaired, and that those who have charge of them have the right to repair them with steam-rollers, and no matter what depth they have to go they will have to go to a depth reasonably sufficient to protect the pipes from a means which is a right, economical, and lawful one—namely, that of using a machine by means of which surfaces are put on the roads more permanent, useful, and beneficial to the majority of the community than the old and less perfect methods that went before. In the St. Mary Abbott's case there was nothing contradictory to that in the judgment. When defining the duty to lay the pipes properly, the Court said, if required, they would put into the order that the protection extended to "properly laid." The words "ordinary traffic" were used; and they were used by the Court, not merely to mean passing over the road, but reasonable use of the road by those who had charge in the way of repairing or maintaining it. We wish to make the injunction more specific than the Court did; and we make it—"An injunction against using any steam-roller on any road under which the gas-pipes of the plaintiffs have been laid so as to break or injure any pipes then properly laid under such road, regard being had to what at the time of the laying of such pipes were the then ordinary traffic and the then reasonable means of repairing and maintaining the road." The now reasonable means include steam-rollers of reasonable and proper weight; and the Gas Company will understand what the extent of their immunity is. That reduces it to a question of costs. The costs in the Court below must follow the finding, because the liability was established and a decree obtained; and the question whether the costs of the appeal are to follow the costs of the Court below must depend on whether the modification that we are making in the language of the injunction is a modification of the real substance of what the parties at the time ought to have understood to be the true meaning of the injunction, which we are only making more specific and explaining. When we read the judgment of the Master of the Rolls, it is plain that he was speaking only of pipes properly laid, and that the definition of pipes properly laid was not really in controversy before him as being a thing that it was important should be defined by his order. The opening of the appeal was the opening of an appeal on the lines of getting the suit dismissed altogether—first, on the ground, in which they have failed, chiefly put forward by Mr. O'Shaughnessy, that the main in question was not broken by the steam-roller, and that the service-pipes were broken because they were not properly laid, having regard to the ordinary traffic. Mr. Healy pressed the legal point that there was a kind of immunity, such as a railway company possesses with regard to using a steam-engine without negligence, in every case in which they used the steam-roller without negligence; and that there was no negligence towards these pipes. In all these pipes we are against him; and we are not making variations in principle or fact in what ought to have been understood from the Master of the Rolls's order and what he intended. The test as to whether the costs of the appeal should follow the costs of the Court below is this, Would the appeal have been brought if the modification had been made below? If the modification had been made below, and the injunction given by the Master of the Rolls in the very words of ours, every word of Mr. O'Shaughnessy's and of Mr. Healy's arguments would have been equally addressed to us to show that the order was wrong. On this test, the costs of the appeal are really a necessary part of what the County Council must bear; and accordingly we modify the injunction by amending its terms, as I have read. But we must in other respects affirm the order, and direct the appellants to pay the costs of the appeal. And from henceforth the Gas Company had better abandon the heroic style they adopted in their correspondence, which was as monstrous an assertion of autocratic right to control and use these roads, as was, on the other hand, Mr. Collen's decision that no matter what might happen to the gas-pipes he could run the steam-roller anywhere he pleased. I hope the result of this case will be to show that the County of Dublin is not to lag behind any other place through having its roads constructed on medieval principles. And I hope that the Gas Company will be protected in the enjoyment of the profits they derive from pipes when they are old ones; but when they come to put down new ones, they will have to lay them better than the old ones, and they will have to march with the times.

#### A Question of Employers' Liability.

At the Stockport County Court on the 29th ult., before his Honour Judge Yate-Lee, sitting as Arbitrator, Michael Moran, employed as a labourer at the Stockport Gas-Works, made a claim against the Stockport Corporation, under the Workmen's Compensation Act, 1897, for 13s. 6d. per week, for injuries sustained while following his employment. Mr. A. Briggs appeared for Moran; the Town Clerk (Mr. R. Hyde) represented the Corporation. The applicant's case was that on Dec. 25 he was engaged in changing the purifiers, when the gas ignited, and he was so seriously burned that he had to be taken to the Infirmary. He had been totally incapacitated for work, and had received from the Corporation 15s. a week since the accident. His average weekly earnings during the preceding twelve months had been 27s. a week. None of the material facts were disputed; the case for the Corporation resting upon the question whether or not Moran was guilty of "serious and wilful misconduct." The Gas Engineer (Mr. S. Meunier) was called, and stated that, in his opinion, the fire which caused Moran's injuries resulted from the use by him of a lighted lamp in the purifier-house, and the opening of a wrong valve. Two other witnesses gave evidence to the effect that Moran's attention had been drawn to the danger of using the lamp when changing purifiers; while others stated that he had confessed to turning the wrong valve. It was mentioned that he was in the habit of carrying a lamp to start the engine and for other purposes. His Honour came to the conclusion that Moran's acts did not amount to "misconduct" within the meaning of the Act, and that the accident did not arise through anything he had "wilfully" done. His application must therefore succeed; and as his wages were 25s. a week, he must have 12s. 6d. weekly during the

period of his incapacity. His Honour also allowed special costs to the amount of £5 beyond the ordinary costs. The Town Clerk applied that, as the Corporation had paid Moran 15s. per week since the accident, which was 2s. 6d. per week more than the judgment to which his Honour held he was entitled, the over-payment should be considered and dealt with. His Honour said he would consider the point, but he thought to take the advantage would be hard upon Moran, who, thinking the 15s. was the amount to which he was entitled, and which the Corporation had so willingly paid, had no doubt spent it all. The Town Clerk, while pressing for it, said he did not think the Gas Committee would be hard with Moran. They might not see fit to deduct it.

#### Action in Regard to a Coke Contract.

At the Cambridge County Court, on the 27th ult., his Honour Judge Bagshawe, Q.C., and a Jury had before them an action brought by the Cambridge University and Town Gas Company against Messrs. Illsley and Son, coal merchants, for the recovery of £8 18s. 4d., damages for breaking a coke contract. The Company alleged that defendants bought 400 tons of coke from them, which they undertook to remove within a stipulated time, and that they failed to do so. Defendants counterclaimed £9 15s., alleging that the plaintiffs had not fulfilled their contract. Mr. Rayson appeared for the Company; Dr. Cooper represented defendants. Mr. Rayson, in opening the case, said the defendants entered into a contract on the 25th of January to purchase 400 tons of coke, at 14s. 3d. per ton. Defendants did not collect the whole of the 400 tons, and asked for further time; and the Company extended it from March 10 to March 25. On the 23rd, the plaintiffs gave defendants notice that, as they had not collected the 400 tons by that date, they would be charged the market price for the rest. Coke at that period was rapidly rising in value. The defendants counterclaimed £9 15s.; alleging that 65 tons were not delivered, whereas they had 350 tons. There was, in fact, a balance due to them of only 45 tons 5 cwt. Mr. R. Brown, Manager of the Company, said defendants ought to have cleared 10½ tons a day, excluding Sunday. From the date of the contract to Feb. 28, they cleared 207½ instead of 300 tons. The practice in the trade was for purchasers to take delivery daily, and in about equal quantities. The coke had to be carted away every day to prevent inconvenience. In cross-examination, witness admitted that there was no clause in any of the other contracts as to the quantity which should be cleared daily; it being, he said, an understood thing. Mr. J. H. Troughton, of Newmarket, said if the coke was not taken away within the given time it was the custom to regard the contract as broken, and not to supply the purchaser. It was generally understood that the coke was to be taken in regular daily or weekly quantities. Mr. Brooks, one of the Company's clerks, produced books showing that defendants cleared 335 tons 3 cwt. up to March 31. Defendants' carts were sent away partially empty on six different occasions between March 13 and 24, because there was not sufficient coke for them. If they had come early in the morning, when the other merchants did, they would have had their share. Sometimes they came after two o'clock, and once at four. He told them that if they wanted to be sure of their coke they must send by 7 a.m. His Honour said he should be glad if Counsel on both sides would say what they wanted to ask the Jury. At present he thought there was very little to go before them. Mr. Rayson said he wished to submit the question of the unreasonableness of the hour. He contended that the defendants were guilty of breach of custom or implied contract as to days and times of days when they should send for the coke; and therefore he asked for damages. Dr. Cooper urged that plaintiffs were guilty of breach of contract in failing to supply the 65 tons of coke contracted for when it was sent for at reasonable times. In his opinion, there was no custom binding them to take a particular quantity daily; and this being so, he asked for damages. Evidence having been called on behalf of the defendants, his Honour, in summing up, pointed out to the Jury that there was nothing in the contract about delivery per diem. As to the question of custom, was there proof that anybody entering into a written contract must be taken to know of the custom; and, if so, what damages did they find the plaintiffs had been exposed to by the defendants failing to take away their 10½ tons of coke per day? With regard to the counterclaim, the delivery was short by 65 tons. If the evidence of the witnesses that vans were sent for the coke was believed, the defendants were entitled to the difference between the contract price of these 65 tons and the market price at the time of the breach of the contract. The Jury returned a verdict for the plaintiffs on the claim and for the defendants on the counter-claim. His Honour gave judgment accordingly, and allowed the defendants the costs of the action.

#### Claim for the Supply of Electric Current.

At the Northampton County Court, a few days since, before his Honour Judge Snagge, the Northampton Electric Light and Power Company, Limited, sued Mr. George Smith Whiting for £6 17s. 6d., made up as follows: Electric current supplied from Michaelmas to Christmas, 1899, £5 4s. 8d.; rent of meter, 4s.; use of installation, £1 4s. 10d.; and quarter's rent of meter from Christmas to Lady-day, 4s. Mr. Wells, who appeared for the Company, said he understood the defendant disputed the charge, as he contended that he had not consumed so many units. Defendant said his case was that there had been great misrepresentation, which he desired to prove; and he went into figures comparing his gas and electric light bills. Mr. Wells said another grievance on the part of the defendant was that, when he had the installation put into his house and shop, it was done by the National Free Wiring Company; and he seemed to have been told that the cost of the electric light would not be more than gas. The Manager of the Wiring Company, however, had nothing whatever to do with the Electric Light Company. After hearing the evidence and defendant's statement, his Honour said there was really no defence to the action. The meter was admitted to be all right, and the contracts were before him. Mr. Wells said the defendant had been offered to have his meter tested in London; but he would not do so. His Honour said the only defence was that the defendant had to pay more than he expected. When first installed, the electric light was often dealt with as a toy; it was turned on and switched off frequently, which meant expense. After the light had been used for some time,



people became more careful. Defendant said he had done his best to economize the current. His Honour gave judgment for the plaintiffs, and ordered payment in a month.

#### Embezzlement by a Gas Collector.

At Todmorden last Thursday, Eli Crowther, aged 40, for several years collector to the Hebden Bridge and Mytholmroyd Gas Board, was committed to the assizes, charged with embezzlement and falsification of accounts.

#### The Quality of the South Metropolitan Company's Gas.

At the Southwark Police Court last Tuesday, the South Metropolitan Gas Company were summoned by the London County Council for supplying at the testing-station in Stoney Street, gas below the legal standard of purity. Defendants pleaded guilty, and attributed to the coal difficulty their failure to comply with statutory requirements. They urged that it was some years since they were convicted of a similar offence. A fine of £3 was imposed on each of three summonses, and £2 2s. costs.

#### Tapping a Gas-Main at Colne.

At Colne on Monday last week, Richard Berry, an auctioneer, was summoned for unlawfully laying a pipe to communicate with the gas supply, and also for unlawfully burning gas supplied by the Corporation. Defendant pleaded guilty. The Town Clerk (Mr. A. Varley), who prosecuted on behalf of the Corporation, said that the chief gas inspector visited defendant's house on Whit-Monday morning, and found that a piece of india-rubber tubing about 2 feet long had been connected with the main. The meter itself had been removed from its position. Defendant asked the inspector to look over the matter, as the meter had been out of order. The Bench considered the case was one of deliberate fraud, and imposed the maximum penalty of £5 and costs, or one month's imprisonment.

#### Are Gas-Stove Exhibitors Hawkers?

At the Yeovil Police Court last Wednesday the above question was raised on a charge brought against Edwin Stockdale, in the service of Messrs. John Wright and Co., of trading as a hawker without a licence between Nov. 30 and Dec. 8, 1899. The prosecution was instituted by the Inland Revenue authorities, for whom Mr. Simpson appeared; Mr. J. Trevor Davies representing the defendant. Mr. Simpson said that Messrs. John Wright and Co. were promoters of exhibitions for showing their various manufactures, and they travelled from one place to another. They came from Exmouth to Yeovil, where a Trades Exhibition was given. The Yeovil Inland Revenue officers visited it, and saw Messrs. Wright's gas-stoves exposed for sale. The firm had not a licence. The Magistrates decided that, from the facts placed before them, a licence was required; and they inflicted a fine of £5 and costs. Mr. Trevor Davies asked the Bench to grant a case, which they consented to do.

#### Contractors' Liability for Parochial Rates.

At the Uppermill (Oldham) Petty Sessions, a case of importance to contractors and rating authorities was heard a few days ago. The Overseers of Saddleworth summoned Messrs. Naylor Bros., Contractors for the new water-works for the Ashton, Stalybridge, and Dukinfield Joint Water-Works Committee in the Greenfield Valley, for payment of certain rates levied upon them. Mr. J. J. Wright appeared for the defendants. Mr. H. Whitehead, rate collector, informed the Bench that the several rates were sanitary, poor, and lighting; and the total amount due was £29 1s. 6½d. This had been demanded in the ordinary way, and payment had been refused. The defendants had had the case before the Assessment Committee on appeal, and the Committee declined to give them any relief. Mr. Wright said his answer was that Messrs. Naylor Bros. were simply licensees of the ground belonging to the Committee; and this being so, they were not liable for the rates. Supposing his clients were contractors for building a certain house in Saddleworth, and they entered the land upon which the house was to be built, they would simply be the licensees of the owner or promoter of that particular scheme for building a house. There would be no question of occupancy whatever, which was the fundamental basis upon which rates were levied. He supposed the Overseers of Saddleworth would not dare to rate any contractor under such circumstances. Mr. Justice Grove had held that a contractor could not be considered to be the occupier of land because he went upon it for the purpose of performing work under his contract. Moreover, section 133 of the Lands Clauses Consolidation Act, 1845, made special provision for promoters of such undertakings as that of the Ashton Joint Water Committee; and they were to make good the poor-rate until the works were completed. The section showed clearly that, pending the completion of the works, the contractors were not rateable. In the present case, the Overseers were actually attempting to assess movable machinery. After hearing evidence, the Bench dismissed the case, but declined to give costs. The tenants of certain huts which had been put up on the ground were then summoned for the non-payment of rates. Mr. Wright explained that these huts were built to accommodate the Contractors' men during the construction of the works, and those who used them were not inhabitant occupiers. He was content, however, to leave the matter in the hands of the Bench. The Chairman said they had decided to make an order for the payment of these rates, amounting to £1 1s. 9½d., and costs.

**Yeadon Water Supply.**—According to statements made at the meeting of the Yeadon District Council last Wednesday, members have had an interview with the Directors of the Water Company relative to the plumbo-solvency of the water; but the Directors declined to have the water chemically treated, even if the Council defrayed the cost of doing so. After hearing this, it was suggested that the only proper solution of the problem was the purchase of the works; but the Council decided before discussing this matter to lay the whole case before the Local Government Board, and ask their advice.

## MISCELLANEOUS NEWS.

### MANCHESTER CORPORATION GAS, WATER, AND ELECTRICITY SUPPLY.

At the Meeting of the Manchester City Council last Wednesday, the minutes of the Gas, Water, and Electricity Committees were presented, and those of the two first-named Committees adopted without discussion. The only item of interest in connection with the Gas Committee's recommendations was the acceptance of a tender for the supply of Junkers calorimeters to each of the works, for the purpose of testing the heating power of the gas. The Water Committee's proceedings included a resolution requesting the Finance Committee to borrow on their account a further sum of £100,000, and also a proposal to authorize the Thirlmere Sub-Committee to enter into arrangements with Mr. G. H. Hill, M.Inst.C.E., to become Consulting and Advising Engineer, and to appoint Mr. M. R. Barnett, M.Inst.C.E., to lay the second pipe from Thirlmere, and to take such other steps as might be necessary to carry out the work.

On the motion to adopt the Electricity Committee's minutes,

Dr. DREYFUS drew attention to a proposal that the Chairman, Deputy-Chairman, and five members should be appointed to visit and inspect the exhibits of electrical plant and machinery at the Paris Exhibition. It might, he remarked, be useful and instructive for a deputation to visit the Exhibition, as they could see there many things which would be of great service to them in the work of the department; but, in his opinion, a deputation of two or three members, along with the Engineer, would be quite sufficient. He therefore moved that this recommendation be referred back to the Committee.

Mr. WILSON seconded the amendment; and it was carried practically unanimously.

Alderman RICHARDS, referring to a recommendation of the Committee that a draft agreement should be sent to the Urban District Council of Whitefield, for transferring their Electric Lighting Order to the Corporation, moved, as an amendment, that this be referred back to the Committee. He said he had always been strongly opposed to spending money outside before they had developed their resources in the city itself. They should hesitate before going to an out-district like Whitefield, without seeing a probability of recouping something for the outlay. They ought to know what they would get in return. The Committee had spent a large sum of money at Chorlton-cum-Hardy, and he had not heard of more than two applications for electricity in that neighbourhood.

No seconder was found for this amendment, which was therefore not put to the vote.

The annual report of the Electricity Committee was then presented. In the course thereof, it was stated that the total quantity of electricity measured and accounted for during the twelve months ending the 31st of March was 6,468,405 units—an increase of 1,254,184 units, or 24 per cent., on the previous year. The number of consumers was 3240—an increase of 670. The total number of lamps connected was: Incandescent (8-candle power) 237,145, arc 2139; as compared with 188,999 and 1817 respectively in 1898-9. There were also in use 500 motors, representing 2050-horse power; showing an increase on the previous year of 166 motors, equivalent to 890-horse power. The maximum load at any time was 5,607,000 watts. During the year, additional mains were laid to the extent of 83,250 yards, or 47 miles 530 yards; making the total length 110 miles 45 yards. The revenue derived from sales of current, &c. (which worked out at 3.2d. per unit accounted for), amounted to £86,297; and the working expenditure to £49,905—showing a gross profit of £36,392. Out of this sum, interest on mortgage debt, &c., £14,265, and sinking fund, £12,935, had to be met; leaving a net profit of £9192. This, with the balance of £2000 brought forward, and £572 interest on the reserve fund investment, had been employed in the payment of £10,000 to the city fund and £1764 to the reserve fund. The financial position on the 31st of March was as follows: Total capital expenditure, £641,821; mortgage debt, £556,278; amount of mortgages redeemed to date by the action of the sinking fund, £49,232; balance at credit of renewals suspense account, £335; do. of reserve fund, £13,360. Owing to the necessity for renewing a considerable length of mains which had proved defective, the charge upon the revenue account for repairs and renewals of mains this year amounted to £7453, against £1495 before. In addition to this, £12,459 had been taken from the renewals suspense account to cover similar expenditure. Reference was also made to the accident at the Dickinson Street station in September last, which involved the withdrawal of £7069 from the reserve fund on account of the breakdown of plant. The parts of the two wrecked engines and one horizontal engine had since been sold, and on the available space two new direct-driven generators, suitable for lighting and tramway work, each of 1000-horse power, would shortly be erected. Very considerable progress had been made with the laying of electric mains in the districts of Withington, Moss Side, and Levenshulme. The supply of current had been available in portions of Moss Side since December, and in Withington since February. On the 30th of September, the price of electric energy to long-hour consumers was reduced from 1½d. to 1¼d. per unit; and a similar reduction was made in the price of current for motor purposes. This represented a concession of £2873 to the consumers in six months. From an appendix to the report, it appears that the department had 4523 meters in use on the 31st of March.

Alderman HIGGINBOTTOM moved the adoption of the report and accounts.

Mr. WILSON remarked that there were one or two things in the report which he did not thoroughly understand, and he should like some information on these points.

Mr. JOHNSTON pointed out that there was not a quorum; and the discussion of the report had consequently to be adjourned to the next meeting of the Council.

At a Meeting of the Gas Committee last Friday, it was reported that nearly all the contracts for coal and cannel for the ensuing year had been signed. The Committee will hold a special meeting next Thursday to consider and adopt the annual report of the Gas Department.





GLASGOW CORPORATION GAS SUPPLY.

New Gasholder Completed—Erection of New Gas-Works Commenced.

Last Wednesday, on the invitation of the Gas Committee of the Corporation of Glasgow, a party of about 200 citizens attended what was popularly described as a small gas function. The Caledonian Railway Company placed at the command of the Committee a special train of most luxurious carriages, in which the several journeys of the day were performed. Meeting on the platform of the Low-Level Central Station, the party travelled by the underground railway to Dawsholm, and thence over a short service into the Temple Gas-Works. When they alighted on the temporary platform which had been erected, they were in close proximity to the large new gasholder which is now all but completed. On the lofty standards of the guide-framing—which rise to a height of 150 feet—flags were flying. Several plates remain to be fixed in the crown, and through the space which they are to occupy a staircase was constructed leading to the floor of the tank. The only daylight which penetrated the interior was by the entrance and by a manhole. There was a row of incandescent gas-lamps at the far side, but so great was the distance, and so numerous the pillars supporting the timber work on which the crown rests, that they had little effect when the company first set foot on the bottom. A weird effect was produced, calculated to give rise to imaginings; but this was not the purpose of the visit. Mr. W. Foulis, the Gas Engineer to the Corporation, when all had gathered within the lamp-lit space, in a few words explained the working of gas-holders, introducing his remarks with the observation that they were met in a place where they had never been before, and where certainly they would never be again. The gas, he said, would enter and leave the holder by pipes 3 feet in diameter. The weight of the holder would exert a pressure upon the gas equal to 45 lbs. per square foot. The holder was 240 feet in diameter, and each of the three lifts was of the depth of 42 feet. It was the second largest of three holders which the Corporation had erected during the last eight years; the largest being one adjoining; and the other being at the Tradeston works. It may be

stated that the foundation for this three-lift gasholder is on the solid rock, to reach which there was much quarrying of stone of a loose description. In consequence, the cone which has been left is not of the usual symmetrical proportions, but slopes towards one side. As in the other large holders which Mr. Foulis has built, the timber-work beneath the crown will be left in. It is of a very substantial nature. For its support a great number of brick pillars have been erected, in a series of concentric rings. It is almost needless to say that the interior, with its labyrinth of brick and wood work, was a mystification to nearly everyone present.

As the company took their seats in the train, a pamphlet containing the following statement was handed to them: The gas-works have now been in the possession of the Corporation for thirty years. At the commencement of that period, the quantity of gas made per annum was 1296 million cubic feet. During the financial year just ended, the production of gas amounted to 5900 million cubic feet. The increase during each decade is shown in the following table:

Year.	Cubic Feet Manufactured.
1870	1,295,863,000
1880	1,859,582,000
1890	3,058,277,000
1900	5,969,110,800

The existing works have been extended from time to time to meet the increasing demand, until there is now no room for further extension. The necessity for the construction of new gas-works has been evident to the Gas Committee for the last five or six years; and during that time the suitability of a considerable number of sites has been carefully considered. The principal difficulty experienced in the selection of a site arose from the necessity of getting a piece of ground of sufficient extent entirely free from coal workings. In 1898, it was decided to select a site at Provan—which included the lands of Easter Blochairn and a portion of Blackhill and Germiston Estates—as being on the whole the most suitable; and a Bill was introduced into Parliament in the following session to empower the Corporation to purchase these lands and to erect gas-works thereon. The Act was obtained in August, 1899. The area



of the site is 131 acres. It is conveniently situated for both railway and canal communication. The levels are somewhat irregular; but advantage will be taken of the difference in levels to facilitate the transference of material. The coals, lime, &c., will be brought in at a high level, and the coke and other materials sent away at a low level. The works, when completed, will be in four sections, each section forming an independent works, which will be capable of manufacturing 12 million cubic feet per day, or a total of 48 million cubic feet. Only the first section will be constructed at present. This will consist of two retort-houses, 390 feet long by 78 feet wide, each containing 720 retorts; a coal-store, having a capacity equal to 50,000 tons; a purifier-house, 503 feet long by 89 feet wide; also exhauster and meter houses, offices, workshops, &c., and all the necessary apparatus. There will likewise be two gasholders, each capable of containing 8½ million cubic feet. The works have been designed, and mechanical appliances will be introduced wherever possible, so as to reduce the cost of manufacture in every department. A works for distilling tar and ammoniacal liquor will be erected at the north-east corner of the site. The tar and liquor will be pumped direct from the gas-works to these works as produced. Railway siding accommodation will be provided sufficient to deal with 4000 tons of material daily. The total length of railway lines inside the works will be about 8 miles; and in addition there will be about 5 miles of 2 ft. 6 in. gauge lines for conveying coke, waste lime, &c. It is hoped that the first section of the works will be completed in three years; and every effort will be made to accomplish this, as, at the present rate of increase, the producing power of the existing works will be completely exhausted before that time.

After a pleasant journey by the north side of the city, the party alighted at the site of the new gas-works at Provan. There they found that an elaborate system of wooden gangways had been laid down. A few yards off was a plank with a barrow. Thither repaired Lord Provost Chisholm, ex-Bailie R. M. Mitchell, Mr. Foulis, and Mr. R. M'Alpine, sen., of the firm of Messrs. M'Alpine and Sons, the Contractors for the whole of the excavation and structural work of the new works. Mr. Foulis said he did not know that it was necessary that he should make any lengthened remarks describing the works, because there had been put into their hands a short description of them; but he thought he might point out that the position they were in at that moment was on the edge of one of the gasholders which they intended to construct. The capacity of this gasholder, they would see from the description, would be from 8½ to 9 million cubic feet. The ceremony of cutting the first sod was performed by Lord Provost Chisholm; ex-Bailie Mitchell, the Convener of the Gas Committee, wheeling the barrow and tipping the contents—over the side—amid cheers. Thereafter Mr. M'Alpine presented the Lord Provost with a beautiful silver-gilt spade, bearing an inscription, and ex-Bailie Mitchell with a solid silver, heavily-chased, punch bowl, with a similar inscription, as mementoes of the occasion. Both gentlemen suitably acknowledged the gifts.

Since they purchased the site, the Corporation have been fortunate in discovering a valuable seam of clay in it, out of which they are making all the bricks which will be required in the erection of the works. The company proceeded to inspect the brick-making process. There are two machines, by Messrs. Bradley and Craven, of Wakefield. The clay is first dried on the floor of a shed, which is heated by the waste steam from the engine. It is then ground in three rolling mills, elevated to the flat above, and sent down to the machines, where it is moistened, worked, and pressed into bricks, the machines working continuously and without noise. By the two machines working night and day, 40,000 bricks can be made in 24 hours. Women take them away from the machines and wheel them to the kilns, of which two have been erected on the Hoffman principle, each containing 14 chambers. The bricks are of a hard and compact nature when fired, and are expected to be very durable. Messrs. M'Alpine and Sons' contract amounts to £200,000. The ironwork has still to be contracted for.

Thereafter luncheon was served in the drying shed of the brick works, which was profusely decorated for the occasion. After the customary loyal and national toasts,

The Lord Provost proposed "The Gas Committee, and prosperity to their new undertakings inaugurated to-day." It was now, he said, thirty years since the Corporation of the city of Glasgow undertook the manufacture of gas. Prior to that time the concern was carried on by private Companies working only for private profit. At that time, in the year 1869, the Corporation of Glasgow bought over the Companies that were then existing; and since that date had carried on the enterprise for the sole benefit of the citizens of Glasgow. It was very interesting and instructive to note one or two points of difference between then and now. The price of coal to-day was rather more than double the price it was in 1869; but the price of gas, which in 1869 was 4s. 7d., was to-day 2s. 2d. So that, in spite of an increase of more than 100 per cent. in the price of coal, there had been a diminution of more than 100 per cent. in the price of gas. If anything more than this needed to be said in token of the excellent work which the Gas Committee of the Corporation of Glasgow had carried on, he did not know what that thing could be. And while this was so, the mere statement of the figures did not by any means convey the importance of the truth which the figures set forth; for it was difficult to imagine what an advantage it had been to the city in having the streets better lit and all the common stairs compulsorily lit, and in having cheap gas provided for those smaller manufacturers who find that gas-engines suit their purpose admirably. Thus, by the success of their labours, the Gas Committee had done not a little to foster the trade and commerce and general well-being of the city. No wonder if, when these things were so, the consumption of gas had increased to such an enormous extent as the little pamphlet which Mr. Foulis had put into their hands showed. In the year 1870, 1,295,863,000 cubic feet of gas was manufactured; whereas in 1900 it was 5969 millions, and he could not tell how many hundreds of thousands. He had not only to propose the Gas Committee, but he had to propose prosperity to their new undertakings now inaugurated. They had had the pleasure of visiting the enormous new gasholder at Dawsholm; and they had taken part in inaugurating this fresh undertaking of an entirely new gas-works at Provan. He thought these enterprises demonstrated the courage of the Gas Committee and their Engineer, and of the Corporation, in facing such an enormous expenditure, although irrespective of the booming of the electric light which was going on all over the city and over the land; and he was satisfied that the courage which the Engineer and the Committee and the Corporation

had manifested would be abundantly justified by the result, and that in the years to come they would have simply a repetition of the continual growth and progress of their gas-works to chronicle—that gas would not be displaced by electricity, but that there was room in the city for both.

Ex-Bailie MITCHELL, in acknowledgment, said they all rejoiced to see their worthy Lord Provost there. He felt that, perhaps, the Lord Provost had said too much about the Gas Committee. Whatever might have been the shortcomings of the Gas Committee, he thought they might justly claim to have done a little towards the prosperity of the city. He might even go the length of saying that, till recently, the Gas Committee had been rather a popular one—popular in this way, that every year they had been able to give a record of success in their working. The Corporation had not much time to deal with their successes; they had been received with satisfaction, he believed, but very quickly disposed of, and the energies of the Corporation had been directed in picking holes in matters which had, perhaps, not been quite so successful. Unfortunately, to-day they were under a cloud. Ever since he had been in the Corporation, only once had the price of gas been raised, thanks to the wonderful efforts of the Gas Committee. So far as he could remember, from 3s. 6d. per 1000 cubic feet they had reached the very modest rate of 2s. 2d. Perhaps the citizens had not taken advantage of the 2s. 2d. as much as they ought to have done; but now they were compelled to increase the price by a few pence, though he did not yet know how much. Some people thought the gas should never go up, but always come down; others thought that some dreadful mismanagement must have taken place, and that they must have a new Convener. There were some people, he believed, who were willing to accept the office; and he had only to say that if it was on a rising market, he would be very glad to let them have it. It was not their fault that the price of gas had gone up. He believed that their efforts had been more assiduous during the past year than they ever had been. He thought that their Engineer had been doing even more than his best in order to economize, to keep down the price of gas; but there were other influences abroad. Of course, the hope among people was that this time of abnormal prices would soon cease; and he was sure he joined with them—at least, as Convener of the Gas Committee. He was sure they would be astonished to see there that they had in view a great new enterprise. It required, as the Lord Provost said, some courage to face it; and he thought it needed some confidence in their Engineer that they were going on with it. They had been told that by-and-bye they should be snuffed out by the electric light. Their Electricity Committee was a very useful one, and a very distinguished one. They had lighted a good many houses and warehouses, and so on, in the city, to the satisfaction of the owners; and they wished them every success. In all great communities it had been found that the progress of electricity and the progress and prosperity of gas went hand in hand. He trusted that this would be so in the future, and that they would be able to congratulate each other that the profit of the one had been to the advantage of the other.

Bailie FIRE proposed "The Engineer of the Department." He said there were four departments which might claim to hold a prominent place in the Corporation—the Water, the Electricity, the Tramways, and the Gas. These were all commercial departments, which might claim to be profit-earning departments. Possibly some critics might say that they should be left entirely to private enterprise; but they said that these were the departments which belonged to the citizens of the Municipality, and they believed that in taking these four spending departments in hand they had done a great work for the citizens. It was an honour to propose the health of Mr. Foulis, the Gas Engineer. Mr. Foulis had been their Engineer during the whole time the Corporation had owned the gas undertaking; and he had risen to the occasion. The duties which he entered upon in 1869 were comparatively small. The revenue then was somewhere about £235,000 a year. In the year that had just closed, the returns would show a revenue of about £770,000. Thirty years ago their expenditure upon works had been somewhere about £535,000; now they had spent close upon £1,500,000 irrespective of the work they were now beginning. They had reduced very considerably the price of gas; while at the same time they had written off for depreciation over £1,000,000, and set apart a sinking fund of £347,000. They were indebted to Mr. Foulis for a great part of what he had mentioned. He had been the backbone of the work since he came among them thirty years ago. And they had had services from him, not only of a clerical character, but a great part of his work had been thorough brain work—engineering work. During the whole of these years, they had not invited the assistance of outside engineering in order to extend their great works, or to build the large works they were now entering upon. The whole of the engineering work, the brain work, the skilled work, had been done by Mr. Foulis, and by the staff under his control. He said, therefore, that in Mr. Foulis they had a public servant who had given them a noble and splendid service. They wished him health and prosperity, that he might be spared to see the completion of these works, and that they would be carried out in the spirit which had been voiced by the Lord Provost and Mr. Mitchell.

Mr. FOULIS, in responding, said he thought that there was nothing that stimulated and encouraged a public servant, or indeed any man, more than to feel that he had the confidence of those who employed him, and that his work was appreciated, whether that work was great or small. And he could assure them that their appreciation of any efforts that he had made to develop this great undertaking would simply have the effect of stimulating him to greater exertions in the future. There was no use denying that the works inaugurated that day were very extensive. They were works which, when completed, would make rather more gas than the whole of the stations they now had in Glasgow. At present their works were capable of making 33 million cubic feet of gas a day; those just inaugurated would be capable of manufacturing 48 million cubic feet a day. This seemed a very large quantity. Forty million cubic feet a day meant a consumption of considerably over 4000 tons of coal per day, and with coke and other materials it meant the transference and the dealing with something like 6000 tons of material every day. It might be thought that they were looking forward to a very large prospective increase; but if the figures he had given were looked at, it would be seen that in the last ten years they had exactly doubled the consumption. So that, if the consumption went on increasing in the same ratio, ten years hence the works now inaugurated would be no more than capable of supplying the town.



Then it might be thought that electricity and other means of lighting would probably check the consumption of gas. This was not the experience of any town either in this country or on the Continent, and more especially on the Continent, where electricity had been developed at a rate much greater than in this country. The gas companies and corporations had not been able to build gas-works as fast as was necessary to meet the demands. He believed that the same thing would be experienced here; and he had no doubt that the Corporation would have to go on building as fast as ever they could. The designing of such a work had been a matter of very great consideration. It was not an easy task to start on a piece of ground and lay it out so as to produce work which would be satisfactory to the Corporation, and which, he hoped, would be a credit to himself; but the matter had been very carefully considered, and he had no doubt they would find when these works were completed that they would give every satisfaction.

Other toasts were given; and the party then travelled to the Central Station, where the day's proceedings came to an end.

### THE NEWCASTLE AND GATESHEAD GAS COMPANY AND THEIR EMPLOYEES.

#### Award of the Umpire on the Wages and Holidays Question.

Our readers may remember that in November last the National Amalgamated Union of Labour made application on behalf of the members employed at the Elswick and Redheugh works of the Newcastle and Gateshead Gas Company for certain advances of wages and other alterations in the terms of their employment, as follows: (1) Retort-house men employed at carbonizing, 1s. per shift advance on the present rate of wages; double time for Sunday work for all three shifts; double time for Good Friday; 14 days' holiday without loss of pay; and all casual or winter hands to receive holiday pay at the same rate. (2) Yardmen, an advance of 10 per cent. on the present rate of wages, with double time for Sunday work; one week's holiday without loss of pay, and all existing privileges. (3) The men in the sulphate of ammonia house to have an advance of 10 per cent. on the present rate of wages, and one week's holiday without loss of pay. On the 10th of February last, as stated in the "JOURNAL" at the time, it was agreed between the parties that the Company should grant to the workmen an advance of  $2\frac{1}{2}$  per cent. upon their then present rate of wages, such advance to take effect from the 1st of February, and that the remainder of the claims should be settled by arbitration; the court to consist of an Arbitrator on each side and an Umpire, the latter appointment to be made by the Board of Trade under the Conciliation Act, 1896, in the event of the Arbitrators failing to mutually agree on this matter. The Company appointed Mr. T. Newbigging; and the workmen, Mr. Alexander Wilkie, of Newcastle, the Secretary to the Shipwrights' Society, as their respective Arbitrators; and as they failed to agree as to an Umpire, the Board of Trade appointed Mr. George Ranken Askwith, of the Temple, Barrister-at-law. The court sat in the Board-room of the Company on the 17th and 19th of May—Mr. R. W. Cooper appearing for the Company, and Mr. E. Clark on behalf of the workmen—when oral and documentary evidence was brought forward by both parties. The court sat again in London on the 29th of June, when the Umpire heard the arguments of the Arbitrators, and on the 3rd inst. he issued his award, as follows: "(1) With respect to the claim of the retort-house men employed at carbonizing for double time on Good Friday, I allow the said claim. (2) I award and determine that the existing conditions of Sunday work for the retort-house men and yardmen shall remain unchanged. (3) I award and determine that the existing conditions of holidays for the retort-house men and yardmen and men in the sulphate of ammonia house shall remain unchanged. (4) I award and determine that the present rate of wages, in addition to the  $2\frac{1}{2}$  per cent. already agreed to, shall be increased from the 8th day of February, 1900 (the date agreed to), by a further amount of  $1\frac{1}{2}$  per cent. for the retort-house men employed at carbonizing and the yardmen and the men in the sulphate of ammonia house."

### SALFORD CORPORATION GAS UNDERTAKING.

#### Annual Report—The Coal Contracts.

At the Meeting of the Salford Town Council last Wednesday, the annual report of the Gas Committee was presented. It stated that the business of the department continued to advance; the increase for the year ended March 31 last being equal to 10.89 per cent. The coal and cannel carbonized during the year amounted to 147,181 tons; and the quantity of gas made was 1,539,374,000 cubic feet, of an average illuminating power equal to 19.44 candles. The cost of coal was considerably more than in the previous year; but the receipts from the sale of coke, tar, and sulphate of ammonia had greatly increased. The works and plant had been maintained in a thoroughly efficient condition; and arrangements had been made to increase the size of the trunk main supplying the Broughton district. Resolutions were submitted confirming the recommendations of the Gas Committee with respect to the acceptance of tenders for the supply of coal to the gas-works and other departments. Mr. Thompson said he would like to know, in view of the increase in the price of gas, what was the extra amount that was being paid for coal. Alderman Phillips (the Chairman of the Gas Committee) stated that the amount was between £20,000 and £30,000. Mr. G. T. Jackson complained that the resolutions did not state the amounts of the tenders. He thought that, when the Council were asked to vote for large sums of money, they should have the figures before them. He had been told that even in Committee the figures were seldom given. Alderman Phillips demanded to know Mr. Jackson's authority for making this statement. Mr. Yearnshaw remarked that the prices were always tabulated and read out to the Committee. Mr. Jackson said he had made no charge, and was quite satisfied with the disclaimer. Alderman Phillips said he was not permitted to state publicly the prices which were paid for coal. The Council had decided this; the reason being that the Gas Committee was a trading committee. The prices, however, would be found tabulated upon the paper which he held in his hand; and any member of the Council could inspect it. Full publicity was given in the Committee to all facts and figures. The resolutions were carried.

### THE TRANSFER OF THE PORTLAND GAS-WORKS TO THE LOCAL AUTHORITY.

Our readers will doubtless remember that some short time ago negotiations were set on foot for the transfer of the Portland Gas-Works to the Urban District Council. Mr. W. A. Valon was consulted on the matter, and eventually purchase was agreed upon at his valuation—£28,656—and a Bill is now in progress to sanction it. As at present arranged, the works will pass into the hands of the Council on the 1st of October, and come under new management. It may therefore not be out of place to briefly review the progress of the undertaking in the 6½ years during which the present Manager (Mr. C. Jeffery) has been associated with it. When he took up his duties, the annual make was 10 million cubic feet; it is now 17½ millions. The leakage account, which was large, owing to the scattered nature of the district and traction-engines passing up and down the streets with heavy loads of stone behind them, has been reduced by about half. This economy must have been effected with some difficulty, for there is also a 15-ton steam-roller used on the streets, and as many as four mains have been broken in one week. Portland being a very hilly place, much care has been required to regulate the pressure, and Cathels governors have been fixed in various parts of the district. In the above-named period, the gas-stove business has been introduced; and at present the Company have in use 168 of Fletcher's cookers. Two years ago they adopted penny-in-the-slot meters, and of these there are 86 fixed. The number of meters has risen from 252 to 508; and that of the public lamps from 163 to 186. Of course, various extensions have been carried out, comprising a set of three 10-foot square purifiers, a gasholder to contain 70,000 cubic feet, and a 4-horse power Crossley gas-engine to drive the exhauster. A good deal of the Company's success as regards extra consumption may be attributed to the way in which the consumers are looked after. At the commencement of the warm season, the Company send round men to examine the cooking-stoves; and if any repairs are required, they are executed free of cost, and the stoves put in thorough working order, so that there can be no complaints as to insufficient supply of gas. When the dark days set in, an examination is made of the fittings; and the Company do any slight repairs necessary, and supply the consumer with suitable burners free of charge, so as not to leave them in the hands of local fitters. This system has been found to pay better than anything else. The Council will take over a concern which has gradually been improved; and it will be for them to follow the course which has led to its present prosperity, and adopt such changes of policy as they may be advised to increase it in the future.

### PROPOSED SECOND GAS AND ALLIED TRADES AND ACETYLENE EXHIBITION AT THE AQUARIUM.

In view of the success which attended the first Gas and Allied Trades Exhibition, held at the Royal Aquarium, Westminster, at the close of the past, and early in the present year, the management are making arrangements for holding a second, from Dec. 21 next to Jan. 22, 1901. The exhibits will comprise appliances for the production, storage, conveyance, measurement, and consumption of gas, and its utilization for cooking, heating, and motive power, including traction. All kinds of apparatus for showing the different systems of gas lighting—comprising compressors, incandescent mantles, and burners—as well as art metal work in connection therewith, will be on view. It is intended to make a special feature of the acetylene section of the exhibition, for which, if necessary, the St. Stephen's Hall (adjoining the Aquarium) will be reserved. Appliances for the generation, purification, and consumption of acetylene gas will be shown, and its applicability for railway carriage as well as ordinary lighting demonstrated. It is proposed to have the appliances in this section tested by experts during the exhibition, and gold, silver, and bronze medals, and possibly diplomas, will be awarded for the most efficient. As the exhibition will open after the great show in Paris is closed, it is anticipated that many of the firms exhibiting there will transfer their articles to the Aquarium direct. This building possesses, as was proved early in the year, special advantages for having such a display as that now projected—the position being central, and the main hall particularly well adapted for showing off all kinds of illuminants; and the hope is entertained that, in addition to the original exhibitors, many firms unable to be associated with them on the first occasion will be represented on the second. The organizer of the exhibition is Mr. M. J. G. Ritchie, Royal Aquarium, S.W.

**Water-Gas Plant for Darlington.**—At the meeting of the Darlington Town Council last Thursday, the report of the Gas Committee stated that the Engineer had reported that, in his opinion, a new gasholder, costing £30,000 should be obtained, and that a carburetted water-gas plant should be erected. Alderman Barron moved that application be made to the Local Government Board for power to borrow £8000 for the purpose of installing the water-gas plant. Some of the councillors wished the matter to be postponed for further consideration, as the medical faculty in the town were opposed to water gas on sanitary grounds. The matter was adjourned for a week.

**No Increase in the Price of Gas at Tipton.**—At the last meeting of the Tipton District Council, Mr. D. Hipkins made a statement which the gas consumers have no doubt received with pleasure. He said that gas corporations all over the country were raising the price of gas; this being found necessary in consequence of the increase in the price of coal, which amounted to about 25 per cent. Their own gas-works last year returned, after paying principal and interest on loans, a profit of £800, which was applied to the reduction of the rates. The expenditure on coal had advanced £2000 per annum; but they anticipated an increase in the value of the residuals. The works were not started with a view to profit so much as the advantage of the parishioners; and the Committee had thought it desirable that the gas consumers should have the benefit, and had decided that there should be no increase in price during the next twelve months. If residuals advanced in value to the anticipated degree, they would still have a profit.



## THE RATING OF PUBLIC COMPANIES.

The following is practically the full text of the memorandum on the above subject prepared by Mr. H. Wilkins, Secretary of the Lambeth Water Company, for the Royal Commission on Local Taxation, and referred to in the letter from him which appears in our "Correspondence" columns to-day. It will be seen that it contains the proposition for making gross profits the basis of rating, to which allusion was made at the close of Mr. F. J. Bancroft's paper on "The Rating of Water Undertakings" read at the recent meeting of the British Association of Water-Works Engineers, and given, with the discussion thereon, in the "JOURNAL" last week.

The foundation of the present system of local rating generally was laid in 1601, when the Poor Relief Act was passed; one of its provisions requiring the Overseers to levy a poor-rate by taxation of every inhabitant, &c., in such competent sum or sums of money as they shall see fit. Early poor-rates appear to have been levied according to the assumed means of the person assessed; but the necessity of some principle being adopted soon became apparent. Judicial decisions limited liability to the poor-rate to permanent residents having visible property in the parish; and, legally, personal property was liable to be rated until 1839, although in practice it had then long ceased so to be. It was also judicially decided that the rate must be equal, and that all must be rated on the same principle. With regard to other local rates, the Legislature appears to have recognized the equity of assessing property in proportion to the benefit derived by the property assessed from the expenditure of the moneys raised. Thus, by the Lighting and Watching Act, 1833, owners and occupiers of houses are to pay a rate in the pound three times greater than the owners and occupiers of land; and the same principle is observed in the Public Health Act, 1875. Public companies have reason to complain (1) that rates are not levied on the same principle in their case as in others; and (2) that they are rated far above the benefit they can by any possibility derive from the expenditure of the local rates. Their grievance is now very substantial, because they have no control over local expenditure, being even deprived of votes for members of Local Boards; and local rates have, of recent years, in many cases doubled, and in some more than trebled in amount.

As to the first cause of complaint, the undertakings of companies are assessed upon income, which is not the principle adopted for assessing manufacturers' and traders' premises generally. Machinery and apparatus, too, which are required for the purposes of their business, are assessed; while coffee-mills of grocers, show-cases of jewellers, vats of brewers, and machinery and apparatus required for some other businesses, are exempt. Again, although a main laid underground derives positively less benefit from the local rates generally than lands—used as market gardens, for instance—it is actually assessed at three or four times the amount. This cannot be said to be equal rating, or rating on the same principle. As to the second cause of complaint, it is manifest that a pipe laid underground cannot derive the same benefit from police or education rates, for example, as a house of equal value full of valuable goods requiring to be guarded, or of children to be educated. But in practice the main is assessed at least upon the same basis. In order to carry out the principle of contributing according to benefit, underground works, which cannot possibly derive the same benefit as inhabited or business premises, should be assessed at a lower pound rate—in fact, the principle of rating lands and railways under the Public Health Act, 1875, should be extended to works of this nature.

But in addition to suffering from inequality before the law, companies are seriously hit by the practice which has gradually grown up, in spite, as will hereafter appear, of protests of the Courts, of estimating the gross annual value, which is the basis of assessment, upon imaginary figures. The law is simplicity itself. It merely requires such concerns to be rated on the basis of rental value, exactly like any other hereditament. But the difficulty is to apply the law equitably to various classes of property for which no rent is, or is likely to be, paid or offered. The first step is to ascertain the gross annual value, which is defined by law as being "the annual rent which a tenant might reasonably be expected, taking one year with another, to pay for a hereditament, if the tenant undertook to pay all usual tenant's rates and taxes and tithe commutation rent-charge, if any, and if the landlord undertook to bear the cost of the repairs, insurance, and the other expenses, if any, necessary to maintain the hereditament in a state to command that rent." The rateable value is such annual rent, "after deducting therefrom the probable annual average cost of the repairs, insurance, and other expenses as aforesaid." On this rateable value the property is to be assessed to the local rates.

It is submitted that the custom of assessing the undertakings of public companies on the basis of income is contrary to the intentions of the Legislature, and that it is distinctly the duty of rating authorities to ascertain the annual rent which a tenant might reasonably be expected to pay. The question is, How is this to be done? If a yearly tenant could be found for an undertaking of such magnitude and offering such contingencies as a London Water Company, for instance, he clearly would not pay a rent which did not leave a sufficient margin to cover expenses, interest on his working capital, risks of various kinds, and personal remuneration proportionate to the extent of the business. As an actual tenant is not forthcoming, a hypothetical tenant is now created, and the rating surveyor comes in with a whole host of hypothetical figures. By disallowing expenses incidental to every-day trading, which ought to be deducted and excluded from rating, and by adopting arbitrary and capricious methods of calculating tenant's interests and statutable deductions, the surveyor is able to calculate a hypothetical rent at a figure approximating (or even exceeding) the gross profits. It surely was never the intention of the Legislature to subject public companies alone to a local as well as to a national income-tax.

In the absence of an actual rent, how, then, can an assumed rent be arrived at on some uniform and intelligible principle? Capital outlay alone, or income alone, would not serve as a satisfactory basis, even if it were legal, because outlay and income do not always stand in the same ratio. A landlord might be content with a well-secured clear 4 per cent. on his outlay, while a tenant might be willing to pay more or decline to pay so much according to the return he can see upon his capital and labour. An analogy may be found in house property. A shop affording additional

facilities for trade, such as a return frontage or a back entrance, may command a higher rent than a shop which cost considerably more to build but does not possess these facilities. But it must never be forgotten that it is rental value and not profit which legally forms the basis of assessment in all cases.

What is required is not to create a hypothetical tenant and estimate the rent he can afford to pay, but to ascertain the rent which a tenant may reasonably be expected to pay. This point seems to be generally overlooked by rating surveyors, who, moreover, take extraordinarily divergent views of apparently simple facts. Everybody who has had practical experience in the rating of the undertakings of public companies will appreciate the truth and force of the observations on this point made by Mr. Loveland Loveland in delivering the considered judgment of the County of London Sessions, on April 6, 1897, in the case of *The London and India Docks Joint Committee v. The Assessment Committees of the Poplar and Woolwich Unions*, as reported in "The Times" of the following day. He said:

In these cases, as in many other rating appeals which have been tried before us, we have had very little assistance from the valuers of the respective parties. First of all, in the Poplar Union, the present net rateable value appealed against is £61,200, whereas in the respondents' case the figures for the rateable value amount to £99,598. Mr. Eve (one of the surveyors called) puts these figures at £86,805, although five years ago it was agreed that this Court should assess the property at £54,315. On the other hand, the appellants were willing before the Assessment Committee to compromise and settle the net rateable value at £51,328 for the parishes in this Union; but here the appellants have asked for the assessments to be reduced to £35,000 rateable, and their valuers afterwards gave evidence that these hereditaments ought only to be assessed at £16,127. In the Woolwich Union case, we find the respondents have more than doubled the old assessments for the part of that system now under consideration, which stood in 1890 at £10,375 gross and £7500 rateable, but now appear in the rate-books at £19,375 gross and £15,500 rateable. The appellants are desirous of being assessed at £10,465 gross and £7500—practically the old figures. Of course, the valuers on both sides in this case also gave evidence of figures which would show a good margin on behalf of their respective clients. Secondly, we find that the valuers for the respective parties have not valued on the same basis. They have worked out their figures on different principles; and we disagree in some points with each mode of calculation.

The views of Mr. Loveland Loveland are by no means either novel or peculiar to himself. As far back as 1859, Mr. Justice Wightman, in the case of *Regina v. West Middlesex Water-Works Company*, expressed a hope that the Legislature might make some provision adapted to the rating of such companies by declaring the principle upon which they are to be rated, and establishing some uniform and practical mode of carrying that principle into effect. In 1863 the Court of Queen's Bench, constituted of Lord Chief Justice Cockburn and Justices Crompton, Hill, and Blackburn, in the case of *Sheffield United Gaslight Company v. Overseers of Sheffield*, while following the decision of the Court in the case of the West Middlesex Company, with some hesitation, referred to and emphasized the remarks of Mr. Justice Wightman in that case; remarking that the rule they felt bound to adhere to does not seem strictly theoretically right, and that they agreed with him in thinking that it is practically impossible to satisfactorily apply the Parochial Assessments Act to such properties.

It is evident, therefore, that the Courts, as well as companies, and no doubt rating authorities, would welcome an alteration in the existing practice which would simplify the mode of calculating or arriving at the rateable value.

After careful consideration, and in the light of experience, both from a rating authority's and a company's point of view, I venture to suggest that the system of rating the undertakings of companies would be placed upon a simple and intelligible basis, in entire conformity with the spirit of the existing law, if the gross annual value were to be calculated at a specified percentage on the capital outlay (or on so much thereof as represents property which is legally rateable), varying according to the amount of gross profits. The following scale would meet most if not all cases, although it is possible that different classes of property might require different scales, which could be fixed by rules of Court or by the Local Government Board: If the average gross profits do not exceed 1 per cent., the gross annual value to be taken at 3 per cent. on the rateable capital outlay, and for every additional 1 per cent. of gross profits the gross annual value to be increased by  $\frac{1}{2}$  per cent. on such capital outlay. If it is thought that more frequent variations in the scale would be more equitable, every  $\frac{1}{4}$  per cent. of profit might increase or reduce, as the case may be, the percentage on rateable capital outlay for calculating the gross annual value by  $\frac{1}{8}$  per cent. The scale, at variations of 1 per cent. in the profits, would work out as follows:—

Gross Profits not exceeding	Gross Annual Value.*	Gross Profits not exceeding	Gross Annual Value.*
1 per cent.	3 per cent.	6 per cent.	4 $\frac{1}{2}$ per cent.
2 "	3 $\frac{1}{2}$ "	7 "	4 $\frac{3}{4}$ "
3 "	3 $\frac{3}{4}$ "	8 "	4 $\frac{7}{8}$ "
4 "	3 $\frac{7}{8}$ "	9 "	5 "
5 "	4 "	10 "	5 $\frac{1}{4}$ "

In order to arrive at the "rateable value," the cost of repairs, insurance, &c., must be deducted from the gross annual value. For mains 10 per cent., for buildings from 15 to 20 per cent., and for machinery from 20 to 25 per cent. of the gross annual value might perhaps be taken as a fair average. It is therefore suggested that an all-round deduction of (say) 15 per cent. should be made.

Having thus arrived at the rateable value of the undertaking as a whole, the next step is to divide the rateable value between works and what are commonly described as "dead mains" (including trunk mains) and directly productive mains. It is suggested that the rateable value of works should be taken at 4 per cent. on the capital outlay—the balance being the rateable value of productive mains. Capital outlay, it is suggested, is the most equitable basis that can be adopted for the valuation of works—firstly, because it represents actual and not imaginary figures; and, secondly, because lands, &c., have, speaking generally, been acquired under parliamentary powers, and therefore never below ordinary market value. It may be added that the works have not uncommonly been con-

\* To be calculated at per cent. on rateable capital outlay.



structed piecemeal, and therefore probably at a somewhat greater expense than if they had been constructed at one time. Alterations and additions are notoriously costly.

The following hypothetical case will illustrate the application of the foregoing suggestion: Suppose an undertaking has cost £1,860,000, is situate in 25 different parishes, has a gross revenue of £270,000 a year, and earns a gross profit of £149,000 a year. A gross profit of £149,000 is just over 8 per cent. on a capital outlay of £1,860,000, so the gross annual value would be 5 per cent. on the capital outlay, or £93,000. Allowing a deduction of 15 per cent., the rateable value would be £79,050. This would be apportioned as follows:—

Station A	cost £120,000, at 4 per cent.	=	£4,800
B	" 90,000 " "	=	3,600
C	" 300,000 " "	=	12,000
D	" 50,000 " "	=	2,000
E	" 30,000 " "	=	1,200
F	" 10,000 " "	=	400
Trunk mains	" 200,000 " "	=	8,000
<hr/>			
Total rateable value of works			£32,000
Leaving for productive mains			47,050
<hr/>			
Rateable value of whole undertaking (as above) . £79,050			

The stations would be assessed at their respective rateable values in the parishes in which they are severally situate. The rateable value of the trunk mains would be divided according to their size and length in the several parishes, as represented by original cost; and the productive mains would be apportioned, as now, according to the revenue derived from the several parishes. It will be seen that the rateable value of the productive mains on this basis would work out at 17·42 per cent. on the gross revenue of £270,000. Such a percentage would at one time have been regarded as a high figure, although parochial rates then were, broadly speaking, half their present amount in the pound.

As the accounts of the London Gas, Water, and Electric Light Companies are certified by Official Auditors, no question can arise as to the amount of the capital outlay or gross profits.

It is submitted that if legislative effect were given to the foregoing plan, the objections raised by the Courts to the present system would be entirely met. In considering the application of this suggested plan to the case of undertakings earning a small amount of profits, it must be remembered that the works are rateable so long as they are occupied, although the business may not be remunerative. Occupation, and not profit, is the test of liability to rates, just as rental value, and not profits, is the measure of such liability.

It may be added that "gross profit" means, for the purpose of the foregoing scheme, the divisible profit—that is, the sum available for paying dividends on ordinary and preference capital, and interest on debenture stock, loan capital, or borrowed money. Rebates to consumers, as in the case of Water Companies earning more than their maximum dividends, are in no sense profits, and must be deducted from the revenue to arrive at the gross profit. Such companies and gas companies paying full dividends would be assessed according to their actual divisible share of the profits earned. They clearly ought not to be rated on money which they actually return to their customers in one way or another.

It is submitted that the system herein suggested would place the rating of properties of the nature referred to on a simple and intelligible basis; that, while it is more readily understood, it is at the same time more scientific, and would give more uniform results than the method now in vogue; and that it would be a return to the true principles of the law of rating, from which a wide departure has been made by the varying methods of valuation adopted by rating surveyors.

#### PROPOSED AMALGAMATION OF JOHN WRIGHT AND CO. AND THE EAGLE RANGE AND GAS-STOVE COMPANY.

The shareholders of Messrs. John Wright and Co., Limited, will have submitted to them to-day a scheme for carrying into effect an amalgamation of the concern with the Eagle Range and Gas-Stove Company, Limited, provisional arrangements for which have been completed. It will assume the legal form of a purchase of the undertaking of the latter Company for shares in the former. The respective capitals of the two concerns stand thus: John Wright and Co., 6 per cent. cumulative preference (£5 shares), £60,000; ordinary (£5 shares), £60,000. Eagle Company, 6 per cent. cumulative preference (£5 shares), £25,000; ordinary (£1 shares), £30,000. The following are the heads of the provisional agreement: "(1) The capital of John Wright and Co., Limited, shall be increased by £103,000, divided into 5000 6 per cent. cumulative preference shares of £5 each, and 78,000 ordinary shares of £1 each. (2) Out of such increased ordinary capital there shall be issued for the purpose of, and prior to, the amalgamation 40,000 shares of £1 each; 20,000 of such ordinary shares will be issued to the Managing-Directors in lieu of future remuneration by commission, and the remaining 20,000 shares as a special dividend of 33½ per cent. in shares to the ordinary shareholders of John Wright and Co., Limited. (3) The property and undertaking of the Eagle Range and Gas-Stove Company, Limited, shall be acquired as from Dec. 31, 1899, for the sum of £61,297, payable as to £25,000 in 5000 6 per cent. cumulative preference shares of £5 each, ranking *pari passu* with the existing issue, and as to £36,297 in 36,297 ordinary shares of £1 each. There will also be issued to Harry James Yates 1403 ordinary shares, and to Wyndham Charles Brodie 300 ordinary shares as part consideration for entering into agreements to act as Managing-Director and Manager of the Company respectively, which will be submitted to the shareholders. (4) The new preference and ordinary shares shall rank for dividend as from Dec. 31, 1899, but shall not be entitled to participate in the dividends declared on March 8, 1900, for the year 1899, nor in the special dividend in shares above mentioned. (5) Each existing ordinary share of £5 fully paid shall be subdivided into five ordinary shares of £1 each fully paid. (6) The name of the Company shall be changed to John Wright and Eagle Range, Limited."

A circular embodying the terms of the amalgamation has been also addressed to the shareholders of the Eagle Range and Gas-Stove Company.

#### ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the borrowing by the West Bromwich Town Council of £30,000 for electricity works.

The Hornsey District Council, after a discussion lasting several hours, late on Monday night last week resolved to carry out their own Provisional Order, and borrow £73,500 to enable electric lighting works to be commenced.

The financial progress of the Bury Corporation electric lighting undertaking is not by any means rapid. During the past year, a profit of £183 has been made, which compares with an adverse balance the previous year of £336.

The big electric lighting undertaking of the Croydon County Council has produced them the little net profit of £900 on the past year's working. No one seems particularly gratified with this; but, by way of apology for the smallness of the sum, the Chairman (Alderman Miller) states that, if they had not adopted the maximum demand system, the profit would have been £2900. It was anticipated that the maximum demand system would have attracted consumers; but the anticipation has not been met by realization.

The Sleaford District Council are pushing forward with their proposed scheme of electric lighting. No sooner has their Provisional Order received the Royal Assent than they resolve to petition the Local Government Board for sanction to borrow £7000 with which to instal the light—the Engineer's estimate being £6500. When the matter was being discussed last Wednesday, it was contended by Mr. Ward that the electric light would only benefit a few of the leading tradesmen at the expense of the ratepayers generally. We have an idea that time will show Mr. Ward is about right.

In many parts of Birmingham the supply of electric light suddenly ceased on the evening of Sunday, the 1st inst., about half-past nine. The deficiency was rectified as speedily as possible, but a good deal of inconvenience was necessarily caused. The mishap was due to the current having short-circuited. The result was almost terrifying at headquarters, where one of the men in charge was temporarily blinded by a sudden burst of brilliancy, and one of the dynamos caught fire. The mischief was located in Bull Street; and after this thoroughfare had been switched off, the supply to other parts of the city was promptly restored.

Mr. H. Percy Boulnois has held an inquiry at Wakefield, on behalf of the Local Government Board, with respect to an application by the City Council for sanction to borrow £25,000 to extend their electric lighting works. It was explained to the Inspector that the sum now asked for included £7854 spent in excess of the original loan. At the close of the inquiry, Mr. J. McGirr, an old member of the Corporation, called the attention of the Inspector to the excess of expenditure on the previous loan. He objected to this state of things, and pointed out that if the Board refused to sanction the excess, the amount would have to be included in the current rate instead of being repaid as a loan spread over a long period. The Inspector agreed with Mr. McGirr, and said the City Council ran great risk in exceeding the loan allowed.

At their meeting on Wednesday, the members of the St. Helens Town Council received from the Mayor a brief sketch of the progress of matters electrical in the borough. He said that on March 31, 1898, 4526 lamps were connected. The cost to produce the current was 4·04d. per unit, and the total cost 6d.; while the sale was above 35,000 units to 63 consumers. In 1899 they had 6463 lamps; the works cost had dropped to a little over 3d.; the total cost to rather less than 4d.; and 65,091 units were sold to 79 consumers at the price of 6d. At the end of March this year, they had 13,981 lamps connected; the works cost had gone down to less than 1d.; and the total cost to nearly 1½d. The sale was 320,160 units, which, of course, included that supplied for the trams. The number of consumers was 190; and there had been an increase in the supply for motors. The output for May was 57,434 units, which was at the rate of 689,000 units per annum, or about double the output last year. Seeing that May was one of the lightest months of the year, the increase was most promising. A profit of £10 12s. 7d. was made last year; but this would be increased next year.

The minutes presented by the Electric Lighting Committee at the last meeting of the Hanley Town Council contained the recommendations of the Sub-Committee referred to in our "Notes" last week, and their own in regard to increasing the charges for electrical energy. Alderman Hammersley having moved the adoption of the minutes, Mr. Coates seconded the motion, and made an elaborate statement in defence of the recommendations; claiming that, while difficulties had been experienced by the Committee, they had not been greater than those usually met with in the control of extensive new undertakings. He pointed out that in the early days of gas lighting, gas companies had many difficulties to contend with; and they must be expected in the initial stages of electric lighting. Other towns, he contended, had had greater breakdowns than they had had at Hanley. In comparison, they had done very well; and their loss was practically *nil*. With regard to calling in an expert, he contended that such a step would be a mistake. They had only to work with one of the best engines, and he would ask them to wait and see what it would do, and how cheaply it could be worked; and if, at the end of a year, it was not being run properly, they might call in an expert. Alderman Cooke said he felt very strongly that the advice of an expert was needed; and he moved an amendment to the effect that the Electric Lighting Committee call in the best assistance available to aid them in reporting upon the undertaking. On being put to the vote, the amendment was lost by 12 votes to 10; and the Committee's recommendations were then adopted.

[In the paragraph on electric lighting at Hastings, in last week's "Notes," Mr. C. F. Botley, whose letter on the subject to a local paper was being dealt with, should have been described as Assistant Gas Engineer and Electrician to the Hastings Gas Company—he, of course, holding no appointment under the Corporation. In the quotation from the letter, the misprint of "custodians" for "customers" of the electric light, which appeared in the cutting from the paper, was inadvertently reproduced. It may be mentioned that the figures given for the Brighton general district rate are, as is usual, for the half year.]



## NEW YORK WATER SUPPLY.

*(Concluded from p. 1742 of Vol. LXXV.)*

In the previous instalment of the review of Mr. John R. Freeman's report on the above subject which we reproduced from the "Engineering Record," his striking revelation of serious errors in the records of the run-off of the Croton watershed was dealt with, as well as his studies to prove the serious waste of water going on in the boroughs of Manhattan and the Bronx. It is now proposed to give his analysis of the various sources of waste and consumption, and the remedies proposed.

The Central Park experiments already referred to indicate that the total waste averages at least 80 gallons per head per day, of which 10 gallons may be regarded as incurable. This leaves 70 gallons as the probable needless waste in the mains and service, although Mr. Freeman states that unknown sources of error in these experiments may show that the amount is less. It is said that 50 gallons is a certain minimum figure for the needless waste. There is little doubt that this waste arises from the following causes: (1) Leaky house plumbing; (2) old, leaky, and abandoned service-pipes; (3) water-cocks unnecessarily left open by the careless 10 or 20 per cent. of the householders; (4) the leaky joints in New York's 833 miles of pipes, and occasional rust-holes and cracks in some of the pipes laid many years ago; (5) a possibly relatively small quantity diverted through surreptitious connections, but not enough to be of any material account in the total distribution.

With regard to leaky house plumbing, there are no data for anything but a guess as to how much of the 50 or 70 gallons per inhabitant per day escapes through leaky plumbing, and how much through leaks in the streets. Judging from isolated examples in New York, and by what has been temporarily accomplished by house-to-house inspection in other cities, or permanently maintained by universal metering, it appears only reasonable to suppose that out of the total leakage and waste of 50 or 70 gallons, the leaks through defective plumbing, together with the careless and wilful waste inside dwellings, amount to from 30 to 50 gallons per inhabitant per day. This is a waste from three to four times as great as the total actual use in the fully metered cities. It is also difficult to subdivide and attribute a definite part of this waste to either cause. But for a guess we may reckon that two-thirds of this 30 to 50 gallons of house waste escapes through poor plumbing, and the other one-third through careless or wilful waste.

The greatest cause of house waste is undoubtedly cheap and neglected plumbing fittings, and among these tank ball-cocks are doubtless the chief offenders. The fastening of cocks open, and letting the water run unnecessarily, is also a great source of waste. One cause of the smaller consumption in certain English cities is probably the rigid requirements in force for the inspection of fittings. Brightly polished fittings look very much alike when new, and considerable loss results in time from those which are light or soft or of cheap design. But with the compression cocks shutting against leather or rubber or fibre discs, common in all American plumbing, it is more often a question of neglect to supply a new disc or washer than of leakage caused by wear or yielding of the metal. For the underground plug cocks, the corporation cocks, or the cellar stop-and-waste cock, there is a temptation to cheapen the cost of manufacture by adding lead to the mixture of tin and copper, or to use the cheaper alloy, soft yellow brass, consisting only of a mixture of spelter and copper—thus giving a metal which can be worked in the lathe at high speed and with broad cuts.

The experience in those American cities which are fully metered appears sufficient proof that each householder will become a fairly good inspector of leaky plumbing if he has a water-meter in the cellar, and that reputable plumbers will supply their customers with proper fittings without the inconvenience and expense of a Government inspection, if the customer finds it to his pecuniary advantage to prevent waste of water through leaky appliances. The great objection urged against meters is the fear that they will tend to a harmful restriction of the use of water in the houses of the poor or in tenement blocks, where the landlord may not be of the most liberal class, and would try to save water, if metered, at the expense of his tenants' health and comfort. This is a matter which can be solved, in Mr. Freeman's opinion, after proper study, by some system of separate meters, combined with a carefully considered scale of minimum charges. The reliable answer is found in the text of experience. No complaint, so far as Mr. Freeman knows, now exists in Fall River, Providence, Worcester, Lawrence, Syracuse, or Poughkeepsie, that the comfort or health of any class in the community suffers because of the complete application of meters.

New York unfortunately has no means of differentiating the waste inside houses from the waste in the mains. There is every reason to infer that the street-pipe waste is very much larger than the 7 gallons per inhabitant per day found in the cities of Woonsocket and Fall River, where the streets are less disturbed, the pipes not so old, and where, from metering water into the distribution and then metering it out again, they keep account of the discrepancy, and trace to its source any abnormal leakage. In Boston, fractured 12-inch pipes have been found with water leaking freely, and 4-inch pipes broken short off and the water finding its way into the sewers without a sign on the surface; while in other cities similar cracks and breaks are often found leaking badly, without showing any sign. It appears that part of New York's oldest pipes were cast on the side in a manner which leads to weakness, and that other old pipes near the water front had been found badly corroded from the salt water in the ground. It is stated that many wrought-iron service-pipes exist—that perhaps one-third of all those in Manhattan and the Bronx, and one-tenth of all in Brooklyn, are wrought iron, the others being of lead; and it is known, from experience elsewhere, that unprotected wrought-iron pipe often becomes badly eaten by rust when buried in damp earth. It has been asserted on excellent authority that a common trick of the plumber is to double-back the end of the pipe next the cellar wall, hammer it together, and then leave it. The service-pipes in New York are not attached to the main by screw-threads, as is the common practice elsewhere, but are hollow tapered brass spigots driven into a hole in the cast-iron pipe. A strain on the pipe, due to settlement, may pull these out.

It can never be known with any degree of accuracy what was the extent

of the underground leakage in the streets until there is a meter on every tap, and a daily estimate is made of all water used for public purposes and for fires. Then, by subtracting what is measured out from what is measured into the distribution system, the difference will show the leakage. This kind of measurement in Fall River and Woonsocket, with the allowance for a smaller number of joints and of service-pipes in New York, gives the ideal of 5 to 10 gallons per inhabitant per day for the maximum leakage from mains and service-pipes towards which the water distribution service of Greater New York should tend. To attain this ideal will require years of patient work and very heavy expenditure.

To find the leaks in the 1500 miles of cast-iron mains in Manhattan and Brooklyn, and to locate among the 200,000 service-pipes in these two boroughs those which are leaky, and to find and plug off the 25,000 more or less abandoned service-pipes, a part of which are, without doubt, leaking badly, and all likely to leak sooner or later, is an enormous task. The remedy cannot be applied quickly enough to help out the imminent shortage in the present water supply, but is a task for twenty years' steady, patient, broadly-planned work. To find a large leak now, or to know where to look for the worst leaks, is like hunting for the proverbial needle in the haystack. Before we can stop the leaks, we must find them; and no better or more economical method now appears for finding the worst leaks first, than the following: Each borough should be subdivided into districts, averaging (say) half a mile square in Manhattan and Brooklyn, following ward-lines where practicable. All water-pipe connections across the district boundary should be stopped excepting three. The water-pipes should be fed through two connections at most—the third being in reserve and shut ordinarily; a Venturi meter being on each of the two in use. This will show day by day the total quantity of water delivered into each district. Occasionally, by the same meters, measure the rate of flow at intervals of five minutes throughout the 24 hours, to get the relation of the night flow to the day flow, and thus determine the total leakage and waste for this selected area, much as was done for the whole city in the Central Park experiments. From the records of the forthcoming census, find the population dwelling in each district. From the Water Register's meter records, find the average daily consumption of metered water for all manufacturing and commercial uses within the district. There will then be available for each district the average rate of total consumption and waste, of night waste, and that of total real use and of manufacturing and commercial use, per 24 hours. From the known population in the district and the character of the houses, a fairly close estimate can be made of the probable real domestic use; and this, added to the manufacturing and commercial use, will check with the determination by the night flow. The total of all the Venturi meters should be checked against the recorded delivery of the aqueducts. Having all this information for each district, those districts in which the leakage is worst can be picked out and placed first in order for further study.

The next proper step would appear to be to begin in those districts where the greatest waste is found; to apply a water-meter to every tap not now so provided; and to keep, with the assistance of Street Department, Fire Department, and Sewer Department, an approximate daily record of the amount of water drawn for flushing, fires, &c. This is found practical and easy in certain other large cities, and could doubtless be readily accomplished throughout New York. Adding the total of the meter readings in the district for each quarter, the average daily use and waste inside houses and commercial buildings would be known; and knowing what was measured into the pipes of each district through the Venturi meters, and deducting from this what was measured out through the service meters, *plus* the draught for fires, flushing, and street sprinkling, there would be for the first time in New York definite knowledge of the amount leaking through defective joints in main-pipes and throughout all the old, leaky, and abandoned service-pipes.

Since to uncover, recalk, and relay any large proportion of the 1500 miles, more or less, of cast-iron mains in Manhattan, the Bronx, and Brooklyn would be a work of many years, with such breaking up of streets at one time as the public would probably tolerate, and since the immediate relaying of any large proportion of the 200,000 service-pipes would, for similar reasons, be inexpedient, it is important to discover and remedy the worst cases first. To discover and locate the worst leaks or the street blocks containing them, the districts mentioned above should be temporarily subdivided into sections about 1000 feet square, by closing the water-gates, and each section fed through a Deacon meter. Then proceeding by the regular Deacon method, one street after another should be temporarily shut off by night, by closing the gates at the intersections of streets, and the effect noted on a leakage diagram. Taken in connection with a special reading of the service meters through this section, this would plainly indicate which streets should have the main-pipes and services first overhauled. It does not appear reasonable to expect that this hunting down, locating, and remedying the thousands and probably hundreds of thousands of underground leaks throughout New York could be at best accomplished in ten years; and Mr. Freeman's present views are that the far-sighted and proper course would be to adopt such a pace, and steadily pursue it, that twenty years hence every main and service-pipe about which there can be any suspicion of weakness or leakage would have been overhauled and replaced, or made strong enough for a regular working pressure of 100 lbs. per square inch, and all fire hydrants meanwhile brought up to date. This could be readily accomplished with no heavy burden on the water-rates, if spread over a period of twenty years.

After having studied these matters as thoroughly as possible in the time at his disposal, Mr. Freeman concludes that the one efficient, practical, and economical method of preventing waste begins with a meter on every service-pipe, domestic as well as commercial. At the same time it must be admitted that public sentiment in New York, as in Philadelphia and other large American cities, appears to be almost hopelessly against the universal application of domestic meters. That this comes from lack of understanding the matter fully, he has no doubt. It is his further opinion that the city should, at its own expense, and through its own workmen, put in all meters; that the meters should be periodically tested and kept in repair by the Public Water Department; and that the city should furthermore put in at its own expense, and maintain, all service-pipes between the meter and the main. He thinks that systematic work in this direction should be at once begun, looking to the city examining and replacing all service-pipes the tightness of which there is any doubt, at



some fixed rate of progress per annum, in view of the entire overhauling and remodelling of these within a period of (say) 20 years, relaying them with fewer main arteries under the roadway, branching near the kerb into the several buildings, and with a kerb stopcock on the pipe into every building—at the same time making all new pipe thick and strong enough to stand a future working pressure of 100 lbs. per square inch. Taking the work up in this manner, systematically, with the aim and end continually kept in view of having all doubtful pipes relaid and made good within twenty years, would not seriously burden the water debt revenues, and the twenty years would quickly pass.

The system of a meter on every tap is slowly but steadily gaining ground in the smaller American cities. It was followed largely from the first in Fall River, Woonsocket, Providence, and Worcester, and has been extended recently to cover a large percentage of all the services of Syracuse, Lawrence, Lowell, Milwaukee, Poughkeepsie, and Newton (Mass.), and has everywhere met with success in greatly lessening the waste of water or in holding the consumption per head (use and waste combined) stationary against the great tendency to increase from year to year, found in the unmetered cities.

We must be governed by the facts, says Mr. Freeman, in conclusion, as to what the public now draw and the present pipe-waste, and by our best judgment as to what the public will use and the existing pipes continue to waste, rather than by our opinion of what the public ought to use; and, above all, our figure must be a safe one. The safest guide is to note that New York and Brooklyn now use less per head than any of the other large American cities, with the single exception of St. Louis, and that the rate of consumption in New York is steadily increasing; also to further note what very eminent engineers, thoroughly familiar with all these facts regarding waste and the small proportion really used, have recommended in other cities. A large water supply cannot be had quickly; and if we get one that is too large at first, the growth of the population will soon come up to it. The Commission of experienced engineers who recently investigated the water supply of Philadelphia strongly recommended the application of water-meters to substantially every tap, and based their designs upon a consumption of 150 gallons per inhabitant per day. The Commission which reported upon the improvement of the Cincinnati supply in 1896 based their designs on 130 gallons, coupled with an expressed expectation that "a more earnest effort to prevent unnecessary waste would be adopted by the city." In planning for the Massachusetts Metropolitan Water System, Mr. Dexter Brackett, who probably has a richer fund of experience in water-waste prevention to draw upon than any man in the United States, after very careful analysis recommended that estimates for the supply of the Boston Metropolitan District for the next thirty years should be based on 100 gallons per inhabitant per day, assuming a greater restriction of waste than has been made. The actual consumption throughout this district four years later (in 1899) averaged about 110 gallons per inhabitant daily. The reasonable and proper restriction of waste looked for by Mr. Brackett has, unfortunately, not yet begun.

After careful consideration of the matter of the actual increase of consumption in New York, and in the light of the use and waste of water in

other large American cities, and in view of the fact, clearly brought out by diagrams given in the report, that with the increasing number of fittings in houses the legitimate use of water per head is steadily growing and the waste also tending to increase, and after reviewing what has been actually accomplished in Boston and various other cities in restriction of waste, and the lack of permanent reform, Mr. Freeman does not consider it safe or prudent to base the estimate of the future needs of the boroughs of Manhattan and the Bronx on less than the following rates of average consumption in gallons per inhabitant per day, including all use and waste: With the greatest effort to restrict waste that public sentiment will probably demand or support—In 1905, 125; in 1910, 130; in 1915, 135; in 1920, 140; in 1925, 145; in 1930, 150. With matters continued as at present: In 1905, 140; in 1910, 155; in 1915, 170; in 1920, 180; in 1925, 190; in 1930, 150.

For Brooklyn and Queens, the probable future consumption is taken at 80 per cent. of the above quantities. For Richmond, a still smaller consumption is estimated, based on the ordinary experience in similar communities. It is dangerous to its public interests to be too hopeful about preventing waste when estimating the date when the new supply must be available, or in estimating its necessary magnitude; for with these hopes unfulfilled, and the reservoirs emptied, the disaster would be beyond remedy.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

We are accustomed to speak of an outstanding occasion as a "red-letter day," or an "oasis" in the ordinary hum-drum of life. Last Wednesday was such a day in the Glasgow Corporation Gas Department. For a year or two workmen have been excavating and constructing at the Temple Gas-Works one of those huge holders of which the Corporation now possess three. Their labours are all but finished; and the Gas Committee went out to see the work. Then, from work completed, they turned their faces towards work contemplated, at Provan. There is to be no halt in the onward march of the gas supply. The past has shown a steady increase in the consumption of gas; and the experienced eye of the Engineer (Mr. W. Foulis) looks into the future, and sees it still rising. It is refreshing to notice how simply the case for gas can be stated. While Glasgow flourishes, so will the manufacture of gas in its midst; and while Mr. Foulis directs the gas undertaking, it will, as it has all along, be conducted upon the most advanced lines. This was the feeling which underlay all the speaking which took place on Wednesday. Mr. Foulis enjoys the utmost confidence of the Corporation. He is able to devote his whole capacity to the working of the undertaking; and the result is unbroken success. Of what engineer can it be said that for thirty years no outside advice has been required or sought? There could be no better testimony to the good management of the undertaking than this. The example of Glasgow should appeal with overwhelming

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 79.

Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£		p. c.		GAS COMPANIES.			£ s. d.	£		p. c.		GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	104	Alliance & Dublin 10 p.c.	174-184	..	5 13 6	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	74	Do. 7 p.c.	124-134	..	5 11 1	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103*	+1	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	10-104	-½	6 13 4
200,000	5	May 16	6	Bombay, Ltd.	6-64	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100-102*	..	3 18 5
40,000	5	"	12	Do. New, 4½ paid.	4-4½	..	5 6 8	250,000	10	Apl. 11	8	San Paulo, Ltd.	114-124	..	6 8 0
880,000	Stk.	Feb. 23	6	Brentford Consolidated	250-260	..	4 12 4	185,000	Stk.	Mar. 14	10	Sheffield A.	246-247	..	4 1 0
270,000	"	"	9	Do. New	182-187	-3	4 16 8	209,053	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	"	5	Do. 5 p.c. Pref.	140-145	..	3 9 0	447,427	"	"	10	Do. C.	244-246	..	4 1 4
159,375	"	June 14	4	Do. 4 p.c. Deb.	118-120	..	3 6 8	5,600,000	Stk.	Feb. 23	5½	South Metrop., 4 p.c. Ord.	127-132	+1½	4 0 10
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	230-240	..	4 15 10	1,520,000	"	Jan. 12	3	Do. 3 p.c. Deb.	97-99	..	3 0 7
226,320	"	"	8½	Do. A. Ord. Stk.	175-180	..	4 14 5	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
999,500	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	70,825	"	Dec. 29	4	Do. 4 p.c. Deb.	120-125	..	3 4 0
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	120,000	Stk.	Mar. 14	6	Tottenham } A. 5 p.c. and } B. 3½ p.c.	120-125	..	4 16 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	250,520	"	June 14	4½	Edmonton } A. 5 p.c. and } B. 3½ p.c.	93-98	..	4 11 10
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	55,100	"	Jan. 12	5	Tuscan, Ltd.	111-115	..	3 9 7
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	9-94	..	6 6 4	182,380	10	Jan. 12	5	Do. 5 p.c. Deb. Red.	7-8	..	6 6 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	149,900	10	July 2	5		98-102*	..	4 18 0
150,000	20	Mar. 14	8½	Cagliari, Ltd.	24-26	..	6 6 11								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	134-144	-½	5 10 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55-57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock.	275-285	..	4 14 9								
236,425	"	"	10½	Do. New do.	210-220	..	4 15 5								
238,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	-2	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	155-165	..	5 9 1								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	780,399	Stk.	June 28	11	WATER COMPANIES.			
51,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	150,000	"	"	5	Chelsea, Ord.	298-303*	..	3 12 7
173,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 5	160,000	"	"	4½	Do. 5 p.c. Pref.	155-160	..	3 2 6</



eloquence to those public men in divers places who look upon the gas manager as the best of all game to shoot at.

The new gasholder at Temple is almost similar in size and design to the other two. There is very stout lattice-girder guide-framing; and the timber work supporting the crown during construction is allowed to remain in. How puny the gasholders which were once looked upon as large appear by the side of these leviathans! The other large holder was up for the occasion, which gave visitors an idea of what the new one would be like. This new holder will raise the storage capacity in Glasgow to about 29 million cubic feet, which is not far off the maximum day's consumption. It thus places the gas supply of the city on a sounder basis than it probably ever has been. Were it not for the constantly advancing demand, the gas staff might now give their energies a rest. Such, however, is not to be. The step which is about to be taken is the biggest stride which has been attempted in Scotland. But a few words more about the holder. Had the company not been taken into its interior, a grand opportunity of impressing the Corporation with the magnitude of the work would have been missed. The pillars which have been left in to support the crown were a mystery. Still more so was the idea that the whole of the space to the surface of the ground was to be filled with water, which some thought was waste. It was apparent, from questions put by the visitors, that a man may be thoroughly familiar with the knotty problems that are met with in the markets and exchanges of the world, and yet be strangely ignorant of the elementary principles of engineering. Thus the visit was more an impressive than an instructive one.

At Provan, the ceremony was of a different nature. There is no mystery about the lifting of a spadeful of earth; and a good luncheon is satisfying to the erudite as well as to those who are less so. The interest in the proceedings lay in the imagination. In a year or two, where there are green fields to-day there will be a busy hive of industry—the largest of its kind north of the Border—a gas-works in which mechanical skill and discipline will go hand in hand in the production of the best possible article at the lowest possible price. Looking at the ground plan which was furnished to every member of the party, along with a short description of the works, it is seen that the utmost simplicity of design has been followed. The productive department is to be begun in the centre, a retort-house and purifier-house standing side by side; and future extensions are to work outwards—a retort-house on one side and a purifier-house on the other. Coal-stores are to be at one end of the retort-houses, on a high level, and the coke-yards at the other end, on the low level. Similarly with the purifier-houses, the lime-kilns and lime-stores are to be at one end, and the exhausters, condensers, scrubbers, meters, and governors at the other. The oil-gas apparatus will also be stationed there. The sketch shows, further, that the retort-settings are proposed to be in twelves; but, of course, it will be a long time before they are erected, and other arrangements may be made. There is also provision for the supply of gas for heating the retorts by outside producers. As yet there is not much appearance of works on the ground, though I was informed that some of the foundations were well in. These do not show very much. What is most apparent is a series of railway sidings and drains,

with a large excavation for No. 2 holder. It was No. 1 holder which the ceremony was connected with; and in regard to it all that had been done was to mark off its site by a row of tiny Union Jacks. These two gas-holders are all that are proposed in connection with the first section of the works; but there is ample room for further gasholder extension, as for the other portions of the works. There is a good deal of excavation work to be done; but the stuff appears to be easy to handle, and there is reason to believe that the Contractors (Messrs. R. M'Alpine and Sons) will be able to complete their work within the time limit. Mr. M'Alpine said he was keeping his eye upon this. When it arrives, it will be about time to enter upon another contract.

The Gas Engineer to the Edinburgh Corporation (Mr. W. R. Herring) has prepared a table showing the output of gas during the past financial year in Edinburgh, Leith, and Portobello to have been 1,882,831,000 cubic feet, as compared with 1,784,251,000 cubic feet in 1898-9—an increase of 98,580,000 cubic feet, or 5.52 per cent., against 4.40 per cent. in the preceding twelve months. Taking the past ten years, there has, with two exceptions (1892 and 1893, when the price of gas was raised), been an augmentation in the annual output.

Everyone is full of congratulation to Mr. Hubert Pooley on his transfer from Dunfermline to Stafford. The output of gas in Stafford is more than double what it is in Dunfermline, so the promotion is a very marked one. Mr. Pooley, during his stay in Dunfermline, has endeared himself to his brethren by the earnestness of his attitude upon all questions which came before him. He had hard work to begin with, the plant and mains being greatly worn out; but he braced himself to it, and he leaves a legacy of easier times to his successor. The estimation in which Mr. Pooley was held was shown by his elevation to the presidency of the North British Association of Gas Managers, which office he held last year. So, while the memory of him will be sweet in Scotland, his recollections of his short stay here will be also of a felicitous nature. He was trusted to the full by his Commissioners; and, in turn, he served them to the best of his capacity. The Commissioners are advertising the vacancy; and it has been pointed out to me that the salary they are offering is £300, which is what is paid by the Perth Gas Commissioners, where the business is twice the size it is in Dunfermline.

The Town Council of Aberdeen, on Monday, agreed to the recommendation of the Gas Committee to charter the same steamship for a further twelve months for the carriage of gas coal, at the rate of £232 10s. per month. There was no dispute about this. But the Committee also recommended that the contract with the stevedore who discharged the cargoes be renewed for the year, on the present terms of 8d. per ton; and to this the Trades Union section of the Council made some objection. The stevedore employs non-Union men, and they are satisfied with the wages they receive. The representatives of the Dock Labourers' Union believe that the wages are not those of the Union; and they wanted the Council not to contract at all, but to employ labourers direct, with a man over them. The Council were too shrewd to adopt such a method of working; and they rejected it by 21 votes to 9. It would be putting too much power into the hands of the Trades Unionists to lay down any rule which would place the coal supply to the gas-works in their hands.

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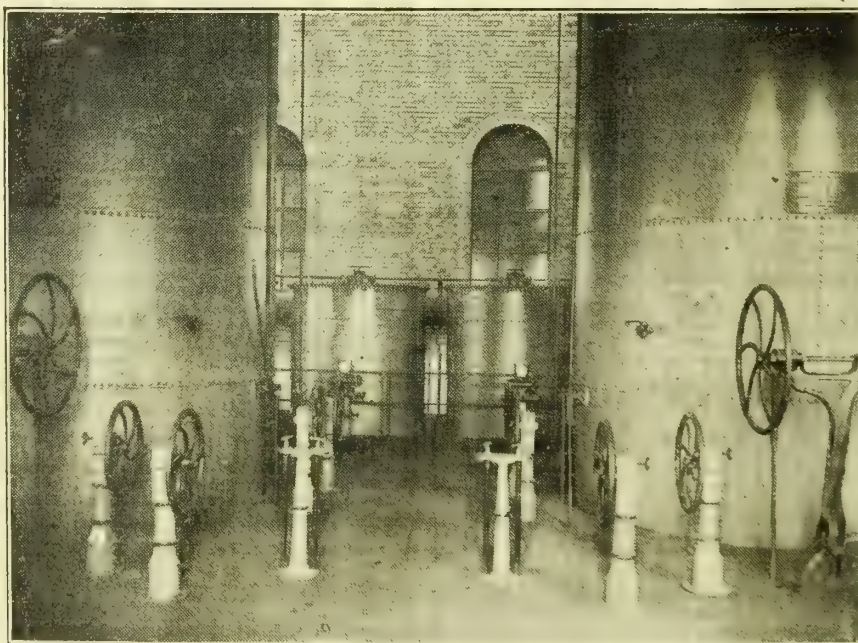
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The report of the Directors of the Kirkcaldy Gas Company for the past year states that there has been a satisfactory increase in the quantity of gas manufactured. It is proposed to pay a dividend at the rate of 7s. 6d. per share. The Directors point out that last year, though there was a rise in the price of coal, they did not increase the price of gas, as was done in some other places. They are pleased that the year's working justified their recommendation; but they are now reluctantly obliged to recommend that the price of gas be raised from 3s. 1½d. to 3s. 7½d. per 1000 cubic feet.

The Motherwell Gas Company had a total income last year of £12,820, and an expenditure of £9038; leaving a balance to profit and loss account of £3782. The amount received for residual products was £1516, as compared with £1078. A dividend at the rate of 10 per cent. has been paid.

The annual meeting of the shareholders of the Hawick Gas Company was held last Thursday. The Directors recommended that the price of gas should be fixed at 3s. 9d. per 1000 cubic feet; being an increase of 5d. per 1000 cubic feet, consequent on the advance in the price of coal. The Chairman, in moving the adoption of the report, stated that the Company had used £1333 worth more coal during the past year. The profit of the year was £1120. They estimated that the increased cost of coal for the current year would be £1500; this causing an increase in the price of gas. They had sold over 5½ million cubic feet more than in the preceding year. This was the largest consumption the Company had ever had; and it spoke well for the Company, and for the trade of Hawick. He thought that the Directors and Mr. Smith, the Manager, deserved great credit for the way the business had been conducted. The report was adopted, and a dividend of 10 per cent. was declared.

The Directors of the Saltcoats Gas Company have declared a dividend at the rate of 4½ per cent., and have raised the price of gas from 3s. 4d. to 3s. 9d. per 1000 cubic feet. At Castle Douglas, the Gas Company have paid a dividend at the rate of 7 per cent., and have added £100 to the reserve fund. The Directors have in contemplation an increase in the price of gas, which is at present 5s. 10d. per 1000 cubic feet for lighting, and 4s. 7d. for cooking and heating. The Stranraer Gas Company have increased the price of gas from 4s. 7d. to 5s. per 1000 cubic feet. The Crieff Gaslight Company have declared a dividend at the rate of 10 per cent., and have increased the price of gas from 4s. 2d. to 4s. 7d. per 1000 cubic feet. The Alyth Gas Company have paid a dividend at the rate of 4 per cent., and have increased the price of gas from 5s. 10d. to 6s. 3d. per 1000 cubic feet. The Newburgh (Fife) Gas Company are paying no dividend this year, but are devoting their profit to improvements on the works. They have raised the price of gas from 6s. 8d. to 7s. 1d. per 1000 cubic feet. The Anstruther and Cellardyke Gas Company have paid a dividend of 3 per cent. and a bonus of 2 per cent., and have raised the price of gas from 3s. 9d. to 4s. 2d. per 1000 cubic feet. The Elie Gas Company have paid a dividend at the rate of 3 per cent., and continued the price of gas at 6s. 6d. per 1000 cubic feet. The Crail Gas Company have raised the price of gas by 5d.—making it now 7s. 1d. per 1000 cubic feet. The Pittenweem Gas Company have paid a dividend at the rate of 10 per cent., and have raised the price of gas from 4s. 2d. to

4s. 7d. per 1000 cubic feet. The Leven (Fife) Gas Company have paid a dividend of 5 per cent., and have raised the price of gas from 3s. 4d. to 3s. 9d. per 1000 cubic feet.

The report by the Water Committee of the Corporation of Glasgow for the year ending May 31 last has just been issued. The rates assessed and levied last year were as follows: Domestic water-rate within the limits of compulsory supply, 5d. in the pound; and the public water-rates, within the said limits, 1d. in the pound. The domestic water-rate levied beyond the limits of compulsory supply was 10d. in the pound. The revenue for the year totalled £212,734. The expenditure, including annuities and interest, amounted to £172,753. Of the balance, £59,783 has been carried to the sinking fund, and £22,740 to next year's account. The income shows a decrease of £4010, and the expenditure an increase of £17,194 over the previous year.

The Dundee Town Council, on Thursday, considered the estimates for the year of their Water Department. Treasurer Ritchie said that the total estimated expenditure amounted to £49,535; being £715 in excess of last year's estimate, and £479 above the actual. The total revenue for the year was expected to amount to £49,722, leaving an estimated surplus of £187. It might be worth noting that the rate of 9d. they now proposed was exactly one-half of the domestic rate levied in 1869, when the water-works were taken over by the Commissioners, and which was also charged during the years 1881-83. The estimates were adopted.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 7.

**Sulphate of Ammonia.**—The week opened with a very quiet market; and sales were made at a decline on last week's prices. Later, a better tone supervened, induced by an improvement in the forward position; and the closing quotations are £10 12s. 6d. to £10 15s. per ton, delivered f.o.b. at the ports, though inquiry is mainly for later months. For July-September delivery, £10 15s. per ton f.o.b. Leith is quoted. But, so far, this price is not reported paid; while for October-March delivery, makers' quotations are £11 to £11 2s. 6d. per ton. Interest in this position is, however, mainly speculative. Consumers have not up to the present followed the advance.

**Nitrate of Soda** is firmer in all positions—spot, afloat, and for shipment f.o.b. Spot quotations are 8s. per cwt. for ordinary, and 8s. 3d. for fine quality.

LONDON, July 7.

**Tar Products.**—The value of fuel generally appears to be stiffening, contrary to expectations; and this reflects itself on the price of pitch. There are now important buyers for next season's delivery at to-day's quotations. Creosote is dull, and difficult to sell; and, in cases where makers have carried oil forward for summer delivery, disappointing prices are being obtained. A steady market exists for naphthalene in its several forms; and this somewhat relieves the strained position brought about by the neglected state of creosote. Carbolic acid is selling well, and

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is likely to be dearer. The position of benzols is difficult to define; and quotations vary in a very remarkable degree, and are evidently influenced first by quality, and next and more important by the position of delivery. A better outlet is developing for gas enrichment. Solvent naphtha is in a little more favour. The outlook for products generally, however, is not too promising.

Prices may be taken as follows: Tar, 17s. 6d. to 28s. Pitch, east coast, 37s.; west coast, 34s. Benzol, 90's, 7d. to 8d.; special qualities for gas, 9½d.; 50's, 10d. Toluol, 1s. 1d. Solvent naphtha, 1s. 1d. Crude naphtha, 3½d. Heavy naphtha, 1s. Creosote, 2½d. Heavy oils, 3d. Carbollic acid, 50's, 2s. 1½d.; 60's, 2s. 7½d. Naphthalene, drained, 35s.; pressed, 75s. Anthracene, "A," 4d.; "B," 2d. to 3d.

**Sulphate of Ammonia**, after a rapid fall (touching the low price of £10 5s. in some instances), has quickly rebounded to about £10 10s., less 3½ per cent. To-day's position is undoubtedly better; but the market appears to be unhappily in the hands of speculative dealers. The higher price now ruling for nitrate of soda should have a beneficial effect upon sulphate.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The tendency of surrounding conditions is perhaps not quite so satisfactory as of late in the coal trade of this district. A noticeable feature is that engine classes of fuel, which until recently have held the strongest, now occupy the weakest, position in the market. Up to the present, this change has been brought about mainly by the large quantities of slack that have been coming forward from other districts, and which practically have taken one or two outside markets out of the hands of Lancashire collieries. A further depressing influence is the outlook in the cotton trade, which is not nearly so good as a short time back; while the serious situation in China is more than likely to still further considerably restrict business in this staple branch of Lancashire industry. Already short time is being very generally talked of in the cotton trade; and if there were to be any large stoppage of production at the mills, this would necessarily restrict to a corresponding extent the requirements for engine classes of fuel. Lancashire collieries are still experiencing no great difficulty in moving away their present production of slack; and it is exceptional where anything like stocks are accumulating. They are consequently holding on to the basis of quoted rates, representing about 10s. to 10s. 6d. per ton at the pit for common slack, up to 11s. and 11s. 6d. for the best descriptions. They are, however, being undersold 1s. per ton by slack coming in from Derbyshire, Staffordshire, Nottinghamshire, and South Yorkshire; and it would seem very questionable whether full prices in Lancashire can be much longer maintained. All descriptions of round coal are still moving off exceptionally well for the time of the year. Even in the better qualities no stocks of any weight are as yet accumulating; but the output is steadily more and more overlapping requirements. The lower qualities continue in fairly good demand for steam and forge purposes; while an

active inquiry for shipment is taking away any surplus supplies that collieries may chance to have, at even better prices than can be secured on inland sales. The quoted pit prices remain very much the same as for some time past—ranging from about 12s. 3d. to 12s. 6d. per ton for ordinary steam and forge coals, to about 13s. and 13s. 6d. for common house-fire descriptions, up to 14s. 6d. and 15s. 6d. for the best qualities of house coal. There is, however, one feature in the market which scarcely augurs satisfactorily for the future. Although collieries were successful in forcing their prices on forward contracts with the railway companies and for gas coal, they are still sellers in the market for current requirements at quite 6d. per ton less than the contract rates; and under such circumstances, it is only natural that users of coal are very chary about contracting, and in most cases prefer to go on with deliveries from hand to mouth. For shipment, prices are steady at about 14s. 3d. to 14s. 6d. per ton at the pit for unscreened, and 15s. 3d. to 15s. 6d. for good screened steam coal. There is still a brisk demand for coke; but prices are not more than maintained at 24s. per ton for furnace, and 31s. to 32s. for foundry sorts at the ovens.

**Northern Coal Trade.**—There is renewed activity in the coal trade of this district; and prices are, on the whole, firmer. But the output is adequate for all requirements. Best Northumbrian steam coals are from 17s. 6d. to 17s. 9d. per ton f.o.b., and steam smalls are from 12s. 6d. to 12s. 9d. There have been some heavy inquiries for this class of fuel, which have stiffened the market. In the gas coal trade, deliveries are now on the new contracts; but they are of about the usual summer extent. Output is fairly good, and exports are well maintained, so that the production is readily taken up. For occasional cargoes, the price is quoted at 16s. 6d. to 17s. per ton f.o.b. for best Durham gas coals; but the sales are not heavy. Local gas companies are taking only limited supplies at present. In the coke trade, there is a strong demand both for home use and for export; so that prices are firm, as quoted by us last week. In gas coke, there is now a limited production, and higher prices are generally asked—indeed, as high as £1 per ton has been quoted this week. This is a price for gas coke that has not been locally known for many years; but it is believed that only limited lots are being taken at that figure.

**Scotch Coal Trade.**—There is a good demand for all classes of coal. The holidays are now on; and, as a consequence, the output is somewhat less. The trouble in China is already being looked to as a possible cause of large demands for ironwork; and, if so, there will be no fall in the price of coal, but probably a further rise. Prices show little variation. The quotations are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 233,615 tons—a decrease of 26,997 tons upon the previous week, but an increase of 22,847 tons upon the corresponding week last year. For the year to date, total shipments have been 5,259,458 tons—an increase of 1,061,731 tons over the corresponding period last year.

Many of the new contracts for gas coal, entered on a month or two ago, commenced on Monday last week. The "Newcastle Chronicle" says the basis of the prices will be about 16s. per ton, free on board—a price that

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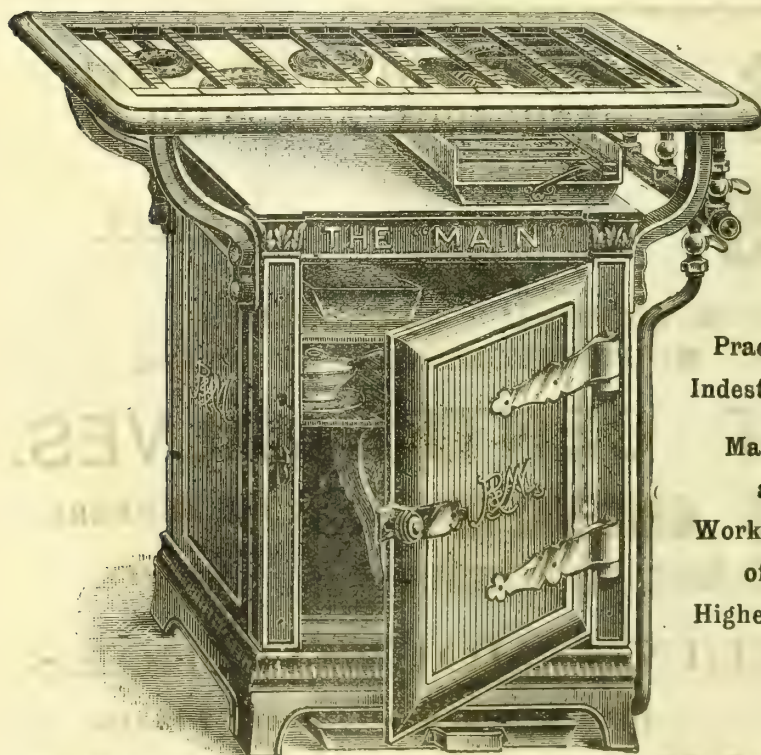
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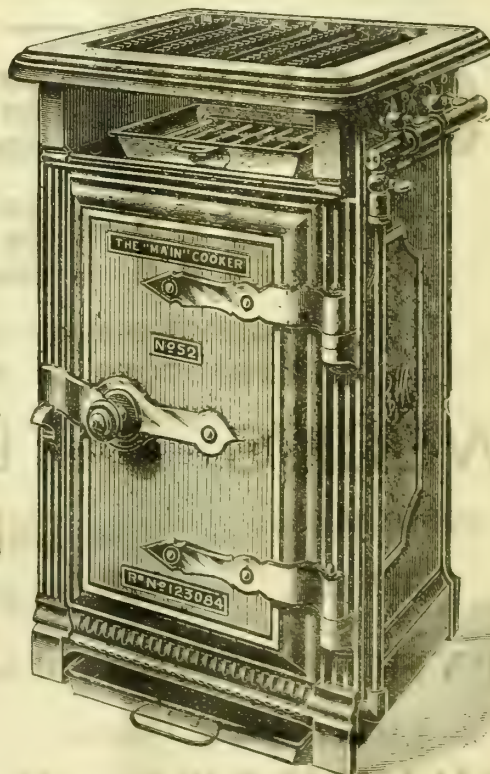
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may be taken as showing an advance on that under the contracts which have just expired of 75 per cent. in many cases. Contrasting this with a period a little farther back, a still more marked advance is seen. Five years ago, contracts were entered into for coal delivered at Rotterdam at 10s. 3d. per ton, or possibly 5s. 9d. per ton, free on board. The advance, therefore, to the rate above quoted is enormous. Our contemporary thinks that it is doubtful whether the high prices of to-day will endure for very long.

**Additional Capital for the Coventry Gas Undertaking.**—The most important business at the meeting of the Coventry Town Council last Tuesday was a report of the Estates and Finance Committee in regard to the creation of stock, amounting to £254,875. The largest item is for gas purposes—£113,203. During the consideration of the matter, Alderman Andrews raised a question as to regularity; pointing out that neither the Gas Committee nor the Council had sanctioned the raising of so large a sum. This was admitted; but the Town Clerk explained that part of the money—about £30,000—was owing by the gas undertaking, and had to be paid off, while the remainder was the estimated cost of new works to be executed during this or next year. No authority was sought to raise the money, but merely to obtain an Order from the Local Government Board for power to raise it should the Council think fit. Time was an object; if application were not made now there could be no issue till next October. Alderman Andrews was unconvinced, and moved an amendment delaying the matter for a fortnight. For this only seven of the members voted; and the recommendation of the Committee was adopted.

**Gas Profits at Bury.**—Upon the minutes of the Gas Committee being presented for confirmation at the meeting of the Bury Town Council last Thursday, Mr. Sykes raised an objection to the allocation of the profits made by the gas-works last year, and pointed out that some years ago they threshed out the question of large profits, and decided that in future they should be as bare as possible, and that the gas should be sold as near as it could be to cost price. He protested against the thin edge of the wedge of large profits being introduced, and after pointing out that nearly £2000 of the profits went in reduction of rates, asserted that, in fairness, it ought to have gone back to the consumers. The Mayor (Mr. J. Byrom), who is Chairman of the Gas Committee, said he agreed with Mr. Sykes that large profits should not be made; and the Gas Committee had endeavoured to sell the gas at as near cost price as possible, subject to contingencies and the maintenance of the works. The reason for the profit was set forth in the minutes of the Finance Committee. They had made a substantial working profit; but in addition there was a contribution of £2000 made on behalf of a colliery company for supplying inferior coal, and also a reduction in the repayment of sinking fund. They could not, however, expect so large a profit next year. They had entered into contracts for the supply of coal for the current year at prices averaging 5s. per ton more than they paid last year; and from what the Committee could see, they did not expect to make more than £2000 profit this year, and it might be less. The minutes were confirmed.

**East Surrey Water Company.**—The annual general meeting of this Company was held on the 30th ult., at the offices, Redhill—Sir Myles Fenton, J.P., presiding. In their report, the Directors stated that there had been 758 additional customers in the twelve months ending the 25th of March. The profit for the year had been £18,376, which, with the balance of £1354 brought forward, made £19,730, out of which they had placed £1500 to the renewal and contingency fund. They recommended that the dividend of 5 per cent. upon the preference shares, and a dividend of 7 per cent. upon the ordinary shares (less income-tax in both cases), should be declared for the year. An interim dividend, however, of 2½ per cent. on the preference and of 3½ per cent. upon the ordinary shares, disposing of £5471, having been paid on the 6th of December last, there would remain to be paid 2½ and 3½ per cent. respectively, absorbing £6148, and leaving a balance of £1737 to be carried forward. The report was adopted. At a special meeting held after the close of the ordinary business, the Directors were authorized to issue by tender 600 ordinary shares of £10 each; and the number of the Board was increased to seven.

**Sales of Shares.**—Last Tuesday week, Messrs. William Bush and Son sold by order of the Directors of the Sheffield United Gaslight Company, £955 class "B" stock, £1030 class "C" stock, and 1875 class "F" shares of £3 each fully paid. The first-named stock realized from £243 10s. to £246 per cent. Of the class "C" stock, £1000 made £240 per cent., and £30 £242 5s. per cent. The 1875 class "F" shares were sold in small lots. Of these, 530 were sold at £7 5s. each, 1105 at £7 3s. 9d. each, and 240 at £7 2s. 6d. each. The same day, Messrs. Hollis and Webb sold some shares in the Aberford Gas Company at £2 7s. 6d. each. Some £10 shares in the Wellington (Salop) Gas Company have recently changed hands at £27 15s. and £28. At the Mart on the 29th ult., Mr. Alfred Richards sold various parcels of gas and water stocks and shares. The first lots consisted of some 4 per cent. perpetual debenture stock of the Southend Water Company, put up by order of the Directors, and it all sold well at from £114 to £115 per £100. Five £10 fully-paid original shares in the West Kent Gas Company (last dividend 10 per cent.) fetched £20 each; five others realizing 5s. more apiece. Some £10 "D" water shares (£4 paid), on which the last dividend was at the rate of £6 6s. per cent. per annum, were sold for £7 10s. each; an allotment of 13 similar shares on which the first call had to be paid fetching, curiously enough, £4 10s. apiece. A parcel of £5 shares in the Horley District Gas Company, Limited, ranking for a 10 per cent. dividend, but the last being at the rate of 3½ per cent. per annum, was sold for £4 2s. 6d. and £4 5s. per share. The final lots, consisting of a few fully-paid additional £10 "C" shares in the Harrow and Stanmore Gas Company (last dividend £5 12s. per cent. per annum), were sold for £11 12s. 6d. each. At Arundel last Thursday, Mr. George Sparks offered for sale £1000 of consolidated ordinary stock of the Arundel Gas Company. The standard dividend is 5 per cent. per annum, subject to the sliding-scale, and the conditions of sale stated that the stock would rank for dividend as from the 1st inst. It was offered in £10 lots, and the prices realized ranged from £11 to £11 4s.; the bulk going at £11 2s.

# JOSEPH AIRD

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# TUBES

## AND FITTINGS

## GAS, STEAM, WATER GALVANIZED-TUBES, &c.

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**Buckley District Council and the Gas-Works.**—In reply to an inquiry, the Buckley Gas Company have informed the Local Authority that they are willing to sell their undertaking for £4750. The Council are trying to obtain a modification of this price.

**Gainsborough's Artesian Wells.**—The second boring for an artesian well to supply Gainsborough with water has been completed; and a plentiful supply of pure water has been tapped at a depth of 1508 feet. Application has already been made to the Local Government Board for sanction to a loan of £8400 to cover the cost of pumping machinery; but as the circumstances at Gainsborough are peculiarly favourable, it is proposed to give special attention to the American system of lifting the water by means of compressed air. Mr. Percy Griffith, the Engineer, has written to the Council advocating this course. He pointed to the low cost of machinery, and the entire absence of friction, and said the system ensured a steady flow of water. A Committee was appointed to visit Hampton to view the compressed-air system in operation.

**Cleanliness and Water Supply.**—The question of water supply to large centres of population is likely to be complicated by considerations which, according to the "Lancet," did not obtain in such force half-a-century ago. Speaking of the 75 million gallons of water per diem which will soon be available for Manchester, the "Lancet" says that, with the increasing growth of habits of personal cleanliness which are gradually permeating through the population from above downwards, there is a much greater demand for water for domestic purposes, including the supply for baths, which are now common in Manchester in small "weekly" houses, as they are called, than would have been dreamt of fifty years ago. The Water Committee, it seems, have come to the opinion that, at the rate of increase for the last ten years, and allowing for the growth of the population, "the whole 75 million gallons per day is likely to be overtaken in about 35 years."

**Water-Works Extensions at Bath.**—Included in the minutes which the Water Committee submitted at the meeting of the Bath City Council last Tuesday were proposals by the Water Engineer (Mr. C. Gilby) with reference to increasing the supply. Mr. Henshaw, in moving the adoption of the report, said a recommendation of further outlay should not be viewed with any regret, for it was an expenditure necessary in consequence of increasing business. In support of this contention, he mentioned that in 1890 the gross receipts were £12,000; and in 1900 they were £15,000. The profits ten years ago were £1383; for the year ended March last they were £3068. Four or five conclusions at the end of Mr. Gilby's report practically summed up the whole situation. He said that an extension should be made sufficient to supply 80,000 persons. The population at present served was 68,100; in 1877, it was 48,000. Even from 1898 to the date of the report, there was an increase of 1500 persons. A point which had given rise to discussion in Committee was Mr. Gilby's recommendation that a supply of 24 gallons per head per day should be provided. During 1899 it averaged 21.86 gallons, which compared very favourably with other towns. The report was carried, with an addition that any scheme for increasing the supply should include a supply to every part of the borough, including the higher levels.

**The Water Supply of Johannesburg.**—The Directors of the Johannesburg Water-Works Estate and Exploration Company, Limited, report that a cablegram has been received, as follows: "Water-works supplying all water required. All men well. Company's property intact."

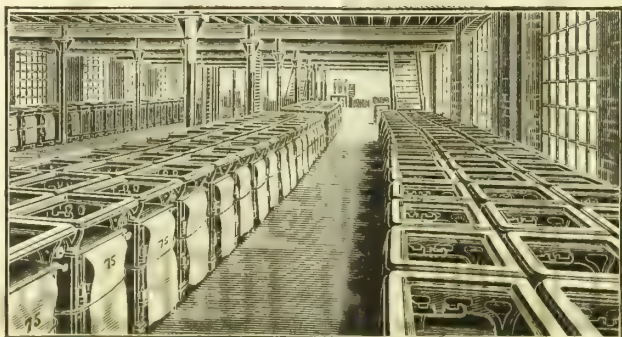
**Dear Coal but no Advance in Price of Gas.**—At the last monthly meeting of the Barrow Town Council, the Gas and Water Committee recommended the acceptance of new coal contracts for the ensuing year, which represented an advance of 5s. per ton on those of last year. This, Alderman Strongitharm explained, would entail a loss on the department of about £4500, unless they made more profits by increased consumption or improved value of residual products. The Committee, however, did not propose to increase the cost of gas. The Dukinfield Gas Committee have purchased a quantity of coal at 16s. 9d., 17s. 6d., and 17s. 9d. per ton, which is an increase of 5s. to 6s. per ton on the previous contracts. Notwithstanding, they expect to get through the year without advancing the price of gas.

**Projected Extension of the Carlisle Gas-Works.**—The Gas Committee of the Carlisle Corporation considered, at their meeting last Thursday, the question of extending the plant at the gas-works, so as to cope with the increasing demand for gas in the city. The Gas and Water Engineer (Mr. C. B. Newton) submitted two estimates—one for plant to make 600,000 cubic feet of carburetted water gas, and another for plant for making an equal quantity of coal gas, per day. The estimate for the former was £14,732; and that for the latter £13,185—a difference in favour of the coal-gas plant of £1547. The deputation who visited other towns to see carburetted water-gas plant in operation were practically unanimous in recommending its adoption in Carlisle; but the vote resulted in favour of the extension of the coal-gas plant. A recommendation in accordance with this decision will therefore be laid before the Council.

**The Second Pipe-Line from Thirlmere.**—The Water Committee of the Manchester City Council last Thursday appointed Mr. George H. Hill Consulting and Advising Engineer for the new work of laying the second pipe from Thirlmere to Manchester, and Mr. M. R. Barnett, who was engaged upon the original Thirlmere works under Mr. Hill, was appointed to act as Engineer for the new undertaking. The Engineers were instructed to prepare the necessary specifications and conditions of contract for the pipes that will be required, and also to present a report as to the method to be adopted for carrying out the work with a view to obtaining tenders for the pipes that will be required. The exact class of pipes to be used in certain places will have to be further considered. It is, for instance, suggested that across the bridges *en route* steel tubes shall be adopted as being lighter than iron ones. Finding that there is some difficulty in drawing a full 10 million gallons daily through the 40-inch pipe now in operation, it is regarded as possible that the new duct may be 42 inches or even 44 inches wide, seeing that the arrangements in connection with the wells and tunnels will allow this change, and that probably little, if any, difficulty would be occasioned thereby along the line from the city to the lake. These matters will be dealt with in the report by the officials.



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## EDITORIAL NOTES.

## The Fate of the London Gas Bills.

THE South Metropolitan Gas Company's Bill was in Committee of the Lords last Wednesday and Thursday. It came on quite unexpectedly; several of the Bills which were before it dropping through for various reasons. With a reticence which was fraught with the possibility of considerable inconvenience, the London County Council, who had petitioned against the Bill generally, did not allow it to transpire until Counsel had actually risen to open the Company's case that they only meant to oppose Part IV. of the Bill—that relating to the proposed purchase of the southern area of the Gaslight and Coke Company. This decision showed that the victory of the Company in the Lower House, in respect of the alteration of illuminating power and sliding-scale, was more complete and decisive than had been supposed. Suddenly as the Bill came on, however, it immediately appeared that the concerted opposition of the County Council, the City Corporation, and the associated North Metropolitan Local Authorities to Part IV. was going to be very strong. A small army of Counsel were in readiness to resist to the utmost the preamble of this portion of the Bill; and, to come to the point at once, the opposition entirely succeeded. The whole circumstances were very remarkable; and the proceedings were of an unprecedented, not to say anomalous character. The striking spectacle was exhibited of Mr. J. W. Field, the Secretary and General Manager of the Gaslight and Coke Company, giving evidence in support of the Bill; but it was obvious from the beginning that the chance of the purchase clause finding acceptance by the Committee was slender, and in the event the preamble was declared not proved without reply by Counsel for the promoters.

It was, indeed, difficult to see how any other result could have been arrived at, in view of the previous dealings of Parliament with the Gaslight and Coke Company, who were the chief beneficiaries under the proposed re-arrangement of areas of supply. The suggestion was put forward in the Bill, in order to place the South Metropolitan Company in a position to accept the transfer, as recommended by the Powers of Charge Committee of last session; the other party to the transaction—the Gaslight and Coke Company—being already in possession of statutory powers to sell. So far the procedure is natural and intelligible. The clause as proposed in the Bill was an enabling one, nothing more. There was, however, another aspect of the proposal, which the opposition successfully took. This was, that the Bill was in this regard a measure for sanctioning the transfer of a statutory gas undertaking with only one of the parties in appearance. The intending sellers were not before Parliament at all, so that it was practically impossible for the Legislature to impose any conditions upon them. When the Bill was opened, the Gaslight and Coke Company were not represented in the room; and the following day they only instructed Counsel to watch the proceedings on their behalf. As the case of the petitioners went on, it was seen to implicate the Gaslight and Coke Company very materially. The fact came out that the two Companies had agreed upon the amount of consideration to be paid for the property—£900,000, besides the value of the stock-in-trade—and the Chairman of the Committee expressed the opinion that somebody from the Gaslight and Coke Company ought to come and be examined on their part in the proposed deal. Consequently, Mr. Field duly presented himself, having been sent for; and a warm time he had of it, under the hands of the swarm of hostile Counsel.

It could not be said truly that Mr. Field lost the Bill in this connection. The scheme proposed was hopeless from the first; and when the Gaslight and Coke Company's own Money Bill was thrown out, it was obvious that the Company would not be permitted to get by a side wind the financial aid which they had been denied directly. For this was clearly their inducement to accept the South Metropolitan offer, although so much under their original estimate. What this was, came out in Mr. Livesey's evidence on May 14. The price asked by the Gaslight and Coke Company was £1,250,000; and the spirit in which the Board of the Company regarded the whole business is shown by Colonel Makins's characteristic comments on it at the meeting of the Company last February. He thought the question of price a fit subject for arbitration, and observed that the objection of the other side to

## TO CORRESPONDENTS.

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this procedure was due to the weakness of their case. At last, however, the Chartered Board were fain to accept Mr. Livesey's offer. But this is a business which does not concern the two Companies alone. The Public Authorities are not directly interested in the amount of money which the South Metropolitan Company might be willing to give, and the present owners to take, for the particular piece of gas property in question; but they are directly and deeply concerned with one of the consequences which would ensue upon its changing hands. At present, and for the last 17 years, the Gaslight and Coke Company have been under the obligation to charge for all the gas they supply for public lighting at the current South Metropolitan price. If the proposed arrangement were to be carried out, this obligation would cease; and to this release of the Company from a condition so advantageous to themselves, the Public Lighting Authorities objected—and justifiably, in the opinion of Parliament. The preferential terms in question meant from £38,000 to £50,000 a year on the public lighting rate, which it is not to be supposed for a moment that the Authorities would give up.

Besides this question of revenue, moreover, there was the difficulty that, if the Bill passed, the Gaslight and Coke Company would be placed in possession of £900,000 of fresh, if not of additional, capital. Mr. Field rightly contended that the purchase-money would not be additional capital; and it might be possible to strengthen this argument by showing that the value at which the property stands in the books of the Company is greater than the agreed price. Mr. Livesey avowedly based his estimate of the price of the severed portion of the old London Company's undertaking upon its value to the South Metropolitan Company to-day; whereas the other side probably took the book value. Be this as it may—the question has for the moment ceased to possess practical bearings—the consequential question of what the Gaslight and Coke Company would do with the money entered into and determined the public policy of the matter. That the transaction would put his Company in possession of some capital was admitted by Mr. Field, who likewise admitted that the Company badly needs capital. These admissions were enough to prove that at least Parliament and the Metropolitan Authorities ought to have a voice in the settlement. So the matter rests; but it cannot remain quiescent for very long. The Companies will probably be advised to go to Parliament next year with an agreed scheme, in the regular way. Then the merits of the recommendation of the Powers of Charge Committee can be gone into.

It only remains to congratulate the South Metropolitan Company in general, and Mr. Livesey in particular, on the signal triumph they have achieved this session. It would deprive this great performance of half its instructiveness for the technical world if the fact were overlooked that it was only possible by the way so wisely followed—that of falling in with the known sense of Parliament in these matters, and also of acting in obedience to the promptings of the best contemporary industrial polity. Parliament can only be led by being followed. Those who think they can safely flout Parliament first, and then get whatever they choose to ask from the same source of power, are likely to lose their labour. Not even the plea of necessity will avail when the applicant is suspected of unworthiness. There was no plea of necessity in the South Metropolitan case; and the Company prevailed upon Parliament to turn away from the best established practice, and to open a new chapter in the statutory history of gas supply in England. The Gaslight and Coke Company asked for nothing more than the most ordinary facility for carrying on their undertaking; and it has been denied again and again in face of obvious need. Surely, none but the wilfully or naturally blind can miss the moral here.

#### Plenty of Coal in London.

In the newspapers last week, a paragraph (given elsewhere) appeared, to the effect that colliery owners in Lancashire and Yorkshire had advised all whom it might concern, "that, although there is no apparent scarcity of fuel, the country is undoubtedly on the verge of another coal famine." Possibly this is only an instance of the wish fathering the thought, because our information does not support any such rendering of the actual situation. Indeed, there is reported to be more gas coal coming into the Port of London than one of the largest Companies can take comfortably. There was never so much coal at this season of the year in the stores of the South Metropolitan Company as there is at

the present moment; and the Company have even been able to oblige others with superfluous cargoes. The fact seems to be that the contractors are generally forward with their season's deliveries; but it would be rash to augur anything definite from this as regards prices for the future. Everybody who can is buying short; and the supply is ample. If, therefore, it is impossible to be confident that coal prices will fall before the supplies for the winter are arranged for, it is difficult to see in the actual conditions any premonition of a coal famine. This is a phrase which can hardly be justified in any circumstances, and certainly not now. If it is supposed to mean that there is likely to be a shortness of supply in some districts, the trouble will only be local. Coal has been hard to get sometimes when the market or contract price was not at all high; and now we seem at the converse condition of having plenty of coal, at a price. The whole course of the coal trade has been difficult to understand for some time past; the only certain thing about it being that the commodity was both scarce and dear. How long a plentiful supply will coexist with high rates, is now the question. Anyone who could make an accurate forecast of the trade for the next six months would not need to work for his living again. Meanwhile, one of the youngest of the London newspapers has had the temerity to publish a suggestion that a short Act of Parliament should be passed at once, ordering "that the exportation of British coal must stop till the price within the United Kingdom has fallen to a figure which will make it possible for every British hearth, whether in mansion or cottage, to have a good fire in it next Christmas Day." This summary remedy for the mischief of dear coal is put forward by a Mr. George Griffiths; and it would be interesting to hear it criticized by an expert or two. It smacks strongly of the famous "fowl-in-the-pot" policy of Henri Quatre; but this is only to say that similar emergencies seem to call for similar treatment in all periods of history. The difficulty is to prove the direct connection between the powers of Parliament and the object of enabling every householder to provide himself with a good fire next Christmas Day.

#### The Committee on Municipal Trading.

THE Committee on Municipal Trading continued their inquiry last week, and resume to-day, when Mr. Livesey is to give evidence relating to the aspects of the municipalization of gas undertakings from an independent standpoint. The subject has already been brought before the Committee by believers in the principle. It should hardly be necessary to repeat here that the party in municipal politics which supports the idea of municipal trading as a principle, does so usually on the ground that municipal administration is cheaper and better than company control, resulting in a service which is either more advantageous to the public in respect of price, quality, and efficiency; or which returns a profit to the Municipality that can be applied in aid of the rates; or serves both objects at the same time. This is the full charter of Municipalism, as upheld in what are called Progressive organs of public opinion, and warmly professed by many well-meaning and thoroughly sincere and honest members of Local Authorities all over the country. Others there are who do not go the full length of these views, and base their advocacy of the municipalization of certain public services on the simpler grounds of the expediency of Local Authorities having full control of their own streets, and the duty of such bodies to carry out the provisions of the Public Health Acts, even where these involve doing things which can be charged for and made to return a profit. Yet another variant of the principle is held by some who would municipalize all "monopolies," and conversely monopolize all such public services as are carried on at the risk of the ratepayers.

There are few men of affairs who would meet the advocacy of Municipalism with a flat negative. Even those who reject the idea of elevating the system into a principle of local politics, will admit that there is something in the street argument, something in the monopoly argument, and always reason for testing and treating every particular proposal for municipalization upon its merits. What they do deny, however, is that there is any intrinsic merit in the so-called principle itself. On the contrary, they regard the erection of the principle as fraught with considerable danger to the body politic, and maintain that the "previous question" is altogether against such an unnecessary extension of municipal officialism over the proper field of private enterprise. It seems, as we have remarked, hardly necessary to repeat



these definitions. Yet it is probably prudent to keep the true elements of the matter steadily in view; for in the discussion of particular cases the real issue is apt to be lost sight of. The general advantage of municipalized gas supply, for instance, is not established beyond the possibility of cavil by all the examples of successfully-worked undertakings that might be picked out from published records. If it is impossible to prove, say, that a Manchester Gas Company would have served the city and its suburbs with better and cheaper gas than the Corporation sell to-day, it is easy to show that the Corporation of Liverpool would find no advantage in municipalizing the undertaking of the Gas Company. That demolishes the "principle," and places the question on the only proper basis, of expediency.

Practically, there is keener interest felt by business men in the minor and ancillary branches of trade in which private enterprise is apt to be confronted with municipal speculation. Naturally, the ironmonger objects to the corporation gas-fitting shop; but, so far as the principle is concerned, the tradesman is obviously out of court. There is no reason, if the principle is conceded, why the line should be drawn anywhere. Why should not the Municipality undersell everybody, and make profits out of every kind of dealings? The right answer to this argument might be made a very voluminous one, if it were to cover all possible objections to the unlimited extension of municipal trading activity. The shortest point that can be made against the suggestion, however, is the very powerful one that the widest possible freedom of trade and manufacture is to the interest of the public. Competition keeps commerce progressive; and monopolies of all kinds, even those based on economical grounds—as with the American "Trusts"—are not to the public interest. People seldom recognize how few strict monopolies there are in the world. There can be no monopoly where there is an equivalent alternative. The most powerful monopolies, in fact, are rarely recognized as such by those who are affected by them; most people's opinions being ruled by names rather than by realities. We hold that the views of Sir Courtenay Boyle against the unlimited trafficking of municipal gas committees in ordinary consumers' fittings are sound, not for the sake of the local shopkeepers, but because, on the whole and in the long run, the latter will serve the public better. Here is a "principle," in short, which is as infeasible as the fancy one of the Progressives in municipal politics is false and misleading.

#### The Yield on Investments.

OUR contemporary the "Statist" discussed in a recent article a question of interest to investors generally, and therefore to shareholders in gas and water undertakings—the question, namely, of whether the return on investments is likely to rise. It has been obvious that during the past few years securities that could in any way be deemed first class have risen in market value to an extent quite unwarranted by any actual enhancement of their value from a dividend-paying point of view. In other words, owing to some external cause, first-class securities have within the last ten years very considerably appreciated in price; and the yield on money invested therein has proportionately decreased. We have always held the opinion that the rise in gas stocks—which has been very heavy—was in a large measure factitious—due, that is to say, to causes quite foreign to the gas industry, and, therefore, certain to disappear with those causes. Gas stocks have, of course, tumbled down smartly of late; but that has been occasioned by special and obvious conditions directly affecting the immediate prospects of gas undertakings. The question of interest for investors is, whether, when these special conditions have passed away, gas stocks in common with other home securities, will stand at the market price at which they stood twelve months ago, and return the same yield on money invested in them.

In the opinion of our contemporary, the probabilities are in favour of a general depreciation in first-class securities and a rise in the return on investment. The special economic circumstances producing, and the political occurrences prolonging, the abundance and cheapness of money in this country, and the consequent appreciation of home securities, are detailed, and form an interesting study. The prime cause was, of course, the Baring crash—leading to heavy withdrawals of British money from investments abroad, and the consequent embarrassment of many of the countries from which capital was thus withdrawn. The finances of the South American Republics, Portugal, Greece, Spain, and Italy were all seriously disturbed; and the United States,

while still suffering from the same cause, was further plunged into depression by the effects of the passing of the Sherman Act. The steady and large purchases of Consols, for debt redemption and on account of Savings Bank deposits (which grew rapidly owing to home trade remaining good), drove the premier security up to a ridiculous figure, and all other stocks followed in sympathy. Then no sooner had the investing public begun to recover its nerve—which process the Liberator disaster did nothing to accelerate—than political disturbances stepped in to warn investors off foreign securities. The trouble with the United States over Venezuela; the Jameson raid and the German Emperor's telegram; the Armenian atrocities; the Chino-Japanese war (with possible European complications); the wars between Greece and Turkey and between Spain and the United States—another menace to the peace of Europe; the Fashoda incident; latterly the Boer war; and now the trouble in China. Such, in brief, is the catalogue of events which have jostled each other in the last five years, to the keeping of British capital in this country to an abnormal extent.

During that period, and especially for the last two years, capital has been rapidly accumulating. We are selling to foreign countries at the present moment coal of the value of some 40 millions annually. This transaction necessarily results in a large addition to the supply of available capital in this country. It may, we think, be assumed that the economic and nervous effects of the Baring and Liberator troubles have disappeared. Nothing then appears to stand in the way of a great flow of British capital to foreign countries and to the Colonies (especially Canada and South Africa) and the development of trade abroad, except the disturbed condition of the political atmosphere. That, however, is a "but" of the first magnitude. Who shall prophesy? Our contemporary takes the most optimistic view, and looks confidently to the speedy restoration of peace in South Africa and in China. With regard to the former, the prospect—in spite of temporary and irritating checks to the establishment of our supremacy—is undoubtedly bright. The difficulties lie now rather in the direction of administration. As to the latter, it must be remarked that there is no small amount of loose gunpowder lying about. The hope of present peace among the Powers is in the immaturity of Russia's plans. The answer to the question propounded appears to be that, given speedy peace and a fair prospect of its maintenance, home securities will be increasingly deserted for foreign, and a rise in interest will ensue.

#### A Question of Nomenclature.

It is with a good deal of quiet satisfaction that those who have suffered from the familiar old political trick of "calling names" must watch the sorrows of the majority of the London County Council. We do not know if the practice has any recognized classification, by which one could refer to it; but what we mean in this connection is the way that certain astute politicians have of naming their own party by some noble-sounding appellation, while applying a prejudicial title to the opposite party. In the case of the London County Council, somebody had the happy inspiration of dubbing himself and his friends the "Progressive Party," while attaching to the others the unattractive designation of "Moderates," which is no name for conquerors. It is unnecessary to labour the point that this exercise in nomenclature has had much influence upon the electorate. Now the tables are turned. The London County Council have a Works Department, which is a great stand-by of the Progressive cause. It so happens that the Progressives allowed their usual feeling for nomenclature to lie dormant in connection with the method of stating the financial results of the operations of this department. They accepted a way of stating these results in terms of "profit" and "loss"—calling it so much profit when the cost of work executed was under the estimate, and loss when the estimate was exceeded. The truth of the matter is that the terms are not applicable to the circumstances; but the actual effect of their use in this sense is that the enemies of the system of the department are presented with a powerful weapon of attack. They affect to regard the so-called "losses" as being really money lost and wasted, instead of mere discrepancies between estimates and accounts rendered; and, do what they may, those who know how the matter really stands are powerless to prevent the misrepresentation. So much for the force of words! It would have been just as easy to call the differences in question by some different name; but the slip was made, and the natural consequences have followed.



## WATER AND SANITARY AFFAIRS.

THE passing of the preamble of the Bill of the Lambeth Water Company by a Committee of the House of Lords presided over by Lord Brougham last Wednesday, ensures the safety of the measure, and leaves the only other Bill of a Metropolitan Water Company now before Parliament—viz., that of the East London Company—to undergo the ordeal of an inquiry by the Upper House. At present, the Lambeth Company are limited to a draft of  $24\frac{1}{2}$  million gallons of water daily from the Thames; and they asked to be allowed to take an extra  $20\frac{1}{2}$  millions, which, with the yield from their other sources, including a well at Selhurst, would give  $54\frac{1}{2}$  millions, or more than sufficient to meet the demands of the population in their district for the next twenty years, on the basis of 35 gallons per head. In order to deal with this extra water, additional storage and distributing works will, of course, be required; and it was in regard to these that the Company have encountered opposition—but not, strangely enough, from the London County Council, who, after the passage of the Bill through the Commons, had assumed a peaceful attitude towards it. The opponents were the Local Authorities of Esher, the Dittons, and Surbiton, who objected to the site of the reservoir, and also to the laying of the large main through their district. The proximity of the site to two sewage farms was certainly a feature of the scheme against which a good deal of sentimental objection could be urged; and the fact that a similar condition of things existed at Staines, when the reservoirs were sanctioned there, would not have weighed with the Chairman of the Committee if he could have been convinced that danger to the public health would be likely to arise from the carrying out of the works proposed. But the promoters brought up Professor Dewar, who told his Lordship and his colleagues that during the whole course of the inquiry by Lord Balfour's Commission, of which he was a member, it was never suggested that sewage farms constituted a danger to water supplies in the sense contemplated by the petitioners against the Bill. Their Lordships were assured that any filtration of offensive matter through the soil was out of the question—in fact, it was an impossibility—owing to the puddle wall of the reservoir being absolutely water-tight; and Mr. G. F. Deacon, as an Engineer, frankly acknowledged that the danger, to his mind, arose rather from the possibility of pathogenic microbes being air-borne. This was the view taken by Dr. Beale Collins, the Medical Officer of Health for Kingston. The promoters, however, had Sir William Crookes at hand to confirm Professor Dewar's statements; but as the Committee had no wish to hear him, it may be concluded that they did not view with any alarm the reservoir part of the Company's scheme.

The next point to be dealt with was the opposition to the course of the large main. As the area under the jurisdiction of the Surbiton District Council would be only interfered with to a slight extent, the Council submitted that their district might be easily avoided altogether; while the other Local Authorities objected to interference with the public roads for putting down water-pipes. Mr. T. F. Parkes, the Company's Chief Engineer, however, showed that the inconvenience to Surbiton would not extend over more than six weeks, and the main, once down, would last for fifty years; and surely this trifling inconvenience would be compensated for by the addition to the rates which its occupancy of the soil will bring. As to the other places, the complaint of Mr. A. J. Henderson, the Surveyor to the Esher and the Dittons Council, was briefly that the roads in his district were to be disturbed, and the "amenities" of the locality interfered with, for the laying of a main which could be taken over agricultural lands. He urged that, as a general proposition, if a trunk main such as the one in question, which was of a size never contemplated when the Water-Works Clauses Act was passed, could be taken across country or private property, it should never be laid in a public road. In this particular case, a 54-inch main would lie at a depth of 15 feet in water-logged ground, which would involve pumping, the result of which would be to overcharge the sewers. Moreover there would be liability to subsidence; and as this had continued for some years after the Company had laid mains, the Local Authority were saddled with the cost of reinstating the roads. The mischief, it was alleged, usually occurred after the expiration of the twelve months

during which the Company were liable for making good any damage. The promoters urged that the opponents of the Bill were already safeguarded in this particular matter by the operation of the general law. The Committee, however, held a different opinion, and they passed the Bill subject to the insertion of a clause making the Company liable for three years for the repair of any damage caused by subsidence to the surface of the road, or to the existing underground pipes or sewers, in consequence of the unusual size of main to be put down, and the great depth of the cutting. The promoters accepted the condition, as well as others safeguarding the interests of the districts; and there need not, we think, be any fear on the part of the Local Authorities concerned as to their being rigorously fulfilled. The extension of the period of liability appears to have been called for by the special circumstances of the case, as set forth in the new clause; but it must not be taken as a precedent capable of general application. However, it was better for the Company to obtain their Bill with the condition imposed, and the inhabitants of the Metropolis to be assured of the additional supply of water which will be available under its provisions, than to lose it by refusing to bear responsibilities which may, after all, be much less burdensome than they now appear.

The discussion on the paper read by Mr. A. J. Jenkins, at the annual meeting of the British Association of Water-Works Engineers, on the waste of water and its prevention, noticed in the "JOURNAL" last week, came very opportunely at the season of the year when waste is generally prevalent, and when, owing to the extra demands upon the resources of the suppliers of water, its check and prevention are all the more necessary. Though difference of opinion exists as to the best course to pursue to attain this much desired end, there is none as to the absolute need of its attainment. No one would for a moment wish to curtail the legitimate use of water. As the "Lancet" has recently pointed out, the habits of personal cleanliness which are characteristic of the population now as compared with half-a-century ago—including the more general provision and freer use of baths in the smaller class of houses—coupled with a greater regard for the public comfort and convenience, necessarily entail a greater use of water in the warm weather than at other times of the year; and when the suppliers of this valuable commodity, whether companies or corporations, ask the consumers to be as careful as possible in its use, they are not demanding anything unreasonable. But there are others besides the consumers who are concerned in this matter—namely, the owners of property. It is unquestionably their duty to see that the fittings in their houses are not in such a condition as to cause waste of water; and if they neglect it, they must be made to pay the penalty. It is therefore with no little satisfaction that we record in our "Legal Intelligence" the proceedings taken by the Liverpool Corporation against two firms and a private individual in the city, who, between them, caused about 107,000 gallons of water to be wasted in consequence of defective fittings. One firm had been warned on six different occasions, without effect; and the Magistrates made an example of them by imposing fines amounting, with costs, to £9 2s.—the other defendants being fined 40s. and 20s. respectively, with costs. Where friendly remonstrance is unheeded, the law must be put in force to punish people whose negligence causes such waste as that recorded in these cases, even though the consumers have the Vyrnwy supply at their command.

**North British Association of Gas Managers.**—The 39th annual general meeting of the Association will be held in the Masonic Hall, George Street, Edinburgh, on the 26th and 27th inst., under the presidency of Mr. W. Ewing, of Hamilton. We learn from the programme issued by the Secretary (Mr. R. S. Carlow, of Arbroath) that, in addition to the Inaugural Address, four papers will be read: "The Construction and Working of Inclined Retorts," by Mr. W. R. Herring, of Edinburgh; "Automatic Meters, with a Comparison of Prices charged to Slot and Ordinary Consumers," by Mr. T. Lighbody, of Renfrew; "Jottings on Some of the Principles of Gas Manufacture, and their Practical Application," by Mr. W. Young, of Peebles; "Observations on Retorting and Condensing," by Mr. Forbes Waddell, of Forfar. Mr. Young will illustrate his paper with lantern views. The members and their friends will dine together in the Balmoral Hotel, after the business. The day after the meeting will be devoted to an excursion to the Falls of Clyde, with luncheon and tea at the Clydesdale Hotel, Lanark.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 175.)

THE Stock Markets have had a less depressing period last week than they had in its predecessor; but still they were not exempt from agitations and fluctuations. At first they ruled quiet, and with rather a cheerful disposition. By mid week, the intense heat of the weather almost arrested what little business was doing, not a difficult operation, for the public were standing quite aloof. Then came a wave of depression caused by another "regrettable incident" in South Africa and by Chinese anxieties; and this lasted to the close. Prices have been irregularly affected; Consols being particularly depressed. The fortnightly settlement was a light one, and proceeded smoothly. The Money Market was quite easy at first, with abundance to meet all requirements. But a marked change supervened, and rates hardened materially; so that a possible rise in the Bank of England rate this week was seriously discussed. In the Gas Market, business was much more active than in the preceding week, especially in certain important issues that had been rather quiet for some little time. It is noticeable that the steadiest stocks were those in which there was most dealing; while those in which there was little or nothing done were most subjected to change. Almost all changes without exception were in the downward direction; and some of the reductions appear to be quite extravagant. In Gaslights, the ordinary stock was moderately dealt in almost daily; and opening at  $98\frac{1}{2}$ , it changed hands occasionally at  $99\frac{1}{2}$ —the quotation advancing a point, but for what reason it was not quite clear. The secured issues were very quiet and unchanged. South Metropolitan was moderately active, and at level figures at first; but just at the close it fell a point. Here, again, the cause of this movement is not readily evident. There were a few dealings in Commercial at level figures, after which the new stock was lowered. The Suburban and Provincial group was much depressed; some parcels of stock appearing to be almost recklessly thrown upon the market. Tottenhams and Brightons were the chief sufferers. In the Continental group, there was considerable activity in Imperial, which was weak at first, and touched as low as 198; but it quickly recovered to 202, and closed steady. Union had a fall. Among the rest, there was no incident calling for notice. The more or less general flatness extended to the Water Companies, even to the choicest issues; and what few changes in quotation took place were for the worse.

The daily operations were: Business opened fairly brisk on Monday with moderate prices. Brighton "A" fell 5, and Continental Union  $2\frac{1}{2}$ . Tuesday was active at steady figures. In Water, West Middlesex receded 5. Transactions were lighter on Wednesday; and the only change was a rise of 1 in Gaslight ordinary. On Thursday, Tottenham "A" was sold at  $104\frac{1}{2}$ , and Brighton "A" at 165; and accordingly both Brighton moved down 5, Tottenham "A" 17, and ditto "B" 8. Friday was very quiet; but Commercial new fell 5, and Crystal Palace  $2\frac{1}{2}$ . In Water, New River debenture relapsed 2. Saturday was almost stagnant; but South Metropolitan fell 1, and East London Water 2.

### ELECTRIC LIGHTING MEMORANDA.

The Electric Power Bills through the House of Commons—The Question of Electricity Meters—Electric Lighting at Hastings—A Spendthrift Department.

THE remaining Electric Power Bills have survived the Committee stage in the House of Commons, and consequently have a good chance of becoming law this session. They may be further opposed in the Lords; but the Upper House will not go over again the ground so thoroughly covered before Sir James Kitson's Committee. It will now be seen how much solid ground there is for all the fuss that has been made over the alleged neglect by English mechanical engineers of the possibilities of cheap electric power. There can be no doubt whatever that the country is now far more ripe for enterprise of this kind than it was even a year or two ago. No engineer nowadays is likely to think himself "no end of a smart fellow" because he has his tools driven by electric power instead of by steam or gas power. The Germans and Swiss have taken the lead in this line—partly through force of circumstances; and the Americans have not been far behind. Consequently there is already a good store of information available with regard to the real advantages of electric power. That it is cheap, as compared with other forms of power, does not seem to be proved. Some light is thrown upon this aspect of the power question by the statement, recently published, that although the American works of the Westinghouse Air Brake Company have changed over to electric distribution of the power required in the shops, the same boiler plant is still in use. Again, there is uncertainty in proportioning the electric motor to the work required. These motors are costly; and it is necessary to have them big enough. Hitherto it has not been particularly ascertained how much power every machine needed. For the successful use of electric power, this must be known; and even then it appears that the motors do not in practice work to much more than one-quarter of their full capacity.

The question of electricity meters is still anything but settled; and one of the first things the new Electric Power Companies will have to face is the alternative between supplying in bulk on agreed terms, or trusting to consumers' meters. Mr. S. Evershed has just brought a new frictionless motor meter under the notice of the Institution of Electrical Engineers; and—remembering our recent passage at arms with the "Electrician" on the comparative merits of meters for electricity and gas—we have been curious to learn more of the subject from this authority. Mr. Evershed admits frankly that electricians have something to learn from the gas-meter, "of which (in spite of much unmerited and ignorant abuse) it may safely be said that, while in point of accuracy it compares not unfavourably with the average electric meter, in other respects it is far in advance of any electric meter at present in use." The gas-meter has the advantage, he goes on to say, that it is not required to measure pressure. There is always plenty of power behind it; and if it does absorb a large proportion of the pressure, this is no disadvantage to the consumer. For the same reason, the gas-meter has remarkable endurance. It is far otherwise with the electricity meter. This is an instrument for measuring energy; and it must not be allowed to absorb more than a very small fraction of the energy and pressure of the supply. How far the makers of electricity meters have succeeded in meeting the requirements of the trade does not transpire; but it seems pretty evident from what Mr. Evershed has said and done, that they cannot just yet crow over the gas-meter makers.

It can be readily understood that the Hastings and St. Leonards Gas Company watch with unholy joy the electric lighting experiences of the Corporation. There is a long story about the electric light in Hastings, and we are not going to tell it here. Suffice it to remark that this is a favoured place where the original speculators in this line were duly bought out in the name of Municipal enterprise, and the service was "municipalized" along the approved lines. How the "deal" answered the expectations of those who transferred their property to the town, need not be inquired into; but the consideration paid was not an unhandsome one. Oddly enough, it transpired soon afterwards that some of the plant needed to be renewed, which was done out of the new capital borrowed. Now it appears that the capital represented by the electric light undertaking amounts to a considerable fraction of that by which the Gas Company light the whole neighbourhood, while it need not be said that the same ratio does not hold good for the business done by the two concerns. The local newspapers which urged the purchase of the electric lighting undertaking in the whole-hearted way usual in such cases, are now beginning to doubt whether a profit of £253 on the year's working is quite such a brilliant success as they anticipated. Of course, if certain allowances are made, it is possible to show a paper profit of double the amount; but this is always the case with municipal book-keeping. What is more to the purpose is the circumstance that the undertaking is not charged a penny for depreciation; so it is already "overrunning the constable" to the amount that should be reasonably borne on this account. When will corporations perceive that it is useless to blink this consideration?

They all do it. Hastings is as bad as the rest; but not worse. Here we find the Chairman of the Electricity Committee, Dr. Allfrey, lamenting that money has to be paid into the sinking fund immediately on account of new machinery purchased. And a good thing, too, for the ratepayers! What corporation finance would be like, but for the salutary check of the sinking fund, it is difficult to say in moderate language. As it is, a popularity-hunting corporation cannot absolutely give away electricity or anything else, and leave posterity to pay the bill. They are bound to redeem their loans, if they are free to let their machinery wear out. Dr. Allfrey, of Hastings, is the very type of the municipal trader. Not a commercial man himself, we judge by his name, he does not see that he is talking financial heresy when he complains of the Corporation being "handicapped" by having to pay back capital at once. Probably he does not appreciate the necessity for every generation of ratepayers clearing its own heels in regard to debt, nor understand that redemption of loan is not the same thing as maintenance of the property on which the money was spent in its profit-earning capacity. There will be no chance, such as the old Company had, of passing the plant on to somebody else at a kindly valuation. Not one iota less than  $2\frac{1}{2}$  per cent. on the capital outlay, as Professor Smith has shown, is required to adequately depreciate electricity supply works. It will be some time before Hastings makes both ends meet in this way—to say nothing of returning a clear profit.

The Index to Vol. LXXV. of the "Journal"—January to June—is now ready; and a copy will be forwarded (free) by the Publisher, on receipt of a post-card from any subscriber.

The Accounts of the Gaslight and Coke Company.—The Secretary and General Manager of the Gaslight and Coke Company (Mr. John W. Field) writes saying that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the statutory rate of £4 8s. per cent. per annum, carrying forward a balance to the next account of £296,755 os. 11d.



## THE QUESTIONS BEFORE THE DEPARTMENTAL COMMITTEE ON PATENTS.

### [FIRST NOTICE.]

It has already been recorded in the "JOURNAL" that the Board of Trade have appointed a Departmental Committee to consider certain questions relating to the working of the English Patents Acts. The names of the members of the Committee, which is a very strong one, and the terms of the reference, were given on May 29. In view of the importance of the inquiry thus ordered, and the position taken up by the "JOURNAL" in regard to English Patent Law and the work of the Patent Office, it is desirable that our readers' attention should be more particularly directed to the subject-matter of the reference. In the first place, it is to be noticed that the Committee are informed that Her Majesty's Government do not think any general system of official examination of applications for letters patent for novelty desirable, and do not propose to establish any such system. Consequently, the Committee are not required to extend their inquiry to include anything of this nature that may form part of foreign patent laws. This prohibition is very clear and positive; and we venture to think it will commend itself as wise and prudent to most experienced practitioners in patent business. The Committee are instructed, however, to inquire into the working of the Patents Acts, as proving the expediency or otherwise of the Patent Office being given additional powers to (a) control, (b) impose conditions on, (c) otherwise limit the issue of letters patent for inventions which are obviously old, or which the information recorded in the office shows to have been previously protected by letters patent in this country. This is the first question referred to the Committee—that of the expediency of a limited and particular official examination of applications for novelty. For the present, we will confine ourselves to the consideration of the issue thus raised; leaving over the two other questions contained in the reference.

The fact of an inquiry being on foot with regard to the much-debated question of the desirability of an official examination for novelty, is calculated to let loose again the floods of controversy that have so often been poured over this matter. It will be as well, therefore, to indicate with all possible exactitude precisely what the present question really is. It certainly does not touch utility. It is clearly also limited in scope. Here appears to be the initial difficulty. Our contemporary "Engineering," which usually treats patent topics with marked ability, complains that the language of the reference is peculiar, and seems almost to involve a contradiction. This is because of the express limitation of the scope of the suggested official inquiry to the detection of the obvious and the plainly anticipated. We fail to see any inconsistency in the terms of the reference, and think our esteemed contemporary has misled itself by overlooking the word "general" put before the word "examination" in the first sentence of the reference, which defines what the Government do not want. Surely, there is no difficulty in understanding the point here—that, while the Government absolutely forbid the Committee to consider the question of a general inquiry ranging over the whole field of human knowledge, they think it worthy of investigation whether anything is feasible in the more limited way indicated. The limitation is perfectly fair and intelligible. It is to be in two directions, if it is to be at all. First, the official examination will be directed to the detection of the obviously old; secondly, to the plainly anticipated by earlier patentees in this country. The former question is within the ability of any ordinarily well qualified workman or other person reasonably skilled in the subject-matter to decide, without hair-splitting or uncertainty. It can as well be done within the Patent Office as in a Court of Law. Any two skilled men can agree as to whether an invention is obviously old or not. If there is a doubt, the applicant would get the benefit of it. The other branch of such an official inquiry is of a different character. Still, if the idea of obviousness is retained as ruling the judgment of the official examiner, there ought not to be any practical difficulty in arriving at a decision.

The former kind of examination is evidently meant to spare the pocket and time of the ignorant would-be inventor; while the latter inquiry would be an assistance to every applicant for letters patent. "Engineering" stigmatizes the suggested limited official examination, on these two heads, as contemplating a very ineffectual and perfunctory practice in this regard. With this remark, we do not agree. On the point of principle only, which is all we have been considering so far, we hold that the idea of a strictly limited official examination, not for novelty, but for the absence of the obviously old—a very different thing—and for equally clear absence of anticipation by prior patent, is quite a feasible one. The two limitations, moreover, are clearly defined, are natural, and are such as everybody can appreciate. Whether the suggestion should be acted upon, is another consideration altogether; and the decision must be governed by the effect which it is proposed to give to the findings of the official examiners.

Accordingly, the Committee are to inquire as to whether, assuming the plan of limited official examination of applications to be feasible of execution, any, and what, effect should be the consequence of its application. Here we are brought face to face with a possible cure for the wrong so bitterly complained of on many occasions—that the Patent Office takes fees from

any ignorant poor man, and issues in return patents which are not worth the paper they are printed on. Quite so; but what is the only alternative to this unrestricted issue of letters patent? A system of restriction; and at the very suggestion, the "howl of deprecation" rises from all the Patent Agents. Let us hear "Engineering," speaking as with the voice of a Patent Agent, on the subject. Our contemporary adjures the public to resist to the uttermost any arming of the Patent Office with plenary powers of refusal of unopposed applications, on the ground of alleged want of novelty; and also any official marking of the letters patent with any opinion or reference to supposed anticipations. This is quite right. At present, in unopposed applications, the patent is granted; and this piece of English liberty is too precious to be sacrificed readily. The point insisted upon by our contemporary is that any official information imparted to the applicant while the application is before the officer should be public property. The applicant would get it first; but he should be bound to mention it in his specification, only in such a way that the public may not know that he did not put it in himself originally, in his own words. That is to say, there should be nothing on the face of the specification to indicate that any reference it may contain to anticipatory matters has been inserted at the instance of the Patent Office authorities.

This is a most important suggestion; and we hope it will be brought well before the Committee. It gets over the objection that the whole benefit of the official examination for anticipations would be for the applicant who is not deserving of any such assistance in his attempt to procure a valuable industrial property. Most of the proposed amendments of the patent laws we have seen are couched in the imagined interest of the inventor, which is a one-sided way of putting the case for reform. The patent system exists for the good of the country, not for a class; but this elementary fact is commonly forgotten by those who talk about the woes of the "poor inventor," as if he were everybody, and everywhere. The suggestion that applicants should embody the result of official intimations of anticipating matter in their specifications, presumably as a condition of the issue of letters patent, is besides in accordance with the dictates of sound public policy. It is eminently desirable that patentees should know what they are about. Consequently, there can be no hardship in requiring them to propound their claims with overt admission of whatever has been done before in the same line. This is, indeed, the common practice of well-advised inventors already. Very many specifications set forth the applicant's knowledge of presumptive anticipations, and discriminate between what is proposed to be done and what has been done before. Naturally, the chances of a valid patent being secured under these conditions are vastly greater than where the patentee holds his course as though he were also a discoverer, which he rarely is nowadays.

It hardly seems to be probable that patentees would object to acknowledge official information as their own, as the price of it. They would realize that, although the warning came to them officially in the first place, and confidentially, it is all public. What is to be the case, however, of the unhappy applicant who wishes to appropriate the obviously old? Will he always be content to retire? Here there can be no condition of admitting information as the price of the application going forward, because such admission carries invalidity on its face. There are, moreover, no more hopelessly obstinate men than ambitious patentees, clever in their own conceit, who are too ignorant to be aware of their own ignorance. Add this impenetrable ignorance to cupidity which reaches to millions, and the combination is not one to be quelled by an official warning. Consequently, in cases where an applicant wishes to patent something obviously old, after having been warned of the fact, the only proper course will be to let him go on. The Patent Office must take his fees; and experience must be his master. Other people, at any rate, will no longer be able to hold him up as a victim of anything but his own pig-headedness.

Whatever is done in this way, it is most desirable that applicants and the public generally should be made aware that the issue of letters patent, with or without examination, carries no sort of guarantee of indefeasibility of the patent. "Engineering" well observes that there is a popular delusion that in countries like Germany and the United States, where the Patent Office authorities have the right to refuse patents on the ground of want of novelty, the protection there given is worth more than it is in England. This is a wholly fallacious idea; but that it finds general acceptance, appears from an otherwise excellent letter of Mr. R. Randal Phillips to the "Daily News" of the 8th ult. This writer, while warning people against the illusion that patenting trifles is a short cut to affluence, goes on to remark that "the granting of a patent should be, as in America, a guarantee of novelty." He also states that "the American Patent Office gives real protection for seventeen years for £7 only." How obstinate is human error, when once, so to speak, standardized!

It is really beside the mark, after the precise definition of the Government view, to discuss all the general aspects of official examination of applicants, with power of rejection. "Engineering" seems to be very much afraid that the Board of Trade may be advised to seek this power for the Patent Office; but there is nothing in the terms of the reference to warrant this nervousness. In all probability, the Department and the Law Officers of the Crown have pretty well agreed as to what should and should not



be done; and this will eventually come out as the recommendations of the Committee, unless it is seriously shaken in the course of the inquiry. Honestly, we think the suggestions for a limited official examination go quite as far as is either necessary or expedient in the direction of advising applicants. The encouragement of ignorant persons of an inventive turn of mind to gamble in patents, is not to be desired in their own or the public interest. It would be better if nobody went in for patenting things unless he could truthfully claim to possess expert knowledge of the matter. But this is beyond hoping for, even if it were in all respects desirable. There are many departments of human ingenuity, moreover, in which there can scarcely be said to be degrees of knowledge; and these are the happy hunting grounds of the amateur of invention. Why should the pleased schemer of the only perfectly good tobacco-pipe be debarred from backing his harmless fancy with a few sovereigns, which he can easily spare? But this reflection suggests another. Is not the machinery of official examination too ponderous to be capable of dealing suitably with trifling matters? Yet how is the line to be drawn? At present there is no line. The first thing for the Committee to decide will be the desirability of attempting to draw one; and it is by no means certain that the answer to the question will be in the affirmative.

### THE GAS SUPPLY OF BOSTON (MASS.).

(Continued from p. 83.)

IN the previous article, we outlined the history of the Boston gas undertakings up to the point when, as the result of much financial juggling, the greater bulk of the capital of four of the principal Boston Gas Companies had been acquired by, and been put in trust for, the Bay State Gas Company, of Delaware, which latter Company had complete control of the subsidiary Companies. The expenses incurred by the Boston Gas Syndicate, who arranged the purchase and putting into trust of the various stocks of the Companies acquired, amounted, it may be mentioned, to no less than \$278,000, or nearly 7 per cent. on the share capital of all the Companies now in the Trust. Of this amount, only \$22,600 went in legal and office expenses; the rest was spent in "commissions" and salaries. The final result of the operations of the Syndicate was, then, a Trust with a capital of \$17,000,000, organized to work companies whose property had been acquired—as some people considered, very dearly—for just about half that amount.

The problem for those controlling the Trust was to earn adequate dividends on the amount of its capital, and to provide its Directors with what they deemed sufficient emolument. On this point it is interesting to note that, whereas prior to the consolidation of the four Companies the total amount paid by them annually in salaries and Directors' allowances was only \$18,300, it rose after the consolidation to nearly \$61,000 per annum, of which amount the President—the chief proprietor—took the modest sum of \$25,000. In order to make clear the method by which the Trust sought to obtain a return upon the inflated capital, we must hark back, and explain a transaction, of much importance in the history of Boston gas financing, to which we have purposely made no previous reference, for fear of possibly confusing the reader. But it will be remembered that Mr. Addicks commenced his operations in Boston by forming the Bay State Gas Company of Massachusetts. Now this Company, in March, 1885, made a contract with Mr. Addicks (who practically owned it) for the construction of its works for the sum of \$4,950,000. The Company was by law unable to issue more than \$500,000 capital; so it paid its contractor, before one brick had been put upon another, \$450,000 in cash, and then gave him a ninety-nine year bond or "obligation" for \$4,500,000, bearing interest at the rate of nine-tenths of the net earnings of the Company. As has already been mentioned, the total outside value of all the works ever constructed for the Company did not exceed \$750,000. This famous "obligation" for \$4,500,000 was assigned to one company, trust, or syndicate after another, till eventually it was held by the Bay State Gas Company of Delaware. Now let us try to make the situation at the time the Trust was formed as clear as possible.

The Bay State Company of Delaware controlled four of the principal Gas Companies in Boston. It was also entitled, under the terms of the "obligation," to nine-tenths of the profits of the Bay State Company of Massachusetts, which had actually undertaken to enter into competition with, and to parallel the mains of, the aforesaid four Companies, among others. The Massachusetts Company (identical, be it remembered, so far as interests were concerned, with the Delaware Company) had constructed water-gas plant of large capacity, but had made no attempt to fulfil its promise of competing with the existing Companies. Now although no statute prohibited the raising of the price of gas to the public, nor the distribution of more than 10 per cent. dividend, by the various Boston Companies, yet "those who formed the combination," says Mr. Gray, "did so with the full knowledge that a tradition stronger than any statute fixed 10 per cent. as a general maximum dividend, and that, having gained admission to Boston solely on the strength of the promise to give the public cheaper gas, it would be impossible to materially raise the price of gas in Boston at a time when gas prices everywhere else were rapidly declining.

It was perfectly plain to everyone concerned that any attempt to raise the price would cause appeals to the Legislature and the Gas Commission for investigation, regulation, and lowering of the price of gas." If, then, it was not practicable to obtain substantially more revenue from the public, nor divide greater profits to the shareholders, how were the owners of the bulk of the shares to get more out of the concerns than had formerly been earned?

Their plan was this: The Massachusetts Gas Company was to make water gas in bulk, at a much lower cost than that at which the pooled Companies had hitherto been able to manufacture coal gas, and then sell it, at a large profit, to these subordinate Companies, who, in their turn, were to charge the public, and pay dividends (to the Trust which owned them, it should be noted) at the previously ruling rates. Under the terms of the before-mentioned "obligation," issued by the Massachusetts and held by the Delaware Bay State Company, nine-tenths of the profits earned by the former were to go to the latter—the holders of the bulk of the minor Companies' stock. The public were, in fact, to pay coal-gas prices for water gas, and the Trust operators (who traded by virtue of the law of another State) to take, in two bites, the larger profits thereby earned. It has been mentioned that, when the Massachusetts Company came into being, the laws of the State prohibited the distribution of gas containing more than 10 per cent. of carbonic oxide, but that the Company, notwithstanding, proceeded to erect considerable water-gas plant. The 10 per cent. limit was repealed in 1890; but prior to that date, the Massachusetts Company had sold some 161 million cubic feet of water gas to other companies, who mixed it with coal gas, and distributed the mixture, which, however, was not always within the prescribed limits in regard to percentage of carbon monoxide. "It is understood," we read, "that this mixture contained regularly more than 10 per cent. of carbonic oxide. But the Companies became liable to a penalty under the prohibition only if their gas contained more than the legal limit of carbonic oxide 'on three successive examinations.' By some 'toleration' on the part of the State administration, it was easy for the Companies to find out when inspections would be made, and thus continue these sales, and still avoid the penalty by being within the limit at one examination out of three."

The Company may, however, be said to have only started business as manufacturers—as distinguished from financiers only—after the passing of the Act of 1890. The measure of the success that attended its early days will be seen from the fact that, during the twenty-one months to March 1, 1892, on a total sale of 1390·7 million cubic feet of gas—to the Companies actually supplying the public—profits were made to the extent of \$875,000, or an average profit of 63 c. per 1000 cubic feet. The means by which such a rate of profit was achieved were as follows: The gas cost the manufacturing Company from 33 c. to 40 c. per 1000 cubic feet. This they sold to the Boston Company—to take the principal of the subsidiary Companies as an instance—at \$1 per 1000 cubic feet; the Company in its turn charging consumers about \$1·28. But the amount paid by the Boston to the Bay State Company did not end at the dollar per thousand. The gas had to pass through about 6 miles of the latter's mains in order to reach those of the former. For the use of these mains, "the first cost of which was somewhat less than \$150,000," the Bay State Company charged the Boston Company \$100,000 per annum, equal to a further 51 c. per 1000 cubic feet. The Boston Company had therefore to sell the gas bought by them from the Bay State Company at a loss, recouping themselves by ceasing to allow the discounts which they had previously given to their largest consumers. Further, the Bay State Company began, in 1890, to supply the Boston Company with its coal "at what was officially declared to be an advance over the market price," and made additional profit by buying the latter Company's tar at less than cost, and selling naphtha to them at excessive prices.

This was all very nice for Mr. Addicks and his party; but the public began to wonder when they were going to reap the benefit of the cheapening of the cost of manufacture, of which they had heard a good deal. An agitation was set on foot, which resulted in the Legislature, in 1892, ordering the Gas Commission to report upon the relations of the Boston Company to the other Companies. The questions to be determined by the Commission were: "As to whether the prices charged by the Boston Company had been raised within six months [by the abolition of discounts]; as to what the Company could manufacture and distribute gas for, and pay 8 per cent. on its capital; as to what extent the Boston Company was paying excessive rent for street mains; and as to what extent it was paying \$1 per 1000 cubic feet for gas which it could manufacture itself at less cost; and, finally, as to whether or not the Bay State Company was diverting the surplus earnings of the Boston Company into the treasury of the Bay State Company of Delaware." The Commission promptly reported that "the Boston Company, under the conditions of that time, acting independently, could sell coal gas to consumers at \$1 per 1000 cubic feet on an 8 per cent. dividend basis, whereas the combination had for several years been selling a much cheaper gas in this territory at from about \$1·21 to about \$1·28 per 1000 cubic feet net." The result of this report was the ordering, in 1893, of a special investigation into "the alleged illegal action and relations of certain of the Boston Gas Companies." With the proceedings leading up to, and during, the investigation we shall next deal.



## THE COAL AND IRON TRADES DURING THE JUNE HALF-YEAR.

THE publication of the Board of Trade returns for the month of June, and for the six months therewith ended, affords an opportunity for looking back upon one of the most remarkable half years ever experienced by the business world, and one little likely to be forgotten by the gas industry. The tidal wave of trade prosperity which was fast rising at the end of 1899, continued to grow in magnitude during the early months of this year, until it reached its maximum, as we are inclined to think, about the end of April. We do not mean that statistics show that since then trade has begun to fall back, but that the real soundness then went out of the expanded condition of the trades whose abnormal prosperity was primarily the cause of the great industrial revival, and whose collapse, when it comes, must as certainly be the primal cause of the inevitable reaction. We need scarcely say we refer to the iron and steel trades.

It must be a matter of some chagrin for the British manufacturers—but it is undoubtedly a fact—that the state of the world's iron and steel markets depends now very much more largely upon the condition of those markets in the United States than upon the position of affairs in this country. That has become inevitable, owing to the enormous growth of the American iron and steel industries in recent years; the production of their manufactories now far exceeding that of our own. The output of pig-iron in the United States has risen from 11,734,000 tons in 1898 and 13,621,000 tons in 1899, until at the present time it is estimated as being at the rate of 15,500,000 tons a year, as compared with about 9,000,000 tons in the United Kingdom. This enormous and rapid increase of production on the other side of the Atlantic, resulting, as it must do, and we believe actually has done, in the considerable overlapping of consumption, will have far-reaching effects on the European side of the water—effects which are already beginning to be felt, and which the student of our own markets for commercial purposes must endeavour to anticipate and discount. Prices began to fall in America at about the time to which we have referred as marking the full-flood of the trade wave—the end of April; and since then pig-iron has come down 25 per cent., and steel billets about 40 per cent. from top prices.

The immediate effect has been to cause buyers on this side to keep out of the market, except on the most urgent business; and a decided change has come over the prospects of the iron and steel trades. Indeed, the manufacturers are finding themselves in an awkward predicament as to the future; for, with competition from America becoming daily more threatening, they foresee great difficulty in maintaining present prices for their goods, while raw material, labour, and fuel grow dearer rather than cheaper. The "boom" which the engineering trades started is, in fact, proving something of a boomerang. However, the iron trades have made a good harvest while the sun has been shining, as the Board of Trade returns plainly show; for the total weight of iron and steel goods, other than machinery and ships, exported during the past half year amounted to 1,992,973 tons, valued at £17,352,533, against 1,686,435 tons, of the value of £12,481,346, in the same period last year, which itself showed an increase of 36,000 tons and close upon £1,000,000 over 1898.

But, as we have said, the fear of American competition is having a wholesome effect upon the disorganizingly high prices of metal goods; and the return to a more normal state of affairs will further be hastened by the reduced demand which is to be noted as consequent upon the paralyzing effect of high prices on trade. As might be expected to be the case, nowhere is this effect seen more clearly than in the shipbuilding world; for there would be as much sense in a firm building a ship with metals at their present prices, unless absolutely compelled to do so, as for a gas manager to choose such a time for erecting new or reconstructing old plant. Ships, like gasholders, have to pay their way through times of bad as well as of good trade, and do not want a handicap of an extra 50 per cent. of capital to earn dividends upon. That the shipping people are alive to this consideration, is clearly shown by the fact that, while the Scotch shipbuilders have launched vessels of a total displacement of 232,600 tons since the 1st of January, they have only received orders equal to 105,600 tons during the six months. The Scotch ironmasters are, indeed, already talking about shutting down; and the annual closing of works for "Fair" holidays is likely to be extended for several weeks longer than usual.

Up to now, we have spoken only of the remarkable expansion in the iron and steel trades witnessed during the half year; but the most noteworthy characteristic of that period remains to be touched upon—namely, the extraordinary condition of the coal market. What this condition has been, our readers know, many of them, better than we could tell them; for they have made personal and painful acquaintance with its unyielding hardness. The past is past, and will not mend by all the discussion in the world; the question of living importance is, What of the future? In the attempt to answer so difficult a question, it must be borne in mind that, great as is the influence of the iron market on the price of coal, it is not the only factor in the present situation. There is the high and rising rate of wages earned by the miner, with its tendency, especially in summer time, to diminish the output; the general absence of stocks, both at the collieries and in the hands of buyers; the

fact that the present has been until quite recently a very cool summer; and, finally—but most important of all—the maintenance of the extraordinarily high rate of export. So far as the last point is concerned, it is to be noted that the total quantity of coal exported during the past six months—irrespective of that shipped for the use of steamers engaged in foreign trade—was 22,063,206 tons, as against 20,990,630 tons exported in the June half year of 1899, and 16,717,793 tons in the first half of 1898; while the value of those exports was estimated at £17,504,764, £10,822,652, and £7,919,488 in the three periods named respectively. Of the increase of 1,072,576 tons in the quantity shipped this year as compared with last, 267,920 tons is shown in the returns for the month of June; so that, up to the end of the first half of the year, the rate of increase was being more than maintained. But it is to be noted that the whole of this quantity is accounted for by the imports into two countries (France and Holland); and that Sweden and Norway, Italy, and Egypt together took 100,000 tons more than in 1899—increases which are not likely to continue to be marked—while the demand from Germany and Russia, which has been so great, shows signs of falling away. The returns, however, must be said to show an unwelcome and somewhat unexpected maintenance of a demand abroad which even a 50 per cent. increase in price has failed, up to the present, to kill.

As to the high, and rising, rate of wages ruling, this, of course, should not be pleaded as an excuse for keeping up prices, because wages in the coal trade directly follow, and do not regulate, selling price. It is, however, frequently used as an argument, and will undoubtedly be sought to be made an excuse for keeping the market stiff. Stocks, moreover, as we have said, are low all round; and there seems little (if any) sign at present of production overreaching the demand, to which the very serious state of affairs in the Far East has given a decided fillip. It is further unfortunately the case that, the present high price of coal being due to its scarcity, and high wages being the consequence of high prices, a decided and obvious temptation is put in the way of the miners to keep down the output, in order to keep up the price.

A well-known firm of coal dealers in a large way of business recently expressed the belief that a break in the coal market would come about Christmas time. Such a consummation is devoutly to be wished, only at an earlier date. But very much depends on the character of the weather between now and then; and who shall foretell how that may be? The fact remains that three weeks after Midsummer day the coalowners are still complete masters of the market, and gas managers generally—but especially those who have as yet been unable to get a fair stock into their coal stores—cannot regard the coming winter season with anything but anxiety; for as they learned last January and February by painful experience, it is one thing to buy coal and another to get it delivered.

**The Price of Crude Oil.**—Eight years ago, crude oil was selling at Baku for from 4d. to 1d. per pood of 36 English pounds avoirdupois weight; but since then prices have been annually advancing. During the year 1899, the average price of crude oil was about 3½d. per pood, and for two or three months previous to the closing of the year the raw material was fetching the high price of between 4d. to 4½d. a pood—a corresponding rise in the prices of other petroleum products of course taking place as a natural result of the enhancement in the value of crude oil.

**The Institution of Gas Engineers and the International Gas Congress.**—It will be remembered that, at the annual meeting of the Institution of Gas Engineers in May last, it was decided that the question of the autumn meeting should be left in the hands of the Council, upon the understanding that, if their decision was in favour of the meeting, it should be held in Paris in September during the period of the International Gas Congress. In order to assist the Council in determining the matter, a circular was sent to the members at the end of last month, for the purpose of ascertaining the number likely to take part in the excursion. The responses so far have justified the Council in proceeding with the arrangements for the visit. Including ladies (of whom there will be about a dozen), the party promises to number close upon fifty. A second circular giving all information has been prepared; and if it has not been already received by those who have signified their intention of visiting Paris, it will reach them in the course of a few days. From this it will be seen that the travelling and hotel arrangements have been confided to Messrs. Thomas Cook and Sons. The party will leave Charing Cross on Saturday, Sept. 1, at 2.45, and proceed to Paris *via* Folkestone and Boulogne. This route has been chosen as it will enable members to reach London from the country, secure a day passage, and arrive in Paris the same day. The time the train is due in Paris is 11 p.m. It will be seen that the circular gives four groups of hotels, which vary in price per person from £1 down to 11s. per day; and members are asked to state which class of hotel they wish to patronize. It will, however, be left to Messrs. Cook to finally decide which hotel in the class will be the habitation of the visitors during their stay. Full instructions are also given in the circular as to forwarding a deposit of £1 to the Secretary (Mr. Thomas Cole), and as to filling in the circular and communicating direct with Messrs. Cook. It is understood that the Congress will be officially opened on Sept. 2.



## PERSONAL.

Mr. G. A. LUSTED, of the Long Melford Gas and Coal Company, has been appointed, out of 30 applicants, Manager of the Ennis Gas Consumers' Company, Limited.

Mr. H. FOWLER, of Horwich, who has lately obtained the position of Superintendent of the Gas Department of the Midland Railway Company, has been presented by his friends and the members of the Mechanics' Institute with which he was connected as a teacher of engineering and metallurgy, with a gold watch and chain, with the best wishes of the donors for his future success.

On Saturday, the 7th inst., the officials and employees engaged at the Wigan Corporation Gas-Works bade farewell to their Assistant-Engineer, Mr. HAROLD O. TIMMINS, who, as already announced, has obtained the appointment of Engineer and Manager of the Tipton Gas-Works. As a tangible expression of the good feeling entertained towards him, they asked his acceptance of a timepiece in an oak case, bearing a suitably inscribed plate, a silver-mounted briar and amber pipe, and a buckskin tobacco-pouch. The presentation was made by Mr. Allen Freeman, the General Foreman, who, on behalf of the subscribers, expressed the hope that the recipient might have long life, good health, and prosperity in his new sphere of work. Mr. Timmins, in responding, alluded to the pleasant relations which had always subsisted between himself and the men, and said he trusted this good-fellowship would continue to prevail at the works. He wished one and all health, prosperity, and comfort. The Engineer (Mr. J. Timmins) added a few words of thanks for the gifts to his son.

[The appointment at the Athy Gas-Works, to which reference was made last week, has been secured by Mr. LOUIS G. YOUNG, brother of, and assistant to, Mr. G. W. Young, Manager of the Carlow Gas-Works, and not by the latter gentleman.]

## OBITUARY.

It is with much regret that we announce the death of Mr. THOMAS M'KINNON CLARK (brother of Mr. Glover Clark), which took place at Sandrook, Pellatt Grove, Wood Green, on Wednesday last, after a prolonged illness. The deceased gentleman represented Messrs. Thomas Glover and Co., Limited, both in this country and the colonies, for nearly twenty years, and was much esteemed by all with whom he came in contact. He was 48 years of age, and leaves a widow and young family.

We regret to record the sudden death at Worthing, on the 4th inst., of Lieut.-Col. E. GALT, J.P., who had been a Director of the Portsmouth Water Company from its formation in 1857, and Chairman from 1877 to 1891. Deceased was in his 78th year. At the funeral, which took place at Portsmouth Cemetery on the 7th inst., the Company were represented by two of the Directors who are also Magistrates (Colonel Lanyon Owen and Alderman T. King), the Secretary (Mr. J. L. Wilkinson), the Resident Engineer (Mr. H. R. Smith), and other officials.

## NOTES.

## Improved Temperley Transporters.

The extensive use which is being made of the Temperley transporter in gas-works, on coal wharves, and for the handling of all sorts of rough materials quickly and cheaply, shows what a real demand existed for a good means of carrying materials over short distances. The growing popularity of this system is one of the notable features of modern ports. Like all other human inventions, the Temperley transporter is the fruit of many trials and much disappointment. It is entirely English in its origin and development, and was due to the dissatisfaction felt by Mr. Joseph Temperley, a London shipowner, with the old-fashioned method of getting out cargo by means of derrick and winch—a plan which had showed no signs of improvement for at least a generation. It was an advance upon the still older system of "jumping" out a coal cargo; but all derrick systems have the drawback of being limited to the sweep of the beam. At the end of this short travel, the skip must be emptied into a truck, or the bags carried off by men, as the case might be. What was wanted was a longer traveller, as well as a hoist; and this was at first provided by Mr. Temperley in the form of a I-section boom, with a travelling-carriage running along the lower flange. This carriage was worked by two ropes; but the system was complicated. It has since been improved and simplified. A good example of the later model Temperley transporter is installed at the Deptford generating station of the London Electric Supply Corporation, and was lately described in the "Engineer." It does the work of coaling the station; the traveller being timed to run at a rope speed of 1000 feet a minute.

## Donkin on Motor Cars.

Mr. Bryan Donkin's report on the motor road car trials at Richmond in 1899 has been published, and gives much useful information to those who are interested in mechanical road carriages for pleasure or goods haulage. As regards the heaviest

class of vans—for coal, water, or other rough and heavy carrying work—there was still nothing to beat steam power, with coke fuel. A van of this description, by Bayley, weighing 6.63 tons, ran at a mean speed of 5.22 miles an hour, on a 20-mile run, with a consumption of 0.32d. worth of coke per mile, or 0.05d. per mile per ton. This van was characterized as "good on road." Mr. Donkin remarks on the extremely low cost of fuel per ton per mile, which is the standard originally proposed by Professor Unwin in order to enable comparisons to be made between motor cars of different weights. At this rate of working cost, the prospects of coke-fired steam road lorries ought to be bright. As regards the lighter makes of carriages—for pleasure traffic—they all use petroleum spirit of .68 specific gravity. The best of them ran 50 miles at a cost for spirit beginning at little more than a farthing per ton per mile—say, 1s. 3d. for the whole run—and increasing to six times the amount per ton per mile. This great difference is not explained; but Mr. Donkin remarks it, and says that the cause should be ascertained. Heavy vehicles are also driven by the same means, at a cost varying from 1d. to 3d. per ton per mile. The foreign manufacturers came out best for the passenger vehicles. Mr. H. A. Hoy, the Chief Mechanical Engineer of the Lancashire and Yorkshire Railway, speaks very favourably of the working of a coke-fired Thornycroft steam lorry in Salford and Liverpool.

## The Combination of Gases by the Agency of Spongy Platinum.

Mr. W. French, of the Grammar School, Bury, has been experimenting in order to ascertain the nature of the part played by spongy platinum in effecting the combination of some gaseous mixtures, especially mixtures of hydrogen and oxygen. It has long been known that this effect is producible under ordinary conditions; but the nature of the operation of the platinum is obscure. Mr. French tried purifying the gases and carefully drying them and the platinum, before allowing these elements to come into contact with one another, both in the presence and in the absence of light. Incidentally, while the arrangements for purifying the gases were in progress, some of the waste or escaping gases from the apparatus were brought into contact with spongy platinum, and combination was always effected. A certain interval of time invariably elapsed between the addition of the platinum and the actual explosion; and Mr. French reports in the "Chemical News" that he thought the interval was less in broad daylight, or when burning a piece of magnesium near the tube, than at night when most of the experiments were carried out. In the case of the dried and purified gases, in no instance did the addition of pure and clean platinum cause combination. He next tried to find the conditions necessary to provide rapid action, but without definite result. Even damping the gases with water was powerless to bring about the effect. Consequently, Mr. French concludes that finely-divided platinum does not, by itself, bring about the combination of a mixture of purified hydrogen and oxygen at ordinary temperatures. The combination of these gases, when not carefully dried, in presence of spongy platinum, seems to be influenced by light. Meanwhile, the nature of the part played by the platinum remains a mystery.

## Protective Paints and Varnishes.

Further particulars have come to hand concerning the paint and protective varnish tests carried out by Professor A. H. Sabin for the United States Navy Department, as mentioned in a "Note" of April 17 last. About 300 pieces of sheet steel were carefully cleaned and covered with three coats of the paint or enamel to be tested. These plates were then sunk for two years in different places—some in fresh and some in salt water. As already recorded, the enamel paints came out much better than the painted ones, especially those which had been subjected to a baking process. The character of the pigment mixed with the paint appeared to influence the result but little, with the one exception of red lead, which proved much the best of the oil paints. Professor Sabin thus distinguishes between a paint and a varnish: An oil paint is made with raw linseed oil, which, with no addition, will dry in about five days. As this is inconveniently slow, a drier is usually added, although the resultant film suffers thereby. The best drier is boiled oil, made by heating linseed oil in a kettle and adding 4 lbs. of lead oxide and a little manganese dioxide to every gallon. Lead linolate is thus produced, which is thinned while still hot by adding raw oil. The boiled oil thus made is stated to be rather better than the product obtained by older processes of manufacture. A varnish or enamel paint is made by the addition of various resins to the linseed oil. Spirit varnishes are of an entirely different nature. In fresh water, shellac varnish lasts well; but not in salt water. Pigments do not increase the protecting effect of varnishes. Professor Sabin calls attention to the extreme thinness of the coating which is relied upon to protect iron from corrosion. Films measured by him, made by two good coats of paint, proved to range in thickness from  $\frac{1}{250}$  inch to  $\frac{1}{500}$  inch.

## Tesla and the Combustion of Nitrogen.

A very remarkable paper by M. Tesla appeared in the June number of the "Century Magazine." Much of it is of a speculative character; but it also contains some striking illustrations of electrical discharges of the kind that are capable of making atmospheric nitrogen combine with oxygen. This is the method



suggested by Sir W. Crookes for replenishing the earth's stock of nitrate of soda. M. Tesla observes that since 1891 great advance has been made in the electrical combustion of atmospheric nitrogen. From an insignificant-looking brush discharge a few inches long, the nitrogen flame has developed into a blaze measuring 65 feet across, and devouring the atmospheric nitrogen with a terrific roar. This phenomenon is produced by the discharge of an electrical oscillator giving 12 million volts and alternating 100,000 times per second. In consequence of the violent agitation of the electrified molecules of the air, its constituents, normally indifferent, combine very readily. These currents are innocuous to the human body. M. Tesla renews the promise that they will be used for the production of light by the agency of vacuum tubes, which would be an ideal system of electric lighting—dispensing with the usual fittings and wires. An experiment is described in which the discharge from a coil, escaping with a deafening noise and a blaze of burning nitrogen, strikes an unconnected coil 22 feet away, and creates such an electrical disturbance that sparks an inch long can be drawn from a water-main at a distance of 300 feet from the spot. The most valuable result of these investigations is stated to be the discovery effected of the extraordinary behaviour of the atmosphere towards electrical impulses of excessive electromotive force. The air becomes distinctly conducting, which opens up the possibility of transmitting large amounts of energy for power purposes to great distances without wires.

#### The Duration of the British Coal Supply.

M. Lozé has published, in France, a book upon the British coalfields and their probable duration. France is particularly interested in all questions of coal supply, because the national consumption of coal is increasing, while the native collieries are going deeper and becoming more costly to work every year. At the present time, France only produces about two-thirds of the coal required in the country; the rest, to the amount of 10½ million tons, being imported. Of this quantity, 6 million tons last year came from England. M. Lozé has consulted all the best English authorities on the subject; and he finally prefers to accept the pessimistic forecast of Mr. T. Forster Brown, who calculates the amount of good coal remaining in the United Kingdom to be worked at a depth not exceeding 2000 feet—the asserted limit of economical mining—at 15,000 million tons. Such is the remaining coal capital of this country, according to one estimate. On the other hand, Professor Hull goes to a depth of 4000 feet, and reports a stock of 81,683 million tons. Mr. Bennett H. Brough, criticizing M. Lozé in "Nature," says that the French author has not made out a clear case for rejecting Professor Hull's views. Coal is actually being raised at Pendleton from a depth of 3500 feet; and at Mons, Belgium, there is a colliery 3937 feet deep. These records show that Professor Hull's limit of depth is not at all excessive. Modern mechanical engineering is quite competent to work shafts of any depth. The only important obstacle to deep mining is the rise of temperature; but even this is an uncertain quantity. The latest determinations show an increase of temperature in boreholes of 1° Fahr. for every 62·1 feet of depth, which would not present an insuperable difficulty to working at a depth of 4000 feet. Indeed, the Calumet and Hecla copper mine, Lake Superior, has already attained the depth of 4900 feet.

#### The Ammonia in Soot.

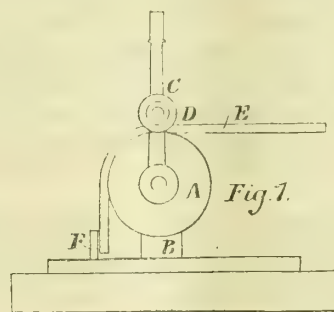
Dr. Warth, of Birmingham, communicates to the "Chemical News" some observations on the composition and commercial value of the chimney soot collected in the city. He remarked that this residual product of the domestic hearth appeared to be in considerable demand for use as a fertilizer; and accordingly he began to inquire about the proportion of ammonium salts which it might contain. On consulting a handbook of chemistry, he found it stated that there were no available data on the composition of soot from "mineral coal." (Blount and Bloxham, in "Chemistry for Engineers," say that soot contains on an average 4·2 per cent. of ammonia.) Dr. Warth examined a sample of soot taken from a household chimney under which had been burnt coal from Cannock and Rugeley. The soluble matter was first extracted from this by boiling with water, filtering, and evaporation. The product of evaporation was strongly hygroscopic; and in order to purify it still further, he sublimated it so as to obtain the ammonium salts separately as sublimate. The remainder was lixiviated with water and filtered, so as to obtain the soluble fixed salts separated from carbon, &c. As a result, the original soot yielded 7·3 per cent. ammonium chloride, and 0·1 per cent. ammonium sulphate. The total ammonium salts amounted to 7·4 per cent., and the total soluble fixed salts to 1·3 per cent., of the weight of soot. These fixed salts consisted of sulphates and chlorides of sodium, magnesium, calcium, and iron. The fixed salts contained much more sulphate than chloride. The proportion may have been about three of the former to one of the latter. This explains the almost total absence of sulphate among the volatile portion. The sulphur trioxide was chiefly retained by the non-volatile metals; and thus it is that the volatile portion consists of nearly pure ammonium chloride. The proportion of ammonium salt in the soot is regarded by Dr. Warth as large enough to justify the estimation in which the soot is held as a plant manure. If his analysis is reliable, however, the prevalent supposition that soot contains sulphate of ammonia in some quantity must clearly be rejected.

## TECHNICAL RECORD.

### THINGS OF INTEREST FOR GAS MANAGERS.

In previous issues of the "JOURNAL," attention has been called to the practical articles contributed by "Engineer" to the "American Gaslight Journal." Two contributions have appeared in recent numbers, from which we make the following extracts.

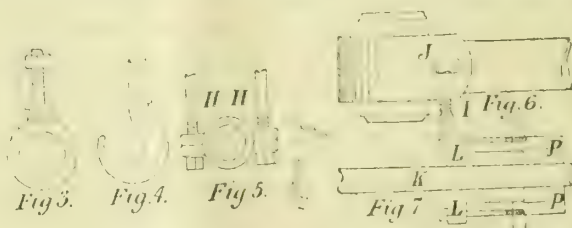
The bending of tubes, pipes, and round bars of metal for use in construction or repair work is an important item. To bend copper, brass, seamless steel, wrought iron, and similar piping of small diameter, have a wood block bored out in the centre, bell shaped at each side, so that the pieces of pipe or tube to be bent can be put through. Hold the block in a vice. Fill the pipe for bending with resin, putty, clay, or wax. If resin is used, it must be melted and run into the pipe. This filling will permit the bending of piping to various angles and turns without buckling. In fig. 1 is shown a little mechanical bending



device of home-made design which can be cheaply constructed. Procure a grooved iron wheel A, about 8 inches in diameter, and place it on a bearing in the stand B. A lever C is then made of iron, and fitted with a smaller wheel, also grooved, at D. The tube E, or whatever is to be bent, is placed between the grooves and the lever forced down, carrying the tube before the wheel D, and bending it to conform to the shape of the larger wheel. The other end of the tube is held by means of a check, at F.

A repair man is sometimes obliged to inspect piping systems of gas-engines for patchwork. Fig. 2 affords an example which came to personal notice. A joint had been made in one of the pipes by putting in a sleeve G, so as to join the pipe. This joint was brazed over, and although it made a neat job, the inner sleeve, being of reduced diameter in its bore, hindered the flow, and also caught considerable loose matter—partly choking the passage. It was said that the substances in use were inferior, and caused the clogging of the outlet-pipes; but when this form of jointing was removed, and one made with the sleeve on the outside—thus leaving the inner passage full and open—the clogging discontinued. Exterior patching of conveying pipes for oils, gases, &c., does not look so well; but, if neatly done, it makes an effective connection.

So careful are steam and gas fitters in their arrangement of supports for steam and gas apparatus, that they have regularly established tables containing figures which may be referred to to obtain the hooks of the right size for sustaining certain weights under particular strains and conditions. The writer has seen evidence of the lack of such tables in the usage of weak eye bolts for supporting parts of the mechanical fixtures. The weight of the pipe increases as foreign matter collects inside and dust on top; so that, in looking over a system, one finds that some of the ring bolts are opened, and broken when the ring is



of two pieces. It is dangerous for a pipe carrying oils or gases to be permitted to fall out of the position in which it was originally placed. The pipe may drop far enough to come in contact with inflammable stuff, and be productive of a fire. Therefore, single-piece ring bolts, like that shown in fig. 3, are advisable; and if hooks are used, care should be taken to select kinds in which the back or base is of heavy proportions, as in fig. 4. This type of hook will not "spread" under ordinary strain. Another form of useful bearing is shown in fig. 5, in which the adjustment is procured by means of the threaded bolts H.

In the form of connecting-arm shown in fig. 6, the key at J frequently loosens, and causes considerable trouble. The most effective way to overcome this is to use a key-setting screw at I.



A hole can be bored through the side of the rod, between the ends of the straps, and tapped for the thread of the set-screw. This may then be jammed against the key to secure it. In fitting up the rod, the centre is bored out and the ends faced off. It is then taken to the planer, and a centre guide-plate is made, and bolted to the planer table. Then a boring-bar is arranged to bore out the hole and face it off to a given distance from the centre for the shoulder of the arm to rest on. There are small chipping-pieces on both inner sides of the receptacle for the arm. They are planed off at the same setting to the proper and uniform width, and true to the centre. The straps should be well lubricated. Those of the mineral oils which have been deprived of their crystalline wax by freezing and pressure are used with satisfactory results. Humming, hissing, knocking, and other noises, may come from the bearings, and be attributed to the machine if the sounds are not stopped or explained. The writer usually lines up a motor-shaft connection by finding the levels with spirit-level and line, and then adjusting the entire centre to this level; after which, the alignment being true, the shaft will ordinarily run evenly and without noise.

Fig. 7 shows a good style of packing-joint to use in connection with air, gas, or oil pipes on horseless vehicle engines. The packing is placed in position on the pipe K, and by means of the clamping screw bolts the flanged section L is faced against the packing, and presses the latter into the hollow of the flanged section P, resulting in a tight and serviceable joint. Leakage often occurs at a point where a revolving pipe joins the elbow. Care should be taken to renew the rubber packing at this union as often as necessary, to prevent leaking. See that the turning portions are well lubricated wherever friction occurs. In choosing brass for trimmings, that of a more reddish tint (when scraped) than the usual tone will prove softer and less liable to crack (this liability, however, will depend greatly on the amount of annealing it is subjected to); and care should be exercised to select sheets free from specks and flaws, these being a cause of disfigurement in finished work, and consequently of much annoyance. The most useful thicknesses of brass are from 26 to 22, imperial standard wire gauge, or 6 to 10 metal gauge (both gauges are used in shops). If the work to be done is of a very elaborate character, the metal should be stout enough to bear the reduction of thickness and the occasional annealings without cracking; but a thinner sheet can be used where the amount of hammering is not likely to be very considerable.

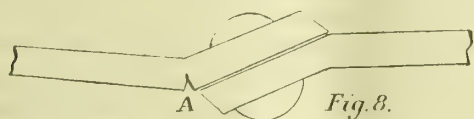


Fig. 8.

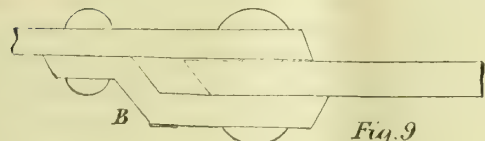


Fig. 9



Fig. 10.

Fig. 8 shows a section of a form of riveted joint sometimes used with unsatisfactory results, as the strain will probably soon spring the metal, and fracture it at A. In fig. 9 is shown a good way to strengthen the joint and prevent its springing out of form. It consists in riveting on the additional strap B. Where great stress comes upon the joint, rivet on double straps like C and D (fig. 10). Let us suppose that we are at work on a tank, and the laps of the sheets have triple-riveted butt-strap joints; the dimensions of the joints being as follows: Strength of plate, 55,000 lbs. per square inch; thickness of plate,  $\frac{3}{8}$  inch; diameter of rivet-holes,  $1\frac{1}{8}$  inch; pitch of inner rows of rivets,  $3\frac{1}{4}$  inches; and pitch of outer rows,  $6\frac{1}{2}$  inches. The efficiency of this joint is 87.5 per cent. The pressure which would rupture the solid shell longitudinally being 625 lbs., that pressure which would rupture a similar shell with a longitudinal joint proportioned as above would be 87.5 per cent. of 625 lbs., which is 547 lbs.; and the safe working pressure, allowing the usual factor of safety of 5, would be  $547 \div 5 = 109$  lbs. per square inch.

When journals are worn, tapering more than  $\frac{1}{8}$  inch in their diameter in boxes of gas machinery, they ought to be attended to at once. There are a number of faults which occur in the alignment of the trucks which are often due to the worn condition of the journals. Sometimes the design of the box is such that the load is sustained principally on the centre of the journal, and wears a hollow journal. Again, in the case of a flat bearing, this may be so rough at one end or at the centre as to make the journal hollow at the centre or taper end. Mature wear of the

journals is often attributed to poor lubrication, or adjustment may be the cause. It does not follow that all cases of journals scaling in spots are due to bad metal, for this may occur in the case of a foreign substance getting to the bearing surface. As is known, the pedestals are frequently pushed outward, affecting all other parts in due proportion; causing unequal wear of the journals. The tipping of the oil-box in turn tips the sleeve, wearing it unduly at the rear end, and tapering the journal. Fig. 11 shows the form of the journal, and the tapering usually occurs at A.



Fig. 11

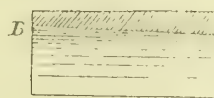


Fig. 12.

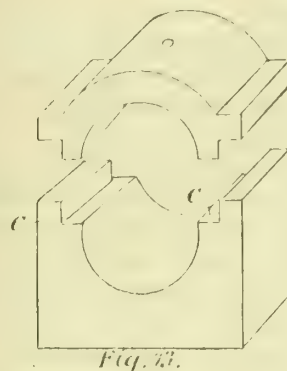


Fig. 13.

In fig. 12 is shown a section of one of the sleeves; and the tapered end is marked B. The first thing to do is to clean well both box and journal, and then set the journal correctly in place, so as to pour the metal readily and evenly. If necessary, cut out the old metal, and start with a clean box. Old grease from lubricants may be effectually removed by heating the box. Next we prepare the box for pouring by cutting some strips of thin sheet metal, and using them for liners on the box edges at C, fig. 13. The cap is put on and tightened, and the box squared with a mandrel in it the same size as the axle bearing. The ends are then plugged with clay and putty, and the same is done with the oil-holes. The box is now ready to be poured. Often, however, a little scraping and cleaning, with the addition of the proper amount of lubrication on dry boxes, will put the latter right. In other cases it may be necessary to take the entire journal to pieces, and refit it with new parts where the old ones are worn. Again, a simple re-adjustment will be all that is needed. A great fault consists in using too heavy grease for lubrication, as the box must first heat before the tallow can run and become effective. For journal purposes, the best grades of tallow ought to be used. Lubricating oils made from crude distillate, paraffin oil, and filtered and steam-refined cylinder stock, form some of the heavy products from which the oils are made which are usually used for lubricating the bearings. Additions of fatty oils and fatty matter, also portions of resin or resin oils, are made to obtain a heavier lubricant.



Fig. 14



Fig. 15



Fig. 16

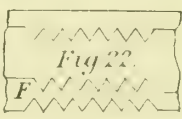


Fig. 17



Fig. 18



Fig. 19

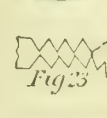


Fig. 20

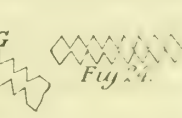


Fig. 21



Fig. 22



Fig. 23

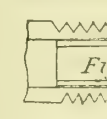


Fig. 24

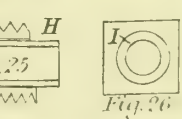


Fig. 25

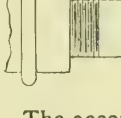


Fig. 26

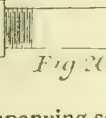


Fig. 27

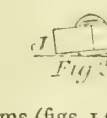


Fig. 28

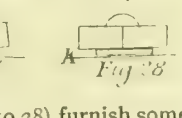


Fig. 29

The accompanying set of diagrams (figs. 14 to 28) furnish some every-day illustrations relating to the practical mechanical work of the gas engineer and inspector. There are in these days some very good plans in progress concerning the inspection of gas-pipes and gas-piping systems and connections; and although the inspector may seem severe at times, no one will say he is not a valuable part of the gas engineering business. The writer has personal knowledge of accidents which were prevented through the watchfulness of the inspector. Many times have these inspectors visited plant and condemned certain pieces of machinery, equipment, or piping just in time to obviate disaster; yet the inspector's appearance is usually the signal for reproaches and remarks as to what business he has to order things to be attended to. But the inspector has no eye for labour or for costs; and if a piece of work must be done, there is no getting out of it, for he has the law on his side, and if what he directs is not attended to, trouble and additional cost ensue. Consequently, when an inspector notices defects in piping systems



of gas or any other plants, the remedy is usually not long in following.

In the inspection of gas-pipes, an important factor is the depth of the thread; and figs. 14 to 17 are given to illustrate this point. In fig. 14 is shown the end of a gas-pipe in which the body portion is represented by dark lines, the thread being light. It can be seen that the depth of this thread is not what it should be, so that when the thread is locked in with the corresponding one we have the interval as shown at A in fig. 16. This will result in leakage and trouble; and it can be remedied only by removing the defective joint and re-cutting the threads to the proper depth. But it will not do to go to the opposite extremes, as in fig. 15, in which is shown a section of a pipe in which the thread is cut too deep. This makes the interlocking of the threads all right, provided that the opposite portion is cut to correspond; but the trouble lies in the increased weakness of the pipe due to removing too much of the metal at the base of the threads. The diagram shows this—the depth of the thread being in white, leaving but a small amount of the metal. The threads may join, as in fig. 17; but still the metal of the pipe is weakened, and disaster may follow. Therefore, care should be taken to gauge every cutting, and see to it that the threads are cut just the right depth to lock well and full, without going too deep. Another example is given in fig. 18 to illustrate the way in which the pipes often break when the metal is reduced to too great thinness between the threads. The least strain on the pipe will very likely cause it to break off at B, or at some other point between the threads, and trouble will result.

When the writer has found that some unskilled gas-pipe machinist or engineer has weakened a pipe or system of pipes by cutting into the metal body of the pipe too greatly, he usually takes steps to prevent the breaking of the pipe by brazing in an additional piece, as shown at C in fig. 19. This little piece of pipe should be of the right diameter to fit inside the main-pipe tightly, and should be about  $\frac{1}{2}$  inch longer than the threadwork on either side. Then the pipe can be brazed in place; or, if brazing is not practical, the piece can be pinned or keyed. It will support the body of the pipe beneath and near the threads, and prevent breaking.

Pipe connections of the style shown in fig. 20 are always difficult to deal with, and should be of the best material and workmanship. The operation of reducing is employed to a great extent in connection with modern apparatus like gas-engines; and since the introduction of these little machines so extensively in manufacturing plants for purposes of small power uses, gas engineers have had a great deal to do with piping systems in which are involved types like that shown. In the first place, every piece in the reducing portion of the pipes should be of superior stock. If there are any pieces of piping about the plant which are inferior, or incorrectly cut or tapped, these should be employed for any other job than that in which there are one or more reductions, for the reason that in reducing it is necessary frequently to thread the pipe on the inside as well as on the outside, as is illustrated at the joints which meet. Again, in reducing, particular pains should be taken to have the threadwork all alike, and very firm. No broken or unsatisfactory work can be permitted to pass in reducing, even in one piece; and when two or more reductions are made, the necessity for substantial threadwork is more evident.

In very many reduction systems in gas-works and gas-piping systems, the writer has noticed excessive leakage and generally bad results due to a part of the thread being chipped out or stripped and broken, as at D and E, fig. 21. This sort of thing cannot be tolerated in reducing systems, although it may pass in heavy piping connections in straight work. In fig. 22 is shown at F the reason for the threads being not only very uniform in cut, but not stripped or broken. If the threads cut for the outside are run into the points of those cut for the inside, and broken in any way, very serious results may follow. Take, for example, the next diagram (fig. 23), in which it is shown how the pipe which is weakened will fracture itself at G. If the mechanic who cuts the threads will so arrange that the tapping is done in such a way as to bring the seat of one system of threads between that of the other, the metal will not be thinned down, and breakage is not so liable to occur. This is further illustrated in the succeeding example (fig. 24), in which it will be noticed that one set of threads from the interior runs almost into that from the opposite side.

It frequently happens that the inspecting officer, or perhaps the mechanics themselves, will discover that there are in a gas-pipe system some weak spots due to the defective cutting of threads on both sides of the metal, and they may in season take steps to prevent accident by following the plan shown in fig. 25. Here is the section of a cut pipe; and it may be noticed that the threading is weakening the metal. In this case the inside threads should be entirely stripped off, and the interior turned out so as to present room for the insertion of the additional piece of pipe H. This can be pinned or brazed into position, and then the new threads should be cut in it.

Fastenings of bolts, bracket screws, &c., should be carefully inspected in gas-pipe matters. It is advisable to use bolts with a face or shoulder like I, fig. 26, for when the jarring or straining of parts causes a nut to shift its position, as in fig. 27, one side J receives the strain, and may become broken. This is overcome considerably if the shoulder plan is used, for then the centre of the nut braces itself upon this place, as at K, fig. 28, and sustains itself firmly.

## THE COMPOSITION OF SOME COAL TAR FROM AMERICAN GAS-WORKS.

By ALFRED H. WHITE and H. W. HESS.

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Every one knows the importance of the coal-tar industry to Germany. It is also well known that it has not obtained a strong foothold in the United States. It is not because the United States does not produce enough coal tar, for every town has its gas-works. The output for 1886 is put by Lunge at 120,000 tons. Later statistics are lacking, except for the State of Ohio, where the Ohio Gaslight Association reports a production of 23,750 tons of tar in 1898. If we assume that the tar production for the rest of the country is in the same proportion to that of Ohio, it gives about 400,000 tons for the United States. This is a very crude estimate, but perhaps it is as accurate as can be made. The tar production of Great Britain is given as 650,000 tons.

One reason generally assigned for the feeble condition of the coal-tar industry in America is that American tars are too thick and heavy—too deficient in light oils to be advantageously used. The literature on the subject is, however, extremely scanty. That American gas tars are thick and heavy is not to be questioned, especially those from large works using regenerative benches, with consequent high heats. These works usually do, or at least may, collect their tars in two portions. Most of it condenses in the hydraulic main immediately over the retorts; while a smaller portion is separated from the gas afterwards in the condensers and tar separators. This is a much thinner tar than that from the hydraulic main. Thinking that there might be enough difference between these two grades to warrant their separate treatment, some careful and complete analyses were made, and, for comparison, analysis was made of the tar from a small and old-fashioned plant.

Tar No. 1 is from a large works with full-depth regenerative benches. From these works came two different samples of tar made at the same time, but collected at different points in the system. 1a is the tar running from the hydraulic main (it is very heavy, and so stiff that it is hardly possible to pour it); 1b is the tar from the condensers and tar separators, and is semi-fluid. These works were using coal from Pennsylvania—the Youghiogheny coal—and were obtaining a yield of 10,000 cubic feet of gas per ton of coal of 2000 lbs., and 13 to 14 gallons of tar, equivalent to 6½ to 7 per cent. of the weight of the coal. It was estimated that from 70 to 90 per cent. of the yield was "hydraulic main" tar, and from 10 to 30 per cent. "separator" tar. Tar No. 2 came from small and out-of-date works using direct-fired benches. It was so free from water and oil, that it could be rolled in the hand without adhering. These works also used Youghiogheny coal, but from a different mine.

The samples were distilled in a bronze still with a working charge of 3200 to 3400 grammes of tar. The temperatures recorded are those of the vapours distilling. Attempts to dehydrate the tar before distillation were but partially successful. Heating the tar for two weeks in an air bath at 80° to 90° C. effected only a limited separation of water. Drawing air through the hot tar, thus stirring it, proved more satisfactory. Vigorous mechanical agitation was better, as it seemed to liberate the small globules of water held by the tar. None of these methods proved sufficient to avoid danger of foaming, so that attempts to dehydrate before distilling were abandoned, and the tar distilled just as it was received. Notwithstanding the fact that the temperature was raised with the utmost caution, the usual difficulty of foaming and boiling over at 90° to 110° C. was experienced; and this caused the loss of several analyses. It was partially prevented by using for the initial heating a ring burner placed around the still at about the level of the top of the tar, instead of heating from the bottom. Table I. gives very fully the individual results.

In further explanation, it should be added that the crude naphthalene and crude anthracene cake were obtained by filtering the chilled oil on a Buchner funnel, and rendering the cake as free from oil as possible by attaching a filter-pump and pressing at the same time. From 270° C. onwards, the vacuum pump was connected, and the distillation carried to 360° C. under a diminished pressure of 150 mm. of mercury. This helped materially to keep the still and condenser from choking. The vapours at 270° C. were of a light yellow colour, which, as the distillation proceeded, grew denser. When in the neighbourhood of 360°, a fine deposit of carbon usually settled out, and had a tendency to clog all openings. This was especially true of tar No. 2, where even at 270° the free carbon, mixed with naphthalene and anthracene, choked the still and stopped the distillation. At as low a temperature as 200° C., this tar gave much trouble by boiling over, though no difficulty was experienced with the others after the water was all off. A coarse wire gauze placed in the still about an inch above the level of the tar seemed to break up the bubbles as they rose, and remedied the difficulty up to 270°. The choking of the still-head did not allow us to proceed beyond that point. The determination of the free carbon, to use the commonly-accepted term, was made by extracting the pitch with chloroform in a Soxhlet extractor. The pitch was mixed with sand to make it more readily permeable; and in this way practically complete extraction could be obtained in four hours without mechanical loss of insoluble matter, as was shown by closely agreeing duplicates.



TABLE I.—Results of Distillations.

	1a. From Large Works. Hydraulic Main Tar, sp. gr. 1.318 at 15° C.	1b. From Large Works. Separator Tar, sp. gr. 1.255 at 15° C.	2. From Small Works. Sp. gr. 1.235 at 15° C.
	Percentage by Weight.	Percentage by Weight.	Percentage by Weight.
First runnings, up to 110° C. . . . .	4.88	5.06	None.
Light oil, 110° to 170° C. . . . .	None.	1.08	0.23
		54.9 per cent. vol. ammo- niacal liquor. 45.1 per cent. vol. oil. Oil contains 1.2 per cent. vol. of phenol.	Mainly ammoniacal liquor.
Carbolic oil, 170° to 230° C. . . . .	0.56	5.03	1.51
	47.3 per cent. naphthalene cake. 52.7 per cent. oil.	47 per cent. naphthalene cake. 53 per cent. oil. Oil has 5 per cent. vol. phenol.	3 per cent. naphthalene cake. 97 per cent. oil. Oil has 11.8 per cent. vol. phenol.
Creosote oil, 230° to 270° C. . . . .	1.54	7.50	9.09
	No cake. 4.9 per cent. vol. phenol.	66.3 per cent. naphthalene cake. 33.7 per cent. oil. Oil has 6.6 per cent. vol. phenol.	7.8 per cent. cake, contain- ing much carbon. 92.2 per cent. oil. Oil has 5.6 per cent. phenol.
Anthracene oil, 270° to 360° C. . . . . Under vacuum of 150 mm. mercury.	7.04	11.71	?
	21 per cent. cake. 79 per cent. oil.	12.1 per cent. cake. 87.9 per cent. oil.	Distillations could not be carried above 270°.
Pitch . . . . .	82.65	68.25	87.86
	Rather brittle. 28.8 per cent. free carbon.	Fair quality. 48.4 per cent. free carbon.	Brittle. 54.4 per cent. free carbon.
Total . . . . .	96.67	98.63	98.69

TABLE II.—Summary and Comparison of Results (Given in Percentages by Weight).

	1a.	1b.	1c.	2.	3.	4.	5.
	Tar from Large Works.			Small Works. Specific Gravity 1.235.	London (Butterfield). Specific Gravity 1.192.	American.	(Pennock.)†
	Hydraulic Main. Specific Gravity 1.318.	Separator. Specific Gravity 1.255.	Large Scale Distillation.			Specific Gravity 1.205.	Specific Gravity 1.231.
Ammoniacal liquor . . . . .	4.88	5.65	1.8	0.23	3.53	1.40	1.10
Light oils . . . . .	..	0.49	3.2	..	1.99	3.12	1.63
Creosote oils, strained . . . . .	1.77	5.07	8.1	9.20	10.53	0.29	0.34
Crude naphthalene . . . . .	0.26	7.33		0.75	7.40	0.20	1.72
Anthracene oils, strained . . . . .	5.57	10.30		? §	8.60	25.09	19.23
Crude anthracene . . . . .	1.47	1.41		? §	3.60	0.19	0.24
Pure anthracene . . . . .	0.40	..	..	..	0.43‡	..	..
Phenols . . . . .	0.07	0.13	..	0.65	0.53	..	..
Pitch . . . . .	82.25	68.25	84.4	87.86	59.20	67.40	74.14
Totals . . . . .	96.67	98.63	97.5	98.69	95.38 (?)	97.69	98.40

\* Calculated from Butterfield, "Gas Manufacture," 2d ed. (1st ed.), p. 313. † Pennock, "Journal American Chemical Society," Vol. XXI, p. 696. ‡ The percentages of pure anthracene are not included in the totals. § The distillation of this tar could not be carried above 270° C. || In these analyses by Pennock the entire distillate coming over after the light oils is collected together. On redistilling these oils the portion to 200° is called creosote oil, and the rest dead oil. The difference between this method and that used for the other samples is so great as to make comparison difficult.

Table II. summarizes the results of our distillations, and gives for comparison the two analyses of American gas-works tars reported by Pennock, and a sample of London tar reported by Butterfield. In the third column, under the heading 1c, is given the result of a large scale distillation (44,000 lbs.) at the works from which the samples 1a and 1b came. The agreement between our laboratory results and those obtained at the works is very satisfactory, when the differences in the sample and method of distillation are taken into account. For the large-scale distillation, all the tar—both hydraulic main and separator—is used; while our analyses are of the two separately. At the works, the tar is partially dehydrated before distillation, hence the lower percentage of ammoniacal liquor. The separation between light and heavy oils is made when the distillate becomes of the same specific gravity as water. In our own works, the separation is made when the vapours distilling are at 170° C., irrespective of the specific gravity of the distillate. This may account for the higher percentage of light oils in the large-scale distillation.

A discussion of the results of these analyses must be brief, as the data are not enough to allow general conclusions to be drawn. The deficiency of light oils and phenols is very marked in all cases, if we take as our standard the German tars carrying, according to the usual statements, 8 to 10 per cent. light oils and 5 to 6 per cent. phenols. The percentage of pitch is correspondingly high. Whether it is due to the high temperature of carbonization, to the composition of the coal used, or to a combination of these and other conditions, can only be settled by analyses of a number of samples. It is to be regretted that it was not possible to measure the temperature of the retorts accurately. An attempt was made with Seger cones. But the lowest numbered cone at hand melted at 1150° C.; and though this was tried, it was unaffected by the heat. The separator tar 1b has a composition more nearly in accord with that ordinarily assigned to gas tars, except for the deficiency of light oils and phenols. The creosote oil, anthracene oil, crude naphthalene, and crude anthracene agree fairly well with the usually given composition; and the percentage of pitch, while

somewhat high, is not extraordinary. The treatment of the pitch with chloroform reveals some interesting differences.

It was expected that the tar from the hydraulic main, having a high specific gravity, would carry more free carbon than the specifically lighter tar from the separators, and that this difference would be accentuated in the pitch. The reverse is the case. The brittle pitch from the heavy hydraulic main tar carries only 28.8 per cent. of free carbon, while that from the separator tar carries 48.4 per cent.—nearly 1.7 times as much—and yet is much less brittle. To determine whether this high percentage was due to decomposition in the distillation of the tar, the free carbon in the separator tar before distillation was determined, and found to be 26.4 per cent. This all remained in the 68.2 per cent. of pitch, and would account for 38.8 of the 48.4 per cent. of the free carbon there, or a little over 80 per cent. This leaves only 20 per cent. of the free carbon in the pitch to be charged to decomposition in the tar distillation. The difference in composition of the two tars then extends farther than the analysis shows, for the pitch from the separator tar must have a very different proximate composition than that from the hydraulic main tar, since it carries a much larger percentage of free carbon, and is still less brittle. This difference, too, must exist in the tar before distillation, since both samples were distilled in the same way. It would be an interesting subject to pursue further, but it would demand much time.

In summarizing these results, we may say that the belief that American gas-works coal tars are not well adapted to distillation for recovery of bye-products is found to be true for the tars we examined. Except that they carry a fair amount of anthracene, these tars are very inferior. By making a separation into hydraulic main tar and separator tar, as was done in these analyses, it is possible to obtain a tar representing not more than a quarter of the total yield, of better composition, but at the expense of making the other three-fourths so heavy that it is exceedingly difficult to obtain a saleable pitch from it. Whether these results are due to the coal used or to the practice at the works cannot be decided.

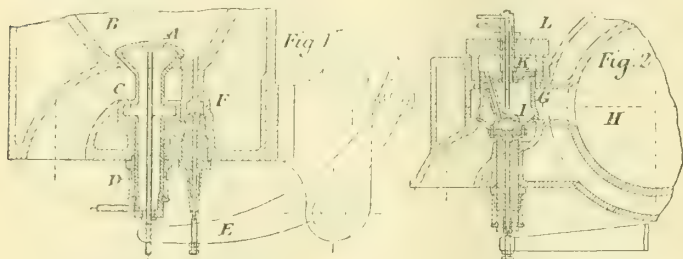


## REGISTER OF PATENTS.

**Exhaust-Valves for Gas-Engines.**—Crossley, W. J., and Coster, A. V., of Manchester. No. 5808; March 17, 1899.

This invention, the object of which is to reduce the power required for opening and controlling the exhaust-valves of internal combustion motors, is specially applicable to large gas-engines which require one or more exhaust-valves of such dimensions that serious resistances have to be overcome by the operating gear.

Fig. 1 shows an arrangement of the exhaust-valve and actuating gear in vertical section; the exhaust-valve being placed in the bottom of the cylinder. Fig. 2 shows an arrangement in which the exhaust-valve is placed on the side of the cylinder.



The exhaust-valve may be a mushroom-seated lift-valve constructed of cast iron or other suitable metal. In fig. 1 the valve A is shown opening into the bottom of the combustion chamber of the cylinder B. Below the head of the valve there is an enlargement C, which forms a piston. This is fitted into a short close-ended cylinder; the stem D of the valve continuing below it to the outside, where it terminates near the end of the exhaust-lever E, which operates it in a usual manner. Placed by the side of the exhaust-valve is a small valve F, also operated by the lever E. This valve opens a communication between the inside of the cylinder B and the underside of the piston C. The lever E is caused to open the valve F a little earlier than it opens the exhaust-valve A; so that pressure from the cylinder B is admitted below the piston before the valve A is opened. Consequently, the valve A is put partly into equilibrium, and requires less power to open it. As there is commonly a pressure of 40 lbs. per square inch in the cylinder B when the exhaust-valve has to be opened, it is of importance that this heavy load should be reduced, especially in engines requiring large exhaust-valves.

Fig. 2 shows an adaptation of the invention to an exhaust-valve G placed at the side of the combustion chamber of the cylinder H. In this instance, the small valve I is fixed in the inside of the valve. The head K of the valve forms the relieving piston, and works in a short cylinder formed in the cover L of the valve. The action of the valve I relieving the power required to open the valve G is similar to the action of the small valve F in the arrangements shown in fig. 1.

**Incandescent Gas-Burners.**—Rosenthal, A., of Cologne. No. 12,339; June 13, 1899.

As is frequently experienced, the removing of the glass chimney of incandescent gas-lights is attended by the risk of damaging the mantle, as the glass is in many cases held fast by the pinching arrangement of the gallery in such a manner that the application of force and the striking of the cylinder against the mantle or its holder cannot be avoided. The present improvement serves for the prevention of such unintended and destructive knocks—the gallery being so formed that, in removing the glass from its place, it will remain in connection with the latter, while the mantle is secured in its normal position by a holder arranged concentrically to the longitudinal axis of the burner, and thus completely isolated from, and out of contact with, the glass cylinder.

**Manufacturing Coal Gas.**—Besemfelder, E., of Charlottenburg, Germany. No. 13,830; July 4, 1899.

In the ordinary process for the manufacture of illuminating gas, the patentee remarks, the coal is subjected to destructive distillation in retorts heated from outside—the coke being afterwards drawn off, allowed to cool, and then used as a fuel. The heat contained in the red-hot coke when being discharged from the retort is either not utilized at all or only imperfectly; and the external heating of the retorts is also attended with considerable loss of heat. This invention has for its object "to combine various operations, so as to achieve an important industrial progress—that is to say, the continuous and almost automatic working of a gas-producer, with complete gasification of the carbon contained in the coal, saving of labour, and without the consumption of fuel for the direct heating of retorts, and an increased yield of gas in comparison with the most advantageous process hitherto known—viz., the Dellwik process." For this purpose, he utilizes the red-hot coke, as it comes from the retorts—that is, before it has had time to cool—for making water gas; and he utilizes the heat with which the water gas leaves the gas-generators for gasifying the coal by conducting the gas from the generators directly into the retorts, where it mixes with the gas liberated from the coal, and then escapes as a gas mixture—the retorts being heated externally by the waste gases obtained from the water-gas producers during the preliminary or heating stage.

The apparatus for carrying out this process may "assume a variety of forms." In the example in fig. 1 (p. 157), a bucket-chain A supplies the raw material continuously to a funnel B leading to a transporting screw (guided by a stuffing-box) situated in a tube extending into the head of an inclined retort revolving slowly on its axis. The material from which the gas is to be extracted is fed along by means of channel-shaped conducting ribs secured to the periphery of the cylindrical retort, at an angle to its axis. The rotation of the retort, and the rate at which the material travels within it, should be so determined, that the latter "may leave the retort in a condition somewhat closely approaching that of the coke from ordinary illuminating gas-works." The red-hot material treated in the retort, is delivered into a scoop C, and thence drops into co-axially arranged apparatus adapted to distribute it uniformly among

three out of four gas-producers D erected underneath; while the admission of charges of material to the fourth generator (which happens to be in the preliminary blowing-in or heating-up stage) is prevented by any suitable cut-off arrangement.

The distributing device is driven by the shaft E, and mainly consists of a hollow distributing cone rigidly secured to the shaft, and the star-shaped groups of distributing blades or paddles situated, each upon its own spindle, below the hollow cone. When any one of the distributing blades—as the shaft E turns—is situated in a recess between each pair of projections, such blade will turn on its horizontal axis, so that the material it carries is discharged into the shoot F leading to generator.

The device serving to provide for the sufficiently tight closing of the generator which is in the preliminary heating or blowing-in stage (so as to avoid any dilution of the water gas with nitrogen and carbonic acid, and to keep any further supply of gas-yielding material out of the generator), mainly consists of a sliding door or valve attached to a revolvable sleeve. This door or valve carries a stop, with which the blades just referred to are adapted to engage—being thus prevented from swinging round at this point. At the end of the blowing-in stage in that generator, and when the generator in which the preliminary heating is to next take place has been charged, the door or valve automatically turns 90°, or any other suitable angle, according to the number of generators, and by so doing closes the feeding-shoot F of this last-mentioned generator. This reversal of the slide or valve is effected by a rotary movement of the shaft E, upon which is mounted a belt pulley; a toothed wheel, also arranged upon the shaft, being geared with a set of tooth wheels which engage with a toothed segment, and, at the same time, through the medium of a tappet, effect the reversal of the steam supply to the generators.

These water-gas producers are fitted with any well-known device for injecting compressed air or superheated steam. The steam-jets (acting by suction) extract tar or petroleum residues from a reservoir with which they are connected, and inject them into the coke in as fine a state of division as practicable. The water gas, so carburetted, sweeps over the red-hot coke on the (combined) distributing and delivery apparatus, passes into the interior of the retort, and here, owing to its high temperature, at the same time expels the constituents of ordinary illuminating gas from the gas-yielding material which it meets. After this, on mixing with these constituents, it leaves the retort through a vertical tube G rising from the stationary front portion of the retort; the gas mixture thereupon proceeding to purifying or scrubbing apparatus of the ordinary illuminating gas type. Below the vertical tube G is arranged a tar-collector fitted with a downwardly-opening lid or cover, whence the tar issues laterally through a syphon.

The revolvable retort is heated externally by the gases produced during the blowing-in stage of the water-gas generators, and containing little or no oxygen. The gases flow through a vertical tube H and the flying-dust collector I into a cylinder surrounding the retort, and are here (with a view to the maximum utilization of their heat) conducted by resistances—which may be provided either on the retort or on the cylinder—so that they are compelled to take a spiral course around the retort.

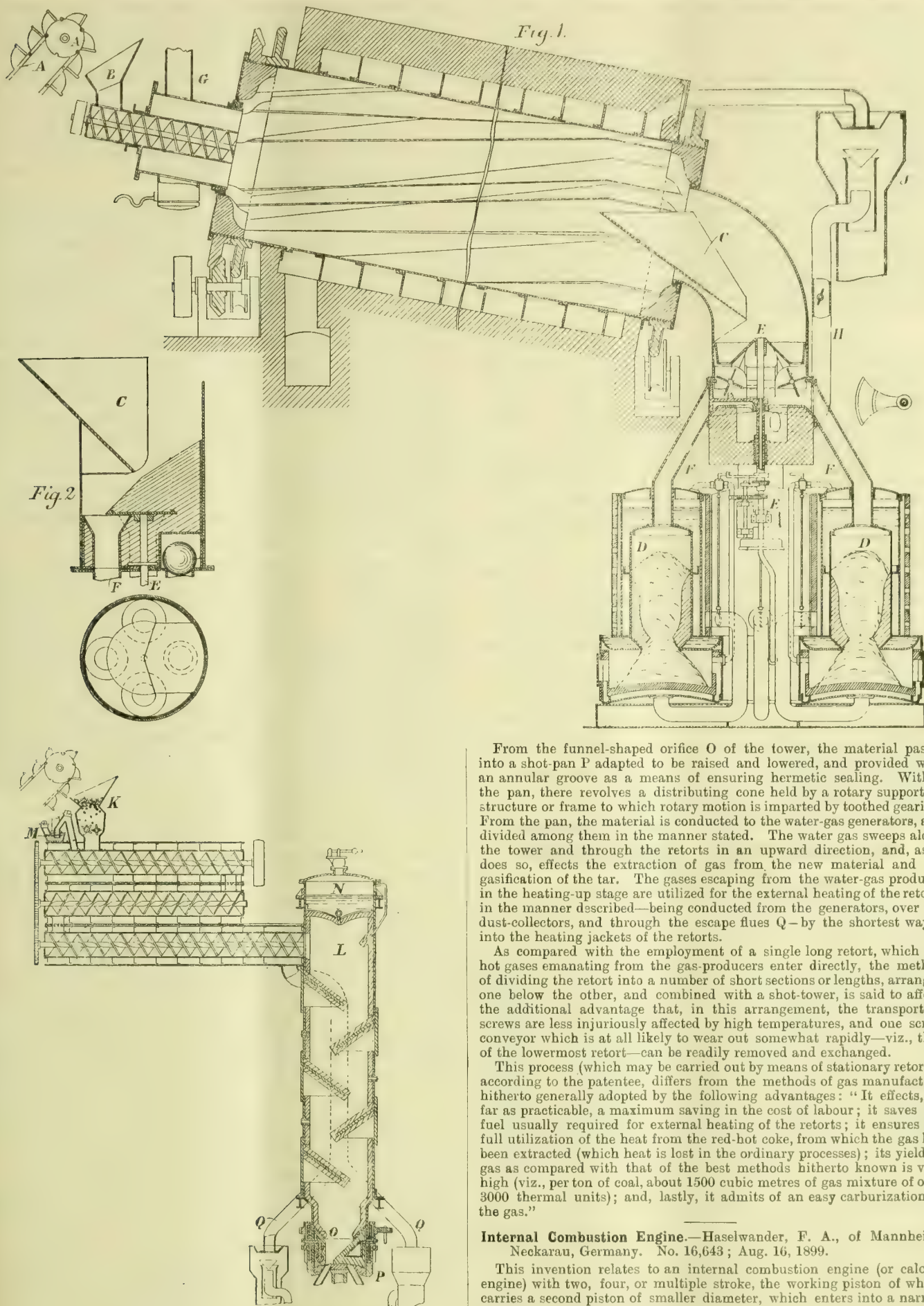
There is also shown (fig. 2) a modification of the apparatus for distributing the coke which leaves the retort in a red-hot condition. In this modified form, the red-hot coke drops out of the scoop on to a conically inclined plane, and thence into the three (or other suitable number of) open shoots. Both the distributing cone and the parts surrounding the shoots, are arranged revolvably, and set in motion by a shaft. The shoot leading to the generator which is being heated up at the time, is closed by a ball confined within a cubical chamber, and adapted to be lifted from its seat and conducted to the inlet of the delivery-shoot leading to the next following generator, as the shaft revolves.

The patentee here remarks: The fact that the extraction of gas from the carbonaceous material in the retort proceeds slowly under the influence both of the heat of the water gas, which heats the retort internally, and of the gases escaping from the water-gas producers which are in the blowing-up stage (whereby the retort is heated externally), this is generally known to happen in the process now employed in the manufacture of illuminating gas; whereas, on the other hand, the gasification of the carbonaceous residue from the retorts takes place rapidly in the water-gas producers. This fact makes it necessary in practice to use a retort of considerable length, whenever it is desired that the water-gas generators be fed with carbon-holding residue from the retort in a manner consistent with continuous operation, and that, at the same time, the coal in the retort, as it travels through the latter, be freed from gas to as full an extent as practicable. In many cases, therefore, it is advisable, with a view to the accomplishment of the object just stated, to employ a series of short retorts arranged one below the other, instead of one long retort (in other words, to divide the retort into a number of compartments placed one under the other); and, further, to locate a portion of the work to be performed in the retort—viz., the extraction of gas from the carbon-holding material—within a shot-tower attached to, and forming (as it were) an extension of, the retort or retorts.

In the apparatus represented in fig. 3, is the elevators by which the coal or other carbonaceous material is supplied to the funnel or hopper K, provided with distributing-rollers, whence it drops into the uppermost of the horizontal retorts. The retorts are fitted with transporting screws, which receive rotary motion from a belt pulley through the medium of toothed gearing, and whereby the material is gradually conducted through each one of the retorts alternately connected with each other at the front and back ends, so that, upon eventually leaving the retorts, the coke may be delivered into the shot tower L attached to the lower retort, and fitted with distributing-plates. Within the tower, the material, from which part of the gas has already been extracted in the retorts, slides downwards from plate to plate, thus moving in a direction opposite to that of the water gas rising from the water-gas producers which are arranged below the tower; and, under the action of the heat of the gas, the material undergoes a further gas-extracting process. The gas mixture thus obtained passes from the tower into the lowermost retort, and thence, moving in the opposite direction to that of the carbonaceous material, passes through all the retorts in succession, and effects a partial gas extraction from the material under treatment. Finally, the gas mixture leaves the retorts at M.

To provide for the carburization of the gas, and generally for the effective gasification of the tar or the petroleum residues obtained in the





course of operation, the tower at its upper part, above the plates, carries a reservoir N having an outlet for the tar, &c., and a steam-injector serving to force it into the tower. To ensure the requisite balance of pressure, the reservoir is furthermore connected at its upper part with the tower by an escape-pipe fitted with a nozzle. Owing to the fact that the tar directly meets the red-hot coal mass, as it moves along from plate to plate in the tower, any caking of the coal residue resulting from decomposition, and its adhesion to the stationary supports, are avoided, and a rapid and complete gasification of the tar is secured. The coal residue, freed from gas, on leaving the tower, passes over a discharging device arranged co-axially with the tower, and serving to distribute the coal residue uniformly among three out of four gas-producers forming a group; while access to the interior of the fourth generator is prevented by any suitable cut-off device.

From the funnel-shaped orifice O of the tower, the material passes into a shot-pan P adapted to be raised and lowered, and provided with an annular groove as a means of ensuring hermetic sealing. Within the pan, there revolves a distributing cone held by a rotary supporting structure or frame to which rotary motion is imparted by toothed gearing. From the pan, the material is conducted to the water-gas generators, and divided among them in the manner stated. The water gas sweeps along the tower and through the retorts in an upward direction, and, as it does so, effects the extraction of gas from the new material and the gasification of the tar. The gases escaping from the water-gas producer in the heating-up stage are utilized for the external heating of the retorts in the manner described—being conducted from the generators, over the dust-collectors, and through the escape flues Q—by the shortest way—into the heating jackets of the retorts.

As compared with the employment of a single long retort, which the hot gases emanating from the gas-producers enter directly, the method of dividing the retort into a number of short sections or lengths, arranged one below the other, and combined with a shot-tower, is said to afford the additional advantage that, in this arrangement, the transporting screws are less injuriously affected by high temperatures, and one screw conveyor which is at all likely to wear out somewhat rapidly—viz., that of the lowermost retort—can be readily removed and exchanged.

This process (which may be carried out by means of stationary retorts), according to the patentee, differs from the methods of gas manufacture hitherto generally adopted by the following advantages: "It effects, as far as practicable, a maximum saving in the cost of labour; it saves the fuel usually required for external heating of the retorts; it ensures the full utilization of the heat from the red-hot coke, from which the gas has been extracted (which heat is lost in the ordinary processes); its yield in gas as compared with that of the best methods hitherto known is very high (viz., per ton of coal, about 1500 cubic metres of gas mixture of over 3000 thermal units); and, lastly, it admits of an easy carburization of the gas."

**Internal Combustion Engine.**—Haselwander, F. A., of Mannheim-Neckarau, Germany. No. 16,643; Aug. 16, 1899.

This invention relates to an internal combustion engine (or caloric engine) with two, four, or multiple stroke, the working piston of which carries a second piston of smaller diameter, which enters into a narrow cylindrical space towards the end of the compression stroke, and, acting as a valve, shuts off the larger cylinder space from the smaller one, so that at each further movement of the piston there is a difference of pressure between the two spaces which is utilized to cause air to flow through passages between the spaces, carry combustible with it, and be injected into the space with lower pressure either before or after the change of stroke, in combination with vaporizers whereby the combustible can be heated.

**Gas and Hydrocarbon Motors.**—Seraine, J., of Paris. No. 7253; April 19, 1900.

This gas-motor comprises a cylinder in which reciprocates the driving piston; the admission of explosive mixture to the cylinder being effected during a portion of the stroke only, so as to obtain a continued expansion of a pressure below the atmospheric pressure, and in this way cause the



atmospheric pressure to act as a driving fluid the next return stroke. There is a supplemental vertical cylinder, within which moves a piston absolutely independent of the driving piston and the motor shaft; the cylinder serving to contain the explosive mixture during and after its compression. The independent arrangement of the piston enables the latter to move, under the action of the expansion of the gas, at a higher speed than the driving piston, and so facilitate "the rapid and perfect ignition and the rapid expansion of the gases," at the beginning of the explosion. The main cylinder is provided with a distributing-shaft actuated by the crank-shaft, and carrying three cams or equivalents, one of which operates the mixture admission-valve, while the second cam operates the air admission-valve, and the third operates the gas admission-valve—the shaft actuating also an ordinary ball-regulator. A supplemental cylinder is secured to the main cylinder, and in line with the latter; and there is a piston moveable in the cylinder and slidable on its rod against the action of a spring. The supplemental piston is connected by rods and cross-bars with a piston moving in a cylinder arranged under the supplemental cylinder, and acting as a hydraulic brake on the first-mentioned piston—the sides of the hydraulic piston being in communicative connection through suitable ports communicating with a chest provided with a valve operated by a cam on the distribution shaft of the valve mechanism.

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 11,955.—POTTER, W. G., "Lamps for acetylene gas." July 3.  
 11,979.—GRAHAM, M., "Hot coke conveyors." July 3.  
 12,029.—MACKENZIE, J. W., "Gas-engines." A communication from the Safety Motor Company. July 3.  
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 12,122.—OLDHAM, M. A., "Gas-heated ovens." July 5.  
 12,125.—SHIELDS, J., "Obtaining cyanogen compounds." July 5.  
 12,159.—HILL, H., "Mantles for incandescent lighting." July 5.  
 12,172.—DAUB, F., "Removing sulphides from crude benzene and other coal tar products, or from coal tar." July 5.  
 12,193.—AULD, J., "Reducing and like valves." July 6.  
 12,239.—GLOVER, J. G., "Gas-lighting torches." July 6.  
 12,240.—SMITH, G. G., "Acetylene gas generators." July 6.  
 12,276.—COPE, ALLMAN, and CO., LTD., and ALLMAN, W., "Hooks or clips for gas and water pipes." July 7.  
 12,278.—ARNDT, M., "Analyzing gases and indicating and recording the results of the analyses." July 7.  
 12,333.—HUMPHREYS, A. C., and GLASGOW, A. G., "Gas-burners." A communication from W. E. Gibbs. July 7.  
 12,335.—SLOCUM, F. L., "Manufacture of gas." July 7.

## PARLIAMENTARY INTELLIGENCE.

### Gleanings from the Committee Rooms.

Week by week, the attendance in the Committee Rooms and corridors is thinning; and this is a good indication that the work of the parliamentary session in this direction is drawing to a close. Had it not been so, and had the corridors been as crowded as they were two or three months since, existence in them during the past week would have been insufferable. As it was, those whose business took them to Committee Room No. 1A, where Lord Brougham and four other noble Lords disposed of two important Gas Bills, found it a very trying ordeal to remain in attendance. Sitting accommodation was limited, and the heat was oppressive, although the Committee very considerably permitted windows and even doors to remain open. But this relaxation of the usual order of things disturbed somewhat the air of decorum that generally pervades the Committee Rooms. There was a continual buzz of conversation in the public part of the room; and more than once a gentle remonstrance came from Lord Brougham. The footsteps, too, of persons passing in and out along the paved entrance outside was rather distracting to those who desired to closely follow the proceedings. But this was more endurable than would have been the stifling heat with closed doors.

The first of the two Gas Bills which came under consideration was what may now be truly called the epoch-marking measure of the South Metropolitan Gas Company. The part of the Bill in which the whole gas industry is intensely interested has, readers will learn with gratification, been passed by the Lords Committee precisely in the form in which the Committee of the Lower House left it, and the import of this may be stated in few words. Low-grade gas there always has been in various parts of the country since it was first used; but the tendency of Parliament has hitherto been to raise the standard of illuminating power. Henceforward, the South Metropolitan Bill of this session will mark the point from which that tendency was reversed. Sufficient, however, was said on this subject when the Bill was before Mr. Oldroyd's Committee; and as the question was not submitted to their Lordships last week—in fact, the opponents who a short while since foreshadowed such disastrous consequences to the consumers if the Bill passed, gave it on this occasion the cold shoulder entirely—we will omit further mention of it in these notes, and merely confine them to giving the trend of the proceedings during the two afternoons which sufficed for the disposal of the Bill. Altogether there were eighteen petitions against it; and the petitioners (most of whom were represented by Counsel) were the public lighting authorities in the northern area of the Gaslight and Coke Company. This indicated beforehand, and last week proved it to be true, that the portion of the Bill which would be assailed was that providing

for the transfer of the part of the Gaslight Company's district south of the Thames to the South Metropolitan Company. If a casual visitor to the Committee Room when Mr. Oldroyd and his colleagues were considering the Bill, had happened to drop into the room where Lord Brougham's Committee were engaged with it last week, he would not have recognized the proceedings as having any relationship with the same measure. In the one case, illuminating powers, sliding-scales, initial prices, burners, and cognate matters were the topics of discussion; while, in the other, the possible effect of the proposed transfer on the cost of public lighting in the district north of the Thames was the subject upon which Counsel bore with their full force. For the little they were mentioned on this occasion, the other important matters in the Bill might, to the uninformed, have been non-existent.

The thought that naturally arises in one's mind is that the Local Authorities have been incomprehensibly dull in discerning that, by the proposal in Part IV. of the Bill, the very favourable position which they have held since 1883 in respect of the charge for public lighting was being undermined, or surely they would not have waited until the eleventh hour before they offered fight. As readers who have studied the Metropolitan Gas Question know, one of the terms on which this southern district was transferred to the Gaslight Company in the year named was that they should not charge more for public lighting north of the Thames than they were charging private consumers in the southern area, where the price was controlled by that charged by the South Metropolitan Company. Consequently the public authorities, under this arrangement reap an advantage, which they are unwilling to forego. Whether under all the circumstances of the case, it is fair to the private consumers in the Company's northern district is a matter upon which there cannot be more than one view among gas engineers and managers. Anyway, the Powers of Charge Committee of last year, with full knowledge of the consequences of their proposal, recommended that the Gaslight Company's southern area should be transferred to their neighbours, who were willing, but not anxious, to comply with the recommendation. Hence the incorporation in the present Bill of clauses giving the South Metropolitan Company power to acquire, and the Gaslight Company power to dispose of, the undertaking. But what Sir James Rankin's Committee considered desirable, the Lords' Committee declined to endorse. For reasons for their decision, it is unnecessary to seek far.

After Lord Robert Cecil had opened the case for the Bill, Mr. George Livesey was called; and he clearly laid before their Lordships the whole story and position of the matter. Then Mr. J. W. Field, who had been summoned while Mr. Livesey was in the chair, was examined. Said Mr. Livesey, before Mr. Field's arrival: "So far as the South Metropolitan Company are concerned, we do not care whether this portion of the Bill passes or not." Said Mr. Field later on: "The Company [the Gaslight] have borne the burden in connection with this southern district for seventeen years, and we are not anxious to be relieved of it." And there was a chorus of approval from the opposing Counsel. There was another matter, too, which may also have had some influence with the Committee. It will be remembered that Mr. Livesey has consistently refused to entertain arbitration in connection with the transfer of the Nine Elms Works, preferring that the question should be settled by agreement. But the other side objected; and when the Bill was before the Commons Committee, it appeared that the matter had arrived at a deadlock, and that transfer was hopeless. But correspondence that was laid before the Lords Committee last Thursday showed that, since the rejection for the second time of their Money Powers Bill, the Directors of the Gaslight Company had looked at the matter in a new light, and had finally decided to accept an offer by the South Metropolitan Company of £900,000 for the southern undertaking, excluding stocks and stores, for which Mr. Livesey calculated £50,000 or £60,000 would have to be paid. Mr. Field was severely pressed on this matter; and he admitted that the bargain would supply the Company with ready capital until such time as they could present to Parliament an acceptable scheme. But opposing Counsel saw that the bargain, if carried through, would delay the formulation of such an "acceptable scheme," and their desire was that nothing should stand in the way of its early presentation. However, it cannot be supposed that it did not occur to such men as Mr. Oldroyd and his colleagues who had previously dealt with the Bill that, if it went through its remaining stages, it left open a way by which the Company could become possessed of a supply of capital for temporary purposes, and which would at the same time effect the carrying out of one of the recommendations of Sir James Rankin's Committee, which so far the Company had altogether ignored. Therefore, in rejecting this section of the Bill, the Lords Committee have taken from them their only immediate chance of securing an amount of unfettered capital, and have thus placed them in a more desperate position than before. However much Mr. Field may profess that the Company preferred to retain their southern area, there can be little doubt they would have been better pleased, at the present moment, if they could have handled the proceeds of its sale.

So far as the local authorities are concerned, if Part IV. of the Bill had gone through, it would have relieved the Gaslight Company of their obligation under the Scheme of 1883; and the authorities north of the Thames would have had many thousands of pounds more to pay per annum for public lighting than now, but the private consumers would no doubt have correspondingly benefited. According to Mr. Field's own showing, all the Company were prepared to allow the authorities was a discount, at the outside, of 5 per cent., although, it seems, they had no idea of raising the price of gas to the authorities to the existing price of 3s. 5d. However, the part of the preamble of the Bill relating to the transfer having being declared not proved, the position at present is unaltered. The remaining parts of the Bill will proceed; and they are of a character which will cause the affairs of the South Metropolitan Company to be watched with even greater interest than in the past.

The next Bill submitted to their Lordships was that of the Wandsworth and Putney Gas Company. It was expected that negotiations with the London County Council and the District Board of Works would have obviated a second contest; but the requirements of these public bodies were so extravagant that the Company were bound to resist them. The objects of the Bill are to enable the Company to raise further capital, to acquire land for extensions, to close certain unimportant roads which intersect the site, and which have no public utility, and to convert and consolidate the capital. These matters were fully explained and the



excellence of the management of the Company and of its record generally commented upon, when the Bill was before the Commons Committee, from which, it will be in the recollection of readers, it issued with only one or two minor alterations. As then so now, the opponents tried to get the Company placed under the yoke of the legislation applying to the three Metropolitan Companies; but Mr. H. E. Jones, with the weight of that bondage on his shoulders, declared that he would sooner drop the Bill than submit to the proposal. A strong effort was also made by the opposition to have the Company's initial price reduced from 4s.; but the unfairness of this was likewise made plain. Objection was also taken to the closing of the lanes through the works. In addition to Mr. Jones, Mr. Corbet Woodall, Mr. E. H. Stevenson, and Sir Frederick Bramwell gave evidence for the Bill. The Counsel opposing addressed the Committee; but their Lordships, without hearing Counsel for the promoters in reply, declared the preamble of the Bill proved. Upon the success which they have scored all through, the Company are to be heartily congratulated.

The Westgate and Birchington Water Bill (which passed through the Committee of the Lords without alteration, although strongly opposed by the Margate Corporation) was threatened with opposition in the Commons by the Ecclesiastical Commissioners, who demanded that their wells in the district should be protected from damage by any pumping operations carried on by the Company. As the terms demanded by the Commissioners could not be accepted by the Company, a petition was filed by them in the Commons. Before the matter came on for hearing, however, the Commissioners had agreed to a simple undertaking of the Company that, should it be necessary, they would deepen their wells to the same depth as the Company's running headings; and the petition was consequently withdrawn. The Bill finally went before the Committee for unopposed measures, the Chairman of which is Mr. J. W. Lowther. The parties therefore appeared with their Engineer (Mr. W. A. McIntosh Valon) before that Committee on Wednesday last; and the Bill was finally reported to the House, without amendment, for third reading. This Bill, although in the first instance meeting powerful opposition from an adjoining local authority, and afterwards from the Ecclesiastical Commissioners in points of detail, was passed through all Committee stages and reported to the House as originally deposited without a word of alteration—in itself a rather remarkable and noteworthy performance.

A difficulty recently arose in connection with the Spalding Water-Works Bill, which it was thought likely would lead to the abandonment of the measure. The Bill was promoted by the District Council for the purchase of the water-works by friendly agreement. It was understood that the Council would take over the existing officers, and that there would be no compensation payable, excepting in the case of the Clerk, with regard to whom an arrangement had been made. Two other officers, however—the Engineer (Mr. W. R. Stimson) and the Collector—put in a claim for compensation, and at their instance a clause was introduced into the Bill entitling officers to compensation, even on voluntary retirement. There was a strong feeling among the members of the Council against any such allowance. An arrangement, however, has now been arrived at, which will permit the Bill to proceed without further question. The Collector has withdrawn his claim; and the Engineer is to receive £350 from the Company.

### HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bills reported, with amendments: Lambeth Water Bill, Oldham Corporation Bill.

Bills read the third time and passed: Gas Provisional Order (No. 3) Bill, St. Albans Water Bill.

Royal Assent given: Gas and Water Orders Confirmation Bill, Bedford Gas Bill, Bristol Water Bill, British Gaslight Company (Staffordshire Potteries) Bill, East Stirlingshire Water Bill, Great Berkhampstead Water Bill, Morecambe Urban District Council (Gas) Bill, Motherwell Water Bill, North Warwickshire Water Bill, Ossett Corporation Gas Bill, Paignton Urban District Water Bill, Woodbridge District Water Bill.

No parties having appeared in opposition to the Mid-Kent Water Bill, the Portland Urban District Gas Bill, and the Rickmansworth and Uxbridge Valley Water Bill, the Select Committees to whom the Bills were referred did not proceed with their consideration.

### HOUSE OF COMMONS.

The following further progress was made with Private Bills last week:—

Bill brought in, read the first time, and referred to the Examiners: Paisley Water-Works Provisional Order Bill.

Bill read a second time and committed: Salford Corporation Bill [Lords].

Bills reported: Water Orders Confirmation Bill [Lords], Westgate and Birchington Water Bill [Lords].

Bills reported with amendments: Bury and District Water (Transfer) Bill [Lords], Gas Orders Confirmation (No. 1) Bill [Lords], Hemel Hempstead Corporation (Water) Bill [Lords], Margate Corporation Bill [Lords].

Bills read the third time and passed: Exmouth Urban District Water Bill [Lords], Falkirk Corporation Bill [Lords].

On Thursday the debate was resumed on the Lords' amendments to the Spalding Urban District Council Water Bill, with the result that they were agreed to. This matter is noticed above, in our "Gleanings from the Committee Rooms."

There was a disastrous thunderstorm in Yorkshire last Thursday afternoon, and it did serious injury in the Bingley district. Among other damage, a bridge was carried away over which passed a gas-main from Bingley to Morton. In consequence the village was deprived of its ordinary means of illumination; and until a connection was again made, primitive methods of lighting had to be resorted to.

### HOUSE OF LORDS COMMITTEE.

Wednesday, July 11.

(Before Lord BROUGHAM, the Earl of MAYO, the Earl of DENBIGH, the Marquis of ZETLAND, and Lord PLUNKET.)

#### THE SOUTH METROPOLITAN GAS BILL.

This Bill, which had already been passed by the House of Commons (see Vol. LXXV., pp. 1369, 1372, 1446), came to-day before a Select Committee of the House of Lords constituted as above.

Mr. BALFOUR BROWNE, Q.C., Lord ROBERT CECIL, Q.C., and Mr. L. W. S. ROSTON appeared for the promoters. The other Counsel engaged were: Mr. WORSLEY TAYLOR, Q.C., Mr. FREEMAN, Q.C., and Mr. TALBOT for the London County Council; Mr. LITTLE, Q.C., and Mr. H. A. RIGG for the Corporation of the City of London; Mr. A. J. RAM, Q.C., for the Strand District Board of Works; Mr. E. MORTEN, for the Corporation of West Ham; Mr. MACMORRAN, Q.C., and Mr. BEVEN, for the Vestry of Hackney; Mr. SINCLAIR COX, for the Vestry of St. Pancras; Mr. ALLEN, for the Vestry of Shoreditch; Mr. TALBOT, for the Vestry of St. Marylebone; and Mr. COURTHOPE MONROE, for the Holborn District Board of Works. A number of Local Authorities also entered an appearance but reserved Counsel.

Lord R. CECIL, in opening, said the Bill had several different objects; being divided into five parts. The first was preliminary and unimportant; the second was very material, as it proposed to alter the provisions as to standard price and illuminating power of the gas supplied by the Company; the third part dealt with a small railway which the Company desired to construct, and was practically unopposed; the fourth part (which was very vehemently objected to) related to the purchase of the portion of the Gaslight and Coke Company's undertaking south of the Thames; and the fifth was miscellaneous.

Mr. FREEMAN said he did not intend to offer much opposition to Part II. What the County Council were really objecting to were certain consequences which would arise from the purchase of part of the Gaslight and Coke Company's undertaking. If the purchase were carried out as proposed in the Bill, it would enable the Company to unfairly alter their present position in all parts of their district north of the Thames.

Lord R. CECIL thought that, in these circumstances, it would be convenient if the Committee began with Part IV.

Mr. RIGG intimated that the position of the City of London was very much that of the London County Council; and he agreed that it would be convenient to take Part IV. first.

Lord R. CECIL said Part IV. provided for the purchase, by agreement, of that portion of the Gaslight and Coke Company's area which lay to the south of the Thames. A Committee of the House of Commons sat last year to consider the powers of charge of the London Gas Companies; and among their recommendations was one that this district should be transferred to the South Metropolitan Company. It was really to carry out this that the South Metropolitan Company put the provision—which was only permissive—into the Bill. When this district was taken over in 1883 by the Gaslight and Coke Company, one of the terms of transfer was that they should not charge in that district any higher price than the South Metropolitan Company charged in their area; and it was also provided that the Gaslight and Coke Company should not charge for gas to light public lamps north of the Thames a higher price than that charged to any consumer in any part of their district. The point raised by the opponents, he understood, was that the joint effect of these two provisions was to make it obligatory on the Gaslight and Coke Company to charge north of the Thames for public lamps the same price as they were charging private consumers south of the river, where they were not allowed to charge more than the South Metropolitan Company. This matter was discussed at length before the Committee of last year; it being pointed out by the Gaslight and Coke Company that, for various reasons, the arrangement was inconvenient, and the suggestion being made by other witnesses that this area should be transferred. Against this, one of the principal arguments used was that if this district were handed over to the South Metropolitan Company they would destroy the privilege the Authorities north of the Thames enjoyed of receiving gas for public lighting at the rate charged by the South Metropolitan Company. In the result, the Committee made the recommendation he had referred to. The South Metropolitan Company were perfectly willing to carry out the duty imposed by the Committee; but they very earnestly protested that one of the suggestions of the opponents should not be acted upon—viz., that they should be compelled to acquire the area at arbitration price. This would be most unfair to their shareholders. They were willing to buy at a fair price; but it was absolutely unprecedented that a purchaser should be compelled to buy, against his will, a piece of an undertaking at a price to be fixed by arbitration. They felt so strongly about the matter that they took care in the notices in regard to the Bill only to cover permissive power. In other words, they had not given the notices which would be needed if they wished to compulsorily acquire; and it would therefore, he presumed, destroy the Bill on Standing Orders if compulsory power were put upon the promoters.

The CHAIRMAN: Is not a permissive power to purchase rather a new expression?

Lord R. CECIL: It is necessary in the case of a statutory company. They cannot purchase property or an undertaking lying outside their district, unless they have power to do so by some Act of Parliament.

Mr. FREEMAN said the clause went a good deal beyond that, because it enabled the Gaslight and Coke Company to sell. It was an unusual thing to empower somebody who was not before Parliament to do something which they could not do at the present time.

Lord R. CECIL agreed that the clause enabled the Gaslight and Coke Company to sell, as well as the South Metropolitan Gas Company to purchase. He went on to state that an agreement had been arrived at between the Companies as to the terms of purchase.

Mr. FREEMAN remarked that, if this was so, the two Companies were joint promoters.

Lord R. CECIL said he should be glad to indicate the broad outlines of the agreement; but he did not know that the Committee would require him to state all the details.



Mr. LITTLER: Why not?

Lord R. CECIL: I do not see that it can possibly affect them.

Mr. FREEMAN said it was obvious the petitioners ought to see the agreement. If it contained satisfactory provisions, the Committee might be relieved of the opposition.

Mr. LITTLER: Is any information going to be given us as to what the Gaslight and Coke Company are going to do with the money they will get? We have for three years running objected to their being granted further money powers. Now they are going to obtain a large sum of money; and as far as I can make out, they can spend it how they please.

Lord R. CECIL: I do not know where, in your petition, you raise that point.

Mr. LITTLER: We could not petition on it until we knew the agreement had been made.

Lord R. CECIL: I am told Mr. Livesey will give all the information in his power on the subject.

The CHAIRMAN (after further discussion) said if there was an agreement he thought it better for all parties that it should be put in.

Lord R. CECIL said it should be put in; there was no mystery, though there was this chorus about it. As he understood, the agreement consisted of only two letters exchanged between the Companies. He would put the agreement in next morning.

Mr. FORBES LANKESTER: I think we ought to have copies.

After further discussion, during which Lord R. Cecil said the letters were not in the room, the matter was left, on the understanding that copies of the letters would be forwarded that night to the parties interested in the matter.

Lord R. CECIL (continuing) dealt with the petitions; the first being that of the London County Council. They suggested that provision should be made requiring the transfer of the part mentioned of the undertaking of the Gaslight and Coke Company, failing agreement, on terms to be settled by arbitration or otherwise, as the Committee might direct. As the agreement had been arrived at, that provision, he presumed, was no longer material. Then they pointed out that one effect of the transfer would, or might, be to enable the Gaslight and Coke Company to charge a higher price than at present for gas supplied for public lighting; and they suggested that provision should be made in the Bill restricting the charges made by the Gaslight and Coke Company for gas supplied for this purpose. As to this, the Gaslight and Coke Company were not before the Committee at all; and it would be improper and unjust to insert a provision affecting their undertaking in the absence of the Gaslight and Coke Company. He did not wish to argue the general merits of the contention, though it did seem to be arguable that this exemption should not exist. What it amounted to was that the Authorities, with immense resources at their backs, received gas at a less price than private consumers—in fact, at the expense of private consumers—because the Company had to charge more to the private consumers in order to supply the public bodies at a lower rate. It did seem to be a curious principle, and one which the Committee ought not necessarily to be very careful to continue. The petition of the City Corporation stated that they obtained a supply of gas for public lighting at the price charged by the South Metropolitan Company. This, Counsel pointed out, was in consequence of the provision for the protection of those dwelling in the southern portion of the Gaslight and Coke Company's district. The present charge of the South Metropolitan Company, they went on, was 2s. 4d. per 1000 cubic feet, while that of the Gaslight and Coke Company was 3s. 5d.; and if the present proposals were sanctioned, the latter Company would be able to raise the price within the City for public lighting from 2s. 4d. to 3s. 5d., or whatever was the charge for the time being of the Company to private consumers, whereby loss and injury would be inflicted on the City. They also stated that the total increase in price which the Local Authorities north of the Thames would have to defray out of the rates would amount to upwards of £50,000 per annum in the aggregate. If this were so, the only result would be that this sum would be taken from the public consumers, and applied for the benefit of the private consumers. The County Borough of West Ham pointed out that the effect of the Company's proposals would be to place at the disposal of the Gaslight and Coke Company a large amount of capital for the purposes of the remaining part of their undertaking north of the Thames, free from such additional restrictions and provisions for the benefit of the gas consumers as without doubt Parliament, in accordance with its customary practice, would have imposed if such additional capital were given under express powers to that end sought by the Gaslight and Coke Company from Parliament. The petitioners and other Local Authorities would therefore, in the event of the Bill being passed into law, be deprived of the opportunity of laying before Parliament, in accordance with the usual practice, reasons why increased capital powers should only be given to the Gaslight and Coke Company subject to additional provisions for the benefit of Local Authorities as a condition to the grant of such powers. With regard to this, the learned Counsel stated that a clause in the Bill provided that all money received by the Gaslight and Coke Company for the purchase of the area should be applied to such purposes as the Company were entitled to apply capital to. It was true that the Gaslight and Coke Company were in want of capital, and that this Bill would give them a certain amount; but he should ask the Committee not to impose upon the Company, in their absence, any conditions with which they would not be able to deal.

Mr. LITTLER said that if Lord Robert raised the objection that under his Bill the Committee could not impose an obligation on the Gaslight and Coke Company, this was a good reason for rejecting the measure; because, if his (Mr. Littler's) evidence was correct, the Committee inevitably would want to impose obligations upon them.

Lord R. CECIL said the answer to this was that it was not a voluntary proposal by the Companies to get round something; the Bill was merely carrying out the recommendation made by the Committee who sat last year. This Committee did not suggest that any conditions should be put upon the Gaslight and Coke Company with respect to the capital in question, nor with respect to the public lamps in the northern part of the Metropolis. All the South Metropolitan Company had done was to take the recommendation, in its actual words, and put it into a Bill. There were, he said, in conclusion, fifteen or sixteen petitions against this part of the Bill; but as they all, he believed, dealt with the points already referred to, he would not go into them.

Thursday, July 12.

Mr. NEVILLE said he appeared before the Committee holding a watching brief on behalf of the Gaslight and Coke Company. He had not been instructed the previous day; but he was now. He pointed out, however, that he was not entitled to be heard; the Company had no *locus standi* before the Committee. It had been suggested that the Gaslight and Coke Company were joint promoters; but this was not the case. They were not promoters in any way.

Mr. FORBES LANKESTER remarked that if his friend wished to be heard he could present a petition against alterations, so that he could not take advantage of the fact that he was inaudible.

Mr. TALBOT said if the Committee would look into the correspondence mentioned the previous night, they would see a resolution of the Gaslight and Coke Company which stated that, with a view to facilitating the passage of the South Metropolitan Company's Bill through its remaining stages, they were willing to consider some arrangement with the Local Authorities which would provide for preferential terms for gas sold for public street lighting to such Authorities. It might materially shorten the proceedings if the petitioners knew what arrangements (if any) were proposed.

Mr. LITTLER and Mr. FORBES LANKESTER both pressed for information on the point.

Mr. BALFOUR BROWNE said he thought the most convenient way would be to proceed as usual with the evidence.

The CHAIRMAN: Yes.

Mr. George Livesey, examined by Mr. BALFOUR BROWNE.

Witness said that, when the London Company were amalgamated with the Gaslight and Coke Company in 1883, the South Metropolitan Company were also seeking to amalgamate with that Company. Both Companies had power—the Gaslight and Coke Company under their Act of 1868, and the South Metropolitan Company under their Act of 1876—to amalgamate with other London Gas Companies. The London Company were peculiarly situated, inasmuch as while their works were south of the Thames, two-thirds of their district was north of the river. At the beginning of 1883, the South Metropolitan Company were selling gas at 2s. 10d. per 1000 cubic feet, while the Gaslight and Coke Company were charging 3s. 2d.; the London Company's figure being 3s. When the proposal for amalgamation was submitted to the Board of Trade, the Board made it a condition that the Gaslight and Coke Company should never charge a higher price for gas south of the Thames than was charged for the time being by the South Metropolitan Company. The South Metropolitan Company had been able to reduce their price more than the Gaslight and Coke Company. In 1889, the difference between the two Companies was reduced to 3d., having been 4d. in 1884. Now the difference was 9d. Consumers of gas for public purposes on the north side had a benefit over private consumers in 1889 of 3d., and at the present time of 9d., which was due to a provision in the City of London Act of 1868 that they should not charge a higher price to any public authority than the lowest price they charged to any private consumer. Private consumers on the north really had to pay more in consequence of this provision. There was considerable discontent and agitation among consumers as to these charges; and particularly were the northern consumers irritated at having to pay, as last year, 9d. more than the consumers in that same Company's area in the south paid. There was no doubt that this discontent led to the appointment of the Committee in 1899. One of the most important points raised before this Committee was as to the differential rate of charge in the same Company's area north and south of the Thames. The Gaslight and Coke Company supplied about 20,000 million cubic feet of gas annually, of which about 1000 millions was sold at a low price south of the Thames, and another 1000 million cubic feet at a low price north of the river. It was argued that selling one-tenth of their total supply at 10d. per 1000 cubic feet below the price necessary to pay their dividend, caused the other nine-tenths to pay 1d. per 1000 cubic feet more. Evidence was given to show that, if the Gaslight and Coke Company were relieved of this obligation to supply the south side at the South Metropolitan rates, they could furnish gas on the north side to private individuals at a cheaper rate; and he (witness) thought that the Committee accepted this view.

The CHAIRMAN: But the rate for public lighting would be raised?

Mr. BALFOUR BROWNE: Yes, probably.

Witness: I mentioned that on two occasions. I said, of course, the rates for public lighting would be raised.

Mr. BALFOUR BROWNE (to witness): Will you say what were your reasons for making the statement before the Committee that you have just explained?

Witness: My reason was that I conceived it to be an injustice to the private consumer to make him pay more in order that the public consumer might have gas at a lower price than it cost to make it. In the old days, the Companies were all in competition; and it was not uncommon for them to offer to supply public lights for practically nothing, in order to get the consent of the Authorities to lay their pipes. But when they were distrusted, that was all altered.

It is quite obvious that, if they supply the public lamps at a loss, they must charge the private consumer more than they would otherwise do?—Yes, because they take their full dividend, and must get it somehow.

And, under these circumstances, it is not the ratepayers who are paying for public lighting, as they ought, but the gas consumers?—Yes.

Did you point out that the object you had in view—the reduction of the price to the consumer—would be best carried out by transferring the southern district of the Gaslight and Coke Company to you?—I do not think I was the originator of that; but I assented to it.

Did you point out to the Committee straight that this would probably involve the raising of the price of gas for the public lamps on the north side of the river?—Yes.

Examination continued: He made it clear that it was only by increasing the cost for the public lamps that the private consumer could get the benefit of the penny. While the Bill might increase the charge for public lighting, it would leave the Company free to reduce the price to private consumers. He thought Sir James Rankin's Committee were strongly of opinion that the southern portion of the Gaslight and Coke Company's district should be transferred to the South Metropolitan



Company. On one occasion, as the Committee were rising, Sir James Rankin (who was with several other members) called witness to him, and asked if he could take the district; and witness said he could. The present Bill was promoted solely because of the recommendation of the Committee that the district should be transferred. The South Metropolitan Company had no need to come to Parliament; but they thought it would be wise to conform to the Committee's recommendations. The Gaslight and Coke Company promoted a Bill last year to obtain further capital, which they said was urgently needed. This Bill was rejected; and another Bill with a similar object promoted this year was also rejected by the same Committee as allowed the present Bill of the South Metropolitan Company—giving powers to purchase, and being, therefore, the means to the Gaslight and Coke Company of getting further capital—to proceed. As early as August last year, witness had been in communication with the Gaslight and Coke Company in regard to transfer; and an agreement had now been arrived at.

The correspondence which had passed between the two Companies was then handed in to the Committee. It was as follows:—

*The Gaslight and Coke Company,  
Horseferry Road, Westminster, S.W.,  
Oct. 6, 1899.*

Dear Mr. Livesey,—The question of a transfer of our district south of the Thames, to which you referred in your unofficial letter of the 17th of August, was yesterday discussed at the Court of Directors of this Company.

While we are not anxious to sell the district and works, we will place no obstacle in the way of an assignment of the southern district, provided we are satisfied that such an agreement will afford the fullest guarantee that the interests of this Company will not in any way suffer by the transaction.

As regards the terms of transfer, and the basis for calculating the consideration money—

- 1.—We agreed that the Nine Elms works and the gasholder stations at Battersea and Vauxhall should go with the district south of the Thames. The daily manufacturing capacity of these works in December next will be 14 millions, and the aggregate gasholder storage nearly 11 millions.
- 2.—The South Metropolitan Company to allow us to rent, upon terms to be agreed, one of the gasholders at Battersea, for a limited period.
- 3.—This Company would require the right to purchase, at a price to be agreed hereafter, fixed quantities of gas in bulk in the first, second, and possibly the third year after the cession.
- 4.—Some provision would have to be made that the officers, servants, and workmen in the employ of the Gaslight and Coke Company at the date of transfer should be continued in the service of the South Metropolitan Company, subject to the same terms and conditions both as regards their present position and their future prospects, or equitable arrangements made in case of compulsory retirement.
- 5.—Payment for stock on hand—coal, coke, and sundry stores—at the respective rates certified by the Company's Auditors.

Under these circumstances, we are ready to negotiate for the sale and transfer of so much of the undertaking as lies south of the Thames, and are prepared to receive a proposal from your Company for its acquisition. We shall also be ready to afford you full information on any point on which you may desire it.—Yours very truly,

Geo. Livesey, Esq.,  
South Metropolitan Gas Company.

*South Metropolitan Gas Company,  
709A, Old Kent Road, S.E.,  
Oct. 12, 1899.*

Dear Colonel Makins,—Your letter of the 6th inst., relating to the proposed sale of your southern works and district to this Company, was read at my Board yesterday.

They authorize me to say that the general conditions you attach to the sale appear fair and reasonable, and that they are willing to enter into negotiations for the purchase.

They think, however, that it would be well to have a preliminary meeting of, say, two (or three if you like) Directors from each Board, with their two Chief Officers, for a friendly discussion of the subject, before either party can be in a position to make a definite proposal as to price.

If this meets with your approval, I would suggest that the meeting might take place at the Nine Elms works. I think we could meet you on almost any day except Wednesdays.—Yours, &c.,

GEORGE LIVESEY.

*South Metropolitan Gas Company,  
709A, Old Kent Road, S.E.,  
Nov. 2, 1899.*

Dear Sir,—Referring to the interview your Governor, Deputy-Governor, and Mr. Woodall had with my Chairman and Deputy-Chairman, on the 24th ult., to consider the question of the proposed sale of your southern works and district as a going concern to this Company, I am instructed to say:—

That the conditions mentioned in Colonel Makins's letter of the 6th ult. are, subject to the explanations given and received at the above-named interview, generally approved.

That the inspection of the Nine Elms works by the deputation and this Company's Engineer was satisfactory, though they found it would be necessary to expend a very considerable amount on the retort-houses.

That your statement is accepted, that the consumption of gas in your southern district will this year amount to about 1000 millions of feet.

That on this basis my Board now make a definite offer of £800,000 (eight hundred thousand pounds) for your works, gasholder stations, and district on the south side of the River Thames; and the enclosed statement will show you how this figure is arrived at.

I am to add that, if you desire it, my Board are quite willing to arrange for another conference at an early date.—Yours faithfully,

J. W. Field, Esq.,  
Secretary and General Manager,  
Gaslight and Coke Company.

[ENCLOSURE.]

#### NINE ELMS PURCHASE.

FOUNDATION OF OFFER MADE AT INTERVIEW.

Nine Elms Works.—Capacity, productive, daily maximum coal gas, 11½ millions, divided thus—

5½ millions for south,  
6½ millions surplus, and  
2½ millions water gas.

The 5½ millions will supply the southern demand of 1000 millions per annum.

On this there will be a profit of 5d. per 1000 feet. It costs 1s. 8d. per 1000 to make gas at Nine Elms; and it is sold at 2s. 1d. Fivepence per 1000 feet on 1000 millions sold equals £20,833—say, £21,000. £21,000 a year will pay 3½ per cent. interest on £600,000, which is the outside figure the South Metropolitan can give for the district and that portion of the works.

There remains a gas-making capacity of rather over 6 millions a day of coal gas—say, 6 millions, because there ought to be some margin or reserve. The South Metropolitan erected complete works at East Greenwich, with everything necessary to produce this daily quantity of gas, land included, for well under £150,000.

There remains the water gas plant, which cost about £27,500—say, £25,000, to allow for depreciation.

The three items are—

No. 1 . . . . .	£600,000
No. 2 . . . . .	150,000
No. 3 . . . . .	25,000
Total . . . . .	<u>£775,000</u>

£800,000 is, therefore, a very liberal figure for the works and southern district.

November, 1899.

G. LIVESEY.

*The Gaslight and Coke Company,  
Horseferry Road, Westminster, S.W.,  
June 18, 1900.*

Dear Sir,—At the Court of Directors held last Friday, Mr. Corbet Woodall read the correspondence which had recently passed between himself and the Chairman of your Company on the subject of the suggested sale of this Company's southern district and works, and, after full consideration, it was resolved as follows: "That the Secretary and General Manager write to the South Metropolitan Gas Company, informing them that the Court formally adopts the figure of £937,500 which has been unofficially mentioned as the purchase money for the southern district, and is prepared to accept that amount; and that, with a view to facilitate the passage of the South Metropolitan Company's Bill through its remaining stages, they are willing to consider some arrangement with the Local Authorities which would provide for preferential terms for gas sold for public street lighting to such Authorities." I will accordingly ask you to be so good as to read this letter to your Directors at the next meeting of your Board.—Yours faithfully,

F. Bush, Esq.,  
South Metropolitan Gas Company,  
709A, Old Kent Road, S.E.

*South Metropolitan Gas Company,  
709A, Old Kent Road, S.E.,  
June 21, 1900.*

Dear Sir,—Your letter of the 18th instant has been considered by the Directors, who instruct me to make you the definite offer of £900,000 (nine hundred thousand pounds) for the works and southern district of your Company, such sum to include all plant, tools, &c., for the proper and efficient carrying on of such works, but excluding stocks of coal, coke, and other stores, which are to be paid for in manner suggested by Colonel Makins in his letter to Mr. Livesey dated the 6th of October last.

Will you please convey to your Court that this is the utmost figure which my Board can give for the property; and the offer now made must be regarded as final.—Yours faithfully,

FRANK BUSH, Secretary.

J. W. Field, Esq.,  
Secretary and General Manager,  
Gaslight and Coke Company.

*The Gaslight and Coke Company,  
Horseferry Road, Westminster, S.W.,  
July 3, 1900.*

Dear Sir,—I am instructed to inform you that, at the meeting of the Court of this Company, held last Friday, the Directors passed the following resolution, which I shall be obliged by your communicating to your Directors in due course: "That, subject to agreement between the Company and the South Metropolitan Company as to the terms of transfer and other details referred to in the letter of Col. Makins to Mr. Livesey of the 6th of October, 1899, and the reply of Mr. Livesey on the 12th of that month, or otherwise, and to the preparation and sealing of a contract embodying all such terms and conditions, the offer of the South Metropolitan Gas Company to purchase the Company's district of supply south of the Thames, together with the Nine Elms and Battersea stations, for the sum of £900,000 be accepted."—I am, &c.,

J. W. FIELD,  
Secretary and General Manager.

F. Bush, Esq.,  
South Metropolitan Gas Company.

The resolution was read in which it was stated that, with a view to facilitate the passage of the South Metropolitan Company's Bill through its remaining stages, the Gaslight and Coke Company were willing to consider some arrangement with the Local Authorities which would provide for preferential treatment in regard to the gas sold for public street lighting to such Authorities.

The CHAIRMAN: What does the word "preferential" mean?

Witness: We allow a discount of 5 per cent. to the Public Authorities on their accounts; and this gives them that amount of preference over the private consumers. I believe they mean something of the same sort.

Mr. LITTLE: I think the Gaslight and Coke Company had better come and tell us the meaning of their own words.

Mr. BALFOUR BROWNE: They have no locus. I see their Counsel watching, but I do not know whether they have a right to explain.

The CHAIRMAN said it had struck him from the beginning that Mr. Balfour Browne had not called an officer of the Gaslight and Coke Company.

Mr. BALFOUR BROWNE said he had not the least objection. There was absolutely nothing to conceal.

Witness (continuing) said that ultimately the figure of £900,000 was agreed upon; but beyond this, there would be a payment for stock—coal, coke, and sundry stores—which would probably amount to £50,000 or £60,000.

Mr. BALFOUR BROWNE: I understand you are willing to pay that money?

Witness: Yes.

And if that takes place—if their Lordships approve of the sale—then the whole district south of the Thames will be part of your area; and



the people in the Gaslight and Coke Company's district south of the Thames will be charged exactly at the same rate as all the people in South London?—Exactly.

There is one thing you always did object to, I think, and that is to buy this portion of the undertaking by arbitration?—Yes. The fact is we cared but little about it; and we certainly were not prepared to run the risk of an arbitration.

And you think that, in giving the price agreed, you will be doing no injustice to the rest of the district?—No. We looked at it from the point of view of what we could afford to give. We did not want to incur any greater capital charge than the district will bear.

Cross-examined by Mr. LITTLE: As far as the South Metropolitan Company were concerned, they did not care whether this portion of the Bill passed or not; but they would like to carry the rest of the Bill. It did not in the least degree matter to them what arrangement the Gaslight and Coke Company made with the Authorities north of the Thames as to street lighting. He agreed that Mr. Oldroyd's Committee rejected the Bill of the Gaslight and Coke Company to increase their capital powers, because they did not adopt the recommendations of Sir James Rankin's Committee. They said so. Mr. Oldroyd's Committee knew that if this purchase was completed the Gaslight and Coke Company would get £900,000, which they could deal with without adopting one of the recommendations of Sir James Rankin's Committee. Witness agreed that by this means the Company would obtain money without the inquiry and conditions which Parliament might insist on if the application for further capital were made in the usual way. A very large number for bodies north of the Thames had protested against this alteration. No amalgamation of Metropolitan Gas Companies had taken place except under a Scheme authorized by an Act and sanctioned by the Board of Trade; very careful provisions being inserted for the protection of the public.

Cross-examined by Mr. RAM, witness said that when the Gaslight and Coke Company were allowed to absorb the London Company, in 1883, the price they were able to charge in the Strand district was limited by what the Gaslight and Coke Company were charging in the South Metropolitan district; and what safeguarded the Strand with regard to their public lighting, and enabled them to get the lower price, was the fact that the South Metropolitan Company were in a position to give the lower price. If the present Bill were passed, the measure by which the Strand was protected would be done away with; and the Gaslight and Coke Company, within their Acts, would be able to charge what they chose.

Mr. RAM: Do you propose any safeguard, in order to prevent this evil to the Strand?

Witness: No; and if I were asked, I should say I would not, because it is not a just thing.

The CHAIRMAN: It is possible, if this arrangement were sanctioned, that the price for public lighting north of the Thames might be increased by 1s. 1d. per 1000 cubic feet?

Witness: 9d. The respective prices are 2s. 8d. and 3s. 5d. per 1000 cubic feet.

Asked what an additional penny in the charge for public lighting came to, witness replied that every penny increase in the price north of the Thames meant an increase of about £4000. He believed the difference resulting from the increased charge of 9d. in the north of London would aggregate £38,600.

Mr. FORBES LANKESTER: What Mr. Ram has just asked you with regard to the Strand applies to the whole of the Authorities who are supplied north of the Thames by the Gaslight and Coke Company?

Witness: Yes.

Mr. FORBES LANKESTER said that, for the rest, he would adopt the cross-examination of his learned friends.

Counsel representing Hackney, Holborn, and Shoreditch intimated that they would follow Mr. Forbes Lankester's example in the matter of cross-examination.

In re-examination, witness said that the expenditure of £900,000 was regulated by existing statutes; and the Board of Trade Auditor would see that no improper use was made of it. The public would undoubtedly get the benefit of the expenditure of the money, because it would bear no interest. If the Gaslight and Coke Company did not get this loan, they would have to raise money by shares or debentures bearing interest. He had always thought it a foolish arrangement to regulate the price charged in one Company's district by the cost of production in another Company's area, as was done in this case. The South Metropolitan Company had not felt anything like the severe strain which the Gaslight and Coke Company had experienced; and, further, the South Metropolitan Company's business had increased very much more largely than that of the Gaslight and Coke Company. The fact was that certain fortuitous circumstances which favoured the South Metropolitan Company, and enabled them to produce gas at a lower cost, had been made the method by which the price of another Company not so fortunately situated was regulated.

The CHAIRMAN remarked that particulars affecting the Gaslight and Coke Company's policy would be best supplied by that Company.

After some discussion,

Mr. BALFOUR BROWNE said the General Manager of the Company was present; and although he had no proof of his evidence, he would ask him to go into the box and answer any questions that might be put to him.

Re-examination continued: It was arranged in the correspondence that the purchase-money should be paid in instalments of not more than £250,000 a year. This was provided for the protection of the South Metropolitan Company.

Mr. J. W. Field, examined by Mr. BALFOUR BROWNE.

Witness stated the circumstances of the absorption by his Company of the London Company, in 1883. The conditions of the manufacture of gas in the South Metropolitan and Gaslight and Coke Companies' districts were very different. He regarded the higher cost in the Gaslight and Coke Company's area as not due to mismanagement, but to circumstances over which the Company had no control.

Mr. BALFOUR BROWNE: Is it the fact that, in regard to labour-saving appliances, the South Metropolitan Company are more advantageously situated than you are?

Witness: They have adopted them to a greater extent than we have. We have been short of capital.

Is it a fact that you have been supplying gas of a higher illuminating power than the South Metropolitan Company?—Yes, I believe the Chairman of the South Metropolitan Company admits that.

The result of the legislation is that you are bound to charge the consumers of gas for public purposes on the north side, not what it costs you, but what it costs the South Metropolitan Company on the south side?—Yes.

Is that, in your view, an anomaly?—It is.

When the Select Committee of last year recommended that the district of the Gaslight and Coke Company south of the Thames should be transferred to the other Company, negotiations were entered into; and ultimately they arrived at the conclusion shown in the correspondence?—Yes; the Directors have arrived at a provisional arrangement.

They are willing to sell the undertaking south of the Thames to the South Metropolitan Company for £900,000; and the South Metropolitan Company are to take over the stores of coal, &c., at a valuation?—Yes. Beyond these two points nothing has been settled.

Examination continued: The Company had power to sell, under their Act of 1860. The Gaslight and Coke Company were badly in need of further capital, and promoted a Bill last year and one this session to obtain more money; but both were rejected. Capital was still absolutely necessary to enable the Company to do their duty under their various Acts.

Mr. BALFOUR BROWNE: Will this bargain, if carried out, enable you to some extent to supply the necessary capital for the purposes required by the Company?

Witness: Yes; until such time as we can present some scheme to Parliament which will be acceptable.

Supposing you get £250,000 from the South Metropolitan Company in the first year, will that money inure to the benefit of consumers in your district?—It will enable us to go on supplying the consumers.

And without it, would you be in great straits and difficulties?—We should have to stop supplying gas by automatic meters.

Examination continued: If the Company raised capital under a Bill obtained (say) next year, interest or dividend would have to be paid on it; but if the £250,000 per annum were obtained from the South Metropolitan Company, nothing would be paid on it. The £900,000, however, was already part of the Gaslight and Coke Company's capital. The Company were bound to supply every consumer. They were suffering very much from the competition of electricity, which left them in possession of houses with mains, meters, &c., while the people took little or no gas. The capital outlay on automatic fittings was very heavy. For the £900,000, the Nine Elms works would be taken as well as the district; and the Company would therefore have to spend a considerable sum in providing other works. The district to be sold represented half the capacity of the works; and therefore the Company would have to erect works of at least half the size of those sold.

Mr. LITTLE (in cross-examination): What did your works south of the Thames cost you?

Witness: The works and plant cost, as far as we can gather from the books of our predecessors, £850,000.

And you are selling them at a profit?—No, I beg your pardon; because, in addition to selling the works, we are selling the district of supply.

You are selling the goodwill?—Yes.

What is the figure of that?—I could not give it at all. I have no figures of the rental on the south side. I understood I was to be called with reference to this correspondence.

What is your income from that side?—I have no figures whatever. My first estimate of the value of these works and of the district of supply was £1,250,000.

Then you had the figures at that time?—I had them at the office.

Always assuming the money goes to the right pocket, any amount which you get for the sale of the works ought to be of assistance to you on the north side?—It will enable us to go on supplying the new consumers on the north side until we get additional capital powers.

In regard to continuing operations on the north side, you urged last year that unless you had the relief to be given by capital, you would come to a standstill?—Yes—bound to come to a standstill. Notwithstanding this, Parliament last year and this year rejected the Company's Bill.

This will give you £900,000, absolutely free of every one of the conditions of Sir James Rankin's Committee?—It is not additional capital.

You will have £900,000 in hand?—To replace works which we are going to sell.

You will have £900,000 to spend for capital purposes absolutely free of any restriction?—As I have said already, the £900,000 is simply replacement of existing capital—it is not new capital.

That is not the question. You will have £900,000 absolutely free of any restriction whatsoever?—What restrictions do you refer to?

Free of any restrictions?—The whole of our expenditure is subject to parliamentary restrictions.

Cross-examination continued: The Company were receiving this £900,000 with which to earn the dividend on the London Company's capital, for which the Gaslight and Coke Company were now responsible. He agreed that some of the money would be applied to the very purposes in respect of which the Company had asked Parliament to sanction new capital this year—which sanction Parliament had refused; but £400,000 of the money must be spent on replacing the works now being sold.

Mr. LITTLE asked witness what he meant by the resolution (contained in the correspondence between the two Companies) in which it was said that, with a view to facilitating the passage of the South Metropolitan Company's Bill through its remaining stages, the Gaslight and Coke Company were willing to consider some arrangement with the Local Authorities which would provide for preferential terms for gas sold for public street lighting to such Authorities.

Witness said he should like to say these were privileged documents which passed between the two Companies; and the first he knew of their being made public was when he had them put into his hands on entering the room that morning.

Mr. BALFOUR BROWNE admitted that they were private letters; but as they had been applied for, he thought he would put them before the Committee for what they were worth.



*Witness*, replying to Mr. Littler's question, said: What was passing through the Directors' mind was that, in the event of this Bill passing, and we being freed of the obligation under the scheme of 1883, we should be prepared to allow the Local Authorities a discount of at the outside 5 per cent. It is not the intention of the Directors to raise the price of gas in the northern area to Public Authorities to the existing price of 3s. 5d. per 1000 cubic feet.

Mr. LITTLER: That having been written on June 18, had one single suggestion been made to any of the Local Authorities for the purpose of coming to any arrangement whatsoever?

*Witness*: This Bill has not been passed yet.

Time after time since 1868 you have been in Parliament. Have you ever ventured to come and ask for a repeal of this provision?—No.

Cross-examined by Mr. RAM: He did not deny that Mr. Livesey might have said he did not care very much whether this part of the Bill passed. *Witness* was not prepared to express an opinion on the subject. The Company had borne the burden in connection with this southern district for seventeen years, and were not anxious to be relieved of it. He should certainly object, if the Bill passed, to be put under the same terms with regard to public lighting as the Company were now under. If Parliament took away part of the Company's district, they would not expect the Company to retain the burden attaching in respect of that district. The area in question was only to be taken from them under strong pressure from the Committee of last year. He agreed that, if the Bill passed the Company would have power to charge the Strand district several thousands of pounds more than they did at present; but the Directors had no intention of exercising this power.

Mr. RAM: As you have no intention whatever of availing yourself of this advantage, you will have no objection to putting in a clause that you shall not?

*Witness*: That cannot be done. We are not here at all.

By Mr. TALBOT: If the scheme were carried out, the Company would be able to charge in all the northern district for public lighting the high price charged to private consumers; but this was not their intention.

By Mr. FORBES LANKESTER: The resolution referred to of June last, about facilitating the passage of the South Metropolitan Company's Bill, was after the Bill had passed the House of Commons, and at a time when the bodies north of the Thames were agitating against anything which would increase the price of gas; but he did not think arrangements were contemplated to prevent those bodies offering opposition to the Bill in the Second House. There was no intention on the part of the Directors to make any advance to the Local Authorities, despite the wording of the resolution. He thought it a little unfair to the Directors that this resolution should have been published without their sanction.

Mr. FORBES LANKESTER: Was it the intention of the Gaslight and Coke Company that, under cover of this Bill, brought in by another party, they should get the advantage of this £900,000 of extra capital without any restraints of Parliament, and also get this advantage as regards the Local Authorities?

*Witness*: Absolutely no.

Was it your intention that arrangements with the Local Authorities should be made after the Bill had passed through all its stages?—Yes.

A MEMBER OF THE COMMITTEE: I gather, Mr. Field, you regard it somewhat in the light of a grievance, having to sell this portion of the undertaking.

*Witness*: Yes; the Company do not like to part with any portion of their business.

Notwithstanding that you are making a loss of £10,000 a year?—That is a loss which may not be permanent. If the Company could find means to cheapen the cost of production, or if the business in that district increased, the profit might be such as would more than counterbalance the loss. The large loss referred to was limited, I believe, to one year.

The CHAIRMAN: You confirm your answer that you are not anxious to sell?

*Witness*: We are not anxious to sell.

But you are taking a very much less price than you proposed?—Yes.

Mr. BALFOUR BROWNE: That will be the case so far as the South Metropolitan Company are concerned.

Mr. LITTLER said he wished to take the opinion of the Committee as to whether there was any case for him to meet. Here was a domestic agreement between these two Companies, about which neither of them very much cared; and there was no evidence that the arrangement would be to the advantage of the public.

The CHAIRMAN: We wish to hear the opposition to the Bill.

Mr. LITTLER said it seemed to him that there had been absolute failure by the promoters to show the slightest ground for legislation. Legislation did not come as a matter of right; it was to remedy some acknowledged wrong, and to give some advantage to the public. There would be no benefit accruing to the public under the Bill. Mr. Livesey said the proposal was made in consequence of the recommendation of Sir James Rankin's Committee; but it was really an evasion of the recommendation of that Committee, because, while it would indirectly provide the Company with £900,000 of capital, the Company had twice (this year and last year) been refused further capital powers—and in the last case, certainly, because their Bill contained not one of the safeguards proposed by Sir James Rankin's Committee. True, Mr. Oldroyd's Committee, who rejected the last Bill of the Gaslight and Coke Company, passed the present Bill; but before that Committee he (Mr. Littler) thought the real argument was not so present to their minds as it should have been. If the Committee released this capital, the Company would not need to come to Parliament for at least three or four years; and they might snap their fingers at every recommendation of Sir James Rankin's Committee. Whether the Company were in the right or in the wrong, Parliament had said they were wrong; and before they got more money, they ought to comply with certain conditions. If the Bill were passed, the Company could, by increasing their price to the Public Authorities, gain about £38,000 a year, which, instead of dividing between their shareholders and consumers, they could carry to the reserve fund. In this case, the money would all go into the pocket of the Company, because the reserve fund was for the purpose of equalizing dividends, and giving the Company the advantage. Ever since 1868, Parliament had made a distinction between the gas consumer and the local authority; and at

the present moment, the ratepayer was deriving a very large amount of advantage from this distinction. Part of the condition on which the amalgamation was sanctioned was that the Company should give this privilege to the public as a public; and the Gaslight and Coke Company had never dared to come directly and ask for a repeal of this provision. If the provision was to be repealed, it should be done directly; and while not repealing it by the present scheme, they avoided it, for when they got rid of the southern area they would no longer have that which bound them to charge the lower price for public lighting north of the Thames. No attempt had been made to meet the Local Authorities; and it was said that no provision for the protection of the Authorities affected could be inserted, because the Gaslight and Coke Company were not present. This was wrong, for it was absolutely in the Committee's discretion to insert any terms they liked—such as that the price for public lighting should not be governed by the price of the Gaslight and Coke Company, but by that of the South Metropolitan Company. If the Bill were passed, the Committee would let the Company give the go-by to the decision of the Committee of last year, and to the decision of the Committee of this year, and furnish them with £900,000 absolutely untrammelled. The Company would not come to Parliament for the next three or four years; and all this would be done at the expense of the Local Authorities. On behalf of the City Corporation, he asked the Committee not to allow the Bill to proceed. Let the Gaslight and Coke Company come with a Bill empowering them to sell—saying what they proposed to do with the money, and saying, if they dared, that they were going to repeal the privileges which Parliament had given to the Local Authorities north of the Thames.

A MEMBER OF THE COMMITTEE: The idea is that, if the public gas is increased in price, then probably the private consumers will benefit by getting their gas cheaper.

Lord R. CECIL: Necessarily.

Mr. LITTLER: The argument is that if they increase the price to the ratepayer, the general consumer will get his gas cheaper. What I urge is that there is no assurance that this will be so—more especially with a Company who have twice refused to comply with the obligations which Parliament has twice put upon them.

The MEMBER OF THE COMMITTEE: But if it were so, it would be taking money out of one pocket and putting it in another.

Mr. LITTLER: To a certain extent—*pro tanto*.

The CHAIRMAN: Supposing the public gas is raised 9d., which means £38,000, that sum goes to the Gaslight and Coke Company, and they can spend it in any way they choose.

Mr. LITTLER: Yes.

Lord R. CECIL said while they could use it in any way they pleased, they could not increase their dividend without reducing the price of gas.

Mr. RAM, in addressing the Committee, said Mr. Littler had raised some of the points which he desired to bring before the Committee; and he should not therefore raise them again. He did not think the Committee could ever have known of a case in which a Company came before a Committee asking for something which would not benefit themselves, but which would undoubtedly benefit another Company who were not present to be cross-examined or to be dealt with, or have terms imposed on them, if the Committee thought fit so to act. Not only that, but the South Metropolitan Company said that they did not very much care whether the Bill was passed or not. He could quite believe it. The Bill made no difference to them; but it made a vast difference to the Gaslight and Coke Company. Yet the witness representing that Company was not anxious for the Bill. Apparently there was no one who desired that the Bill should pass; but there were 25 Local Authorities who desired that it should not pass—the disadvantage to them being reckoned by thousands of pounds per annum. If the Bill were passed, they asked for clauses to protect them, in order that what had been put upon the Company in the past for the benefit of the Local Authorities should not be removed simply for the benefit of the Company.

The CHAIRMAN: Do you propose to call any evidence?

Mr. RAM: No.

The CHAIRMAN: Does any learned Counsel propose to call evidence?

A LEARNED COUNSEL: No.

The CHAIRMAN: Then there will be no right of reply for the promoters. Therefore I think it will save time if I say the Committee are of the unanimous opinion that the preamble of this part of the Bill is not proved.

The remainder of the Bill being unopposed, Mr. Livesey formally proved the preamble; and the clauses having been gone through, the measure was ordered to be reported to the House.

## HOUSE OF LORDS COMMITTEE.

Friday, July 13.

(Before Lord BROUGHAM, Chairman, Earl of MAYO, Earl of DENBIGH Marquis of ZETLAND, and Lord PLUNKET.)

### WANDSWORTH AND PUTNEY GAS COMPANY BILL.

This Bill, which had already passed the House of Commons ("JOURNAL," Vol. LXXV., p. 1449), came to-day before the above-named Select Committee of the House of Lords.

Mr. BALFOUR BROWNE, Q.C., Lord ROBERT CECIL, Q.C., and Mr. MOON appeared for the promoters. The petitioners against the Bill were represented as follows: The London County Council, Mr. G. J. TALBOT; the Wandsworth District Board of Works, Mr. E. F. VESEY KNOX; and the Battersea Vestry, Mr. PAUL CALDWELL (Solicitor).

Mr. BALFOUR BROWNE said he was sorry to have to inform the Committee that negotiations which had been proceeding had not resulted in agreement, so that he must open the Bill as an opposed measure. This was just such a Bill as gas companies were bound to come to Parliament for every few years; the policy of Parliament being, by limiting their capital powers, to compel such applications periodically. In this case, all the Company's capital was expended, and their works required extension; and the object of the present Bill was to raise more capital under the auction clauses, and to acquire land on which to extend the works. The Company had a straggling district, in which there were 71 miles of mains and about 14,000 consumers; the amount of gas sold



per consumer being 48,000 cubic feet. The Company's manufacture had largely increased; this development being chiefly in consequence of the adoption of slot-meters, which were very popular with the smaller class of consumers. The total capital of the Company was £230,000, beyond which they had raised by mortgage over £22,000. This capital consisted of different classes of stock bearing different rates of dividend; and one proposal of the Bill was to convert these into one stock bearing the same rate of dividend, and to consolidate the debenture stock. The standard price of the Company was 4s. per 1000 cubic feet; but they had sold gas at a cheaper rate than any Metropolitan Company, except the South Metropolitan Company, whose business was very much larger. The promoters' present price was 2s. 6d. per 1000 cubic feet (having been 2s. 2d. when the Bill was before the House of Commons); and that of the South Metropolitan was 2s. 8d., having recently been largely raised. The Company's price to-day was more than 1s. below the average of the twelve Suburban Companies. There was no complaint in any way of the Company. Their capital being exhausted, they sought power to raise £300,000 more, with the usual borrowing powers of one-third this amount, which would last eight or ten years at the present rate of growth. There was no object in having large capital powers, because every share had to be sold by auction, which made it to the interest of the Company to raise as little capital as possible. The Company had sold since 1883 stock to the amount of £56,468, on which they received £63,532 in premiums; so that more than half the capital bore no interest at all, and solely benefited the consumer. The site of the Company's works was ideal, as it had the river on one side and the railway near, and it was proposed to extend it. Certain thoroughfares ran through this area; and it was desired to close them. They were unimportant, as they led practically only to the Company's works; and he understood there was really not much objection to this part of the Bill. Turning to the petitions, he took first that of the London County Council, who had little or nothing to do with the Company, because they had no functions in regard to gas in the district of the undertaking. In the portion of London which was covered by the three great Metropolitan Gas Companies, the County Council had certain statutory powers. But outside the district they had none whatever; and their whole object now was to induce the Committee to give what ought only to be granted (if at all) by public legislation—viz., power over an outside district. In their petition, they said by far the greater part of London was supplied by the three Metropolitan Companies whose undertakings and powers were subject to various provisions with respect to the testing of gas, and otherwise, which had been imposed in the interests of the public. This was quite true. Those powers were imposed by the Act of 1860; but the Act expressly excluded the Wandsworth Company, with the other twelve Suburban Companies, from its operation. If it was expedient that the Wandsworth and Putney Company should be brought under the operation of the Act, it was equally desirable that the other Companies should also; but it was not expedient that special power should be inserted in the Bill dealing with one Company. When the Crystal Palace Company were in Parliament a few years ago, an attempt to impose these conditions was made, but without success. Then the County Council submitted that the new capital powers were excessive, and that if further powers were conceded to the Company the standard price of 4s. should be reduced. This he asked the Committee not to listen to, because it would be a most improper thing to do. Only last year the Company had raised a large sum of money with premiums of £150 on every £100 of stock, on the strength of the standard price of 4s. Now, notwithstanding that the Company had induced people to subscribe their money on the understanding that they might get a higher dividend if the price were reduced, the County Council wanted the Committee to take away the consideration for which these people had paid their money. Such a thing had never been done, except in the Lea Bridge Company's case; but there it was proved, absolutely to the satisfaction of the Committee, that no capital had been raised on the strength of the standard price. Here £56,000 of capital had been raised, with premiums of £63,000, on the strength of the standard price. The real object of the County Council was to take advantage of the Company being in Parliament to secure over them the same power as, under the Act of 1860, they had over the other three great Metropolitan Companies; and this, he contended, should not be done. The Wandsworth petition referred to the proposal to stop up, and discontinue for public use, several "roads, footpaths, and thoroughfares of importance, which would operate injuriously to the public, who would have to use circuitous routes, and be otherwise inconvenienced." They submitted that such powers should not be granted unless, and until, the Company, in return, provided, sewered, paved, and lighted at their own expense another road, and undertook also the widening of Worple Way. They asked that the further demolition of property in their district, and consequent reduction of rateable value, should not be authorized, or only on condition that the Company made good such diminished rates. They pointed out also that the standard price of the Company was 4s. per 1000 cubic feet, whereas that of the South Metropolitan Company, who supplied a part of the petitioners' district adjoining the area of the Wandsworth Company, was only 3s. 6d.; and they requested that the recommendations of Sir J. Rankin's Committee should be given effect to, so far as they should be applicable, and in particular that the standard price should be reduced. The latter paragraph, Counsel urged, was an improper one to insert in the petition, because the recommendations of Sir J. Rankin's Committee had no reference whatever to this Company, but only to the three large Metropolitan Companies. The Battersea petition was very similar to that of Wandsworth; and therefore he would not go into it.

Mr. H. E. Jones then gave evidence.

Witness said he was Deputy-Chairman and formerly Engineer of the Wandsworth and Putney Company, and Engineer of the Commercial Gas Company. He strongly objected to the proposal to reduce the standard price. The auctioneer, when selling stock, always pointed out the probability of an increase in the sale of gas, and that the sliding-scale enabled a larger dividend to be paid in the future; and the result was that a higher premium was secured. Having obtained all these large premiums, it would be a breach of faith to reduce the standard price of 4s. The total charge for capital in the year 1899 was only 7½d. per 1000 cubic feet of gas sold in the case of this Company. The average of the other

Metropolitan Companies would be over 11d., and the corresponding figure for the South Metropolitan Company would be 8½d.; so that the Wandsworth consumer was paying less by 1½d. on every 1000 cubic feet of gas than the consumers of the South Metropolitan Company, who were unrivalled for good management. The Wandsworth and Putney Company having been so well managed, it would be unfair in the extreme to reduce the standard price. The outlook in the coal market pointed to the fact that the Wandsworth Company would soon have to make an increase of price corresponding fully to that made by the South Metropolitan Company; and he pointed out that for every increase in price of 1d. per 1000 cubic feet, the Company would have to reduce their dividend by ¼ per cent. Witness called attention to the fact that the Company had great difficulties to contend with; the district being a very straggling one. They had only 168 consumers to each mile of main; and the consumption per head was only 48,000 cubic feet, against 51,000—the average of the twelve Companies. The Wandsworth Company had exhausted their capital, and had had to borrow from their bankers in order to meet the large demands made on them owing to the influx of working men consumers—this class of business involving heavy expenditure in laying mains and providing automatic fittings. The gas-works required extension. The lanes to which the Wandsworth Local Authority referred had practically no traffic, except that which went to the Company's own works. They were impractical for driving, and there were several places where they were less than 9 feet wide. The public would suffer no harm by their being closed. Owing to the small dividends payable by the Company on their early capital, the public benefited by the sliding-scale more than usual—namely, in the proportion of 9 to 1.

Cross-examined by Mr. TALBOT: He would sooner drop the Bill than come under the Metropolitan gas legislation. It was sufficient that the Company should be subject to such legislation as the gas undertakings in York, Liverpool, Manchester, and other large towns. This was a small Company; and he objected to coming under the legislation applying to the enormous Metropolitan Companies. He agreed that when the Commercial Company were first brought under this legislation, their capital was only about £700,000, and that that of the Wandsworth Company at the end of ten years would approach this figure. The reason that the Company were excluded from the operation of the Act of 1860, under which the great Metropolitan Companies were chiefly regulated, was that the concern was so much smaller than those Companies. Asked what practical difference there was between the parishes of Wandsworth and Putney and the adjoining districts of Camberwell, Battersea, and so on, which were in the South Metropolitan Company's area, witness replied that the consumption per mile of main, and the total aggregate of consumption in those districts, constituted the difference—it was the difference between wholesale and retail. If anyone drove or walked through the parish of Battersea into the Wandsworth Company's district, he might not be conscious of any change in the scenery, but he would find the houses gradually becoming meaner and more poverty stricken. Witness objected to applying the Acts of 1873 and 1880, because they were extremely harassing, very expensive, and did no good to anybody. The requisitions of the Gas Authorities in London had led to the expenditure by the Commercial Company of at least £150,000 in various sorts of purifying plant, which had occupied the attention of himself and his Managers to the extent of at least 25 per cent. of their time, which would have been far better spent in economizing the manufacture of gas. A strong point of objection to being placed under the London Acts was that there was no finality about them. Why should they change from a system which had been found to work well throughout England and Ireland, to one which, according to the contention of the London County Council before recent Parliamentary Committees, had done no good. A rich and powerful Company could afford to vary the mode of testing as required by the Gas Referees; but a small Company could not. And beyond all this, there was the expense of maintaining distinct apparatus.

Cross-examined by Mr. VESEY KNOX: He agreed that the Company proposed to stop up four public highways; but there was no traffic through them. They intersected the works, and the closing of them would enable the Company to construct their works more profitably, and at the same time relieve the parish of the cost of lighting and watering. In return for closing up these lanes, it was proposed to widen Worple Way to 40 feet over its entire length—thus giving the public a very much more convenient road than at present existed.

Mr. E. H. Stevenson.

Witness said the average rate of increase in the Company's area in the last four years had been about 8 per cent., which was very much more than the ordinary rate. Further capital powers were absolutely necessary. In every way the Company had been most prosperous, because of the economy observed in their early history in regard to capital expenditure. Of the consumers of the Company, about one-half were of the working class; and the supply to them involved much greater capital expenditure per 1000 cubic feet sold than with the better classes, because, while they used less gas, they took it through prepayment meters, which were very expensive. Capital expenditure per million cubic feet of gas sold would, therefore, probably be greater in the future than in the past. At £500 per million cubic feet, the capital sought would equal a supply of 800 million cubic feet, which, at the average rate of increase of 8 per cent. per annum, would last for the next ten years. The public would suffer no injury by closing the lanes crossing the site of the extension of the works.

Sir Frederick Bramwell.

Witness agreed that the capital demands of the Company were moderate, and that the site of the extension was an ideal one. The thoroughfares through the works were mere undeveloped water-side pathways, leading from nowhere to nowhere.

Mr. Corbet Woodall.

Witness thought the present an inopportune time to put the Company under the legislation applicable to the Metropolitan Gas Companies. The proposal to alter the standard would be palpably unjust, so large a proportion of the capital having been subscribed on the present basis of dividends. There was no case of a similar character in which the standard price had been reduced.



Several witnesses were then called who testified to the smallness of the traffic on the thoroughfares sought to be closed.

This completed the case for the promoters.

Mr. TALBOT, on behalf of the London County Council, said he should not call evidence. The Council's case was simply that the time had come when these two parishes, which were geographically within the Administrative County of London, should be brought within London for gas purposes, as they were for other things. These two parishes of Putney and Wandsworth were really suburban parishes in 1860; and for this reason they were excluded from the purview of the Act of that year, which was meant to apply only to the Metropolis. But their character had now entirely changed; and why the legislation which applied to the South Metropolitan Company, who supplied the neighbouring area, should not also apply to this, which was London rationally and in every sense of the word, he could not understand. There had been no reason shown why the legislation should not be applied; and he asked the Committee not to allow the Bill to proceed unless provisions were inserted with this object.

Mr. VESEY KNOX supported the contentions of the London County Council. The only two points he wished to refer to on preamble were: First, as to whether the standard price should be altered; and, secondly, as to what regulations should be imposed upon the Company. The district of the Wandsworth Board was entirely in the County of London, and paid towards the Metropolitan rates, out of which the cost of testing over London was defrayed; but, in addition to paying towards the general county rate, Wandsworth had to perform—and at their own expense—the duty of testing the gas of the Wandsworth and Putney Company. The County Council were willing to take over the duty; and the Board asked that it should be transferred. With regard to the standard price, he said the last application of the Company to Parliament for capital was in 1880, since when circumstances had so entirely changed—the population having enormously increased, and the district become so much fuller of houses, and therefore cheaper to supply—that, when a further application to increase their capital by about 200 per cent. was made, the Local Authority thought they had a right to ask that the conditions should be revised in such a way as, while not causing hardship to the shareholders, would confer advantage on the consumers. This, he submitted, could be effected by a reduction of (say) 2d. in the standard price. There was precedent for the proposal in the Lea Bridge case; the only distinction between that and the present Bill being that the Lea Bridge Company had not been as successful as the Wandsworth and Putney Company, with the result that they had not been able to take as much advantage of the sliding-scale. This, however, made no difference in principle; and Parliament, having there reduced the standard price, could do the same here. It was admitted that there were many precedents for altering the illuminating power; and the Wandsworth Board held that they would have been justified in pressing for the illuminating power to be raised, as in the case of the Mitcham Company. As they had not asked for such an alteration, the Board did hold that the Company were all the more bound to give some compensation by reducing the standard price as suggested.

The CHAIRMAN, on the conclusion of Mr. Vesey Knox's speech, without calling on Counsel for the promoters to reply, said the Committee were of opinion that the preamble of the Bill was proved.

Consideration of the clauses was postponed.

## HOUSE OF LORDS COMMITTEE.

Tuesday, July 10.

(Before Lord BROUGHAM, Chairman; the Earl of DENBIGH, the Earl of MAYO, the Marquis of ZETLAND, and Lord PLUNKET.)

### LAMBETH WATER BILL.

This Bill, which has passed the House of Commons (see "JOURNAL," Vol. LXXV., p. 1507), came before the above Committee to-day.

Mr. PEMBER, Q.C., Mr. CLAUDE BAGGALLAY, Q.C., and Mr. RIGG appeared for the promoters; Mr. MACKENZIE, for the Surbiton Urban District Council; and Mr. WORSLEY TAYLOR, Q.C., Mr. HONORATUS LLOYD, and Mr. NEPEAN for the Esher and the Dittons Urban District Council.

Mr. BAGGALLAY, in opening, said there was one peculiarity about the Bill—namely, that it was not opposed by the London County Council. The objects were to enable the Company to take further water from the Thames, to provide a storage reservoir, to construct certain main aqueducts, to take a small area of land, and to raise additional capital by means of debenture stock issued by auction or tender and subject to the sinking-fund clause. The population of the district was very rapidly increasing; the number of supplies given by the Company in 1881 having been 67,000, whereas last year it was over 113,000. The population actually supplied was about 719,000. The present rate of increase was about three times more rapid outside the County of London than inside. The Company, for practical purposes, were limited in their draft upon the Thames to 24½ million gallons daily; but they had, on gravel beds near the river, works from which they obtained a further supply of nearly 7½ million gallons daily. A question had arisen as to whether water taken from gravel beds near the Thames ought not to be treated as water from the river. This had never been the subject of judicial action; but it had been matter of communication between the Thames Conservancy and the Company, and it was being settled in a practical way in the present Bill. This made the power of the Company 32 million gallons daily. But beyond this, by the Act of 1883, the Company had sunk a well in the chalk at Selhurst, which was expected to yield 2 million gallons daily extra—making the total 34 million gallons. The present storage capacity of the Company consisted of five reservoirs, constructed or being constructed, the total capacity of which was 462 million gallons; and it was now proposed to increase them by 1000 million gallons, making 1462 million gallons, which would be equal to 44 days' maximum supply of the year 1899, or 57 days' supply of the average of 1899. Having regard to the further requirements of the district, it was necessary to considerably increase the filter-beds, which were of 28½ million gallons capacity. The actual amount of water supplied by the Company in 1899

was, on an average, a little over 25½ million gallons daily; the maximum being very considerably more. This being so, the Company's present sources were taxed to the full at a time of maximum demand, both as regards works and the water they had to supply, and therefore they had to look ahead. It was calculated that, to meet the demands of the population in 1920, on the basis of 35 gallons per head per day, they would require about 40½ million gallons daily, or, making provision for maximum demands, between 50 and 51 million gallons daily. They therefore asked power to take an extra 20½ million gallons daily, which would give a total available supply of 52½ million gallons, or, including the well at Selhurst, 54½ million gallons. The site of the reservoir in East and West Moseley, a little to the south of the pipeline, had an area of about 170 acres. It was low-lying land, and unsuitable for the erection of buildings. It was being objected that, in proximity to the site, were two sewage farms. This was true; but so there were at Staines, when the Staines reservoirs were authorized. Evidence would be given by Professors Crookes and Dewar that there was absolutely no objection whatever to this site as a place for storing water owing to the contiguity of the sewage farms. Filtration through the soil was out of the question, and an impossibility, because, in order to prevent water escaping from the reservoirs, they must have water-tight puddle walls, and water could not flow in, any more than it could flow out. All that could be suggested, he thought, was that possibly microbes or something of that sort might be air-borne from the sewage farm, and thus contaminate the water. The evidence, however, would show conclusively that this would not take place. Further, the water would be filtered before being used; and then the liability to contamination was no greater than that along the whole course of any river, on the banks of which there were sewage farms, and into which the effluents from these sewage farms flowed. Another point was that the great body of the Company's consumers were represented by the London County Council and the Surrey County Council, who both presented petitions in the House of Commons—the former actually raising this point; but they apparently became satisfied that no injury would be done, because they withdrew opposition, and did not now appear. The through main was to be a 54-inch one. The capital sought to be authorized was £750,000, of which £653,000 was for works, £60,000 for filter-beds, £10,000 for engine power, and £27,000 for working capital and various other matters. Counsel proceeded to refer at length to the petitions which were now presented in opposition by the Urban District Councils of Esher and Surbiton. They were voluminous; and Counsel said they seemed to raise every conceivable question. There were only two points, in the Esher petition at least, which the petitioners were really entitled to go into. The first was as to whether there was any undue interference with roads by the mains, such as could not be sufficiently met by the ordinary general law. It lay with the petitioners to show that there were circumstances which the general law would not cover. The second point was as regards the sewage farms; and in regard to this, he thought they were entitled to ask the Committee to hear what they had to say with reference to flying microbes. Counsel then briefly referred to the petition of Surbiton, whose area was only interfered with to a very slight extent. They submitted that their district could easily be avoided altogether; that the laying of the main would seriously interfere with the sewers and drains; that the size of the main might cause serious damage to the roads and adjoining property; and that the Company ought to be prohibited from using roads for laying mains, except such as were for the benefit of the particular district. They held that the power of the general law was insufficient to cover them, and that clauses for their protection were required. Counsel, in conclusion, briefly replied on the various points raised; asserting that everything possible had been done to meet the petitioners; that their district could not be avoided; and that they were amply safeguarded by the operation of the general law.

Mr. H. Wilkins, Secretary of the Company, was then called, and gave evidence in support of Counsel's opening statement; explaining the position of the Company in regard to capital, and the calculations on which the present application was based. The consumption was taken at 35 gallons per head per day in the future. It would be difficult to keep the daily average down to this figure, because, although the Company were taking steps to prevent waste, the legitimate consumption was increasing almost *pari passu* with the quantity saved.

Cross-examined by Mr. LLOYD: The Company had not had constant complaints from Esher. There had been complaints of want of pressure, some being from the Fire Brigade. Esher was supplied by gravitation from the Coombe reservoir; and in the upper parts of the district the pressure was not sufficient to deal with a large outbreak. If further pressure were required, it was given by working the engines at Surbiton. He never heard of pressure being cut off while a fire was in progress. He did not agree that the proper way to take the main along the roads was by easements alone. This would be done to some extent. With two sewage farms adjoining, and a dry refuse-burning apparatus close by, he still thought this was an ideal site.

Cross-examined by Mr. MACKENZIE: He denied that it would be convenient to take the mains by an alternative route through Surbiton. He was not aware that there were many subsidences in Portsmouth Road, Surbiton, where there were six large water-mains. Even if the Local Authority could show that extra expense had been caused to them by subsidence of the Company's mains, he should object to pay anything towards the increased burden, because that would betoken neglect on the part of the Surveyor, who had to see that the mains were properly laid. The Company paid £286 a year in rates to Surbiton; and when the main was laid, this sum would be increased.

Mr. T. F. Parkes, Chief Engineer to the Company, also gave evidence in support of the Bill. With regard to a suggestion that the Company should lay their pipe in Balaclava Road, Surbiton, on the Company's property, between the fence and their filter-beds, he said there was absolutely no room. The main traversed Surbiton for a distance of 350 yards; and it would only occupy six weeks to lay, and once laid, the main would not need to be disturbed for probably fifty years.

Cross-examined by Mr. LLOYD: The Company proposed to lay their main at a depth of about 15 feet. The soil was watery sand; and there would have to be constant pumping of the water while the main was being laid. The Company were in a position to acquire a number of easements. Easements in private property would save the expense of



reinstating the roads; but this saving would not be as great as the cost of acquiring the easements.

Professor Dewar said he was appointed, in connection with the Balfour Commission, to investigate the supplies of water from the Thames. During the whole course of the inquiry, it was never suggested that sewage farms constituted a danger to water supplies in the way that had been maintained by the petitioners against the present Bill.

In cross-examination, witness maintained that the site was a perfectly proper one for a reservoir, despite the fact that there was a sewage farm on each side. Probably there were cakes of sludge drying on these farms; but this would be a material the least likely to do harm, because it was the result of the chemical—the antiseptic—treatment of the sewage. Nor would any harm be likely to result from the burning of house refuse near the site.

Mr. PEMBER intimated that Professor Crookes was in attendance, and ready to give evidence confirming that of Professor Dewar.

The Committee, however, did not desire that he should be called.

This closed the case for the promoters; and evidence was at once called for the opponents.

Mr. A. J. Henderson, Surveyor to the Esher and Dittons Urban District Council, said that there were now four deep trunk mains in his district; and experience showed that they were most damaging to the residential amenities of the locality, and also to the district from a financial point of view, because the roads were never left by the Companies in the condition in which they found them. The Local Authority had to step in and do what the Companies had left undone. The Local Authority did not object to the Company passing through their area; but they did object to their roads being disturbed when the Company could take the main over agricultural lands. There were unoccupied lands on which the main proposed could be laid; and the Council offered to negotiate to secure the necessary easements for them. The main, if laid as proposed in the Bill, would rest in water-logged ground. Pumping would therefore be necessary; and the water resulting would be more than the sewers could take. He strongly objected to the site of the reservoir.

### Wednesday, July 11.

The CHAIRMAN asked Mr. Pember if it was usual for a company to pay anything for the easement to lay pipes compulsorily under the roads of a hostile authority.

Mr. PEMBER said he had never known such a case. If the mains passed under the field of a private individual, compensation would be given.

Mr. Henderson, further examined, explained the method by which drain and sewer pipes laid in concrete were slung when another pipe, as was here proposed, was to be laid at a lower depth. The effect was that the sewer joints were cracked; and so all the labour to secure a perfect system of drainage for this particular district was swept away. The mischief unfortunately occurred usually after the period of liability (one year) for which the Company admitted they were responsible had expired. The District Council held that they occupied these roads by virtue of an Act of Parliament passed to secure the health and welfare of the district. Why should they be disturbed in order to lay a trunk main which, on the admission of the Company's officials, was not to serve the district? There were unoccupied lands which the Council held they could and should use for the purpose.

In cross-examination by Mr. PEMBER, witness said that, as a general proposition, if a trunk main of this description could be taken across country on private property, it ought never to be laid in a public road. Such a large main as this was never contemplated when the Water-Works Clauses Act, containing elaborate clauses with regard to the laying of mains in a public road, was passed. Subsidence had continued for years after the Companies had laid mains, and the cost thus involved of reinstating the roads fell entirely on the Local Authority.

Mr. G. F. Deacon said if the proposal to use this site as a reservoir had come before a Local Government Board Inspector, it would not have been sanctioned. The principal danger was not so much from water running into the reservoir as from the air-borne dust and microbes. He held that the main ought to avoid public roads and highways.

Mr. W. J. Dibdin said the site of the reservoir, in connection with its surroundings, was altogether objectionable. If it were constructed, the sewage farms would soon have to go, which meant that the Local Authorities would have to incur considerable expenditure in providing a new site and new works.

Dr. H. Beale Collins, Medical Officer of Health to the borough of Kingston, said the site of the reservoir was very unsuitable. There was always doubt whether germs of disease might not be conveyed to the water. It was not known exactly how far typhoid was spread by air or dust; but he considered it very dangerous to have a large reservoir where there was any possibility of contamination. The process of filtration, to which the water from this reservoir would be subjected before use, would not ensure the removal of the danger.

Mr. John Kent, District Surveyor of Hampton, gave evidence as to the difficulty he had experienced in designing a sewage scheme at Hampton, owing to the presence of so many large water-mains in the roads.

This closed the case for the Esher and Dittons Council.

Mr. LLOYD having addressed the Committee, evidence for Surbiton was adduced.

Mr. Samuel Mather, Surveyor to the Surbiton District Council, largely corroborated the testimony already given regarding the difficulty and expense thrown upon local bodies by the laying of mains in the public streets.

Mr. MACKENZIE then addressed the Committee on behalf of Surbiton; asking them, if they passed the Bill, to grant special protection to his clients on account of the great hardship which would be caused them by the laying of the main.

Mr. PEMBER having replied,

The Committee deliberated in private. On the re-admission of the public,

The CHAIRMAN said: The Committee are of opinion that the preamble of the Bill is proved; but they decide, in consequence of the unusual size of the main to be laid, and the great depth of the cutting, that the Company shall for three years after the completion of the works

be liable to repair any damage caused by subsidence to the surface of the road or to the existing underground pipes or sewers.

### Thursday, July 12.

Mr. PEMBER brought up a clause to carry out the decision of the Committee which, after discussion, was agreed to in the following form:—

Clause 10 A.—Whereas the main to be laid under the authority of this Act under roads in the urban district of Esher and the Dittons, and in the urban district of Surbiton, will be of unusual size, and the cutting in which the same will be laid will be of unusual depth, therefore the Company shall for three years after the completion of the works be liable to repair any damage caused by subsidence due to the execution of the works to the surface of the road or to now existing pipes or sewers under such road.

Mr. LLOYD then brought up a series of clauses for the protection of the Urban District Council of Esher and the Dittons. Clause 13 in the Bill, and the sub-clauses, had been inserted for the protection of the Urban District Councils of East and West Molesey; and what was now sought was similar clauses for the protection of Esher and the Dittons.

Mr. BAGGALLAY argued that Esher and the Dittons were, on the whole, sufficiently protected.

The Committee eventually accepted a number of clauses safeguarding the interests of these places; among them being provisions that the aqueduct should be finished within two years of its commencement, and that the Company should not, in executing any works under the Act, allow water drawn or pumped or flowing out of any such works to pass into the sewers or drains of the Council, but should construct all such works as might be necessary for conveying such water into the nearest watercourse. The latter was designed to prevent the sewers being choked with sand, which, it was contended, would be pumped from the trench in which the trunk main was being laid.

It was also agreed that the clauses, so far as they applied, should be extended to Surbiton.

### THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons who are inquiring into the subject of municipal trading (see *ante*, p. 94) continued their proceedings on Tuesday last, under the presidency of the Earl of Crewe. Before dealing with the fresh evidence, however, we will amplify our report last week of the proceedings on the 6th inst. by giving some of that adduced by Mr. Dixon H. Davies, the Secretary of the Chesterfield Chamber of Commerce.

Mr. Davies began by stating that the Chamber objected to municipal trading for the reason that it could not be so well depended upon for the supply of a commodity to a community as commercial enterprise. He cited as an instance the case of the Cardiff Corporation with regard to the supply of electricity. A start was made with works which were not quite up to date; but the ratepayers, on being polled on the subject, refused to extend the plant very materially. There was an element of vacillation in municipal trading which was absent in the case of private enterprise. An instance in point was furnished by his own district of Chesterfield, where, in view of foreign competition, it was essential that the large workshops should have a cheap and efficient supply of electrical energy. Ten years ago the Corporation obtained powers of supply, but had never commenced work. A private Company would not expect customers to run after them, but, on the contrary, would take the risk of starting, and would push their goods. The large manufacturers of the district joined with others in promoting the General Power Distributing Bill of last session—a measure which met with the approval of all commercial interests. By the rejection of the Bill, on which the promoters had expended £10,000, a great injustice was done. It was brought about by the influence exercised by the Municipal Corporations Association; and the burden thrown upon the rates thereby must have been very serious. He considered opposition of this kind, organized at the expense of the rates, and making use of the political influence of the authorities, was a very serious interference with the development of those enterprises which required parliamentary sanction. Mr. Davies produced a number of charts showing the increase in local indebtedness and the rapidly growing expenditure for trading undertakings. They showed that whereas the Imperial debt had decreased from 770 millions in 1879 to 650 millions in 1898, the local debt had risen from 130 millions to 260 millions during the same period—in other words, the local debt had grown in the same proportion that the Imperial debt had diminished. While the population had increased 23 per cent., and the rateable value 27 per cent., rates had gone up 80 per cent., and the local indebtedness 105 per cent. Thus the debt had been increased out of all proportion to the security. One chart gave the amount of local debt per £100 of rateable value in England and Wales and eight representative towns. In Liverpool, the total debt was 225 per cent. of the rateable value, 80 per cent. being for ordinary local government, and 145 per cent. for trading purposes. Huddersfield showed a debt of £560 per £100 of rateable value, of which £400 was for trading purposes. The conclusion witness had come to, from the figures he had adduced, was that if municipal industrial undertakings were to extend generally as they had done in Huddersfield, they would have to face a gigantic increase in local indebtedness. If London were to undertake all the enterprises which Huddersfield had carried out, it would have to increase its debt by £200,000,000, or nearly one-third of the National Debt. Asked by the Chairman if he thought, as a matter of fact, that municipalities were not to be trusted to act impartially when they had trading interests in their own hands, he replied: "Yes; I think there ought to be something done where a municipality becomes a trader. It is no longer an impartial holder of the balance between citizen and citizen. Something ought to be done to transfer their judicial functions under these circumstances. For instance, I do not think corporations who have gas-works ought to be allowed a veto in electric lighting, and those who are tramway owners ought not to be the licensing authorities for omnibuses. A case of this kind—that of Blackpool—recently came before the Courts. The Corporation, as owners of the municipal tram-



ways, refused to license omnibuses." He went on to contend that it was improper for local authorities to be pervaded by an atmosphere of trading, as it tended to make councillors act as traders, and not as statesmen. He did not agree with Mr. Garcke (a previous witness) that municipalization led to over-trading; his view being that it led to stagnation.

The first witness last Tuesday was the Lord Provost of Glasgow, who gave evidence as to the numerous undertakings carried on by the Corporation—viz., markets, gas and water supply, tramways, electric light, hydraulic power, and telephones. He said these enterprises were not undertaken for trading purposes, but simply in the interests of the citizens. The Corporation tried to make them pay, and they practically did so; but the profits were not applied in relieving the rates, but in the improvement or the reduction of the price of the individual enterprise in each particular case. The rates were used for general municipal purposes. With regard to water, the Corporation had carried on the supply for forty years, to the great advantage of the city and the citizens; and they had been able to form a large sinking fund and a depreciation fund. The charge, which in 1855 was 1s. 2d. per pound in one part of the city and 1s. in another, was now 5d. Outside the city area the price was 10d. per pound. He was satisfied a company could not have carried out such an improvement. They thought it was right that they should be allowed to supply water to citizens outside, because the area might be within the city next year; and, in the second place, outsiders could not by any possibility get a supply to meet their needs unless a big city were to provide it, because they could not furnish the capital required. Asked if he saw any difference between gas and water supply, he said practically none. The Corporation regarded the lighting of the city as an essential part of the duty of a municipality, just as much as the supply of clean water. When the Corporation took over the gas undertaking in 1869, the price was 4s. 7d. per 1000 cubic feet; it was now 2s. 2d. He did not think that a private company would do as well. He considered it was to the interest of the outsiders that the city should be allowed to supply them with gas. His Lordship proceeded to give the Committee details of the tramway enterprise—claiming that the fares had been reduced and greater comfort afforded to passengers since the concern came into the hands of the Corporation. They were looking forward to the continued prosperity and success of the undertaking. They had been very successful financially, although they had to meet the competition of underground railways and subways. The electric system was expected to be completed next year, in time for the Exhibition in Glasgow. He was satisfied that the Corporation had done what a company could not do. The first aim of a company was, within reasonable limits, to make profits. The first aim of a corporation was the comfort and convenience of the citizens, and the provision at the same time of a reasonable amount for the sinking fund and depreciation. After making these allowances, the Corporation were prepared to carry people at as nearly as possible cost price. There was no disposition on their part to apply a penny towards the reduction of rates. With regard to electric light, the Lord Provost stated that there were upwards of 3000 consumers, and the capital expenditure in May, 1899, had been £388,599. He thought the Corporation might have gone ahead a little more vigorously at the beginning; but there were circumstances which, in his opinion, accounted for the delay. It was not taken up as a serious enterprise to be pushed, as it were, by a Committee, but as an adjunct to the gas supply, to be furnished as it was asked for. He thought the Corporation might have provided larger facilities at the very first; but they really took more interest in their largely developed gas undertaking. It was also a matter of caution, because electric lighting was a comparatively untried enterprise in 1890. His Lordship gave particulars regarding the supply of hydraulic power, the loss upon which, he said, was met out of the ordinary water undertaking; and he also furnished details with regard to the acquisition of a telephone licence. He looked forward to a vast extension of the telephone service; and he mentioned that the Corporation purposed having numerous call offices, where the charge would be 1d. The Chairman asked his Lordship if he thought the Corporation would be better able to carry out the work than a trading company. He replied that they had had many years of a trading company who either could not or would not do it. Dealing with the position of municipal employees as voters, he said there were 8021 boys, girls, and men working in the various departments of the city, of whom about 6500 were voters. The constituency numbered 132,808, and the city contained 25 wards. There were always one or two close contests; but he never knew of a contest turning on the question of the position of municipal employees. These men were not dismissed by the Town Council, but by the responsible Manager of the particular department, although they had an appeal to the Committee. He did not think there was any real danger in the employment of so many men; because, if there were, workmen would see that any advantages the Corporation employees were seeking to obtain would be at the expense of other men. The Chairman asked his Lordship whether, in the event of the Corporation incurring a loss on their enterprises, he would still say what he had just stated to the Committee. He replied that if the Corporation were carrying on any enterprise which showed a persistent loss, it would be a serious argument against them being allowed to continue. He thought the ratepayers would very quickly bring them to book. As to the increase of municipal debt, he might say that their experience in Glasgow was that it was nominal—the assets having augmented in far larger proportion than the debt. It was a dangerous system for a Corporation to apply profits in relief of the general rates; and he would not be disposed to encourage it, because there was a risk in so doing of starving an enterprise for the purpose of putting aside the profits for another purpose. He could imagine cases where they might be allowed to make a special contribution. Reverting to the subject of electric lighting, he admitted that the Corporation of Glasgow had been sluggish at the beginning, but they were making up for it now. He did not think there was any deduction as to municipal management to be drawn from his admission. He regarded the action of the Corporation in associating the electric light with gas as a mistake. The Chairman then put this question: "Do you think a corporation with a large gas undertaking of its own would be likely to discourage electric light?" The Lord Provost replied: "I confess it might seem so; but our experience was not that. We have now two Committees working as energetically as they can for both gas and electric light."

The next witness was Mr. R. H. Smith, of Sheffield, General Secretary of the Ironmongers' Associations. He said the Associations had severally

considered the question of municipal trading, in view of the inroads which had been made on the retail trade by trading municipalities. Through the sale of gas-stoves and internal electric light fittings by municipalities, the retail trade had suffered very considerably, and the prices had been very much affected. In Southport, the ironmongers had the sale of gas cooking-stoves entirely in their own hands, and formerly showed at exhibitions—going to much expense and trouble in the matter. Then the Corporation stepped in, and not only sold gas-stoves, but let them on hire; the result being that trade in these particular articles by the local retailers had been entirely wrecked. He knew three firms in particular who had lost from £125 to £150 profit per annum through the trading of municipalities in these articles. At Nottingham, the ironmongers were very large ratepayers; and they had suffered heavily in consequence of the Municipality selling gas-stoves, &c., and letting them on hire. He could not say that in the case of Nottingham this grievance had been brought before the burgesses at municipal elections; but he believed this was done in Edinburgh as a reason for not electing certain gentlemen to the municipal body. The opposition, however, did not succeed. Speaking generally, he should say that from his experience the ironmongers had the sympathy of the great body of the ratepayers in this competition, but possibly not of the consumers, because consumers had the idea that they could get their articles cheaper from a corporation than from a private trader. At Oldham, the Corporation had a retail shop, and sold stoves and fittings in competition with private traders. The present Corporation price for gas-stoves was £5 10s. The actual cost was £5 3s. 11d. exclusive of cartage and a man's time for fitting or fixing, so that the sale would actually be at a loss. In Sheffield, the Corporation owned the electric light undertaking. The gas supply was owned by a private Company, and worked exceedingly well. To-day the price was 2s. per 1000 cubic feet. The Corporation supplied electric lamps and all the internal work which the ironmongers usually did. The profit of the Electric Light Company in the last year of their existence was £10,562. The first year the Corporation took over the business they incurred a loss of £2613. He should not like to say, speaking generally, that corporations had not done their work well; and, as far as the articles supplied were concerned, there had been no complaints from the public. He, however, objected to municipalities as rival traders.

At the sitting of the Committee on Friday, some interesting evidence was given by Mr. W. J. Jeeves, Town Clerk of Leeds, and formerly Town Clerk of St. Helens. He said that in regard to water and gas supply, tramways, and electric lighting, municipal trading had been, and was, the definite outcome of the policy of Parliament, as settled by public statute. Practically there has been no variation from this policy except after careful consideration by Parliamentary Committees of the particular facts. Speaking from experience, he was perfectly certain that the actuating motive of corporations in acquiring gas and other undertakings was not a pecuniary one, but was the better service of the community in matters which, if not absolutely essential to life, were certainly so to the well-being of the community. Whether gas, water, electric lighting, and tramway undertakings were owned by companies or corporations, he thought that they ought to be in one set of hands—that they should be monopolies. Asked whether he considered that the parliamentary and departmental checks on the introduction of novel and experimental powers were sufficient, he said he thought they were. Special powers were never obtained without a special inquiry by a Parliamentary Committee, and after they had been subject to the criticism of the ratepayers. He did not wish to say it offensively, but the Local Government Board reports on Private Bills were really a terror to municipal authorities. One never knew what the Board were going to say. They never let a thing slip, and they very often, he thought, took many points which might very well have been left alone. There had been two cases within his own experience in which the Local Government Board, being dissatisfied with the decision in the first House, had sent a supplemental report to the second, to enforce their views against the decision of the other House. Luckily in these two cases the second House agreed with the Corporation, and not with the Local Government Board. He ought to say, however, that he thought the Board reports were of great value. Asked if, in his opinion, it was possible to lay down any hard-and-fast rule on this subject, he said he did not think it was, but the actual circumstances must be considered. If a general rule were laid down that a corporation should not manufacture, a stop would be put to the manufacture of gas. If it was said that they should not sell articles, it would be made impossible for them to sell or let gas-fittings on hire. Experience had shown that in many cases it was necessary to do this for the purpose of developing the consumption of the article. In the matter of electricity fittings at St. Helens, it was found that it was necessary for the electric lighting authority to supply them. Neither the landlord nor the tenant would incur the expenditure of capital necessary for the wiring of houses, though they would pay a certain amount yearly on account of the wiring. One of the members of the Committee (Sir W. Foster) submitted to the witness whether it was not very hard on the small traders and manufacturers of St. Helens for the Corporation to supply the fittings. He said he did not think it was. As to the manufacturers, he did not see why a corporation should manufacture the fittings; they could purchase from the makers. As to the traders, they could not undertake the work as the Corporation could. The corporations did not desire to compete with the retailers. At Leeds, the Corporation did not supply any fittings, though they supplied stoves. He could mention other towns that came into the same category. If one went from town to town, it would be found that the amount of fitting supply that was done would be very small. Sir W. Foster asked witness if the corporations had not crushed the stove dealers out of existence. He replied that he did not think they had, because, as a matter of fact, there were very few stoves used except those which were out on hire. People would not buy them. He should say that manufacturers of stoves had benefited infinitely more by corporations taking up the gas business vigorously than the retailer had lost. The Chairman put it to witness whether he considered it right for a corporation to undertake a business which would admittedly damage a number of retailers. Witness said the question was a hard one to answer on general principles. He rather condemned it. He would not go so far as to say that no retailer should ever be injured by corporation competition. He should say that if the general good of the community required, as in some cases it did, that there



should be competition, then this should take place. But he really did not think that corporations entered on these things lightly, without the fullest possible consideration of the facts all round. While there was a balance of advantage, he did not consider that corporations ought to undertake competition; and he did not think they did undertake it. Witnesses laid before the Committee an elaborate return which he said had been prepared by the Municipal Corporations Association respecting various undertakings owned by boroughs. He said, in reference to water undertakings, that the total number of boroughs included in the return was 91, having a total population of 6,512,692, and a total rateable value of £33,023,480. Of the 91, 85 had returned their capital expenditure to the Association, and it amounted in 1879 to £21,138,686, which total had been increased on March 25, 1899, to £42,413,149; the percentage of increase being thus 100.64. The capital paid off in March, 1899, was £6,233,706, or 29.48 per cent. of the capital expenditure in 1878, and 14.69 per cent. of the capital expenditure in 1899. The quantity of water supplied increased in the twenty years by 69.72 per cent. Twenty years ago the profits amounted to £28,000, and the loss to £111,000; while last year the profits had increased to £111,000 and the loss had decreased to £59,000. Taking an average for twenty years, the profits were £53,000, and the loss was £82,000, or an average loss of £29,000. In the case of gas undertakings, the number of boroughs included in the return was 49; the population being 4,249,000, and the rateable value £20,249,000. The total capital expenditure to March 25, 1879 (or such later date as the authority acquired the undertaking), was £11,506,000, and the total output to March 25, 1899, was £17,608,000; the percentage of increase being 53.026. The total capital paid off and in sinking and redemption funds, including the reserve fund, was in March, 1899, £5,207,000; the percentage to capital expenditure in 1879 being 45.260, and in 1899 29.576. The total quantity of gas supplied during the year ending March, 1879, or such later date as the undertaking was acquired, was 13,933,800,000 cubic feet; while in the year ended March, 1899, it was 30,547,900,000 cubic feet; the percentage of increase being 119.236. The total amount of profits devoted to the rates in 1879 was £239,000, equal to a rate of 2.75d. in the pound on the total rateable value; while in 1899 it was £369,000, equalling a rate of 4.24d. — the average for twenty years being £267,000, or equivalent to a rate of 3.18d. With regard to electric light undertakings, there were 51 included in the return; the population represented being 5½ millions, and the rateable value £29,465,173. The capital expenditure to March, 1899, was £4,452,944; the total capital paid off (including sinking, redemption, and reserve funds) being £394,646, and the percentage paid off to capital expenditure being 8.86. In this connection, it must be observed that the average period of ownership had been less than four years. The number of units supplied during the year ended March, 1899, by 45 boroughs was 28,445,303; and the total income derived from the charges made to consumers for the year was £487,815. The number of boroughs in the return showing profit and loss to rates was 31. The profit was £21,625, and the loss £10,725. It was found, however, that in the earlier stages of an electric light undertaking there must be a loss. Witness said he had calculated from the return the prices paid for gas in 1879 and in 1899, and he found that the average charge in the first-named year was 3s. 5d. per 1000 cubic feet, whereas in the second it was 2s. 6d., or a reduction of 11d. He thought this justified him in coming to the conclusion that these enterprises had been well carried out. Witness went on to say that it could not be shown in a single instance that there had been lack of enterprise on the part of corporations in carrying on undertakings of this kind, that the principles of management were bad, or that the consumers of the community had suffered. Asked if he thought these trading matters interfered with the other duties of corporations, such as those relating to sanitary and police affairs, he said he was absolutely sure they did not. He added that he thought the decision of Sir J. Kitson's Committee on the Electric Power Bills (see *ante*, pp. 32, 94) was a distinctly right and proper one, and one which fairly met the contending interests.

**The Deduction of Income-Tax.**—We learn from "The Times" that Mr. T. H. Clare, the Treasurer of Birmingham, has been in correspondence with the Inland Revenue Department relative to the amount of income-tax properly deductible from the half-yearly payments by the Corporation for interest and annuities falling due on June 30 and July 1. The Treasurer has had numerous complaints in respect of the deduction of 1s. in the pound from mortgagees and annuitants, who contend that the deduction should be 10d., inasmuch as the tax was not raised from 8d. to 1s. till midway through the half year. Following a letter of inquiry to Somerset House on the 2nd inst., the Treasurer forwarded a statement of the case the next day. The following is the reply (dated July 6) received by Mr. Clare from Mr. E. Nott Bower, the Assistant-Secretary, Inland Revenue, Somerset House: "In reply to your letters of the 2nd and 3rd inst., relative to the rate of income-tax deductible from interest payable on the various loans and from annuities of the Birmingham Corporation, I am directed by the Board of Inland Revenue to state that where such interest, &c., is payable and paid in whole or in part out of the rates levied by the Corporation which are not assessable to income-tax, and where consequently the Corporation are liable to account to the Crown for income-tax on such interest under the provisions of section 102 of the Income-Tax Act, 1842, or of section 24 of the Customs and Inland Revenue Act, 1888, the interest is chargeable by law with the rate in force at the time of its payment, according to the clear and express provision contained in the last-named clause; and the Corporation, being accountable to the Crown for duty at that rate in respect of the interest, may reimburse themselves by deducting at the same rate. With regard to the interest in respect of which the Corporation are not required to account to the Crown under the provisions of either of the sections mentioned, in consequence of such interest being charged on and paid out of the assessed profit of an industrial undertaking carried on by them, the rate of duty to be deducted on payment of such interest is not a matter which concerns the Revenue; and the Board have no statutory authority to determine the question. They are, however, of opinion that, assuming that the rates are pledged as a part of the security for the loan, in this case also tax is deductible at the rate in force at the time of payment, under the provisions of section 24 of the Customs and Inland Revenue Act, 1888."

## LEGAL INTELLIGENCE.

### NEWCASTLE SUMMER ASSIZES.—Tuesday, July 10.

(Before Mr. Justice RIDLEY and a Special Jury.)

**Richardson v. South Shields Gas Company**—A Case as to the Loading of Coke too Hot for Shipment.

According to the statement of claim in this action, it appeared that the plaintiff, Adam Richardson, was the owner of a wherry called *The Brothers*; and he claimed damages against the Company for loading a cargo of coke which was too hot for shipment, so that it was liable to ignite, and did ignite and set fire to, and damaged, the wherry. The defendants denied that the coke was too hot for shipment or that it was liable to ignite, or did ignite. They said, also, that the plaintiff was the Agent for Walter Scott and Co.; that they (the defendants) used all reasonable care in the shipment of the coke; and, in the alternative, they said the plaintiff was guilty of contributory negligence.

Mr. JOHN STRACHAN, Q.C., Mr. MANISTY, and Mr. GOWAN TAYLOR appeared for the plaintiff; Mr. SCOTT-FOX, Q.C., and Mr. BRUCE WILLIAMSON for the Company.

Mr. STRACHAN said the coke was loaded at Mill Dam on April 10, for Messrs. Walter Scott and Co., of Felling. The Gas Company's works were half-a-mile from Mill Dam. The plaintiff had nothing to do with it except to carry the coke on the river, and deliver it to Messrs. Walter Scott and Co. The practice of the Company was to take the coke from the retorts, throw it in a heap, and quench it with water. Then the coke was taken from the face of the heap for loading. The only people who knew whether coke was safe or not were the gas people. After the wherry got to Felling, it was found that the cargo was on fire. Water was poured upon it, and eventually the wherry turned over, and the coke fell into the river. The fire had begun at the bottom, and extended upwards; and the wherry was considerably damaged. The coke must have been in an unfit condition to be loaded.

Thomas W. Candlish, wherryman, who was in charge of the wherry, gave evidence as to the facts stated by learned Counsel. The Company's men, he added, put the coke into the wherry. Witness thought at the time it was all right. On the way up the river, they threw some water on the coke to lay the dust.

Cross-examined: Witness said the coke might be hot without burning the carts that brought it from the gas-yard to the wherry. The heat might be inside the coke, and not be found till the coke broke. He had, on a previous occasion, found fire while they were loading coke. At the time the coke was put on board, nobody could detect any danger in it. He was not in charge of the coke till it was in the wherry.

His LORDSHIP inquired if the coke would take fire when packed and moistened, like hay.

Mr. STRACHAN said that would not happen unless there was a core of fire in the coke.

Adam Richardson, the plaintiff, said that, if the coke was carefully watched when it was being put into the wherry, there was no need to watch it afterwards.

Mr. BRUCE WILLIAMSON, for the defence, said he could not get away from the fact that the coke did take fire and damaged the wherry. But it was a concealed defect, which the defendants, by the exercise of the greatest care, could not have found, and for which, therefore, they were not liable.

His LORDSHIP said the case should go to the Jury.

Mr. WILLIAMSON, addressing the Jury, said the coke was dealt with by the Company just as it had been treated for thirty years with perfect safety; and it could not be said that they were guilty of negligence or carelessness.

Mr. George Keyte, Superintendent of the South Shields Gas-Works, explained how the coke was quenched, and said in this case it appeared to be perfectly safe.

In cross-examination, he said, if the coke did set fire to the wherry, it had not been properly quenched by the man whose duty it was to quench it. Some of the coke that was put into the wherry had been lying on the heap a couple of hours. He considered that safe.

His LORDSHIP asked the Jury to say: (1) Was the coke in such a condition as to be dangerous for shipment? (2) Was the dangerous condition owing to the negligence of the defendants? (3) Could the effect have been obviated by reasonable care on the part of the plaintiff?

After an hour's absence, the Jury intimated that they answered the first question in the affirmative, but were disagreed as to the other two. They thought they could agree if they were permitted to assess the damages, which had been agreed upon at £95 7s. 6d. They retired, and returned with an answer "Yes" to each of the three questions; and a verdict for the plaintiff for £75.

His LORDSHIP pointed out that the verdict could not stand. The Jury having found that the plaintiff could have avoided the effect, that was a verdict for the defendants. If the plaintiff could have avoided the effect, why should the defendants pay for the damage? He would decline to enter judgment, as the verdict was not satisfactory.

A JURYMAN said there was a misunderstanding. Some of the Jury thought the fire might have been prevented if the plaintiff had taken more care. Another said he thought there was some contributory negligence on the part of the plaintiff.

His LORDSHIP said if there was contributory negligence on the part of the plaintiff, he could not recover.

The Jury asked leave to retire again. On their return, they answered the first two questions "Yes" and the last "No," and awarded the plaintiff £75.

Mr. WILLIAMSON objected.

His LORDSHIP said he would not enter judgment at present, but would consider it, and give his decision at Durham.

Friday, July 13.

At the opening of the Durham Assizes this morning,

His LORDSHIP, referring to the above case, said he was informed that the Jury were seven to five against the plaintiff on the question of his negligence; and probably, thinking there had been faults on both sides, they gave the plaintiff £75 as a compromise—he having asked for £95.



The verdict could only be supported as a compromise. It was a fair conclusion; each side paying its own costs. He then entered judgment for the plaintiff for £75, without costs on either side.

### Question as to a Calcium Carbide Patent.

Last Wednesday, Mr. Justice Farwell had before him, in the Chancery Division of the High Court of Justice, an action brought by the Acetylene Illuminating Company, Limited, against the Midland Acetylene Patent Syndicate, Limited, to restrain an infringement by the defendants of plaintiffs' patent No. 16,342 of 1894, for making calcium carbide for the purpose of generating acetylene gas. After putting in their defence, the defendant Company went into voluntary liquidation, and the Liquidator had been added as a defendant; but there was no appearance on their behalf. The plaintiffs were represented by Mr. Moulton, Q.C., Mr. Cripps, Q.C., and Mr. Colefax. The patent having been briefly explained by Mr. Moulton, Mr. James Swinburne was called. He stated that, in his opinion, the commercial manufacture of calcium carbide, as set forth in the specification, was a novel and useful invention at the date of the patent. Having examined some of the calcium carbide produced by the defendants, he said he considered it had been manufactured by the same process as that described by the plaintiffs. On this evidence, his Lordship granted an injunction, with costs, and gave the plaintiffs an inquiry as to damages. He also certified that the validity of the patent had come into question.

### A Fraudulent Gas Inspector at Leeds.

At the Leeds City Quarter Sessions last Thursday, William Handley, a gas-meter inspector in the employ of the Leeds Corporation, was charged with making false entries in certain collecting-books, with intent to defraud. The prisoner pleaded guilty. The Superintendent Inspector of the Gas Office and a Police Inspector were called upon to give evidence as to the character of the prisoner. Handley, it was stated, had been some eleven years in the employ of the Corporation, and had no prospect of securing re-employment. The prisoner was sentenced to two months' imprisonment with hard labour.

### Property Owners of Liverpool Heavily Fined for Allowing Water to Waste.

At the Liverpool City Police Court last Tuesday, Messrs. J. McGuinness and Co. were summoned under the Liverpool Corporation Water Act, 1862, for allowing certain water-fittings at four houses in the Drayton Road to be out of repair so as to waste Corporation water. Mr. Pierce, Deputy Town Clerk, prosecuted on behalf of the Corporation. It was stated that defendants were notified on six different occasions since May 11 as to the defects, and warned to remedy them, but the desired repairs were not effected. As a result of this neglect, 60,912 gallons of water had been wasted. A collector in the employ of defendants appeared, and stated that the work had not been done owing to pressure of other things. The leakages were made right now. The Magistrates said they would have to make an example of defendants in such cases; and Messrs. McGuinness would be fined 40s. and 5s. 6d. costs in each of the four cases, amounting in all to £9 2s. Messrs. Thomas and Son were summoned for a similar offence in respect of a house in Hornby Street, where 36,000 gallons of water had been wasted. A fine of 40s. and 5s. 6d. costs was imposed. William Davies was fined 20s. and 5s. 6d. costs for allowing a valve at a house in Royston Street to be defective, whereby 9360 gallons of water was wasted.

### Action as to an Ammoniacal Liquor Contract.

An example of the law's delay was furnished by the case of the *Montreal Gas Company v. Vasey*, which occupied the Judicial Committee of the Privy Council (consisting of Lords Hobhouse, Macnaghten, and Lindley, Sir R. Couch, and Sir H. Strong) on Wednesday and Thursday last week. The action was brought as far back as June, 1892, to recover amounts to the extent of \$32,280 for damages arising out of alleged breaches of contract between the parties in respect of the sale of ammoniacal liquor. The matter came before the Court as an appeal by the Company from a judgment of the Court of Queen's Bench for Lower Canada of Dec. 29, 1898, confirming, with a modification, a decision of another Court. At the close of the arguments, their Lordships reserved judgment. The Company's case was supported by the Hon. Edward Blake, Q.C., and Mr. Brosseau, both of the Canadian Bar; that of the respondent by Mr. Lawson Walton, Q.C., and Mr. R. C. Smith, Q.C. (of the Canadian Bar).

**New Water Scheme for Tamworth.**—The Manager to the Tamworth Joint District Water Committee has advised that additional reservoir accommodation is required; and he recommends the construction of a new concrete reservoir at Hopwas, on the top of a hill, and within about 500 yards of the present pumping-station, to hold 500,000 gallons. He also proposes the construction of a new engine-house, and the putting in of two new modern pumps. The carrying out of the work would occupy a year-and-a-half; and he estimates the cost at £7500.

**The Price of Gas in Birmingham.**—The outcome of a discussion on the question of the price of gas by the Gas Committee of the Birmingham City Council is that they have resolved to recommend an increase of 3d. per 1000 cubic feet, to take effect from the quarterly reading of the meters at Michaelmas. It was found, on an examination of the prospects for the year, that 3d. per 1000 feet was the smallest increase it was possible to recommend; and this will not by any means represent the increased cost of manufacture. The charges in respect to public lighting and the slot meters will be adjusted in accordance with this advance. At present, the amount charged for public lighting is less than is paid by ordinary consumers, and this will be proportionately increased; while those who burn gas through the slot meters will be met by the reduction of 1 cubic foot of gas for a penny—viz., from 26 to 25 cubic feet. It is estimated that upon a year's consumption the advance will produce about £65,000.

## MISCELLANEOUS NEWS.

### THE INCREASED PRICE OF GAS IN THE METROPOLIS.

An Important Report to the London County Council—The Attitude of the Board of Trade.

The agenda for the Meeting of the London County Council to-day contains a memorandum, prepared by the Comptroller of the Council (Mr. H. E. Haward), at the request of the General Purposes Committee, on the subject of the notification recently received from the Gaslight and Coke Company with reference to the increase in the price of gas. The Committee submit to the Council the substance of the memorandum, in the following report:—

The increase in price of gas from 2s. 11d. to 3s. 5d. per 1000 cubic feet, for their district north of the Thames, which the Directors of the Gaslight and Coke Company have just announced, coupled with similar increases made by the two other Metropolitan Gas Companies, is a matter which should engage the serious attention of the Council.

The South Metropolitan Company made a 3d. increase in price—viz., from 2s. 1d. to 2s. 4d.—as from Lady-day last, and then intimated that a further advance might have to be made. The following is an extract from the circular issued by the Company to their consumers in March last:—

The Company's coal contracts, free on board in the Tyne, made a year ago, were at a material—about 20 per cent.—advance, which has been to a considerable extent met by increased receipts for coke. The coal contracts expire this month, and the prices demanded for Newcastle gas coal are 100 per cent. in excess of those of last year, and, unfortunately, little if any further advance in the value of coke can be expected. The greater part of the burden must, therefore, fall upon the gas consumers. To meet the extra cost of coal, not less than 8d. per 1000 feet is necessary; but in the hope that the present extreme price of coal may not be maintained throughout the ensuing twelve months, the Directors have resolved to try a moderate advance of 3d., making the price 2s. 4d. per 1000 feet.

The Directors of the southern Company have recently decided to make a further increase of 4d., bringing the price as from Midsummer last up to 2s. 8d. per 1000 cubic feet.

The Commercial Gas Company have advanced their price from 2s. 6d. to 3s., as from Midsummer.

#### Cause of Increase in Price.

The rise in the price of coal is the immediate cause of the increase in the price of gas which the three great Metropolitan Gas Companies have been compelled to make, in common with many other gas companies throughout the country. The annual coal contracts of the South Metropolitan Company ran out at Lady-day last, whereas those of the other two Companies expired at Midsummer. Hence the difference in the dates from which the advances in the price of gas have been made.

It is reported that the new contracts for coal have been negotiated by the Companies at about 16s. per ton, or about double the figure of last year. The Main Drainage Committee reported to the Council on the 26th of June that the prices for the various descriptions of coal used by the Council showed an advance on the average of about 8s. 4d. per ton on those of the last year's contracts.

Assuming that the advance in gas coal has been 8s. per ton, the additional gross expense falling upon the Companies would be as follows:—

Company.	Tons of Coal Carbonized in 1898.	Amount.	Equivalent in Price of Gas, per 1000 Cubic Feet.
Gaslight and Coke . .	1,987,957	£795,182	9d.
South Metropolitan . .	956,608	382,643	10
Commercial . . . .	192,837	77,135	7½
Total . . . . .	3,137,402	£1,254,960	

The additional gross cost will be reduced by the increased prices obtained from the residual products, the chief of which is coke. Last year the moderate rise in the coal bill of the Gaslight and Coke Company was a little more than counterbalanced by the increased revenue from residuals; the net cost of coal in 1899 being 4s. 8d. a ton, against 5s. 1d. in 1898.

While a moderate rise in the price of coal may be met by the gain from an improved market for coke, it cannot be assumed that an increase of 100 per cent. in the former will result in a corresponding increase in the latter. The "JOURNAL OF GAS LIGHTING" of the 3rd of April last, contains an estimate of the enhanced value of residuals for the year ending June, 1901, which works out to about 2s. 6d. per ton of coal carbonized. It is evident that, in fixing the increased charges for gas, the Companies have, to some extent, taken this factor into account; but whether they have given the fullest effect to it possible under the circumstances, I cannot say.

#### Result of Increase in Price.

The above-mentioned increases of price, if unaccompanied by any diminution in the sales of gas, will bring the approximate additional revenue to the Companies as shown in the next table.

It will be seen that the result will be a tax on the consumers of gas amounting to no less than £788,942, while the shareholders of the Companies will only suffer to the extent of £141,247. This is the effect of the sliding-scale arrangement which I discuss later on in this report.

#### Difference of Price North and South of the Thames.

Whether the above increases in the price of gas are fully, or only partly, justified by the rise in the price of coal, their effect is to bring into greater prominence than ever the disparity between the charges for gas north and south of the Thames.

The record of the South Metropolitan Company shows an almost uninterrupted succession of reductions in the price of gas since 1876; and the result is that the recent large advance of 7d. only brings the charge to



Name of Company.	From Consumers.		Withdrawn from Shareholders.		Total.
	Extra Price per 1000 C. Ft.	Amount.	Loss of Dividend per Cent.	Amount.	
Gaslight and Coke—					
North of Thames	6	£407,490			
*South "	7	27,083			
*Public lighting	7	29,534			
		£464,107	30s.	£89,958	£554,065
South Metropolitan—					
Private lighting	7	£252,025			
Public "	7	10,123			
		262,148	35s.	39,493	301,641
Commercial—					
Private lighting	6	£59,834			
Public "	6	2,853			
		62,687	30s.	11,796	74,483
		£788,942		£141,247	£930,189

\* In their district south of the Thames and for public lighting, the Gaslight Company are bound to charge the same price as the South Metropolitan Company.

2s. 8d., which, although high as compared with the Company's prices during the last few years, is not excessive.

On the other hand, the tendency of the Gaslight and Coke Company's charges has been to increase in recent years. Whereas in 1889 they were selling gas at 2s. 6d., they were last year charging no less than 3s. (the reduction from 3s. to 2s. 11d. for the six months to Midsummer last may for the present purpose be left out of account). The recently announced increase of 6d. comes, therefore, on top of what had been condemned as a high price. It is more than twenty years since such a price as 3s. 5d. has been charged for gas by any of the Metropolitan Companies; and its imposition is naturally creating much dissatisfaction among the consumers of gas throughout the Company's district north of the Thames, which comprises a population of upwards of 2½ millions of persons.

The difference between the two prices north and south of the Thames is now 9d., or, making an allowance of ¾d. per 1000 cubic feet for meter-rents charged by the South Metropolitan but not by the Gaslight, 8½d. per 1000 cubic feet.

This difference in price, which for many years has been the cause of dissatisfaction to consumers north of the Thames, has been a growing one. The following table shows this—

Year.	Gaslight and Coke Company (North of Thames).	South Metropolitan Gas Company.	Difference against Gaslight and Coke Company.
	s. d.	s. d.	d.
1889	2 6	2 3	3
1890	2 7½ (b)	2 3	4½
1891	2 9	2 3½ (b)	5½
1892	3 1	2 6	7
1893	3 1	2 5½ (b)	7½
1894	3 0 (b)	2 4½ (b)	7½
			(Deducting ¾d. for meter-rents.)
1895	2 10	2 3½ (b)	5½
1896	2 10	2 3	6½
1897	2 10	2 3	6½
1898	2 11½ (b)	2 3	7½
1899	3 0	2 1½ (b)	9½
1900	1st half-year 2 11	1st quarter 2 1	
	2nd " 3 5	2nd " 2 4	
		3rd " 2 8	8½

(b) Average for year.

It was shown to the Select Committee last year that, as compared with the prices charged by most of the small Suburban Companies round London, some of which supply gas within the Metropolis, and by most of the large provincial towns, the Gaslight and Coke Company's charge is very high.

Past Action of the Council.

In 1894, the maintenance of the Gaslight and Coke Company's price at the high figure of 3s. 1d., while the South Metropolitan Company's price was being reduced to 2s. 4d., led to an agitation by the consumers north of the Thames. Various Vestries and District Boards passed resolutions of protest; and on July 17, 1894, the London County Council passed the following resolution:—

That application be made to the Board of Trade to hold an inquiry into the present management and working of the Gaslight and Coke Company, with a view to ascertaining whether there is any reason why the gas supplied to consumers north of the Thames should be charged at a higher rate than that supplied to consumers on the south side, and whether measures can be taken to secure a uniform rate of charge for all gas supplied in London, and generally upon the question of the advantage, or otherwise, of the enrichment of gas, and the use of the portable photometer for purposes of testing gas.

The Board of Trade, in their reply of January, 1895, pointed out that no action of a searching and important character could be taken without a parliamentary inquiry, and intimated that practically they could not assist the consumers. The Company, doubtless as the result of these public protests, reduced the price of gas from 3s. 1d. to 2s. 10d. from the latter part of 1894, and the agitation slumbered, only to break forth again in 1898, when the Company advanced the price to 3s.

As the result mainly of the Council's action, supported by practically all the Vestries and District Boards north of the Thames, the House of Commons, on June 21, 1898, appointed a Select Committee "to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and to report as to the method in which those powers

have been exercised, having regard to the differences of price charged by the various companies."

Verdict of the Select Committee of 1899.

This Committee held an inquiry in the session of 1899, which virtually resolved itself into an investigation into the affairs of the Gaslight and Coke Company. The consumers' case against the Company, as presented to the Select Committee by the Council, was generally endorsed by the Committee, whose report was a grave indictment of the management of the Company. The Committee reported their conclusions as follows:—

The Committee have very fully considered all the evidence submitted to them, and, after giving due weight to the reasons offered by the Gaslight and Coke Company in explanation of the higher price charged for their gas, they are of opinion that the affairs of the Company have not been well managed. The intention of the sliding-scale was to give to the consumers a special interest in economical administration, while the control was left exclusively in the hands of the Company. Hence there was an implied obligation on the part of the Company that their affairs should be administered (to quote the language of Mr. Cardwell's Committee) "with due care and management." Your Committee have arrived at the conclusion that this has not been done. Hence, the intention of the parliamentary bargain, which was in effect made, has not been realized by the Company; and thus the benefit to the consumers which was contemplated when the standard price was fixed nearly a quarter-of-a-century ago has not been obtained.

Your Committee think it probable that in years gone by there has been a wasteful expenditure of capital by the Gaslight Company; but this cannot now be remedied as far as the money spent is concerned. An important question, however, arises in respect of reducing this capital, inasmuch as a reduction of capital would permit of a reduction of rates, and thus enable the Company to produce gas, and consequently sell gas, at a less price; and your Committee are prepared to make a recommendation on this point.

Your Committee are of opinion that but little benefit would accrue to the public were they to attempt to dictate to managers of a gas company how to carry on their business; and therefore your Committee will only apply themselves to those questions which seem to them to be within the scope of parliamentary action, and to suggest some means of enabling the Gaslight Company to lower its price; and the Committee feel that they must leave the disputed and intricate questions of purchase of coals, disposals of residuals, enrichment of gas, and many others, to be settled by those responsible for carrying on the business.

The Select Committee's recommendations affecting this Company were: (1) The reduction of the standard price from 3s. 9d. to 3s. 3d. per 1000 cubic feet when the Company should again come to Parliament for an extension or alteration of their capital powers, and the introduction of a secondary scale providing for an additional increase or decrease of ¼ per cent. in the dividends for every complete 3d. of decrease or increase in the price of gas below or above the standard. [This recommendation applies to all three Companies.] (2) The transfer of the Company's area south of the Thames to the South Metropolitan Company. (3) Further capital powers should only be granted for five years. (4) Company should make an effort to redeem by sinking fund or otherwise its obsolete or unproductive capital.

Proceedings in the Session of 1900.

The Gaslight and Coke Company introduced into the present session of Parliament a Bill to authorize it to raise additional capital to the extent of £2,500,000, by the creation and issue of 3 per cent. debenture stock. This Bill was identical with that thrown out by the House of Lords in the previous session; and the House of Commons Committee who considered it this year have declined to pass it mainly on the ground that the Company had not embodied therein any of the recommendations of the Select Committee.

Meanwhile, the South Metropolitan Gas Company have a Bill before Parliament which has passed the House of Commons, and is now awaiting the consideration of a Committee of the Lords.\* This Bill provides, among other things, that the Company shall have power to purchase by agreement from the Gaslight and Coke Company that portion of the area of the latter which is situated on the south side of the Thames. Up to the present time, the two Companies have been unable to agree as to the price to be paid for this portion of the undertaking; but the loss of their Money Bill again this year may have the effect of inducing the Gaslight and Coke Company to come to terms. Should they be able to do so, they would be in command of additional funds to the amount of from £800,000 to £1,000,000, which would be available to meet new capital expenditure, and would obviate the necessity for an application to Parliament by the Company for four or five years. The result would be that the Company would escape the imposition of the Select Committee's conditions.

As to the Future.

It is impossible to predict how long the Gaslight and Coke Company will find it necessary to continue the increased charge for gas; but its imposition even for a year will be a serious burden on the consumers, and will certainly affect the Company's sales of gas.

One of the main reasons given by the Company to the Select Committee last year for its high price was that the quantity of gas sold by it had not increased so rapidly as in the case of the South Metropolitan Company—the result being that its capital and other fixed charges had to be spread over a smaller volume of business. The extra 6d. now announced cannot fail to add to the Company's difficulties by checking the sales of gas, and this will tend to keep the price of gas high, if not to inflate it still further.

The Company's reserves are very small. The undivided balance on the net revenue account at Midsummer is probably not much more than £150,000; while its reserve fund, which in 1891 stood at £531,000, has been almost completely dissipated, and in December last amounted to only £51,224. The prospect for the consumers is, therefore, a serious one.

Notwithstanding the development of electric lighting in London, the amount of gas consumed is increasing year by year, and in some districts very rapidly. It must be borne in mind that a large portion (in the case of the South Metropolitan Company 50 per cent.) of the gas used is for heating, cooking, and manufacturing purposes. The introduction of the slot-meter system has enormously increased the amount of gas consumed by the poorer classes in London. For gas supplied in this way, the

\* This passage of the report was, of course, drafted before the decision of the House of Lords Committee on the Bill was arrived at last week—see ante, p. 163.—ED. J.G.L.



Companies charge an additional 9d. or 10d. per 1000 feet, to cover the use of the meter and various fittings supplied. It cannot be said, therefore, that the price of gas is of less moment to the people of London than formerly.

The Effect of the Sliding-Scale.

Under the sliding-scale arrangement, the consumers are partners with the shareholders in these great gas undertakings. Under the old system which prevailed prior to 1875-6, the shareholders were entitled to divide 10 per cent. if they could earn it; and everything over that went to the consumers in the form of reduction of the price of gas. Under the sliding-scale, the extra profit is divided between the consumers and the shareholders.

I pointed out to the Select Committee last year that the very large increase in the amount of gas sold in recent years, as compared with the growth of the share capital of the Companies, has tended to weaken the effect of the sliding-scale as an incentive to the Companies, because it takes a relatively larger sum to enable a reduction of 1d. to be made in the price of gas than to give the corresponding increase of 5s. per cent. in the rate of dividend. In other words, out of every £100 increase in net profits the proportion which goes to the consumer in the shape of reduction in price tends to increase. This will be apparent from the following figures\* :—

Company as now Constituted.	Consumers' Share (i.e., Amount required to Reduce Price by One Penny.)				Companies' Share (i.e., Amount required to Pay 5s. per Cent. Dividend).			
	1876.		1898.		1876.		1898.	
	£	P. Ct.	£	P. Ct.	£	P. Ct.	£	P. Ct.
Gaslight and Coke	44,088	82·3	87,406	85·5	9511	17·7	14,806	14·5
South Metropolitan	11,524	76·2	38,637	87·4	3615	23·8	5,600	12·6
Commercial	4,623	75·1	9,756	83·9	1529	24·9	1,877	16·1

This is satisfactory to the consumer when the cost of producing gas is tending to get cheaper, although, as I have pointed out, there is less inducement to the shareholders to economize than there used to be, because they are less directly affected pecuniarily by the results of economy.

But when the cost of manufacturing gas is on the increase, the effect is the reverse of satisfactory to the consumers, as they have to bear an increasing share of the extra cost.

It is possible, indeed, to conceive of a state of things, if this process goes on, in which the ordinary shareholders will practically occupy the position of preference shareholders in the undertaking; while the consumers will fill the place of ordinary shareholders—they benefiting almost exclusively by any increase in profits, or suffering from any diminution thereof. The figures given earlier in this report show that in this present crisis in the gas industry, the bulk of the extra burden is falling upon the consumers; and they have no control over the management of the undertakings.

The Shareholders' Dividends.

The following paragraph appears in the March circular issued by the South Metropolitan Company: "The Directors take this opportunity of correcting the common mistake that gas shareholders receive large dividends. Since 1876 Parliament has enacted that all new capital shall be raised under the auction clauses—that is, it has been issued to the public (a large proportion being the Company's consumers) at the market price of the stock, which only yields 3½ per cent. interest to the purchaser."

This statement appears to me misleading; and it is important that the public should be made aware of the facts of the case—especially as, owing to the conversion of stocks, which has recently taken place in the case of the two largest Metropolitan Companies, the true position of the Companies in the matter of dividends tends to become obscure.

The effect of the conversions referred to was to increase the nominal amount of the capital of both the Gaslight and South Metropolitan Companies by two-and-a-half times, and to reduce correspondingly the rate of dividend; so that the 10 per cent. dividend upon the original capital has become 4 per cent. upon the converted capital.

Disregarding these conversions (which were only paper transactions) the facts regarding the share capital of the three Companies are approximately as follows :—

Company.	Share Capital authorized prior to 1876, and not subject to Auction Clauses.	Share Capital Issued under Auction Clauses up to Dec. 31, 1899.			Total Share Capital (including Premiums).
		Amount of Stock.	Approximate Amount of Premiums.	Total Capital.	
	£	£	£	£	£
Gaslight and Coke .	5,097,230	900,000	1,100,000	2,000,000	7,097,230
South Metropolitan	1,941,500	315,255	425,000	740,255	2,681,755
Commercial . . .	786,425	Nil.	Nil.	Nil.	786,425
Total . . .	7,825,155	1,215,255	1,525,000	2,740,255	10,565,410

From this table it will be seen that, out of a total share capital (including premiums) of £10,565,410, only £2,740,255, or 26 per cent., has been raised under the auction clauses. Upon this comparatively small part of their share capital it is perfectly true that the shareholders get only a moderate rate of interest; but upon every penny of the £7,825,155 they have received, and still receive very large dividends. The following are the dividends to which they are now entitled, even with gas at the advanced prices :—

Gaslight and Coke (gas at 3s. 5d.)	11 per cent.
South Metropolitan (gas at 2s. 8d.)	12½ "
Commercial (gas at 3s.)	11½ "

\* The first column under each year gives the amount, the second the proportion.

We have forwarded a copy of the Comptroller's report to the Parliamentary Committee for their information.

A. M. TORRANCE, Chairman.

The following is the report of the Parliamentary Committee on the subject :—

Our attention has been directed to the very considerable increases which have been made in the price of gas supplied in the Metropolis. The Council will be placed in possession of particulars with regard to these increases by a report of the Comptroller which the General Purposes Committee are, we understand, taking up to the Council, so that it is unnecessary for us to go into detail on the subject at the present time.

The question of Gas Companies' charges has been before us for some time past, not only in connection with the conduct of the Council's case in Parliament with regard to Bills promoted by the Metropolitan Companies, but also in connection with the proceedings before the Select Committee appointed by Parliament which held an inquiry last year as to the powers of charge of the Companies, and as to the manner in which they have been exercised. The Council, by resolution, entrusted us with the duty of submitting evidence on its behalf to the Select Committee. But before determining as to the line of action which should be taken up before the Committee, we conferred with representatives of Local Authorities whose districts are situated north of the River Thames; and the Council in submitting evidence before the Select Committee acted with the full concurrence of such authorities.

We think that the manner in which the Companies are now exercising their powers of charge and the recent proceedings in Parliament upon the Bills promoted by the Gaslight and Coke Company and the South Metropolitan Gas Company, have created a situation in which it is desirable that the Council should again confer with the Local Authorities of the Metropolis in order to ascertain their views on the whole question, and to consider what action should be taken in the interests of the gas consumers. It appears to us desirable that such a conference should take place without delay; and, with the approval of the Council, we propose to invite representatives of the Local Authorities to meet us. We recommend—"That the Parliamentary Committee be authorized to convene forthwith a conference of representatives of the Corporation of London and the Vestries and District Boards of the Metropolis, with regard to the charges for gas made by the London Gas Companies, and the action which should be taken in the interests of the gas consumers."

E. A. CORNWALL, Chairman.

The Attitude of the Board of Trade.

Our readers may remember that Sir Albert Rollit, the member for South Islington, has placed upon the paper of the House of Commons a notice of his intention to bring before the House the subject of the increase which has taken place in the price of gas supplied by the Gaslight and Coke Company in North London. He did not name a day for moving his resolution; and he has since written to Sir Courtenay Boyle, the Permanent Secretary to the Board of Trade, to explain that his object is to obtain for the new London municipal authorities greater powers and facilities for dealing with the control and supply of gas generally, and to ascertain whether the President of the Board will be disposed to regard the matter as one of urgency, and afford him any assistance in bringing it forward. He expresses the hope that this will be done, as, he says, the question "greatly affects the well-being of the people who are being most unjustly and oppressively dealt with by a monopolist undertaking." Sir Courtenay Boyle has replied as follows: "With reference to the question raised in your letter, you are aware that the Gaslight and Coke Company have given notice of an increase of 6d. per 1000 cubic feet of gas to private consumers north of the Thames; thus raising the price from 2s. 11d. to 3s. 5d. A like increase has been notified by the Commercial Gas Company; and the South Metropolitan Gas Company, having previously increased their price by 3d., have now notified a further increase of 4d.—making their present price 2s. 8d. This will enable the Gaslight and Coke Company to charge private consumers south of the Thames 2s. 8d. and to make a corresponding charge to the Local Authorities throughout their district—the Company being entitled to charge for public lighting the lowest price which they charge to private consumers. The price to Local Authorities is therefore increased by 7d., and to private consumers north of the Thames by 6d. per 1000 cubic feet. At a price of 2s. 11d. the Company are entitled, under their sliding-scale, to pay a dividend of 12½ per cent. on their original share capital, and an increase of 6d. on that price will involve a decrease of 1½ per cent. in the dividend—bringing it down to 11 per cent. Under the present law, there is no power to interfere with the operation of the sliding-scale, and, subject to a proportionate reduction of dividend, any increase of price is made entirely at the discretion of the Company. The Select Committee of last year reported in favour of an alteration in the sliding-scale as applied to the Metropolitan Gas Companies, which, if applied to the Gaslight and Coke Company, would only admit of the payment of a dividend of 9½ cent. at the price of 3s. 5d., as against 11 per cent. under the existing scale; and the Committee recommended that the suggested revision of the sliding-scale should take place whenever any of the Companies come to Parliament for an extension or alteration of their capital powers. The Bill of this session, by which the Gaslight and Coke Company sought to increase their capital, was, as you know, rejected by the Committee of the House of Commons to which it was referred; and until the Company find it necessary to make a further application to Parliament, there seems to be no means by which the Committee's recommendations can be carried out. I confess I do not see how the matter could be treated by the House of Commons as an urgent one."

**Sleaford Public Lighting.**—At the last monthly meeting of the Sleaford District Council, the Clerk produced a tender from the Sleaford Gas Company for lighting the public lamps from August to May for 1500 hours, at £2 5s. per lamp—an advance of 6s. 6d. each. One of the members remarked that it was a "big figure;" but another said he did not think it was too high, considering the increase in the price of coal and other expenses. The tender was accepted.



## THE GRIEVANCE OF LONDON GAS CONSUMERS NORTH OF THE THAMES.

Under the auspices of the resuscitated Gas Consumers' Protection League, a conference of "representative" gas consumers was held last Thursday night at the Memorial Hall, Farringdon Street, E.C. Including pressmen, the number present was a few short of 100; but evidently in order that the proceedings should not be dwarfed by the Press, it was carefully explained that a large proportion of those who attended were members of the local governing bodies of the Metropolis, and therefore represented a very large constituency. Mr. JAMES ROWLANDS, the "President of the League," was in the chair.

The CHAIRMAN opened the proceedings with a long speech. He said he first wished to clear the ground of the questions, "What is the use of you people complaining? Don't you know that the price of gas has been raised not only by the Gaslight and Coke, but all other gas companies and corporations throughout the country?" He asked to be allowed to say that they were not so dull as not to know this; but it was not the necessary increase which might have been caused by the higher price of coal that had prompted them to move in the matter. The consumers in the north of London were in a distinctly different position to the consumers living either in the extreme east of London or in the area of the South Metropolitan Gas Company. They on the north of the Thames had not simply to bear the burden that was necessary on account of the high price of coal, but they had to bear a burden produced by mismanagement for a long period of time. While the consumers on the south of the Thames had been getting their gas as low as 2s. 1d. per 1000 cubic feet, and those who used slot meters had likewise been in an advantageous position, on the north they had been paying 2s. 11d. or 3s. per 1000 cubic feet. At the increased price, they were to pay 5d. per 1000 feet more than the people in the East-end, and 9d. more than the South Metropolitan consumers. In an interview which a representative of the "Daily News" had had with Mr. Livesey, this gentleman was stated to have said, in reply to a question, that the Gaslight and Coke Company were justified in the advance they had made. Had the interviewer put his question to Mr. Livesey in a different manner, he might have obtained a different answer. If he had asked him, "Will you justify the Gaslight and Coke Company in charging 3s. 5d. per 1000 cubic feet to their consumers?" then, either Mr. Livesey would have altered his opinions very materially, or, he (Mr. Rowlands) ventured to say, he would not have justified it at all. The difference was extraordinary. If the consumers north of the Thames were being supplied by the South Metropolitan Company at 2s. 8d., it would make a difference to them of no less than £720,000 a year; and if they were supplied by the Commercial Company, it would make a difference of about £480,000. This was the grievance they had, and the grievance they intended to keep pegging away at, until something took place that would alter the present management of the Gaslight and Coke Company. When Mr. Livesey was criticizing that Company last year before a Parliamentary Committee, he was asked what he considered was the reason for the high price of gas in their district; and he summed it up in one short sentence—"Persistent incapacity and incompetence; nothing else all through." The "Daily News" interviewer also stated that he found Mr. Livesey preparing a circular explaining to his consumers why he had had to raise the price of gas in the South Metropolitan district. In the north of London, the consumers were not favoured with an explanatory statement. But they had from the autocrats of Horseferry Road an edict, a ukase, or something of the kind, that the price of their gas would be 3s. 5d. on and after a certain day. As to going into detail, or giving the consumers any reason for the increase, they did not trouble about that at all. He supposed Mr. Livesey did it because he considered there was some association between the consumers and the Company; and he thought it was a wise policy to keep on good terms with his customers, and sell them as much gas as he could. In short, he considered the consumers were entitled to a certain amount of respect; but the other Company did not go out of their way at all to conciliate them. It was time they taught Colonel Makins that they intended to persistently fight him until his Company were brought to reason. The Gas Consumers' Protection League took credit that the agitation which they started in 1893 had, by the end of 1894, resulted in causing the Company to reduce their price no less than 3d. per 1000 cubic feet. They also got the meter-rents abolished from the area outside the City (where they were not charged previously). The members of the League who were working then were prepared to go further forward; but their friends were so satisfied when they got gas at 2s. 10d., that they would not proceed with the agitation. Sir Courtenay Boyle had attributed to the agitation the reduction which he (Mr. Rowlands) claimed on behalf of the League, seeing that they carried on the most active part of the agitation. Owing to the parliamentary inquiry which was the outcome of the agitation, the Company had had the opportunity of defending themselves; but anyone who had read the whole of the evidence could only have arrived at one conclusion—that the Company entirely broke down in making a case to justify their disproportionate price in comparison with the other Companies in London. When they set up certain statements with regard to their difficulties, their pleas failed before the evidence of experts like Mr. Charles Hunt. The Company stood to-day condemned, not only by Mr. Livesey but by the Parliamentary Committee of 1899, in regard to their capacity to supply properly one of the things which was an essential of everyday life. To show the magnitude of the question, Mr. Rowlands quoted a number of the figures presented to the Powers of Charge Committee by Mr. Haward (on behalf of the London County Council) and by Mr. H. E. Jones. Upon these figures, Mr. Rowlands remarked that anyone who had to do with big commercial enterprises would suppose that the largest of the three London Gas Companies, with the largest works, the largest output, and the largest and richest district, would be able to buy their materials under the best possible conditions, would have a smaller average working expense, and would be able to supply gas at the lowest charge. But it was not so; and on the figures placed before the Parliamentary Committee, the consumers had a perfect right to attack the Company. He referred to the admissions of Mr. Field before the Committee as to the then extraordinary treatment of the slot-meter customers

of the Company south of the Thames, and compared that with the manner in which the other Companies dealt with their prepayment class of consumers. He had no doubt that in a week or two Colonel Makins would try to get some fun out of those who were taking up this matter. He was quite welcome to do so; and he (Mr. Rowlands) would read his remarks with a great deal of satisfaction. The law had given the Company a monopoly of the gas supply north of the Thames; but there was no law which compelled people to burn gas. Some people had already adopted that policy; but why should they be placed in the position of being compelled to resort to such drastic methods? Or, why should they be compelled to submit to the charges of this Company? They were prepared to carry on this agitation more vigorously and more thoroughly until something was accomplished for the consumers.

Mr. E. H. PICKERSGILL, M.P., as one who had been engaged for some years in fighting the Gaslight and Coke Company, moved the first resolution—

That this representative conference of gas consumers supplied by the Gaslight and Coke Company strongly protests against the exorbitant charge of 3s. 5d. per 1000 feet, and 4s. 2d. to the users of slot meters. This in comparison with the charges of other Companies supplying the Metropolis is totally unjustifiable. The report of the Parliamentary Committee justifies this statement: "The Committee have very fully considered all the evidence submitted to them; and, after giving due weight to the reasons offered by the Gaslight and Coke Company, in explanation of the higher price charged for their gas, they are of opinion that the affairs of the Company have not been well managed." This conference is therefore of opinion that active steps should be taken to prevent the Company obtaining any further parliamentary powers until the management of the Company has been thoroughly reformed.

He said he had never known a Parliament in which the interests of companies were so fully considered as they were in the present one; and it was therefore very difficult to fight the battle of the public against monopoly. The question of the increase in the price of gas was causing a large amount of feeling among his own constituents and in the East-end of London. The Company had made the extraordinary claim that they could charge the consumers the enhanced price for gas which was consumed some ten days or a fortnight, and even longer in certain cases, before notice was given to the consumers of the increase. That was the most preposterous claim that had ever been made by a company. For his own part, he thought it was absolutely illegal; and he was confirmed in that opinion. He understood that some of the East-end authorities had taken the opinion of Counsel on the point; and they were informed that the action of the Company was illegal.\* In this regard the statute empowered, and not only empowered but imposed, a duty on the President of the Board of Trade to intervene. By section 45 of the Metropolis Gas Act, 1860, it was provided that, if it appeared to the Home Secretary (by a subsequent statute the President of the Board of Trade had succeeded him) that a Metropolitan Gas Company were acting in a manner which it would be to the public advantage to restrain, he might put the Attorney-General in motion. He (Mr. Pickersgill) had called Mr. Ritchie's attention to this; and the reply he received was: "I am not aware of any obligation upon the Company to give notice of their intention to raise the price of gas. The obligation to give such notice imposed by the Metropolis Gas Act, 1860, section 40, no longer exists. It was superseded by the sliding-scale provisions applicable to the various companies." As one who had had occasion to be conversant with the gas question for many years, and as having sat upon the Committee to which reference had been made, he was well aware that section 40 of the Metropolis Gas Act had long been repealed, and that it had been superseded by other provisions. What, however, he relied upon was the common law; and he was glad that some of the local authorities were going to raise a test case, to see whether this preposterous claim could be upheld. But even if the authorities succeeded, he quite admitted that the consumers' position would not be much improved. Agitation, however, was likely to succeed and likely to be effective. Having shown how the difference in price between the Gaslight and Coke Company and the South Metropolitan Company had been growing during the past ten years, Mr. Pickersgill said the best policy they could adopt was to fight the Company's Bills as they were introduced into Parliament. He gave an account of the success that had been accomplished so far in this direction, and stated that what had been established was that the Company were suffering from bad management. He believed the capital of the Company was now absolutely exhausted; and they must apply to Parliament for additional powers next session. The consumers were now in a very favourable position to fight the Company, and to get conditions imposed upon them; and he should therefore look to them to make their voice heard in this connection.

Mr. JOSEPH BENSON (London County Council) seconded the motion, and stated that the County Council had, in connection with the Company's Bills, put in an appearance, and fought them on every possible point.

There were several other speakers; and their remarks ranged over a variety of topics—among them being the price and quality of gas, the bye-products, and the question of the purchase of the undertakings.

The resolution was unanimously carried; and it was subsequently agreed to forward copies to the Members of Parliament, the London County Council, and the Local Authorities in the area of supply.

A vote of thanks to the Chairman concluded the proceedings.

Carburetted plant on the Maxim system has been adopted at the Sheepscar station of the Leeds Corporation Gas Department; and it is probable that in the near future similar plant will be laid down at the other stations.

The Tees Valley Water Board have decided to accept the tender of Mr. John Scott, of Newcastle, for the excavation of the Grassholme reservoir and other works in connection therewith in Upper Teasdale, for £388,499. This reservoir is much larger than the Hury and Blackton reservoirs of the Board in the same district, and will, it is stated, occupy about ten years in construction.

\* We learn from Mr. Leonard Potts, the Clerk of the Poplar District Board of Works, that the Board have decided, acting upon the opinion of Mr. Shireff Will, Q.C., to resist any advance in the charges of the Commercial Gas Company for gas supplied prior to the 6th of April last—the date when the Company gave notice of their intention to increase the price.



## WIDNES CORPORATION GAS SUPPLY.

## Slot-Meter Depredations—The Quality of the Gas.

At the Meeting of the Widnes Town Council last Tuesday, the minutes presented by the Gas and Water Committee set forth that the Engineer (Mr. Isaac Carr, M.Inst.C.E.) had reported that another batch of six penny-in-the-slot meters which had been broken into and robbed were submitted for inspection. This brought up the total to twelve for the past two months. In view of the amount of destruction and loss, he desired instructions as to the advisability of extending the system in the streets where the robberies had been committed; also as to whether he was to continue introducing it to streets of a like character from which applications had been received, but which had not yet been complied with. The number of applications for the supply of gas under this system had been 3880, and 3645 houses had been fitted up. Alderman Timmis having moved the approval of the minutes, the motion was seconded by Mr. Davies. Mr. Midwood said he should like to know which of the streets were affected with regard to the slot-meters, and whether the people who wanted gas and had complied with the regulations had not the right to have it. Mr. Shuttleworth asked if it was a fact that several gentlemen had been down from London making tests of their gas. Alderman Timmis, in reply, said it was a fact that experts had been down from London making tests on their own responsibility; but they had had no authority from the Committee. They wanted to get one side of the question. At the same time experts had been down on their side, and obtained information which would prove very valuable, not only to the world, but to Widnes itself. He had been acquainted with what had been done. The extraordinary results given by these gentlemen would be found in the "JOURNAL OF GAS LIGHTING," and in a subsequent number they would see that the evidence was rather comforting, and that reasons were given why the unknown experts managed to get the results they had done. It was because they made their test on the day on which Mr. Carr was showing to the Committee's experts what low-quality gas he could give, and how suddenly he could enrich it. Mr. Davies, replying to Mr. Midwood's question, said he did not know that he could indicate all the streets where the robberies had taken place. All the depredations were committed by three or four youths who had been brought before the Magistrates and punished. Mr. Shuttleworth, referring to the tests of the gas, said he should have been better satisfied if the Chairman of the Committee had given them the result of the tests. As he had not furnished them, he (Mr. Shuttleworth) would do so. On the 27th of April, four tests were made at a distance of 950 yards from the gas-works by Mr. Henry Woodall and gas testers from the Crystal Palace and Liverpool Gas Companies. The result was 14.7-candle power. On April 28, the second test was made; the result being given as 13.10 candles. The results on April 29 and May 2 were 14.84 and 14.64 respectively; so that the highest result obtained was 15.96 and the lowest 12.79 candles. He pointed out that their legal standard in Widnes was 14-candle power. Anything produced below that was the most crude and vile stuff it was possible to manufacture. Now, if they were turning this vile stuff out to consumers, and calling it 19.21-candle gas, it was a most abominable shame. It was a commercial fraud. If a poor grocer or a poor farmer conscientiously adulterated his milk with a little water, he was fined without the least hesitation. They were selling this stuff and calling it good gas. He would suggest that they should provide a private testing-station, as they had in London, under the guidance of the County Council. This station should be quite apart from their Gas Engineer and the Committee. He had every faith in the Engineer; but he thought, for the satisfaction of the consumers, it would be better that they had a test made quite independent of the Gas Committee.

Alderman Timmis, in reply, said he regretted that, before Mr. Shuttleworth made the observations he had done, he had not followed the information he (Alderman Timmis) gave to him. In the next issue of the "JOURNAL" there was further evidence showing that the tests he had quoted were not reliable. They were made, as had been explained, when the gas was "being knocked about" with the idea of proving certain things. With regard to the question of a private testing-station, he failed to see the need of such a thing. They had each month on their minutes the tests made by Mr. Bellamy, of Liverpool, who was one of the authorities in the gas world. He visited the works at an hour when they were closed, and the Engineer and officials had left. When he made his tests, he came and went without the knowledge of the Engineer, and in the morning a note was found in the room to the effect that he had been there the night before, had made a test, and found such-and-such things. The tests were reported to the monthly meeting of the Gas and Water Committee, and they could not but accept them as being correct. Mr. Bellamy was a gentleman of very high standing; and he imagined it would be "a very tall order" to call his test or his statement into question at all. He (Alderman Timmis) was sure Mr. Shuttleworth would withdraw any remarks as to the independence and accuracy of the tests, when he was acquainted with these facts. The minutes were then passed.

## Some Remarkable Working Statistics.

In a report upon an inspection which the members of the Widnes Town Council made of the corporate estate last Thursday, a Liverpool contemporary says: "Widnesians are proud of their gas and water; the supply of these essentials being both abundant and cheap—Widnes having for years held the record for the cheapest gas in the world. The gas-works were in excellent order; and great interest was manifested in the various processes, more especially in one just devised by the Manager, Mr. Isaac Carr, M.Inst.C.E., for enriching the gas by means of benzol. There are various carburetted plants in the market; but they are costly in construction. Mr. Carr has fitted up an ingenious appliance, at a trifling cost, which is exceedingly effective; so much so that in five minutes he can by its means enrich the gas supplied to the town by 5 candles, up to 20-candle power. The benzol is vaporized and mixed with the coal gas; the enrichment being completely under control, so that the candle power can be varied as required. This process supersedes

the enrichment by tar and cannel; these materials having become very costly. To further economize production, a bench of retorts, containing 56 mouthpieces, is being reconstructed on the modern regenerator principle. As showing the remarkable work accomplished by the Widnes Gas Engineer, we may mention that the actual cost of manufacture and distribution of 18-candle gas has been gradually reduced from 8.8d. per 1000 cubic feet in 1895 to 6.1d. per 1000 cubic feet last year—figures which have never been equalled elsewhere; and last year's result was attained notwithstanding that the coal used cost £2000 more than the previous year. For the present year, we may add, the coal contracts are £6000 in excess of last year; but still a further reduction has been made in the price of gas supplied for motive power, bringing it down to 1s. 1d. per 1000 cubic feet. Including standing charges, the cost of gas production last year worked out to 11.3d. per 1000 cubic feet, as compared with 1s. 4.3d. in 1895. In 1881, the year preceding Mr. Carr's appointment as Engineer, when residuals were worth more than double what they are at present, the cost of manufacture and distribution was 1s. 2.2d. per 1000 cubic feet, against 6.1d. at present; this reduction being equal to a saving to the gas consumers on the present supply of over £8000, which is entirely due to economies effected in production. In the same period the number of consumers has increased from 600 to 6000, and the consumption from 60 million cubic feet to 225 million cubic feet."

## THE LEAMINGTON CORPORATION AND THE GAS-WORKS.

## A Desire to Withdraw from the Purchase.

At the Meeting of the Leamington Town Council on Monday last week, the General Purposes Committee's report contained a recommendation that the Town Clerk (Mr. H. C. Parsman) be instructed to ascertain if the Gas Company would consent to allow the Corporation to withdraw from the purchase of their works. It also set forth that, at a meeting of the Gas-Works Purchase Sub-Committee a letter was read from the Solicitor to the Gas Company (Mr. J. W. Hassall), stating that at an extraordinary general meeting of the shareholders a resolution was unanimously passed declining to accept the offer of the Corporation. A letter from Mr. T. Newbigging, dated the 21st of May, was also read, acknowledging receipt of a notification of the adoption of the Gas Committee's report as to the appointment of Arbitrator, three expert witnesses, &c., and stating that he would place himself in communication with Mr. Livesey, and endeavour to effect a settlement on the basis of his recommendation to the Committee. The Committee resolved that the Town Clerk be instructed to forthwith retain Messrs. E. H. Stevenson, Charles Hunt, and Arthur Silverthorne to be witnesses on behalf of the Corporation in the event of the matter going to arbitration. Alderman Flavel, in moving the adoption of the report, said he was afraid the Council would be charged with not knowing their own mind; but to acquire the gas-works at a price beyond what they had offered would be a mistake. It seemed to him that the works were now very profitably managed; and if the Council acquired the concern at an extraordinary and outrageous price, they would make a mistake. To over-capitalize a business was against the law of common sense.

Mr. Wench seconded the motion, and said that some of those who voted for the purchase were not now prepared to go beyond the £140,000. Alderman Wackrill suggested that the clause referring to the recommendation that the Town Clerk should approach the Company with a view to withdrawing from the purchase was out of order, as it really amounted to rescinding a resolution without giving the usual notice. The Mayor (Mr. J. M. Molesworth) said it did not seem to be varying or rescinding a resolution of the Council. It was merely a tentative resolution. The Town Clerk said he had carefully studied the question, and he did not think the clause was out of order. Mr. Heath Stubbs said he had always opposed any attempt to acquire the gas-works compulsorily. If the ratepayers who objected to the purchase, and the shareholders of the Company, sent a memorial to the Council and the Directors, they would have something substantial to deal with. He should certainly not vote against the recommendation, because he would be glad to see anything done that would enable the town to be relieved of the acquisition of the gas-works. Alderman Harvey said many of the ratepayers had expressed themselves as strongly opposed to the purchase; and he, for one, regretted that they had not adopted some means of putting forward their opinions in public. Meetings had been held to discuss far less important subjects than this. The report was adopted. A proposition was subsequently brought forward by the Mayor, that the Corporation seal should be affixed to the document appointing Mr. Newbigging as Arbitrator *re* the gas-works purchase. Alderman Bright moved that the Council should adjourn till the 23rd inst., to enable the Town Clerk to consult with the Gas Company as to the withdrawal of their notice to purchase, and that they should not seal the appointment until that date. This was agreed to.

## CARLISLE CORPORATION GAS UNDERTAKING.

## The Coal Contracts and the Price of Gas—The Extension of the Plant.

The minutes presented by the Gas Committee at the meeting of the Carlisle Corporation last Tuesday showed that, in consequence of the great increase in the price of coal, the Committee had resolved that the price of gas be advanced 4d. per 1000 cubic feet from the 1st of July; making the price 2s. 7d. per 1000 feet, instead of 2s. 3d. Mr. Corbett, in moving the confirmation of the minutes, said the Committee in entering into contracts for coal had selected the best and cheapest they could find; but the fact remained that there would be £10,000 more to pay for coal during this year than last. A penny per 1000 cubic feet produced £1000; and by increasing the price of gas 4d., they would obtain £4000. The Committee calculated that there would be a loss of £3700 after the reduction; and they would have only a balance of £300 to carry on with. This was a small margin; but he hoped the Committee would be able to tide over the year without an adverse balance. Mr. White moved, as an amendment, that the further consideration of the question be deferred till after the gas accounts for the year ending June 30 had been completed, so that they might be able to see how they stood before raising the price.

\* See Vol. LXXV., pp. 1308-9.



Perhaps when the gas accounts came out, they might adopt a different way of dealing with the profits this year. Mr. Scott seconded the amendment. In recent years they had been making a profit of 6d. per 1000 cubic feet on the gas sold at 2s. 3d.; and it was not fair to load the willing horse too much. Mr. Corbett said he had no objection to the amendment. Mr. Hurst, another member of the Committee, also agreed with the amendment, which was supported by Mr. Wardle, who said he did not see why they should relieve non-consumers from rates by making such large gas profits. The amendment was then put and agreed to.

The Gas Committee had further considered the question of the extension of the manufacturing plant. Tenders for the supply of plant for the manufacture of carburetted water gas, and also offers for the erection of additional plant for the manufacture of coal gas, had been submitted; and it was resolved that the coal-gas plant be extended at an estimated cost of £10,585, and that the Engineer prepare plans and specifications of the work, and submit tenders to the next meeting. Mr. Corbett moved the confirmation of the minutes. He quoted figures to show that the works were now strained to their utmost capacity in winter. The Committee, he also stated, had considered the question of introducing a carburetted water-gas plant. A deputation had visited Preston, Liverpool, and Manchester, and were very favourably impressed; but there being some doubt as to the cost of the requisite plant, they had abandoned the idea in favour of extending the coal-gas plant. After a long discussion, the matter was referred back to the Committee; and it was decided to seek the advice of Mr. Corbet Woodall.

### GOOLE URBAN DISTRICT COUNCIL GAS DEPARTMENT.

#### A Satisfactory Balance-Sheet.

The Engineer and Manager of the Gas and Water Department of the Goole Urban District Council (Mr. Matt. Dunn) has prepared his yearly working statement connected with the gas undertaking, and it came before the Committee on Monday last week. It showed that the gross profits in the twelve months ending March 31 last amounted to £7793, and the net profits to £1982, as compared with £5811 and £1325 in the preceding year. In 1897-8 there was a deficit of £97; whereas in 1898-9 there was an increase of £1423, and last year one of £656, in the net profits. The summary of income showed a net increase of £1557 on that for the year 1898-9; while the increase in this period was £1610 on the 1897-8 returns. The quantity of coal carbonized was 4875 tons; of gas made, 44,870,000 cubic feet, or 9203 cubic feet per ton; of gas sold, 38,424,915 cubic feet, or 7881 cubic feet per ton; of gas accounted for, 39,025,015 cubic feet, or 8004 cubic feet per ton; and of gas unaccounted for, 5,844,985 cubic feet, or 13·026 per cent. on the make. Commenting upon the financial statement, Mr. Turton remarked that the Council could congratulate themselves upon the result of the year's working. Though they were paying a little more for their coal, they were able to show an increase in the revenue all round. This showed that the undertaking was well looked after. They had more customers and had sold more gas, both for private and public consumption. As compared with the previous year, they had an increase of £933 for gas, of £558 for coke, of £101 for tar, and of £92 for ammoniacal liquor. Since the Council had acquired the gas-works, the gross profits realized had been £7793. He formally moved that the accounts be accepted. Mr. Blyth thought that the concern was in a very healthy condition, and that the Council could congratulate themselves upon the balance-sheet which had been presented. There had been an upward tendency in the price of coal. But the Manager had been active in the discharge of his duties, and had given close attention to the sale of residuals; and the instinct of commerce had been very actively and profitably carried out. While they were anxious to supply the town with gas as cheaply as possible, they found it necessary to make a substantial profit in order to maintain the works in a satisfactory condition without having to apply for a loan for any slight improvement which might be necessary. He sincerely congratulated the Manager, and expressed the hope that he would go on during 1900 as well as he had done in 1899. The Chairman (Mr. J. Cawthorn), in putting the motion, referred to the satisfactory accounts which had been presented. He remarked that, seeing they were paying 5s. a ton more for coals now than they did last year, they could not expect to maintain such a balance-sheet unless some advance were made in the price of gas. If at the end of the year they did not show such good results as now, it would not be due to the fault of the Manager or the Committee, but simply to circumstances they could not control. Should the increased demand for gas continue, he had not the slightest doubt that, all round, their financial position would not be behind that in which they were now. Mr. Watts reminded the Council that in the past two years they had reduced the price of gas 5d. per 1000 cubic feet. In view of this, he considered the balance-sheet most satisfactory. Mr. Turton having offered a few remarks in reply, the motion was carried, and Mr. Dunn returned thanks for the expressions used in regard to himself. He said they had, as a Council and an undertaking, accomplished great things, and he felt satisfied this year, because two years and a half ago he vowed that they would realize £2000, which had never before been done. This had been accomplished. He would endeavour to make the ensuing year one of which they would be proud. He could not take all the gilt in the matter, because a great deal of it was due to the good feeling which pervaded the works, and the way in which the men had discharged their duties. He had a good staff, and he was proud of them; and they endeavoured to bring about good results both for him and the Council.

**Water Charge Remission at Sheffield.**—The Water Committee of the Sheffield City Council recently decided to remit the remaining 12½ per cent. increase of water charges entailed by the Bradfield disaster; and the matter was mentioned by Alderman Gainsford at the meeting of the Council last Wednesday. The proposition had his support and approval; and he thought it could be done safely, although, by taking off this percentage four-and-a-quarter years earlier than necessary, they lost £56,600.

### THE NEWCASTLE (STAFFS.) GAS UNDERTAKING.

#### The Past Year's Working.

At the last monthly Meeting of the Newcastle (Staffs.) Town Council, Mr. W. L. Elliott, the Chairman of the Gas Committee, speaking with reference to the report presented by the Auditor on the financial working of the gas undertaking for the past year, said he thought the Council would agree with him that it was most satisfactory. The profit from the gas-works, after all sums for the payment of interest and contribution to the sinking fund had been met, amounted to £3350, or an increase of £1300 on the profit realized the previous year. Out of this sum, the town had been lighted free of cost. In 1898-9 this had cost something like £1190. The balance had been spent on extensions at the works which had been found necessary through the very large increase in the consumption during the last two years—extensions to the retort-house, mains, and meters. The report of the Auditor showed that the income from private lighting had increased by £1003. The make of gas had been 109 million cubic feet, which was equal to a rise of 10 per cent. on that of the preceding twelve months. They had had an exceptional year so far as the price of coke was concerned, and the augmented income from the sale of coke had been £902; and the return from residuals was altogether something like £2800. The increased revenue from private lighting seemed to have resulted from the popularity of the prepayment meters; and more than half of the extra income, or about £500, came from users of these meters. On the 31st of March there were in use about 819 slot-meters, and during the year there had been an increase of nearly 300. The stoves let out on hire, too, had gone up by about 110. The cost of these stoves had to be borne entirely from revenue, and they had cost about £300. Against this they had written off about £116 for depreciation. It was not possible to say whether the results would be so favourable next year as they had been, as they had to bear an increased cost of coal, which would mean something like £3000. He could not say whether they would be able to meet this with an increase in the price of gas and with a greater amount received from residuals. At any rate, he hoped that at the end of the year their balance would come out quite as well as it had now done. Alderman Briggs, after congratulating the Chairman and members of the Gas Committee upon the excellent financial results of the year, said the report was satisfactory evidence of the soundness of the policy of the Council in 1877, when they included powers for the purchase of the gas-works in their Special Act of Parliament; in 1880, when they gave notice to the Company of their intention to purchase; and, further, in 1894 and 1895, when they had expended about £15,000 on new works, plant, and mains. He wished to remind them, however, that within the past twelve months an Act of Parliament had been passed containing a Provisional Order for the supply of electricity for lighting purposes in the borough. By this Order the Corporation were allowed two years to make their arrangements; and he thought that as soon as possible after that limit the public of Newcastle should have the opportunity of taking the electric light. He did not anticipate that the supply of electricity would very seriously affect the gas-works, which, he believed, would still have a long and useful career—although, perhaps, a modest one—before them. Mr. Elliott stated that a meeting for the consideration of the electric light question had been convened.

Alderman Heath congratulated the Committee upon their highly satisfactory report, and said he considered the Corporation and the town were largely indebted to the Chairman and Vice-Chairman, as well as to the Manager (Mr. W. Winstanley), for the results shown.

The report was adopted.

### SALES OF STOCKS AND SHARES.

The sale of gas and water stocks conducted by Mr. Alfred Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday comprised two new issues. The Directors of the South Essex Water-Works Company gave him instructions to offer £5000 of 4 per cent. perpetual debenture stock, issued under their Act of 1882; and it fetched from £105 to £106 10s. per cent. This was the first time the Company had issued by auction. The other new issue was 500 £10 "C" shares in the East Grinstead Gas and Water Company. They rank for a maximum dividend of 7 per cent. per annum; but the last dividend on similar shares was at the rate of £5 12s. per cent. per annum. All the shares were sold at from £11 to £11 10s. each. Mr. Richards also sold some £10 "A" shares (last dividend 8 per cent.) in the Harrow and Stanmore Gas Company, at £15 10s. and £15 12s. 6d. apiece; some "D" £10 water shares (£4 paid) in the Barnet District Gas and Water Company (last dividend £6 6s. per cent. per annum), at £7 and £7 2s. 6d. each; and a few £10 shares in the Woking Water and Gas Company, ranking for a maximum dividend of 10 per cent., and the last dividend having been at the rate of 4½ per cent. per annum, at £10 15s. each.

Among recent sales, the following may be noticed: Messrs. A. G. and A. Notley sold some ordinary £10 shares in the City of Norwich Water-Works Company, at £18 each; 3½ per cent. debenture stock of the Company, at £108 per cent.; 4 per cent. debenture stock of the Great Yarmouth Water Company, at £114 10s. per cent.; and similar stock of the Lowestoft Water and Gas Company, at £114 and £114 10s. per cent. At Holmfirth, Mr. A. Beardsell sold some £20 shares in the Holmfirth Gas Company, at £34 and £35 10s. each; and £5 shares in the New Mill Gas Company, at £4 5s. At the offices of the Newcastle and Gateshead Gas Company last Wednesday, Mr. R. Mack offered for sale by auction £25,000 of ordinary stock of the Company. The standard rate of dividend is 7 per cent., subject to the usual sliding-scale clauses, under which, so long as the price of gas is 2s. 4d. per 1000 cubic feet, the authorized dividend payable will be 8½ per cent. per annum. There were in all 250 lots of £100 ordinary stock; the price per lot being £200. The vendors purchased several of the lots, and after a brief sale, the whole of the issue was disposed of at the above figure.

The salary of the Gas Engineer and Manager of the Bolton Corporation (Mr. W. Smith) has been raised £50 per annum.



Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apr. 11	7½	Alliance & Dublin 10 p. c.	174-184	..	5 13 6	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	10	Do. 7 p. c.	123-134	..	5 11 1	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb.	101-103	..	4 17 1	851,070	10	Apr. 27	7	River Plate Ord.	10-10½	..	6 13 4
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	7	Do. 4 p. c. Deb.	100-102	..	3 18 5
40,000	5	"	12	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	10	Apr. 11	8	San Paulo, Ltd.	114-124	..	6 8 0
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250-260	..	4 12 4	135,000	Stk.	Mar. 14	10	Sheffield A.	245-247	..	4 1 0
270,000	"	"	9	Do. New	182-187	..	4 16 3	209,063	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	"	5	Do. 5 p. c. Pref.	140-145	..	3 9 0	447,427	"	"	10	Do. C.	244-246	..	4 1 4
169,375	"	June 14	4	Do. 4 p. c. Deb.	116-120	..	3 6 8	5,600,000	Stk.	Feb. 23	5½	South Metrop. 4 p. c. Ord.	127-180	-1	4 2 0
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	225-235	-5	4 17 10	1,520,000	"	July 12	3	Do. 3 p. c. Deb.	95-98*	..	3 1 3
226,320	"	"	8½	Do. A. Ord. Stk.	165-170	-10	5 0 0	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
999,506	Stk.	Feb. 23	5	Bristol, 5 p. c. max.	125-130	..	3 16 11	70,825	"	July 12	12	Do. 4 p. c. Deb.	117-122*	..	3 5 7
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	120,000	Stk.	Mar. 14	6	Tottenham } A. 5 p. c. and } B. 3½ p. c.	103-108	-17	5 11 1
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c.	24-26	..	4 12 4	250,520	"	June 14	4½	Edmonton 4 p. c. Deb.	85-90	-8	5 0 0
79,000	10	"	9	Do. 7 p. c.	19-21	..	4 5 8	55,100	"	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
600,000	10	May 16	6	Buenos Ayres (New) Ltd.	9-9½	..	6 6 4	182,350	10	July 2	5	Do. 5 p. c. Deb. Red.	98-102	..	4 18 8
220,000	Stk.	June 14	4	Do. 4 p. c. Deb.	99-101	..	3 19 3	149,900							
150,000	20	July 12	8½	Cagliari, Ltd.	23-25*	..	6 12 0								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	134-144	..	5 10 4								
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	65-67	..	5 5 3								
550,000	Stk.	Apr. 11	13½	Commercial Old Stock	275-285	..	4 14 9								
286,425	"	"	10½	Do. New do.	205-215	-5	4 17 8								
288,237	"	June 14	4	Do. 4½ p. c. Deb.	133-138	..	3 5 3								
600,000	Stk.	May 31	9	Continental Union, Ltd.	155-160	-2½	5 12 6								
200,000	10	Feb. 23	7	Do. 7 p. c. Pref.	170-175	..	4 0 0	780,404	Stk.	June 28	11	Chelsea, Ord.	298-303	..	3 12 7
51,600	Stk.	"	14	Croydon A 10 p. c.	335-340	..	4 2 4	150,000	"	"	5	Do. 5 p. c. Pref.	155-160	..	3 2 6
173,400	"	"	11	Do. B 7 p. c.	265-270	..	4 1 5	160,000	"	Mar. 29	4½	Do. 4½ p. c. Pref.	143-148	..	3 0 10
556,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p. c.	113-118	-2½	4 9 0	175,785	"	Apr. 11	7	Do. 4 p. c. Deb.	145-150	..	3 0 0
60,000	10	Jan. 26	11	Do. 5 p. c. Pref.	130-135	..	3 14 1	1,720,560	Stk.	June 14	4½	East London, Ord.	187-192	-3	3 12 1
486,090	"	"	5	European, Ltd.	194-204	..	5 7 4	654,740	"	June 14	4½	Do. 4½ p. c. Deb.	142-147	..	3 1 3
854,060	Stk.	Feb. 9	4½	Do. £7 10s. paid.	144-155	..	5 6 5	890,000	"	June 14	8	Do. 3 p. c. Deb.	96-98	..	3 1 3
14,993,075	"	"	3½	Gas- 4 p. c. Ord.	98-100	+1	4 18 0	700,000	50	June 14	7½	Grand 10 p. c. max.	104-107	..	3 10 1
2,800,000	"	"	3½	light 3½ p. c. max.	95-97	..	3 12 2	810,000	Stk.	Mar. 29	23	Junction 4 p. c. Deb.	130-135	..	2 19 3
8,799,735	"	"	3½	and 4 p. c. Con. Pref.	117-119	..	3 7 3	708,000	Stk.	Feb. 23	14	Kent	307-312	..	4 9 9
8,993,975	"	June 14	3	Coke 3 p. c. Con. Deb.	95-98	..	3 1 3	160,000	"	June 28	10½	Do. New, 7 p. c. max.	200-210	..	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	134-144	..	5 10 4	1,043,800	100	June 28	7	Lambeth, 10 p. c. max.	285-290	..	3 12 5
2,800,000	Stk.	May 16	10	Imperial Continental	198-203	..	4 18 6	406,200	Stk.	Mar. 29	8	Do. 7½ p. c. max.	203-208	..	3 16 11
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red.	100-103	..	3 8 0	350,000	100	Feb. 23	13½	Do. 4 p. c. Deb.	130-133	..	3 0 2
76,000	5	June 14	6	Malta & Medn., Ltd.	44-5	..	6 0 0	500,000	100	Feb. 23	13½	New River, New Shares	422-427	..	3 3 2
560,000	100	Apr. 2	6	Met. of 5 p. c. Deb.	107-110	..	4 10 11	1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb.	130-135	-2	2 19 3
260,000	100	May 31	4½	Melbourne 4½ p. c. Deb.	106-108	..	4 3 4	902,300	Stk.	June 14	7½	South- work Ord.	195-200	..	3 15 0
541,920	20	Feb. 23	9½	Monte Video, Ltd.	104-114	..	6 1 8	126,500	100	"	7½	Do. 7½ p. c. max.	182-187	..	4 0 3
867,946	Stk.	June 28	3½	Newcastle & Gateshead Con.	215-220	..	4 4 1	489,200	Stk.	Apr. 11	5	and 5 p. c. Pref.	155-160	..	3 2 6
299,855	Stk.	May 16	8	Do. 3½ p. c. Deb.	104-107	..	3 5 5	1,019,545	Stk.	June 14	10	Vauxhall 4 p. c. A Deb.	129-134	..	2 19 9
150,000	5	"	8	Oriental, Ltd.	71-73	..	5 8 3	1,155,066	"	"	4½	West Middlesex	270-275	-5	3 12 9
135,000	5	"	8	Do. New, £4 10s. pd.	64-66	..	5 6 8	200,000	"	Mar. 14	8	Do. 4½ p. c. Deb.	145-150	..	3 0 0
15,000	5	"	8	Do. do. 1879, £1 pd.	14-13	..	4 11 5	200,000	"	"	8	Do. 8 p. c. Deb.	99-101	..	2 19 5
				* Ex. div.											* Ex. div.



£189,890, because the plans and particulars of the remainder of the proposed expenditure were not yet in a sufficiently advanced state to lay before the Board. The money applied for was required for the erection and equipment of a new generating station. Mr. James Bowes, Deputy-Chairman of the Electricity Committee, gave evidence to the effect that the present generating station was quite inadequate for the growing demand made upon it. Mr. C. H. Wordingham, the Corporation Electrical Engineer, spoke as to the rapidly increasing demand upon the Committee for electric power. Compared with 1893, the increased demand in 1898 was at the rate of 31 per cent., and in 1899 43 per cent. The capacity of the existing plant was fully occupied, and would probably be overloaded next winter. It was therefore imperative that the plant should be supplemented as soon as possible. By the end of the present year, it was proposed to have three sections of electrical tramways in operation in the city, covering ten miles. Mr. J. H. Andrews, architect and surveyor, described the building proposed to be erected. The cost of the erection was estimated at £49,310; including the original estimate of £41,895, £4189 for contingencies, and £3226 for architect's, surveyor's, and other fees.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The announcement is made that the increase in the price of gas in Glasgow, which was foreshadowed by the Convener of the Gas Committee (ex-Bailie Mitchell) when he recently addressed the Corporation on the subject, has not yet been fixed, but that it is expected it will amount to about 4d. per 1000 cubic feet. The present rate is 2s. 2d. The coal contracts entered into show an increase of about £140,000 as compared with last year, and over the year prior to that, again, of £191,000, the figures for the three years being, respectively : £324,000, £382,000, and £515,000. Such an abnormal increase could not be dealt with in any other way than by advancing the price of gas. When the Corporation took over the gas undertakings, in 1869, the price of gas was 4s. 7d. per 1000 cubic feet. It has now been at 2s. 2d. for four years, prior to which it was 2s. 4d. for one year, and 2s. 6d. for the two years preceding. During the year ending May 15, the Peebles Gas Commissioners had a revenue of £4238, of which £3728 was for gas sold, £434 for residual products, and £75 was cooker-rental. The balance carried to profit and loss account was £1185. The output of gas during the year was 19,181,000 cubic feet; and the quantity sold was 17,991,000 cubic feet. The unaccounted-for gas amounted to 6.3 per cent. The increase in the quantity of gas sold was 4½ million cubic feet. This great increase is due to the liberal terms upon which cookers and heaters are supplied. The demand for these has been something phenomenal. Out of about 930 consumers on the books of the Commission, there are 692 who use the Commissioners' cookers or heaters; and of these, again, 690 are furnished with slot-meters. The quantity of gas consumed through pre-

payment meters was 4,946,500 cubic feet, and through ordinary meters 11,981,000 cubic feet. Peebles is certainly the place where, for provincial towns, the most interesting figures relating to the consumption of gas by means of prepayment meters are to be found. At a meeting of the Commissioners this week, Provost Ballantyne stated that during the past year coal and oil had cost them £650 more than in the preceding year; and they had written off for depreciation of cookers and meters £99. Their net profit for the year amounted to £600. They estimated that during the current year they would have to pay £575 more for coal; they would have to begin the first instalment of the sinking fund amounting to £230; and there would be an extra £110 for depreciation on cookers and heaters. This made, in all, an increased expenditure of £915. To meet this, they calculated on an increased output of gas of 2 million cubic feet, upon which there would be an additional net profit of £150. In the six weeks of the present year which have elapsed, there has already been an increase of 600,000 cubic feet; and there was thus more than a fourth of the estimated increase for the year already accounted for. They further estimated for an increase of £100 from residuals, and that they would have to expend £80 less upon pipes. They would also have their profit of £600, as last year. These four sums of £600, £150, £100, and £80 made together £930 profit, to meet £915 of increased expenditure. They had come to the conclusion that they could go on for another year without raising the price of gas, which was very gratifying, seeing that the cost of producing gas was 10d. per 1000 cubic feet more than it was two years ago. If the gas supply had been in the hands of a private company, the probability was that the price would have been 5s. per 1000 cubic feet. He moved that it remain at 4s. 2d. to ordinary consumers, and at 3s. 6½d. for power purposes. This was unanimously agreed to. It was reported to the meeting that the output of gas during June was 53.1 per cent. more than in June of last year, and that, as compared with the output in June, 1898, the increase was 180 per cent. The figures furnished by Peebles deserve more than a passing glance. Exception might be taken to the spirit of the remark by Provost Ballantyne, that if the gas supply had been in the hands of a private company in all probability the price would have been 5s., because it savours of the throwing of stones. But there is a sense in which it is most emphatically true. There was no movement in the Peebles Gas Company, like what had taken place in the Commission, since the transfer, for the encouragement of the use of cookers. But for this, there would not have been the great increase in the consumption of gas, and there would, consequently, not have been the possibility of keeping down the price. I understand that the policy which has resulted in so much profit to the Commissioners is that of the Treasurer (Mr. H. Williamson), and that it has for its basis the belief that reserve funds, or funds which are permitted to be so dealt with, may be more profitably invested in cookers to be used in their own business than in outside undertakings. There is the double advantage of investing in stock which can be made secure or insecure according to the conditions of purchase and hire, and of the increased profit upon the working of this stock. The reflection arises that if this be possible in Peebles, why is it not so in other places.

# CARBURETTED WATER-GAS APPARATUS

Merrifield-Westcott-Pearson Patents.

## The Economical Gas Apparatus Construction Co., Ltd.

London Offices : 19, ABINGDON STREET, WESTMINSTER, S.W.  
American Offices : TORONTO. TELEGRAPHIC ADDRESS : "CARBURETED, LONDON."

### CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily
BLACKBURN	1,250,000	BUFFALO, N.Y.	2,000,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	WINNIPEG, MAN.	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
COLCHESTER	300,000	YORK	750,000
BIRKENHEAD	2,250,000	ROCHESTER	500,000
SWINDON (New Swindon Gas Co.)	120,000	KINGSTON, ONT.,	300,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	CRYSTAL PALACE DISTRICT	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	DULUTH, MINN.	300,000
HALIFAX	1,000,000	CATERHAM	150,000
TORONTO	250,000	LEICESTER	2,000,000
OTTAWA	250,000	ENSCHEDÉ (HOLLAND)	150,000
LINDSAY (Remodelled)	125,000	BUENOS AYRES (RIYER PLATE CO.)	700,000
MONTREAL	500,000	BURNLEY	1,500,000
TORONTO (Second Contract; Remodelled)	2,000,000	KINGSTON-ON-THAMES	1,750,000
BELLEVILLE	250,000	ACCRINGTON	500,000
OTTAWA (Second Contract)	250,000	TONBRIDGE	300,000
BRANTFORD (Remodelled)	200,000	STRET福德	500,600
ST. CATHERINES (Remodelled)	250,000	OLDBURY	300,000
KINGSTON, PA.	125,000	TODMORDEN	500,000
PETERBOROUGH, ONT.	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
WILKESBARRE, PA.	750,000	YORK (Second Contract)	750,000
ST. CATHERINES (Second Contract)	250,000	ROCHESTER (Second Contract)	500,000
		NEWPORT (MON.)	250,000

W. H. PEARSON, Chairman.  
W. H. PEARSON, Junr., Deputy-Chairman.  
J. T. WESTCOTT, M.E., Manager.  
L. L. MERRIFIELD, M.Inst.M.E., Engineer.



To follow this subject, I take up what was transacted at the Dunfermline Gas Commission this week. There the Commissioners had before them, at their meeting in June, proposals by Mr. Hubert Pooley, their Engineer—who is about to take up his new duties at Stafford—to raise the price of gas to ordinary consumers from 3s. 9d. to 3s. 11d. per 1000 cubic feet, and to consumers by prepayment meters from 4s. 2d. to 4s. 9d. Mr. Pooley's reason for these proposals was that a year ago gas to ordinary consumers was raised by 3d. per 1000 cubic feet, and that no increase was made to consumers by prepayment meters. The two classes would thus be equalized. The subject was sent back to the Committee for further consideration, and in Committee counter proposals were made—one that the price to ordinary consumers be increased by 1d., and that there be no increase to other consumers; and the other that the increase to ordinary consumers be 2d., as recommended, and that there be no increase to other consumers. The Engineer's recommendation was adopted by the casting-vote of Provost Scobie, who presided. When the subject came before the Commission this week, Provost Scobie moved the recommendation of the Engineer. The first alternative was again moved—the increase of 1d. &c.—and was spoken to at some length. In support of it, it was urged that, in addition to a net profit of £1540 last year, they had wiped out a debit balance of £450 from the previous year, which made a net profit of £2000, and that there was no need to increase the price of gas so much as recommended by the Engineer. This argument was shown to be a fallacy; the £450 not having been wiped out in addition to the £1540. But what I wish to call attention to is the remark of the mover of the amendment that "he demurred to the idea that they should tie themselves to the Engineer, and held that this was a matter in which they should exercise their own judgment." Now, in this, as in so many other matters, there is truth on both sides. It is not for an engineer to fix what the price of gas is to be. He is to estimate what the cost of it will be, and the probable consumption; and then the Commissioners, on their own initiative, or on the advice of their finance official, are to say what they are to charge for gas to meet the outlays. I daresay that official would act foolishly if he did not consult with the engineer and manager; but there are departments which the latter is not supposed to be responsible for, and if he should enter into these, then the Commissioners need not be tied by any recommendation he may make. In his own department, if the Commissioners be not tied by his recommendations, they might as well not have a manager—a foreman would do. I wish to point out, as between the two places of Peebles and Dunfermline, that though, as in Peebles, a manager may, working under finance conditions laid down by his employers, conduct a prosperous business, when new finance conditions are allowed him, he may rise to a much greater height of prosperity; and so there is much truth in the remark at Dunfermline that the Commissioners are not, in all things, to be tied to the recommendations of their Manager. The lesson to managers is that they should not be discouraged if, in matters which are not purely managerial, their employers do not see eye to eye with them. In Dunfermline, neither the motion nor the counter-motion became the finding of the meeting. What was agreed upon was the compromise that the increase be 2d. to ordinary consumers, and nothing to prepayment con-

sumers. In Peebles, I agree that the Commissioners, not by any means disregarding a recommendation by their Manager, did right in acting upon their own motion; but I cannot agree that the Commissioners have done right in Dunfermline in rejecting part of Mr. Pooley's recommendation. There is something managerial in the matter. It is a somewhat subtle proposition; but it comes out in this way—that, although the duty of recommending what the price of gas is to be does not lie upon the manager, yet, to increase one class of consumers by 5d. per 1000 cubic feet in two years, while not increasing the other at all, is to give an advantage to one class over another. Any such interference with classes of consumers might lead to the upsetting of the manager's calculations. Thus the business of the Commissioners is not advanced by the action of the Commissioners. A policy of constructive independence is one thing, and that of independent rejection is another. We have had one at Peebles and the other at Dunfermline.

Before proceeding with the ordinary business of the Commission, Provost Scobie expressed the regret of the Commissioners at their losing the services of Mr. Pooley; their high appreciation of the very efficient manner in which he had discharged the duties of his responsible and important office under the Corporation; and their best wishes for his future success and advancement in his profession. Other members of the Commission also expressed similar sentiments.

The Cowdenbeath Gas Company, Limited, are offering their works for sale. At a meeting of the Police Commissioners this week, a letter from the Secretary of the Company was submitted, in which it was offered to dispose of the undertaking as a going concern, at the price of £500. The Commissioners are to consider the offer in Committee. The Company, it will be remembered, substituted acetylene gas for coal gas, with disastrous results to their business; the price being so much higher than coal gas, that the sale greatly fell off.

The Alloa Gas Commissioners, in the year which ended on May 15 last, had an income of £10,718, as compared with £9406 in the preceding year. The revenue from gas was £8128, as compared with £7397; from residuals £1383, as compared with £1113; and from coke £1124, as compared with £813. The expenditure amounted to £9771, as compared with £8409. Coal and lime cost £5705, as compared with £3796; wages £1965, as compared with £1835; and repairs and furnishings £672, as compared with £1308. The balance carried to profit and loss account is £947, as compared with £906. The amount borrowed during the year amounted to £2542; and in the preceding year to £15,050—raising the capital charge, in two years, from £38,035 to £55,627. Loans have been repaid to the extent of £31,352; leaving the capital account now at £24,275. The Commissioners possess a reserve fund of £1000, and a sinking fund of £16,803. This reduces their capital liabilities to £6472, which, upon an undertaking having an annual revenue of over £10,000, is an exceedingly enviable position. The accounts were presented to the Burgh Commissioners this week by Bailie Arrol, who stated that the consumption of gas had increased by about 5 million cubic feet during the year. They anticipated a similar increase this year; and, in this expectation, he moved that they continue the price of gas as it was last year—2s. 6d. per 1000 cubic feet—but that discounts to large consumers



**RICHMOND'S WARRINGTON EXCURSION TO DOUGLAS, JUNE 30TH, 1900,**

THE S.S. "PRINCE OF WALES" APPROACHING DOUGLAS HARBOUR.

1600 PEOPLE ON BOARD.



be abolished. Baillie Arrol took credit to the Commissioners in their not requiring to raise the price of gas. This is quite as it should be. So far, there are only five towns I know of in Scotland where the price of gas has not been increased this year—Hamilton, Peterhead, Alva, Peebles, and Alloa. In the latter two places, the Peebles oil-gas process is used. Who shall say now it has not been an advantage to gas undertakings?

This week a deputation of three members of the Falkirk Gas Commission, along with the Gas Manager (Mr. J. Kincaid), paid visits of inspection to the gas-works of Perth and Aberdeen, for the purpose of gleaning information, in view of the erection of new works at Falkirk. On Wednesday, they were shown over the Perth works—new and old—by Mr. Watson, the Convener of the Works Committee, and Mr. W. B. McLusky, the Engineer and Manager. As there is at present in progress in Perth a process of transferring the gas-works to a new site, what they saw in that city was of special interest to the visitors. Next day, in Aberdeen, they were received by Lord Provost Fleming and a number of the town councillors and city officials, including the Gas Engineer and Manager (Mr. A. Smith) and the Electrician (Mr. J. A. Bell). At the gas-works, Mr. Smith showed them three methods of carbonization—by hand drawing and charging, by West's stoking machinery, and by inclined retorts; the latter of which (the first in Scotland) are being experimented with. These retorts are 20 feet long, and are inclined at an angle of 31°. The deputation were shown the electric light station, and other public works, and were entertained to luncheon. They returned home highly gratified at the large amount of information they had received. The Commissioners are to be commended for their judgment in selecting two such interesting works for visitation. Smaller works would have been of no use to them; and the copying of larger works for smaller places is not always—indeed, almost never is—a success.

The Alva Burgh Commissioners have continued the price of gas at 3s. 10d. per 1000 cubic feet, and have abolished discounts to large consumers. Last year a reduction of 1d. per 1000 cubic feet was made.

At the Kilsyth Burgh Commission this week it was reported that during the past year the accounts of the Corporation gas undertaking showed a deficit of £293, as against a credit balance of £125 the preceding year. About 14 million cubic feet of gas were manufactured. There was an indebtedness on the gas undertaking of £5720. During the past year, the average price of coal per ton was 18s. 11½d., as compared with 13s. 6d. in the preceding year; and this fully accounted for the deficit.

The Rothesay Burgh Commissioners have increased the price of gas from 3s. 4d. to 3s. 9d. per 1000 cubic feet, with discounts. They have also resolved to increase the wages of the gas stokers by 1s. 6d. per week, and of coalbreakers by 1s. per week. The stokers asked for a rise of 3s. 6d. per week.

The Irvine Gas Company have advanced the price of gas from 3s. 5½d. to 3s. 11d. per 1000 cubic feet. There was a profit on the past year's working of £1717, out of which a dividend at the rate of 10 per cent. has been paid. The Galston Gas Company have raised the price from 3s. 9d. to 4s. 2d. per 1000 cubic feet. The Newmilns Gas Company (old) have increased their price from 5s. to 5s. 10d. per 1000 cubic feet.

At Johnstone, there was a gross profit on the year's working of the Corporation gas undertaking of £4044, and a net profit of £132. The revenue from gas, secondary products, waste lime, and coke was £7382.

At Burntisland there is a balance of profit on the past year's working of the Corporation gas undertaking of over £400. The Commissioners have resolved to retain the price of gas at 3s. 9d. per 1000 cubic feet.

The accounts of the Kirkintilloch Corporation gas undertaking for the past year show a deficit of over £227. The price of gas has been raised from 3s. 4d. to 3s. 9d. per 1000 cubic feet. At a meeting this week, the Convener of the Gas Committee drew attention to the difficulties that lay in the way of the economical production of gas, owing to the want of accommodation at the works, and said it might be necessary, if the best results were to be obtained, that they should remove to a new site.

Mr. G. Keillor, jun., has every reason to be proud of his first year's working at Peterhead. The accounts for the year were submitted to the Town Council on Monday by Mr. Ritchie, the Convener of the Gas Committee. There had, he said, been an increase in the consumption of gas to the extent of 2,091,000 cubic feet, equal to 10½ per cent., during the year. Their revenue amounted to £4360, as compared with £3868. From the sale of gas, there was derived £3822, or an increase of £327; and from residual products, £508, or an increase of £159. Coal had cost them £2065, as against £1669, an increase of £396. On the other hand, though they had produced much more gas, their charge for purification was only £58, compared with £89. This had been accomplished by new economical methods of procedure which had been introduced without lessening the standard of purity maintained in their gas manufacture. The success of the year's operations had been mainly due to the introduction, by their able Manager, of improved methods of carbonization which, while effecting a great saving in cost, had increased the yield of gas per ton by 198 cubic feet. They carbonized 2160 tons during the year. They had a balance of profit of £1026, as against £870. Adding £2358 brought forward from the previous year, they had, in the profit and loss account, £3384. Out of this they had placed £508 to sinking fund, and had paid £440 as interest on mortgages, &c., leaving to be carried forward £2436, or £97 more than a year ago. They had to face an expenditure of £450 more for coal this year; but the Committee were confident that their accounts next year would also show a balance to the good, without their requiring to raise the price of gas. The accounts were adopted, and the price of gas was continued at 4s. 3d. per 1000 cubic feet. Others also spoke in congratulatory terms of the ability of Mr. Keillor. Mr. Keillor is a son of the Gas Manager at Nairn; and before receiving his appointment at Peterhead, he was for some years in the gas-works at Hamilton, under Mr. W. Ewing.

As the result of memorials presented to the Local Government Board appealing against the surcharges made on the Merthyr Board of Guardians in connection with the strike relief money, the members have been notified that the payment will be remitted.

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## EDITORIAL NOTES.

## The Welsbach-Sunlight Amalgamation.

THE long warfare between the Welsbach and the Sunlight incandescent gas-burner interests is over at last; and, as will be seen by the statement which appears elsewhere, the two Companies will be fused upon terms satisfactory enough to themselves, whatever the public may think of the arrangement. The legal position in this connection is sufficiently remarkable to call for particular notice. It was notified in the paper that Mr. Justice Buckley would deliver judgment in the Kern action the first thing on Wednesday last; but any curious person who might have dropped into Court at about three minutes past the hour for commencing business, would have found the learned Judge going on with another case. What had happened was this: On the Judge taking his seat, Mr. Moulton, Q.C., asked, on behalf of the parties, that his Lordship would consent to formally defer his judgment until the 30th inst. An agreement had been arrived at, and was actually signed, between the parties to the suit that had been heard, as well as to the one which was down for hearing on the 23rd. It awaited confirmation by the shareholders of both Companies, which could not be obtained before the 27th, for which date meetings had been duly called; and if the judgment were postponed until afterwards, his Lordship would be spared the trouble of delivering it. Upon receiving the assurance that the arrangement in question would have the effect of putting an end to all the litigation concerning the patents, Mr. Justice Buckley acceded to Counsel's request; and so the matter ended. The pending action on the 1893 mantle patent has since been taken out of the paper; and the extraordinary result appears that the action on the Kern patent comes to nothing after having occupied the Court during many days, and merely by the parties most immediately interested taking advantage of the accident of judgment being reserved to make terms between themselves.

This may be quite in order; but it looks very much like using the procedure of the High Court to put pressure on one or other party, or both, to enable a private and self-regarding agreement to be brought off. It is well understood that the process of a Criminal Court must not be abused with the object of gaining private ends; and if there could be any civil form of the same kind of abuse, this Kern business is an example of it. Of course, any civil action can be put an end to by the withdrawal of a juror, if it is a jury case, or by consent of the Court. Where the issues are of purely private interest, there may well be as great liberty for stopping a lawsuit as there is for commencing it. But a case under the Patents Act seems to implicate the interest of the public, and to belong to a class of actions which, although necessarily initiated for some private end, must go on to the finish for the sake of their general effect. A litigant who undertakes to demolish another man's patent monopoly for his own private ends, thereby sets free many things to which he may have no more right than anybody else. Nobody asks him to raise the question, which he must do at his own expense; but having set in motion the machinery for carrying out the provisions of a Public Act, is it quite right that the litigant should be open to be "squared," even while the Judge is writing out his decision, and so deprive the public of whatever advantage the community might derive from the labours of the Court?

Obviously, so far as the particular interests of the Welsbach and Sunlight Companies are concerned, it is the best thing these old enemies can do to put their horses together and work the same preserved ground. Whatever may be the intrinsic value of the Kern invention, there can be no doubt that the issues in the action which was pending on the Welsbach mantle patent of 1893 were of cardinal importance. The interest of the gas industry at large and the general public in the question of the validity of this patent is as great as it could possibly be; for the upsetting of the patent would mean the immediate throwing open of the mantle trade to the world, whereas if nobody assails it it will remain in force until 1907. If the united monopolists are wise, they will cut down their patent surcharge to the smallest reasonable ratio of the selling price of their specialities, so as to reduce the temptation to attack the preserve in force. The patent in question, it is to be remembered, is of a description which many publicists regard as unjustifiable. It is apparently a "covering patent," having the effect of prolonging the duration of the prior patent out of which it sprang. In Austria and some other countries, the lifetime



of patents of this description is limited to that of the original patent. Under the existing English law, however, patents remain in force irrespective of the expiry or absence of any foreign patent. It is contended that this condition puts the English public under a disadvantage as compared with the foreigner; and the least a favoured patentee can do is to make his tax as light as possible.

This obligation of moral law and sound commercial sense has not hitherto been acted up to by the Welsbach proprietary. Now that their inveterate rivals, the Sunlight people, have succeeded in forcing the position so jealously kept by the Welsbach interest, the British market is for the moment at the mercy of the Westminster firm. It will not be so for long, however, while fancy prices make the trade so inviting to the adventurous. Now, while they still have all the trade, is the opportunity for the Welsbach Company to make a strong effort to keep it, in the fashion already indicated. If they do not—if their coalition with the Sunlight Company was merely a despairing attempt to save an artificial position by buying off a dangerous foe, just as the degenerate monarchs of decaying states used to purchase temporary safety from their enemies—the lesson of history will doubtless be repeated in their experience. It is unnecessary to repeat that lesson here; and we hope we shall never have to use in this connection the equally familiar phrase—We told you so!

#### The London Gas Question.

INTEREST in questions of the gas supply of London shifted last week from the parliamentary arena to the cockpit of the London County Council. We were able to publish in last Tuesday's "JOURNAL" the important memorandum on the existing situation of the London Gas Companies, prepared by Mr. H. E. Haward, the able Comptroller of the Council, who once more in this lengthy document displayed that grip of the important facts of the matter which he temporarily lost when he backed up the laboratory gentlemen in their performances before Mr. Oldroyd's Committee. There is nothing to criticize in Mr. Haward's figures; and it is rather to be regretted that he had not the courage of them himself. Take, for example, his admission that the Companies have to pay about 8s. more per ton for their coals, which works out to an enhanced cost for coals of from 8d. to 10d. per 1000 cubic feet of gas. He goes on to observe that residuals appear to bring in 2s. 6d. per ton more, which is about 3d. per 1000 cubic feet. Deducting this from the enhanced cost of coals, we have a net addition of from 5d. to 7d. on the cost of gas manufactured in London. This is roughly the amount of the higher charge decided upon by the Companies. Mr. Haward might have said so, instead of hinting a fault in the query as to whether they (the Companies) "have given 'the fullest effect to' the factor of dearer residuals. Of course, if these words were only meant as a caution that Mr. Haward could not speak positively on the course of the residuals market for the coming year, there is no exception to be taken to them; but, in the circumstances, they are open to the suspicion that Mr. Haward, knowing his book, was afraid to justify the action of the Companies overmuch.

The report settles down at the half-length into another impeachment of the administration of the Gaslight and Coke Company. This, of course, was to be expected. The only real "gas question" for London—for all England, even—is this of the Gaslight and Coke Company's past, present, and future. It is impossible to exaggerate the importance of the crisis through which this huge undertaking is now passing; because whatever is done to deal with the emergency must exert an influence over a far wider area than that in which the trouble has originated. The system of gas supply by what is not always rightly styled private "enterprise," the principle of the sliding-scale, the system of administering gas undertakings by boards of directors—all these, and many other elements of the general executive problem, are involved in the actual climax of the affairs of the Horseferry Road. All gas people throughout the length and the breadth of the land are asking anxiously what is to be done. Nobody has the smallest sympathy with the Horseferry Road oligarchy that has brought the great undertaking to this pass. The case is too glaring. If it were only a domestic matter, so that one could leave the Directors to lie uneasily upon the bed they have made for themselves, the affair would wear a different aspect. But the mischief is that

they have been bedmakers for others, and that their incapacity afflicts those who would fain have nothing to do with them. The latest excuse offered by the Horseferry Road is the plea of poverty. They have always been "short of capital," as Mr. Field told Lord Brougham's Committee, which is a curious reason for its excessive expenditure during the last fifteen years, as ascertained by Sir James Rankin's Committee. The Company are short of capital now simply because they have come to the end of their once ample tether; but they show no sign of accepting the Prodigal's view of the same situation.

Here is the difficulty. The Governor is flippant, detached, and optimistic; Mr. Field is dogged. Nobody else seems to count. It was they who brought in the Money Bill, and were sent empty away. If they come again next year, and the year after that, in the same way, they will fare the same. That is the prospect before the Company. Parliament will not trust the Directors with another shilling, to misuse as the Powers of Charge Committee said they had squandered their great resources. Unhappily, our forebodings of August last year have been fulfilled to the letter. Mr. Oldroyd's and Lord Brougham's Committees have answered Colonel Makins's strictures on the Powers of Charge Committee. The once well-esteemed policy of Metropolitan gas amalgamation stands hopelessly discredited. If Parliament could dismember the Gaslight and Coke Company next year, and reconstitute the old undertakings as they were, or with a difference, many members would vote for such a measure. Mr. Haward's table, showing the increasing inequality of the prices charged for gas by the two chief representatives of the policy of amalgamation, is a damning count in the renewed indictment of the Horseferry Road system.

Well, what is to be the upshot of it all? The question got "downstairs," in very truth, when it left St. Stephen's for Spring Gardens. The ordinary County Council "Pro-gressive" is not exactly a Rupert of debate. His oratorical style is strongly reminiscent of that habile controversialist, the bus conductor, without the wit. There are exceptions, of course. Mr. Cohen, M.P., is of this honourable category. He wearied of the wild and whirling words which some of his colleagues thought fit to use in what was supposed to be a discussion upon Mr. Haward's report. As he said truly and wisely, the case of the consumers cannot be advanced by the use of violent language in the County Council, and the scattering broadcast of ridiculous aspersions on gas directors. Mr. Cohen understands that the Gaslight and Coke Company are to be pitied as well as blamed. The undertaking needs to be delivered, if the consumers require to be protected. The County Council should set themselves to devise a feasible scheme of reform, nor rest content either with abusing the Gas Companies as if they were pickpockets, or with the pettifogging promptings of those who led the chief London Local Authority into their parliamentary fiascoes of this session. Let the real men of light and leading, like Mr. Cohen, discountenance any recrudescence of the "policy" of pin-pricks, which resulted in the production of the Portable Photometer Bill. Unhappily, the run of members of the Council seem to be incapable of perceiving that Parliament is equally entitled to respect when it rejects a Bill of their promoting as when it deals with a gas company. The recommendation of the Parliamentary Committee, on Mr. Haward's report, was that a conference of Metropolitan Local Authorities should be convened to consider the charges for gas in London. This was very right and reasonable; but the perfervid Progressive mind must needs spoil the reference by adding the subjects of the quality of the gas, as well as the character of the consumers' meters.

Both additions are superfluities. The quality of the gas supplied by the Gaslight and Coke Company has never been questioned; indeed, the Company received so good a testimonial on this account before Mr. Oldroyd's Committee that opinions were freely expressed that the Company's own Bill ought to pass on the strength of it. The manufacture of the South Metropolitan Company's gas has been otherwise settled. There remains only the Commercial district to serve as the hunting-ground of the peripatetic photometrist; but he will find no "game" in those regions. There is no further question as to meters, after this year's legislation. The only real business for the proposed conference is the hard case of the Chartered, and what alternative suggestion the local authorities should



offer to Parliament when the Company next appeal for more capital. It will not have been overlooked by the astute Mr. Haward that he under-estimated the amount of the Company's balance for the past half year. The announcement has been made that the revenue at the disposal of the Directors will enable them to recommend the payment of the full statutory dividend at the rate of £4 8s. per cent. per annum on the consolidated stock (11 per cent. on the old stock) and carry forward £296,755. This comes as a surprise, grateful or otherwise as the case may be. One effect the announcement will certainly produce—it must enhance the interest of Mr. Haward's point about the incidence of sliding-scale increases and decreases of dividend. We have always entertained an uncomfortable suspicion that while the working of the sliding-scale was "all wery capital," as the elder Weller remarked of something else, while gas prices were coming down, it might turn out differently in the case of a substantial rise. This is not because the citizen objects to gas companies paying good dividends, but simply because all the public care for is the selling price of gas, just as in the case of every other commodity. The buyer neither knows nor cares whether the seller of what he wants is on the verge of bankruptcy or is rolling in wealth. He only thinks of the price and quality of the article; and if his thoughts wander to the condition of the merchant, he is pleased to notice the prosperity of a worthy tradesman. Bad and dear wares are in the ordinary man's mind associated with unprofitable commerce. Now, in regard to the sliding-scale of gas companies, some people seem to imagine that the beauty of the arrangement lies in the fact that when the price of gas is coming down, as is usually the case when the settlement is fresh, the shareholders have to allow the public 70 or 80 per cent. of whatever advantage there may be, while they only come in for the small remainder. We do not believe that the public take this view of the matter at all. They want gas as cheap as possible, and they do not care one straw about the incidentals. On the other hand, when the disagreeable necessity arises for an increase of price, what do the public care for the painful circumstance that the shareholders suffer a diminution of dividend which is, after all, only represented by a sum of money six or seven times less than the amount of their surcharge? This effect is described by Mr. Haward as "the reverse" of satisfactory to the consumers." He is merely saying what people are likely to think.

He and others, however, are not justified in merely talking "about it and about." They must discover a policy, if they can by any amount of pondering come by a remedy. We fear that Parliament will prove impatient of any repeated attempt to assert the sanctity of the initial price in the name of the purchasers of premium capital. Only 26 per cent. of the London Gas Companies' stock is of this class; all the rest receiving the full rate of dividend. Mr. Haward should have added to this proportion the capital which has changed hands at the market value since 1876, which would put a different aspect on the case. Still, it is difficult to believe that where Parliament is dissatisfied with the manner in which a gas company has discharged its trust, the delinquents will be allowed to escape unpunished because somebody has bought stock at a premium governed more or less by the standard price. The Directors are the proper guardians of the shareholders' interests; and where incompetency has been permitted to go blameless, the supposed sanctuary of the standard price will hardly accommodate all the applicants for its protection. The shareholders ought to look after the Directors, if necessary. Is Parliament to be stultified by having tried an experiment which is found not to answer? Sir James Rankin's Committee hit upon the standard price as affording an opening for coming to a fresh arrangement of gas companies' finances. The way will not be barred by setting up the notice "No Thoroughfare—Standard Price not to be Touched." Meanwhile, to the question of what is to be done there is only the answer—wait, and we shall see.

#### Mr. Livesey on Municipal Trading.

MR. GEORGE LIVESEY gave evidence this day week before the Committee on Municipal Trading; and a special report of the proceedings will be found in another column. Mr. Livesey had taken the trouble to prepare a proof in opposition to the popular contention that there is something desirable in the principle of municipal trading; and he made some strong points against it in practice. It is not to be

supposed that he succeeded in converting to his views those members of the Committee who have adopted the principle; but he nevertheless contrived to demolish several pretty theories, and to bring out some striking facts and figures. There was the streets argument, for example, to which we referred last week. Mr. Livesey said that there is very little in this argument, which is so often used as if it would clench the matter. When local authorities enjoy the sole power of doing everything to their own streets, the public are liable to suffer every bit as much inconvenience, and more, as if a wicked company were laying pipes in the roadway; and the road work is apt to last longer and cost more, in the ratio of the idleness and inferiority of corporation workmen to the employees of commercial firms. And as to the monopoly argument, there is no more tyrannical monopoly than your corporation department, which fears no man, except Trade Unionists with votes. If gas undertakings are to be municipalized, then Mr. Livesey would prefer that this should be done on the Scotch principle of performing the service at cost price. Naturally some of Mr. Livesey's critics on the Committee thought the ratepayers have the power to see that their wishes are obeyed by the Corporation. Theoretically, of course, this is so; but Mr. Livesey insisted that practically the power of the individual ratepayer, or of many unorganized ratepayers, is nothing. Too great subserviency to Trade Union desires; inability to recognize, and disinclination to adequately reward, merit in the higher ranks of their officers; lack of enterprise in opening out new developments; grasping at profits in reduction of rates—these are some of the positive failings Mr. Livesey observes in trading municipalities. Negatively, he denies that they can obtain capital cheaper than statutory companies. Time was when the process of municipalization of gas undertakings was more advantageous than it can be now. That was when the old order of maximum dividends was being changed for the new settlement of sliding-scale and auction clauses. At this juncture, a gas undertaking can usually be bought up to advantage; but not otherwise. It would not pay to buy up a sliding-scale company or any modern gas company enjoying the fulness of its commercial development. Certainly, the consumers would have nothing to gain, and might have something to lose by such a transfer. Generally speaking, Mr. Livesey holds that the proper office of a municipality is to govern, to administer, and to control; and that it loses more than it gains by going into trade, to which occupation neither the constitution of corporations nor the character of their membership is usually well adapted.

#### The Need for a Coal Commission.

In his address yesterday week to the annual meeting of the Victoria Institute, on "Our Coal Reserves at the Close of the Nineteenth Century," Professor Edward Hull lent the weight of his authority to the demand which is being pressed upon the Government by Mr. D. A. Thomas, M.P., for the appointment of a new Royal Commission on the question of our coal supplies. We have before now more than once pointed out the need for inquiry into some previously neglected aspects of the subject, and for the bringing up to date of the information and estimates contained in the report of the Argyll Commission of 1871, but have suggested that a Committee of experts would probably suffice. This view Professor Hull's opinions would support, though he speaks of a Royal Commission. We only mention the point because a Committee would be the cheaper and more expeditious form of inquiry.

The questions for consideration are divided by Professor Hull into four groups. In the first place, in the terms of Mr. Thomas's proposed resolution, the persons appointed to investigate the subject would have to determine "the quantity of coal available for naval, commercial, and other purposes, contained in the coalfields of the United Kingdom." For this purpose the information collected by the Argyll Commission would provide a wide basis. In the second place, the question of the area and resources of the "concealed" or overlaid coal-bearing strata would require to be investigated, as we already know of much additional light that has been thrown on the subject by fresh boring experiments in the midland districts and the south-east of England since the 1871 report was compiled. The third branch of the subject is suggested by the terms of reference proposed by Mr. Thomas—namely, "to report whether any means should be taken to prevent the too rapid exhaustion of coal, and to preserve it for the use of British



"subjects." This would involve the questions of greater economy in consumption, and of an export duty on coal—the latter one of the most frequently urged panaceas for the present-day ills of the coal consumer. Finally, and by no means of least importance, inquiry should be made into the question as to how far a permanent rise in the price of coal would place our manufacturers at a disadvantage as compared with our foreign competitors, and would induce the importation of coal from America or other coal-producing countries.

In such terms of reference, a Committee or Commission would find scope for much useful work; and their report would be a document of very considerable interest and value to the nation. No one would have better right to a place on the Commission than Professor Hull, whose work on "The Coalfields of Great Britain" was the first, and remains the standard, book of reference on this all-important subject. We trust that the Government will accede to Mr. Thomas's request without further delay.

#### Four per Cent.

It is but last week that we were discussing the possibility of a rise in the value of money, and, consequently, of the yield on investments. A movement in this direction—whether temporary or lasting depends largely on the course of events abroad—was made on Thursday last, when the Directors of the Bank of England raised their rate from 3 to 4 per cent., at which latter figure it stood from the last Thursday in January until May 24. In the earliest weeks of the year the rate was still higher; so that money has been cheap for only eight weeks of this year up to the present, and is likely, we think, to be dear rather than plentiful for the rest of 1900. As luck will have it, too, the seasons of cheap money generally occur, as in this present instance, when gas companies are lenders to, rather than borrowers from, their bankers. For the next few weeks they will benefit by the higher rate of interest; but when dividends are paid, and the winter supplies of coal have to be purchased at present prices, while the cash for a summer quarter's consumption of gas is coming in, dear money will not have a welcome effect upon the half year's profits. Even, however, were better news from China to cause an easier condition of the Money Market now, we can see no reason to expect anything but a high bank rate in the early winter months.

### WATER AND SANITARY AFFAIRS.

THE result of the proceedings before the Earl of Camperdown's Committee on the East London Water Bill last week, as reported elsewhere, should be not less gratifying to the water consumers than to the Directors of the Company, as by the passing of the Bill additional storage to the extent of 5300 million gallons will be provided, bringing up the total capacity to 7700 million gallons. It has been the singular ill fortune of this Company to be checked in their endeavours to meet the requirements of their district, and then to be abused for being compelled to curtail the supply of water. Curiously enough, when the Company last year promoted a Bill to obtain power to place their works on a more adequate footing—an object which, one would have thought, would have obtained the unhesitating support of Parliament—their efforts were thwarted by a Committee of the Upper House. Nothing daunted, however, they applied again this session, and have been successful. The works now sanctioned constitute the last instalment of those submitted to Lord Balfour's Commission of 1892-3; and their estimated cost will be £1,338,000. This is a large amount; but its expenditure will be attended with one very desirable result—East London will be safeguarded from any scarcity of water for many years to come. Furthermore, the Company are authorized to take from time to time, with the consent of the Local Government Board and the Conservators of the Thames, an extra 10 million gallons daily from the river, for which privilege they will pay the Conservators £1000 a year. In the House of Commons the Bill met with opposition from the London County Council and other interested parties; but when it reached the Upper House these had all been satisfied with the exception of the Middlesex County Council. A clause was, however, drafted with respect to the supply of certain places in the county in cases of emergency. This met the Council's views, and (with a slight verbal alteration) those

of Hertfordshire also. Everything seemed to be in a fair way for settlement, when objections were raised on behalf of the London County Council, who had not petitioned either against the Bill or against alterations therein. The Council urged that the clause would authorize the abstraction of a larger quantity of water from the Thames for the supply of a district in Middlesex which at present has no right to take that water. It was explained that their reason for not presenting a petition was because they thought the House of Lords would pass the Bill as it left the Commons. Lord Camperdown told them, in effect, that they were not justified in entertaining any such idea; and as they had quietly let the matter go on, they had no *locus standi* before the Committee. The clause was accordingly accepted. With the passing of this Bill, the only two London Water Companies in Parliament this session—the East London and the Lambeth—have secured the powers they sought for placing their undertakings on a firmer basis, while the London County Council Purchase and the Welsh Supply Bill were not allowed to proceed. This fact, as pointed out by Mr. Pember, in opening the case for the East London Bill before Lord Camperdown, is significant of the present temper of Parliament on the London Water Question.

We have been having a good spell of tropical weather lately; but fortunately there has been no indication of a falling off in the customary supply of water in the Metropolis. Not even in East London has there been, as far as we are aware, a word of complaint; and therefore it may be concluded that the Water Companies are meeting the extra demands which the exceptional weather is making upon them. This fact, however, did not prevent the "Daily News" from inveighing against the water supply and those who furnish it, in a leading article which appeared on Monday last week. The writer seems to be specially annoyed at the rejection by Parliament of the Welsh scheme of the London County Council, and at the approval by Lord Llandaff's Commission of the scheme submitted to their predecessors for the construction of storage reservoirs in the valley of the Thames, and of the proposal to take the flood waters of that river, as alternatives to the more stupendous undertaking favoured at Spring Gardens. With regard to the last matter, he abuses the Commissioners for following the opinion of "rural" (*sic*) experts, which led them to the conclusion that flood water might safely be taken "if it was drawn into a storage reservoir before being let in to the filter-heads" (*sic*). Now, one of the so-called "rural" experts was no less a personage than Sir Alexander Binnie, who, while expressing the opinion that no water should be drawn out of the Thames when it was in a "turbid" state, acknowledged that he could not, without careful inquiry, define turbidity. The other "rural" experts, such as Sir W. Crookes, Professor Dewar, Mr. R. E. Middleton, and Mr. Groves, the Chemist to the Thames Conservancy, failed to see any objection to taking it; and, as the result of all the evidence, the Commissioners came to the conclusion that it was not necessary to "impose any restrictions" upon the taking of flood water, and that it might be left to the discretion of the Engineers of the Companies to determine how soon after a flood they would draw this water. The writer complains that the Commissioners make light of the fact that waters in times of flood contain more organic impurity derived from sewage than average Thames water. We venture to think they were justified in their conclusion by the evidence laid before them. It is perhaps to be regretted they were not able to avail themselves of the riper knowledge and wider experience possessed by their newspaper critic, as these would doubtless have far outweighed the opinions of the "rural" experts of whom he speaks so contemptuously.

The next point on which the "Daily News" writer questions the wisdom of the Commissioners is their approval of the Staines reservoirs scheme. Here, again, it is regrettable that the Commission of 1892-3 did not have the newspaper man before them as a witness, as he would have opened their eyes to the enormity of the undertaking they favoured so strongly. Far from the scheme being commendable, he would have told them that it was simply a "device for increasing the means of supplying London with water which always runs the risk of serious pollution." But on æsthetic grounds he would have roundly condemned the scheme. He tells us that these so-called reservoirs will not really be sheets of water, but "huge



"tanks raised high above the natural surface of the country." He draws a frightful picture of the disfigurement of the locality by their construction. He asks his reader to "conceive the whole of Hyde Park surrounded by an enormous bank as high as a two-storeyed house, completely obstructing the view!" One can conceive this, but the conception will not be in the least like the Staines reservoir now under construction; for there are no houses, or but one or two, near it. In fact, the site was specially selected for its adaptability for the making of such a reservoir, while it was not suitable for erecting residential property. Our sapient and truthful critic complains that the reservoir will have to be built with the "maximum of ugliness—hard, straight banks, without a curve or a blade of grass." He has evidently never been invited to see the works at Staines, or he would have found that the embankments are to be sown with grass. We are surprised that the writer has nothing to say about the puddle wall being such a flimsy structure that it will give way when the reservoir comes to be filled—breaking the embankments, and liberating the enormous body of water to devastate the country, flood the Home Park, and sap the foundations of the Royal Residence at Windsor! What a chance missed, because readers of the "Daily News" might really have believed this! The writer wants to know why these "monstrosities" are called into existence; and he answers his question to his own satisfaction—to prevent, for a time, London going to Wales. He then asks why London is to be precluded from doing this, and to be put off with makeshifts; and this inquiry he answers by saying it is because the water supply is in the hands of "half-a-dozen monopolist Companies." And we would ask the writer where the water supply of London would have been if the Companies had not come forward to provide it. The writer of the article thinks "the creation of the gigantic tanks which the Commission contemplates should be postponed at least until the water supply is in the hands of men who will have only the public good, and not the pockets of shareholders, to consider." The works now in progress at Staines have received parliamentary sanction after searching inquiry, and when ready, as they will be before very long, they will furnish water for the supply of another million of the population. Before the next instalment of the scheme will be called for, the water-works of the Metropolis may be in other hands, but probably not those contemplated by the writer in the "Daily News." But whether they are or not, if the present works are found to be such "monstrosities" as he makes out, and their so-called "ugliness" is not compensated for by their great utility, there will be plenty of opportunity for him, and those holding similar opinions, to raise objections to the prosecution of any further undertakings of this character.

**The "Transactions" of the British Association of Water-Works Engineers.**—We have received Vol. IV. of the above-named work, containing a report of the proceedings at the annual meeting held in London last year, under the presidency of Mr. W. Watts, M.Inst.M. & M.E., of Sheffield, whose portrait is given as a frontispiece. The technical matters brought before the members were noticed in the "JOURNAL" at the time. Dr. Kemna's paper on "The Biology of Sand Filtration" is accompanied by some valuable plates. The papers and discussions are supplemented by the rules, accounts, and lists of members of the Association. The volume has been produced under the editorship of the Secretary, Mr. Percy Griffith, M.Inst.C.E., &c. It is somewhat late in appearing, seeing that the fifth annual meeting has been held.

**The Arrangement between the Welsbach and Sunlight Companies.**—Until the terms of the arrangement arrived at between the Directors of the above-named Companies, which resulted in the stoppage of the recent litigation, commented upon elsewhere, have been submitted to the shareholders of the Sunlight Company, nothing official can be published in regard thereto. It appears, however, that, in the circular which has been issued convening a meeting of the Company for Friday next, the consideration is put at £110,000 (the capital of the Sunlight Company being £185,000), by a bond or debenture stock, on which the Welsbach Company will pay a minimum dividend of 5½ per cent., or the purchase money may be paid in a lump sum. Should the stock be issued, it will rank before all the other stock of the Welsbach Company. There are three courses open to the Sunlight shareholders; but the Directors are disposed to recommend the one under which a distribution will be made of whatever remains in hand of the stock after satisfying all claims and liabilities. It is estimated that this will represent about 10s. in nominal amount of stock for each existing share in the Company.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 237.)

THE Stock Markets have had a very poor week. The anxiety produced by the state of affairs in the far East caused general depression; while the unstable condition of the Money Market induced even the professional operator to stand shyly aloof, at all events until the action of the Bank of England on Thursday should be known. In addition to this, the tropical heat indisposed to activity. The net result was that business almost came to a standstill; and it was just as well that the Exchange was closed for repairs on Saturday. Prices in every department have suffered materially. Consols on Friday touched 97½; and railways were very flat on bad dividend prospects. It is noteworthy that the same section of the Press which condoles with the Railway Companies over a 40 per cent. rise in the price of their coal, has nothing but the most virulent abuse for the Gas Companies who are much greater sufferers in this respect. As was generally expected, the Bank of England rate was raised on Thursday to 4 cent., from the 3 per cent. rate which had lasted five weeks. The state of the reserve required nothing less than this advance. Business in the Gas Market was very slack indeed—in fact, there was hardly anything doing except on the opening day, and even then transactions were very limited. There was no settled tendency either way, but rather a state of suspense; changes of quotations being both few in number and slight in degree. In Gaslights, the ordinary stock opened a point easier, and then remained steady all the rest of the week, unmoved by the announcement that the dividend to be paid next month will be at the rate of £4 8s. per cent., a reduction of ½ per cent. off the last-declared dividend. This reduction is imposed on the Company by their most recent Act, which enacts that a rise in price made at any time in the course of a year shall reduce the dividend over the entire year. The provisions of the South Metropolitan Act are somewhat similar; but the Commercial Company are not affected in like manner. There was very little business in South Metropolitan; but the quotation was lowered a point. Commercial were quite quiet and unchanged. In the Suburban and Provincial group, business was almost at dead low water; and the only feature was a slight recovery in Alliance and Dublin. Matters were equally quiet among the Continental Companies. The only change was a fall of a point in Imperial; but the actual prices recorded for the few transactions which were marked did not show any shrinkage. Among the undertakings in the remotest world, the only move was a slight reduction in Buenos Ayres. Business in Water was almost devoid of feature; but New River fell slightly.

The daily operations were not of a character to demand detailed notice. On Monday, Gaslight ordinary fell 1. On Wednesday, South Metropolitan fell 1, and Buenos Ayres ½; but both Alliances rose ½. New River fell 2. On Thursday, Imperial Continental fell 1.

### ELECTRIC LIGHTING MEMORANDA.

**The Opposition to the Electric Power Bills—American and British Lamp Practice—The Case of St. Pancras—An Insolvent Undertaking.**

THE subject of municipal trading crops up again in a special "Times" article on the Electric Power Bills. The writer tells over again the story of the rejection last year by the House of Commons, at the instigation of the Association of Municipal Corporations, of the Bill for providing electric power in bulk in a Midland area. He calls this Association a Trade Union of the officials of municipal corporations, and ascribes to its influence the persistence of the municipal dog in lying in his manger to the distress of the electrical animal. This is a left-handed compliment to the electricity-generation-in-bulk people; but doubtless the writer meant well. This year, he says, a determined effort was made to dislodge the municipal dog; and so strong was the attack that the corporations gave way for the time being. The Power Bills were sent upstairs, where three out of four of the schemes were passed by Sir James Kitson's Committee. Now, it appears, the indomitable Association of Municipal Corporations have decided to take advantage of all the forms of the Houses in order to upset the findings of the Committee. This is condemned as an outrageous proceeding. It at least shows once more that when municipalities think their commercial interests jeopardized, they care not how the public suffer so long as they are protected. A little municipality with a pulsing electricity supply undertaking struggling along with the utmost difficulty at a selling price of 8d. per unit, arrogates to itself the right to bar the way of a great power company who propose to supply an extensive district with electricity in any quantity at from 1d. to 2d. per unit. What it could scarcely do for itself it arranges to get done through the Association. The worst of it is that with a little luck the machinations of the municipalities may possibly succeed.

How differently altered circumstances affect questions of policy appears very strikingly in the contemporary conditions of the electric incandescent lamp trade of this country and America. It has to be remembered that consumers' electricity meters are not much used in the United States, most of the business of



electric lighting being done upon a rental basis. The companies do not publish their accounts, nor show their profits; so that they are perfectly free to quote private terms to favoured customers, or, indeed, to make money by any and every device at their command. This being the case, they find it pays to give particular attention to the working of lamps, and they frequently supply all lamps gratis to their customers. The cost of the electricity which a lamp uses, or wastes, in its lifetime being very much greater than the price of the best lamp itself, it is good business for a rental company to co-operate with the lamp manufacturers for the production of an economical lamp, and then to see that the consumer uses no other. In England, the opposite conditions prevail. Not only is the supply of electricity usually by meter, but the undertaker is forbidden by law to prescribe the kind of lamp to be used by his customer. This prohibition is not absolutely embodied in central station practice; but its spirit remains and animates the presumption that the lamp is the consumers' affair. Of late years, as it has often been pointed out, the consumer has been victimized by having a high-voltage lamp thrust upon him—a kind of lamp which the knowing American supply company does not patronize.

That famous example of municipal electricity supply, the St. Pancras Vestry electric lighting undertaking, supplied the accounts which were analyzed in the last issue of the "Electrical Review." As our contemporary very justly remarks, the annual accounts of this Vestry's undertaking are always looked out for as the time for their publication comes round, for a variety of reasons. It is one of the oldest of local authorities' ventures of the kind, for one thing; and it has always exhibited some curiosities of capital or revenue, or both. After seven years, the business is still growing, and the capital expended now stands at £288,147. The average price per unit sold is 4.29d., and there was a gross revenue of £45,066 for the past year, of which £17,650 is entered as gross profit. It cost to generate the unit 2.66d., whereof coal stands for 0.92d. This fact ought to be enough to explain to silly persons in technical colleges and on local authorities why dearer coal does not hit the electric lighting business so hard as it does gas manufacture. The electrical engineer's coal bill is a heavy one, the heaviest he has to pay indeed; but it only accounts for one-fourth or one-fifth of the price he has to charge for his unit. Capital charges are his bugbear. St. Pancras had last year to find £7321 for interest on loans and £3374 for sinking fund payments. This was under 4 per cent.; so that the full burden cannot have come on for the gross amount of capital shown. Be this as it may, interest and sinking fund left a "net profit" of £6955, which was appropriated as follows: Depreciation of accumulators, £1000; depreciation of meters, £600; to the credit of the lighting rate, £2000; to reserve account, £4000; to cover bad debts, £112; the remainder being carried forward.

It is hardly necessary to point out that this is not making both ends meet. A gross profit of at least 7 per cent. on the capital expended is the smallest out of which adequate provision can be made for interest—say, 3 per cent.; sinking fund (say) 1½ per cent., depreciation (say) 2½ per cent. Afterwards such matters as reserve fund can be provided for, if there is money enough. Here is St. Pancras, after seven years, with nearly £300,000 to pay interest upon and redeem; and not one penny can be spared yet for general depreciation of machinery or mains. It is playing with the business to allocate £1000 a year to depreciate batteries—who knows what these things are worth?—and meters with £600. The Vestry supply 315 arc lamps, mostly employed in street lighting, for which they pay themselves. We mentioned the state of the finances of the undertaking last month, when the other leading electrical journal published an analysis of the accounts; but no apology is needed for returning to the charge, inasmuch as the example is a very conspicuous one. Surely, if St. Pancras cannot now show a clear balance-sheet, its chances of ever doing so must be getting thin. And if the St. Pancras Vestry electricity supply undertaking is not a paying business, where shall the advocates of municipal trading find a more favourable field for the application and development of the principle? They cannot complain of the difficulty of having over-cheap gas to contend with, at any rate.

#### THE "ENGINEER" ON THE LONDON GAS BILLS.

THE parliamentary dealings with the gas supply of London have been treated by the "Engineer" with the respect due to the importance of the subject. It is greatly to be desired that other journals of the first rank would do likewise; for in this way knowledge is spread. The gas industry has notoriously always suffered from the ignorance of ordinarily well-instructed people as to its peculiar conditions and necessities. On this occasion, the "Engineer" has endeavoured to do justice to the subject, and has devoted two long ably-written articles to the Bills brought before Mr. Oldroyd's Committee. The first article, which appeared on the 6th inst., dealt with the Portable Photometer Bill of the London County Council and that of the Gaslight and Coke Company, and did so in a style that redounded greatly to the writer's credit. He evidently knows all that it is necessary to know about the photometry of gas; and he denounced the County Council Bill in good set terms, as a trustworthy and independent expert should. He dismissed as

unsatisfactory the case sought to be made by the witnesses for the County Council out of their secret detective testings, and applauded the decision of the Committee for refusing to give the Council "power to harass the Gas Companies" by peripatetic penalty examinations. With regard to the Gaslight and Coke Company, he was sharp enough to see that the Company's Bill was lost because it ignored the findings of the Powers of Charge Committee. Everybody outside the Horseferry Road can tell what is the matter with this Company.

When the writer in the "Engineer" comes to deal with the South Metropolitan Company's case, which he does in the current number, he betrays a certain degree of feebleness in grasping the issues deliberately raised by the Company, which we trust to be able to cure by offering a little further explanation. That he has tried to follow the matter in all its ramifications is shown by his having collated the part of the Company's case relating to the illuminating power of their gas with Mr. Webber's Gas Institute lecture. He is highly complimentary to Mr. Webber individually, but holds opposing views as to the merits of "simple coal gas" for London. He sums up these views in the statement that he can see no reason "why simple coal gas should be adopted in London, in place of a mixture of coal gas and carburetted water gas of 16-candle power. The arguments in favour of the adoption of simple coal gas are, in reality, yet more forcible arguments in favour of simple water gas. For the present, we believe that the 16-candle power mixture supplied on the north side of the Thames is the most advantageous supply from the general consumers' standpoint. Later it may be advantageous to lower the illuminating power, by increasing the proportion of simple water gas in the mixture. We believe the South Metropolitan Gas Company have taken a retrograde step in obtaining powers to supply simple coal gas, and have made a wholly irrational movement in offering flat-flame burners gratis to consumers. *Do they thereby hope to stem the increasing use of incandescent lighting?*" The italics are ours. This sentence, in conjunction with an earlier remark that "it is to the present interest of the Company to keep the flat-flame burners in use, since even Mr. Sugg's latest pattern burner consumes fully five times as much coal gas as does an incandescent burner affording the same light" betrays a singular narrow-mindedness in the writer, and shows him to be no gas engineer. Why, this is the stupid old calumny that used to be cherished by the amateurs of the Welsbach system to explain the suspicion that members of the gas engineering profession undoubtedly entertained at first as to the serviceability of the invention. We are almost ashamed to repeat the assurance that gas managers know on which side their bread is buttered. It is rather disheartening to find, at this time of day, the "Engineer" gravely declaring that an extravagant burner is the gas companies' best friend. The fact, however, only goes to show how difficult it is for outsiders to understand even the first principles of the gas business. It is particularly sad and stupid of anybody to talk in this way of the South Metropolitan Company, who have done more than any other London Gas Company to help the local authorities to the incandescent system for street lighting.

But having set our contemporary right on this point, how can we convince him that so far from the South Metropolitan Company having taken a retrograde step in breaking with the tradition of 16-candle gas, they are putting themselves in a position which can be defended on the soundest economical, technical, and commercial grounds? He does not accept the case made out by the Company's witnesses to the satisfaction of the Committee, and amplified in Mr. Webber's lecture. We are afraid that if such a mass of proof does not convince him, nothing will. It is therefore hopeless to go over this ground again; and so we will take what new points he has to offer against the proposal of the South Metropolitan Company which the opposing experts, whom he justly regards as having been discredited by their performances on the County Council Bill, failed to bring before the Committee. Supposing that the "Engineer" writer had been in the room, what would he have said to the Committee? Apparently, that the Company ought not to be permitted to give their consumers flat-flame burners better suited than those hitherto in general use, for burning uncarburetted gas. Also, that if the Company want to "let down" their gas, they had better do so by the addition of "simple"—that is, uncarburetted—water gas. But surely, this writer ignores the obvious objection to any considerable addition of plain water gas to the ordinary supply of our towns. He forgets, also, that English gas companies must make coal gas in order to obtain the coke for water-gas generators; and he is plainly ignorant of the fact that natural, or simple, coal gas is the cheapest gas that a London or any other British gas company can possibly send out to the customers. The South Metropolitan Company wanted the simplest and most intelligible of reliefs from an obligation to "doctor" their gas. Their opponents raised the objection that the drop of from 16 to 14 candles illuminating power would injuriously affect the users of flat-flame burners; and it was to overcome this objection—whatever it might be worth—that the Company offered to give the people the most suitable burner procurable for the purpose. This is the "irrational movement" complained of by their critic of the "Engineer."

But, the critic goes on to remark, if the Company had really believed all that Mr. Webber had to say about the coming of incandescent lighting, they should have offered to supply not flat-flame but incandescent burners, and gone in for "straight"



water gas. He again forgets the patents and the prices. We have already touched upon the objection to distributing water gas pure and simple. Suffice it to say that this is not done anywhere, even in America. It is not the case that in Germany simple coal gas is made because the duty on petroleum renders carburetted water gas prohibitively dear, but because it is the natural product of the cheapest available coal. We do not believe that in Germany, as the "Engineer" declares, the fashion of gas manufacture will change from low-grade coal gas to Dellwik water gas slightly carburetted with benzol vapour. Such a mixture is of too low a calorific power. It may answer in the case of a new undertaking, where all the conditions can be adapted to the particular requirements; but it is not practical gas politics for a London Company. The "Engineer" alleges that the supply of simple coal gas at the present day in London "is an illogical proceeding." On the contrary, it is a most reasonable arrangement, as the evidence abundantly proved; and no amount of "logic" would suffice to obtain a London Gas Company permission to distribute uncarburetted water gas, which the writer seems to prefer. For logic, however, commend us to this passage:—

We have already spoken of carburetted water gas, which may be produced of practically any desired illuminating power. In many places, 14 or 16 candle power carburetted water gas can be made as cheaply as coal gas, and forms 50 per cent. of the gas distributed. If made of somewhat higher illuminating power, it will, when added to 14-candle power coal gas in proper proportion, give a mixed gas of over 16-candle power. Such a mixed gas is supplied to the greater part of London; the South Metropolitan Company's district excepted. Its cost should not be, and is not in many cases, more than 1d. per 1000 cubic feet greater than the cost of simple coal gas. We have not forgotten in making this statement that the oil used in the manufacture of carburetted water gas now costs about 5d. per gallon. The consumer of gas for heating purposes will often need to burn 5 to 10 per cent. more of this mixed gas than of coal gas. This is its sole disadvantage.

That is all! The consumer will only need to pay an increased gas-bill of from 5 to 10 per cent., in quantity, and a rate per 1000 cubic feet which "should not" be more than a penny higher than is necessary. It scarcely seems likely that Parliament would listen patiently to such a tale. The "Engineer" contends that this mixed gas will be burnt to greater advantage than simple coal gas in "the flat-flame burners best adapted for the gas in each case." Here we have the bad old argument of the County Council experts over again—that the least efficient type of burner is to govern the gas industry in perpetuity.

Nowhere does the "Engineer" recognize the necessity for maintaining the calorific value of town's gas, however made, at about the standard to which the public are accustomed, which is the core of the whole matter. Instead of keeping this simple rule in view, we get such a passage as the following:—

Simple coal gas has a considerably higher calorific power than simple water gas, but affords a flame of much lower temperature. Broadly speaking, simple coal gas has twice the efficiency of simple water gas for most heating purposes; while in incandescent burners simple water gas affords twice the lighting duty of simple coal gas in similar burners. Simple water gas can be produced under the Dellwik process for about one-fourth the cost of simple coal gas. Hence, if there were no other than these two applications of gas, water gas would, in virtue of its cheapness, supplant coal gas. There remains, however, the chief application of gas—viz., lighting by self-luminous flames, for which simple water gas is useless. As soon as this application ceases, coal gas must give place to simple water gas as the staple supply throughout the country, unless it can be produced at about half its present cost.

Observe the data assumed here. It is admitted that the simple water gas is only of about half the fuel value of coal gas, which means that double the quantity must be put in circulation. Passing over the claim for a double efficiency with incandescent burners, we learn that Dellwik water gas can be made for about one-fourth the cost of simple coal gas. From what? Is it so certain that, even if this were true, it would pay to distribute water gas? If the writer had been a gas manager, he would have known that the cost price of gas into the holder is not everything. Taking his own claims as they stand, by the time his Dellwik gas reached the London consumer, through the complaisance of the Home Office, the latter would not find his gas-bills very materially lightened.

In conclusion, we hope and believe that our colleague of the "Engineer," who must be friendly to the gas industry in his heart, will not be justified in his dismal foreboding that "gas consumers in South London will be sufferers by the gas legislation of the present year." Whatever the result may be to the Company, the consumers have been more than compensated by the terms upon which the Company have agreed to alter the character of their supply. The whole face-cost, and very much more, of enrichment has been given to the public; and the Company will have to get down to 2s. per 1000 cubic feet before the shareholders will be as well off as they were under the old settlement. There will be no carburetted water gas in that cheap article, whenever it is put upon the market.

In the course of a paper which appears in the "Proceedings" of the Institution of Civil Engineers, Mr. G. J. Morrison gives the following rule for gauging concrete, which he says he has always found satisfactory: Decide tentatively on the quantity of large and small stones, if necessary trying two or three proportions. Add sand by degrees till the mixture, after being well turned over and shaken down, shows a decided increase in bulk (at least 5 per cent.); then add cement to an amount equal to between one-third and one-half of the sand.

## LORD AVEBURY ON MUNICIPAL TRADING.

PUBLIC attention is, we are glad to observe, being increasingly drawn to the practical questions involved in the craze for the municipalization of public services generally without regard to the expediency of every such particular enterprise. It is always so much easier to catch the public ear with clap-trap generalizations which herald the approaching regeneration of society, than to get citizens to listen when it is sought to measure the practicability of well-sounding theories by the standard of hard facts and actual experiences. The callow politician who knows how to set everything right, but who excludes from all his calculations the factor of human nature which dominates all systems and all societies, can always command so large an audience of persons less informed than himself, that it is very necessary that men of practical experience should, from time to time, infuse into the discussion a corrective of common, work-a-day sense. We, therefore, welcome the appearance, in the current number of the "Contemporary Review," of a statement by Lord Avebury (under which name it is necessary to remind oneself that one is meeting Sir John Lubbock of yore) of some of the many objections to which not a few of the proposals for widening the scope of municipal enterprise are open.

Lord Avebury reminds us that the old school of Radicals (Mill, Fawcett, Cobden, and Bright) were all strongly opposed to any form of trading by governments and municipalities, and remarks upon the fact that the new school of Radicals—or, rather, Progressives—have deserted entirely those principles of their political forebears, and "seem to consider that we might place over any municipal buildings the motto which Huc saw over a Chinese shop: 'All sorts of business transacted here with unfailing success.'" That is not the only respect in which the principles of the earlier school of reformers have fallen into disrepute; but principles are stronger than fads, and their truth will remain and be recognized when playing to the democratic gallery at the expense of the public welfare has met its due retribution. Lord Avebury gives a compendious list of the varied businesses which it is now suggested that municipalities should undertake; and we may note, in passing, that among them is to be found the following rather curious example of the author composing and the compositor disposing: "Manufacture of electrical fitting of the residual products of gas." What Lord Avebury wrote was probably something different. He then first enumerates, and afterwards amplifies, the principal objections which he sees to indiscriminate municipalization. The first he puts forward is "the enormous increase of debt which such a policy will involve," the present indebtedness of local bodies (somewhere about £250,000,000) being given prominence, and an estimate made of the probable addition thereto which would follow from the taking over of the gas and water companies, housing schemes, tramways, &c. "Add on," says the writer, "the capital required for manufacturing, and it is evident how enormous our local indebtedness will become if some check is not put to the present tendency." Now we do not think that this is by any means the strongest argument to bring forward against the Progressive programme—at any rate, not as Lord Avebury shapes it. What is there specially alarming or financially unsound in a local debt, as such? The whole question is whether the debt is justified by the possession of an asset of equal value. If so, what matter how large it be? It cannot be argued that while a company may owe its debenture-holders a million sterling and be prosperous, that a corporation is necessarily in a state of financial rottenness if it take over the same property and owe the same amount to the same or different people. The question is, can the corporation maintain the property at the same value by equally good management of its affairs. If so, what matter the size of the loan?

We are sorry Lord Avebury should have weakened his case by putting his least powerful argument to the front. It gives the "Progressive" a fair chance for a reply, an opportunity promptly seized by the "Speaker," which, in a carping review of the "Contemporary" article, remarks, not untruly, that "if he (Lord Avebury) were talking of railways or banks he would call this 'alarming growth' an increase of *capital*." Here, however, the accuracy of the "Speaker's" criticism begins and ends. For this is the sort of argument that follows. Lord Avebury, it is said, forgets "that there may be a public benefit in the municipalized management of works and tramways which cannot appear on a mere balance-sheet." (The contemptuous allusion to a "mere balance-sheet" is delightful; so many municipal enterprises would cut such a poor figure on a "mere balance-sheet," if the same were honestly compiled!) This intangible benefit, we are told, "is obtained by increasing that advantage to individuals which Professor Marshall has called 'consumer's surplus.'" We may, proceeds the writer, "illustrate our argument by a hypothetical case. A company sells 100 million feet of gas at 3s. per 1000, and makes a profit of 1s. 6d. a foot (*sic*)—i.e., £7500. If the price is reduced to 2s. 6d., the consumption will be increased by one-half; leaving the profit precisely the same. Now to a company this will be no inducement, for it gains nothing; but a town council, on the other hand, would be certain to make the reduction, because, without throwing any burden on the rates, it could relieve every consumer in the town of one-sixth of the price of his gas. The council, perhaps, might be willing to reduce the price, even if the expected increase of consumption were only one-third,



because the saving to the consumer would be much greater than the loss to the rates—i.e., the community would gain."

We have quoted this precious argument in full, as it is a splendid example of the commercial ignorance and loose thinking of the Progressive journalist. Indeed, taking into consideration the brilliancy of the whole argument, we cannot but regard the little slip about making a profit of rs. 6d. a "foot" as illuminative. It is said that figures can be made to prove anything. Undoubtedly they can—if you are allowed to start with a hypothesis and proceed with arguments suited to the desired end. Observe the simplicity: "If the price is reduced to 2s. 6d., the consumption will be increased by one-half"—nothing could be more obvious—"leaving the profit precisely the same." There you are; now you have only to proceed to your conclusion! But there are just one or two remarks to make. In the first place, it is assumed in the hypothetical case instanced, that the cost of manufacture and all charges for management would remain the same per 1000 cubic feet if 150 millions were consumed as if only 100—an assumption worthy of a writer who says that Lord Avebury's article "would hardly convince a City clerk," but one which only requires to be stated for its absurdity to be seen.

Further, if the profit of rs. 6d. per 1000 cubic feet in the first instance were made after paying interest on capital, then, in the second instance, it is assumed that the charge for capital would be as great per 1000 cubic feet on the increased quantity; while, on the other hand, if the £7500 had to pay the charge for capital, then either the town council would be out of pocket by the interest on all additional capital required for the supply of the extra 50 millions, or else the writer has assumed that no extra capital would be required. Of course, to men who have the slightest acquaintance with business, it need scarcely be observed that if any company charging 3s. per 1000 cubic feet could be certain of securing a 50 per cent. increase of consumption by reducing its price to 2s. 6d., the managers would send out notices of that reduction as soon as they could be printed. The last sentence in the quotation we made is simply nonsense. Carried to its logical conclusion, it is an argument in favour of a town council supplying gas free. This would not matter if every ratepayer were a consumer of gas in exact proportion to his assessment, which is just what he is not. Were it so, however, how could the consumer gain more than the ratepayer lost?

To return, after this long digression, to Lord Avebury's article. The second objection urged is the check to private enterprise which would ensue upon the municipality, with the rates as a financial backing, entering into the arena of general commerce. If it be urged that the representatives of the ratepayers will not carry on business at a loss of the ratepayers' money, Lord Avebury replies that, unfortunately, the electors are by no means all ratepayers, and that, in such cases (London particularly), "electors feel little interest in economy." Moreover, we have only too good cause to fear the accounts of municipal authorities often do not make it sufficiently clear to ratepayers what the real profits or losses on their enterprises are.

The third objection brought forward is the impossibility of municipal councillors devoting sufficient time to their duties to properly supervise all the enterprises which it is suggested they should undertake. The tendency would be, were the already heavy duties of municipal administrators increased, to reduce the number of business men who would seek election, just when business capacity would become more and more in demand. Then the undesirability of increasing the number of municipal (or state) employees so often urged in the "JOURNAL," is emphatically stated and some striking illustrations given from the experience of the Australian State Railways; and, finally, the risk of loss without a corresponding possibility of gain is pointed out—concerns managed by persons only indirectly interested being more liable to loss through inattention to detail and want of zeal, than those which are conducted by their direct owners for personal gain.

Lord Avebury concludes with three suggestions—namely:

- (1.)—That no extension of municipal trading for purposes not yet sanctioned should be permitted, except after full notice, and special parliamentary inquiry.
- (2.)—That, as regards water, lighting, tramways, and telephones, fresh undertakings by municipalities should only be sanctioned if it can be shown that there are special reasons why they should be carried on by the municipality rather than by private enterprise.
- (3.)—That any ratepayers objecting should have a right to be heard, and give their reasons for opposing the Bill.

These suggestions, like the preceding article, will not be appreciated by the megalomaniacs and collectivists; but it is high time that the public should be made to hear both sides of the question, and we welcome Lord Avebury's contribution to their enlightenment.

#### THE QUESTIONS BEFORE THE DEPARTMENTAL COMMITTEE ON PATENTS.

[SECOND NOTICE.]

THE second of the questions referred to the Departmental Committee was: "Whether any, and if so what, amendments are necessary in the provisions of Section 22 of the Patents, &c.,

Act, 1883." This, as our readers will be aware, is the famous section instituting compulsory licensing. The wording of the reference is noteworthy for strength, the use of the word "necessary," instead of desirable, or expedient, in this connection being no accident. In truth, there is nothing more debatable in the whole range of patent law and practice than the subjects embraced by Section 22. The principle involved is absolutely new in English law; and, as will be remembered, the section remained dormant for many years. Yet in his well-known book on "The Law and Practice of Patents," Mr. Roger Wallace, Q.C., pointed out that the utility of a system of compulsory licenses was fully discussed at the Vienna Congress, and passed by a large majority. He remarks that it is likely to prove of great public benefit, especially in regard to the case of foreign inventors who take out patents in this country without any intention of working here but merely to prevent any competition in this country. This was precisely the ground upon which the section was eventually put in motion. The peculiarity of the provision is that it is never likely to be made use of, except in respect to commercially valuable industrial property; so that the procedure under it is essentially of a contentious character. Still, the moving of the Board of Trade to give effect to the section need not necessarily be a costly business.

We have characterized the principle as new to English law; and this is probably the true reason why an inquiry into the working of the provision has been ordered. A patent is property like any other, after it has once been granted by the Crown; and it is a quality of property that the owner can do what he likes with it, so long as he does no wrong thereby to the rights of others. Many inroads have been made in the major interest of the public upon the absolute right of a man to do as he likes with his own; but before the enactment of Section 22, it was open to the holder of letters patent to work under them or not, as he pleased—just as a landowner has discretion as to whether he will develop his estate, or let it remain unproductive. The property in patents, however, being granted by the Government, for the public good, several countries have made it a condition of the continuance of the patentee's protection that he should make adequate use of his patent by working it in the country. This expedient has not commended itself to the best judgment of Englishmen of experience in such matters, for reasons that need not be repeated here. Suffice it to state that the principle of compulsory licenses was accepted in 1883 as an improvement upon that of compulsory working, inasmuch as it would be likely to more effectually prevent patentees from playing the "dog-in-the-manger," which is really the object desired. At the same time, it is a strong proceeding to order a patentee to part with his exclusive right of manufacture and sale under his patent for the benefit, generally speaking, of a trade rival. Mr. Wallace did not adequately discuss the provision in his book; but last year Mr. J. W. Gordon published a work specially on the subject of compulsory licenses, so that nobody need be ignorant of the far-reaching character of this alteration of the law.

Writing as a lawyer, Mr. Gordon was naturally most concerned with the remarkable circumstance that the powers of Section 22 were withdrawn from the High Court and vested in the Board of Trade. He thought it a most serious thing that so important an alteration of the law of industrial property should be made outside the jurisdiction of the High Court, and at the discretion of a Government Department. He hoped the result would be satisfactory; but, metaphorically speaking, he shook his wig over the whole arrangement. That the transfer of jurisdiction in this sense was not without justification, however, was regretfully conceded by Mr. Gordon himself as a consequence of the remarkable judgment in the case of the *Incan-descient Gaslight Company v. Cantelo*. He characterizes this decision as tantamount to a refusal to entertain any question of the public convenience as against the pretensions of a patentee. Doubtless, this subject of the competency of the Board of Trade to protect the public and others interested in a patent from unreasonable and prejudicial conduct on the part of a patentee; and the bearings of the leading case just mentioned, will be thoroughly investigated by the Committee. It is as well to recall some part of the astounding dictum of the Court in this case. The Judge said that "the patentee has the sole right of using and selling the articles, and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them, or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person to take a license, 'Mind, I only give you this license on this condition;' and the purchaser is free to take it or leave it, as he likes. If he takes it, he must be bound by the condition." If this is the law, then the drastic reform of it by means of something like Section 22 of the Patents Act, 1883, would have been imperatively called for now, if it had not already been enacted.

The short cut to equitable dealing with patentees in virtue of Section 22 is therefore likely to leave the High Court very high and dry in this matter. "Any person interested"—the words are very general—can petition the Board of Trade for a grant of a compulsory license on reasonable terms. The petition must show that the patentee has been unreasonable in the matter of



granting licenses; that the patent is not being worked; that the reasonable requirements of the public with respect to the invention cannot be satisfied; or that the petitioner is prevented from working or using to the best advantage an invention of his own. It must show, in short, the nature of the petitioner's interest in the matter, and state what is required by way of remedy or relief. It should be premised that the petitioner must mean business, for the Board of Trade will not listen to mere paper declarations. The application is then handed over to an independent legal expert—practically one of the Counsel practising in patent cases—who gives his opinion as to whether there is a sound *prima facie* case for proceeding further with it. If he decides to the contrary, the Board of Trade may dismiss the petition out of hand. Otherwise, the same Counsel will be appointed as Referee to hear the case for the Board, and he proceeds to put matters in train for the hearing, according to the rules. Ultimately, the settlement is an arbitration by a single arbitrator. Nothing like a fishing inquiry is permitted. The petitioner tells what he wants, and why, and what he is willing to pay for it; the objector puts his own case; and the Referee decides between the parties. Not publicly, however; the report of the Referee is treated as a private document, and the decision of the Board is announced by a formal notification from the office.

Naturally, in discussing the procedure under Section 22, Mr. Gordon lays most stress upon the formal and regular operation of the Board. Practically, a great deal may be and probably is done informally and under the imposing presence of the section as a background. A firm contemplating the marketing of a new speciality find the course barred by the existence of an opposing patent. What are they to do? What is the patentee to do? This depends entirely on the parties and their circumstances. If the respective parties are big people who mean business, and if the validity of the patent involved is admitted, Section 22 comes in very handy. A obtains B's terms for a license; and if he has reasonable grounds for objecting to them, he goes to the Board of Trade and has a chat with an Assistant-Secretary on the subject. The matter may not go further, if the parties are honestly desirous of striking a bargain on business lines. Suppose, however, that the patentee is weak, while the other person interested is strong, what is likely to happen? There is no converse to the power of the person interested to demand a license, in the shape of a right of appeal on the part of the patentee to the Department to order the other person to take a license on reasonable terms. The poor patentee, however, has the protection of the other person's interest. If a firm mean business, and there is a patent in the road, it is clearly to their advantage to purchase on fair terms, and so acquire whatever value may attach to it. This, however, by the way.

It will be interesting to follow the evidence and the observations of the Committee on the operation of the system of compulsory licenses. Most probably the chief alteration to be suggested will have reference to costs. It is difficult to see in what other respect the procedure can be changed for the better; but the opinions of Mr. Roger Wallace and Mr. Bousfield, who have been Referees several times, will naturally weigh with the Committee. Mr. Wallace, who heard an incandescent gas-burner petition which was eventually dismissed, commented strongly on the unfairness to patentees of making them pay their own costs in any event. Where the application is refused—an application that perhaps ought never to have been made—the patentee certainly ought to be protected from this impost.

We have nothing particular to remark concerning the third and last question referred to the Committee—the suggested extension of the period of grace prescribed for applicants under international arrangements under Section 103. This provision was a considerable improvement on the old law. The question appears to be one of procedure, as to which the experience of patent agents should guide the Committee. No fresh principle is involved, the only point left for the Committee being the question of time. It will be understood from these notices of the reference that the work of the Committee will be of great interest and importance to inventors and the general public. At the same time it is a notable testimony to the soundness of the settlement arrived at in 1883 that so few questions relating to the possible amendment of English patent law and Patent Office practice are regarded as still open; and there are no complaints that the reference is too limited.

### THE GAS SUPPLY OF BOSTON (MASS.).

(Continued from p. 149.)

THE history of the Companies supplying gas to Boston has, in former articles, been brought up to the time when the Bay State Company of Delaware were in control of four of the principal Gas Companies, and were, by various methods peculiar to themselves, reaping a fine harvest from the public. We have now to consider how, and with what success, it was sought to bring that Company to terms more favourable to the consumers. It will be seen that the attempts made were not always solely in the interests of the public, but in some cases owed their inception to a desire on the part of other financiers to obtain a share of the plunder that was to be had.

The principal attack upon the Company run by Mr. Addicks was made in 1893 by the then Mayor of Boston, Mr. Nathan

Matthews, and was, as afterwards became evident, due rather to a desire to win popularity for his (the Democratic) party in the State, than to a disinterested concern for the public welfare. Were that party to continue in power, he, the Mayor, had high hopes of becoming the Governor. Hence a sudden and mighty zeal for the welfare of the gas consumers. By an amendment of the City Charter in 1885, the administrative powers had been largely centralized in the hands of the Mayor; and Mr. Matthews interpreted the law as giving him power to grant leave to other Companies to enter into competition with existing gas undertakings in Boston, without obtaining the consent of the Aldermen of the city. With this interpretation the Aldermen vigorously declined to agree, but were unsuccessful in their protest against the Mayor's supposed illegal actions. The plan of campaign against the Bay State interests entered into by Mayor Matthews makes interesting reading.

The opportunity for attack was afforded by the expiration, in 1893, of the five-year contracts for public lighting; and for the purposes of the campaign another Company were brought into prominence—namely, the Brookline Company. This Company, under their Special Charter, had the right to lay mains in Boston (of which Brookline is a district), "with the consent of the proper Local Authorities." This consent the Mayor assumed the right to give, and did give. What inducement was there, however, to the Brookline Company's enter into competition with the Bay State interests? The answer—that the former was backed and practically owned by the magnates of the Standard Oil Company, who have had for years past a virtual monopoly of the naphtha used for enrichment purposes by the water-gas manufacturing companies in the States, and who, by reason of this monopoly, were enabled to buy up on most advantageous terms many of the considerable gas undertakings of the country. In the course of some of these movements to acquire the works to which their naphtha was an essential, the Standard Oil Company had come into conflict—at Buffalo, Chicago, and elsewhere—with Mr. Addicks, already mentioned as the controller of the Bay State interests; and the Company were therefore only too pleased to seize the occasion of doing him an injury, if possible, in Boston.

It has before been noted that the public began to call for inquiry into the charges of the Gas Companies run by the Bay State Company in 1892; and in June of that year, the leading Democratic newspaper began to work up an agitation, having for its cries: "Down with the Gas Trust," and "Give us dollar gas." Following on this, the Mayor gave the first place to the question of the charge for public lighting in his inaugural address at the beginning of 1893; recommended a reduction of \$65,000 in the annual appropriation for the lighting department; and "gave notice that the Gas Companies must come down." The reduced appropriation was passed by the Aldermen on the 31st of January, and shortly afterwards advertisements inviting tenders for the public lighting of Boston appeared in the New York and Boston newspapers. Bidders were, in addition, requested to state the price per 1000 cubic feet at which they would furnish gas to consumers other than the City authorities; and the city was, for the purposes of these tenders, divided up into nine districts.

The Brookline Company sent in bids for the public lighting of the greater part of the districts which were in the area of their own supply and in that of the Bay State Companies; the prices quoted being: To the city for street and other lighting \$1.25 per 1000 cubic feet, and to the private consumers \$1.50 in the Brookline Company's Brighton district. In the Bay State districts, they were: 70 c. per 1000 cubic feet to the city, and \$1 to the private consumers. The Bay State Companies did tender, but ignored the special districting of the city; each Company bidding for the lighting of the streets in their own area, while no quotation was made for other than public lighting. With these tenders, however, were sent in proposals that the Companies should take over from the city the lighting, extinguishing, and maintenance of the street-lamps—work which cost the city \$50,000 annually. It is of interest—as bearing on American gas and municipal politics—to note that the Mayor admitted in evidence that the Lamp Department (which existed to execute the work in question) cost Boston more than twice as much per lamp as other cities paid their Gas Companies for the same services, and that Boston was about the only city that had such a department. The Mayor defended the continuance of the system on "administrative grounds"—whatever that might mean—but he was publicly accused of maintaining it at the expense of the city "to save for himself one hundred and thirty odd political votes." Municipal traders please note.

The Brookline tenders were at once accepted, and contracts signed forthwith for three years certain, which, however, were, at the option of the City, to continue at the same prices until abrogated by the Mayor. Subsequently, in August of the same year, the other Companies agreed to new contracts for the public lighting of the remaining districts at prices considerably lower than those previously charged, but in no case at such low rates as those charged by the Brookline Company—the reduction being from an average of \$1.53 to \$1.18 per 1000 cubic feet. These contracts, as well as that with the Brookline Company, were voluntarily cancelled by the City in June, 1899, when an entirely new arrangement was entered into for the lighting of the city. A seven-year contract, with an option to the City



to renew for a further similar term, was then made with the Rising-Sun Lighting Company, who are not makers of gas. They undertake to furnish lanterns, Welsbach burners and mantles, keep the whole outfit in repair, light and extinguish the lamps, and provide them with gas—all of which they purchase from the Gas Companies. For these services the Company receive \$30 per annum per light of 60-candle power, burning all night. The extraordinary contracts due to the cutting-out policy of the Brookline Company had, therefore, a life of barely six years.

At the time of the execution of the contracts just referred to, the Brookline Company were selling gas at \$1.90 per 1000 cubic feet, which cost them \$1.14 to manufacture and distribute, and were paying 7 per cent. dividend on share, and 5 per cent. on loan, capital. As the Company at once gave notice that they would reduce their price all round to the figure quoted for their Brighton district—namely, \$1.50—and were, moreover, undertaking to supply gas elsewhere at \$1 and less, there seemed little prospect of them maintaining their rate of dividend. The fact was, of course, that the prime object of the Company at this time was rather to hit the Bay State Companies than to pay dividends.

The Mayor, however, who was working in concert with the Brookline owners—the Standard Oil Company—immediately announced that the contracts entered into between the City and the Brookline Company afforded conclusive proof of the ability of all the Companies to supply gas at the same prices, and make a profit; and, within a few weeks, an order was, on his initiative, passed by the House of Representatives for a thorough investigation, by a Special Committee, into the history and relations of all the Bay State Companies. This Committee, who completed their work in about seven weeks, had power to compel the attendance of witnesses and the production of books and papers, and made a very thorough investigation; the report and evidence filling over 1000 pages. The majority report stated that, in the opinion of the Committee, the law had not been violated by any of the manœuvres of the Bay State financiers, as, although the extra State capitalization of their Companies exceeded the value of the property by from \$5,000,000 to \$6,000,000, the dividends paid by the Boston Companies did not exceed 8 per cent. on the value of the property. The Committee were expressly ordered to report whether any of the Charters of the Companies in question ought to be revoked; and they reported against any such revocation. The legality of the \$4,500,000 "obligation" issued by the Massachusetts Company was upheld in the majority report; but the minority urged that it should be annulled.

The immediate (but not very logical) consequence of the presentation of the reports was the passing of a measure revoking the Charter of the Bay State Company unless they should, within six months, cancel the "obligation" for \$4,500,000, without incurring new obligations beyond the issue of such additional share capital as should bring up the total capitalization of the Company to the actual value of their property, as judicially determined. This value was found to be \$2,000,000; and the Company accordingly were obliged to cancel the obligation for \$4,500,000, and issue in its place only \$1,500,000 of new shares—the original capital having been \$500,000.

"Thus," says Mr. Gray, "ended this remarkable campaign against the Companies. The Mayor appeared to be successful at every point. Under his leadership the price of gas had been made lower than prevailed in any other large American city; public opinion had been created and directed; the policy of the State in regard to competing Gas Companies had been reversed; \$3,000,000 of fictitious capitalization had been squeezed out of a great Corporation by legislative fiat; and the legislature . . . had resorted to the heroic remedy of undertaking to revoke the Charter of an active Corporation." The means by which these ends had been achieved were, however, that of actual competition between one Company and several others. Were the ultimate results as beneficial as the immediate ones appeared to be? That is the question which remains to be considered.

Of the total quantity of illuminating oil that was imported into the United Kingdom during the first six months of the present year, 57,304,420 gallons was American, 36,591,010 gallons Russian, 3,968,620 gallons Roumanian, and 158,440 gallons came from other countries; making a total of 98,022,490 gallons. Lubricating and other descriptions of oil brought up the total imports to 125,150,580 gallons. The total quantity imported during 1899 amounted to 236,260,653 gallons, of which 193,230,177 gallons were illuminating, 36,261,988 gallons lubricating, and 6,768,488 gallons other descriptions of oil.

At the acetylene works which supply the gas to the Hungarian street railway, chloride of lime was formerly employed as the purifying material. A mixture of chloride of lime and sodium plumbate containing an excess of alkali is now used. Chloride of lime alone is likely to cause explosions of the gas, on account of the liberation of chlorine. A purifier charged with the new mixture was opened after ten hours' working. When the upper grating, covered with lime, was removed, spontaneous combustion took place, and a long flame rose from the apparatus, but there was no explosion. Under these conditions, therefore, it may be said that the new mixture is not dangerous.

## OBITUARY.

Mr. EDWARD MARFLEET, the Secretary of the Newport (Mon.) Gas Company, was found dead in bed last Thursday, at his residence at Llantarnam. Deceased, who was a bachelor; slept latterly in the house alone; and his housekeeper, who lives a few doors away, went every morning to call him and prepare his breakfast. She could get no response on Thursday morning; and on the door of the bedroom being forced, it was found that death had taken place some hours before. Deceased had been under medical care for some time for flatulence and spasm; but he was at business on Wednesday, and left at the usual time in the evening, apparently in his wonted health. Deceased, who was a native of Cambridge, was upwards of 60 years of age; and for the last 28 or 29 years had been Secretary to the Newport Gas Company, by the Directors and officials of which he was much esteemed for his kindness and generous dealing. Deceased's hobby was rose-growing, in which he attained to a high pitch of skill and excellence; and the garden of his lodge is annually one of the sights of the district to the amateur rosarian.

## PERSONAL.

At the first meeting of the new Council of the Society of Arts, Sir JOHN EVANS, K.C.B., F.R.S., was elected Chairman.

Herr FRIEDRICH SIEMENS, of Dresden, a brother of the late Herr Werner von Siemens, has been elected Honorary Doctor of Engineering by the Polytechnic Academy at Dresden, for his services in regard to cremation and technical inventions.

The Association of German Gas and Water Engineers have decided to dedicate a memorial to Dr. CARL AUER VON WELSBACH, who is an honorary member, in recognition of the services he has rendered to the gas industry by the invention of the incandescent gas-light.

Mr. R. C. SMITH has retired from the position of Chairman of the Devonport Gas Company, and has also resigned his seat on the Board. Mr. Smith has been a Director of the Company for 51 years, and its Chairman for more than 41 years. Mr. ALBERT BENNEE succeeds him in the chair, and Mr. A. W. WHITE has been appointed Deputy-Chairman.

Mr. F. W. TAYLOR, son of Mr. F. C. Taylor, Manager and Secretary of the Shanklin Gas Company, has been presented by the Directors with a case of drawing instruments, on his leaving the Company's service to become apprenticed to Messrs. E. Cockey and Sons, Limited, of Frome. The gift was accompanied by a letter to the recipient's father, in which the Directors expressed their pleasure at recognizing merit, and cordially wished "the young student engineer every success in the career of his choice."

The esteem felt by the employees and officials at the Tipton Gas-Works for their former Manager, Mr. VINCENT HUGHES, has recently been tangibly expressed by two presentations made to him before leaving to take up his duties at Smethwick. The gifts from the men consisted of an ebony walking-stick with ivory handle and gold mount, engraved with his initials, and a smoker's outfit. The officials, being desirous also of testifying their regard for Mrs. Hughes, selected an electro-plated tea service, on an oak tray bearing a suitably inscribed silver plate. Both gifts were accompanied with the best wishes of the donors; and they were acknowledged by Mr. Hughes in feeling language. He expressed the hope that the workmen would extend their unstinted efforts to his successor, Mr. H. O. Timmins, who, at the presentation made by the officers, was introduced to them.

## NOTES.

### Portland Cement.

It is remarked in the "Builder" that, although the use of portland cement in building is increasing enormously, many architects are still far from comprehending its nature and characteristics. For their guidance in this respect, our contemporary describes portland cement as a "tempered lime;" the word tempered in this case meaning the adjustment of its active or cementitious properties to a fixed point, to give a certain result. Portland cement of good quality consists of from 61 to 63 per cent. of lime. The most important of the other component parts are silica and alumina; their proportions having a certain effect on the speed of setting, while the lime gives the strength and soundness. There are so-called natural portland cements; but in these the proportions of the constituents, and consequently the value of the cement, vary greatly. The best materials for cement making are English chalk and the alluvial clay of the Medway estuary. The quality of the product is decided by the proportions in which these materials are mixed in the first place to form the "slurry," which is afterwards dried, burnt to a clinker, and ground. All these stages of the manufacture are susceptible of being conducted in different ways; and in particular the burning, for which coke used to be employed exclusively, is now receiving much attention with a view to economizing the fuel and enabling other kinds to be employed. The writer of the article strongly objects



to the addition to the cement of Kentish ragstone or other adulterant, and allows it to be inferred that, in his judgment, all existing methods of testing cement leave much to be desired.

#### A Report on Steel Rails.

A remarkable monument of fruitless cleverness and industry is the Blue-Book which has recently been issued, giving the report of the Committee appointed by the Board of Trade four years ago to inquire whether steel railway metals lose strength during long service. The question is of great interest to all engineers, most of whom entertain more or less of a conviction that steel does get fatigued, or altered for the worse with age and hard knocks, without being able to adduce valid proofs of the fact. The appointment of the Committee grew out of the St. Neot's railway accident of Dec. 10, 1895, when a couple of rails broke and wrecked the Scotch express. These rails had been in service from 1873; and apart from the circumstance that they had lost 10 lbs. in weight per yard, and therefore ought to have been removed from the main line, there was nothing apparently the matter with them. Chemical analysis revealed no striking peculiarity of composition. The metal was too hard—probably as an effect of continued cold rolling by the passing wheels. By the use of micro-photography, Sir W. C. Roberts-Austen discovered in parts of the broken rails patches of "martensite," the characteristic sign of steel hardened from a high temperature; but he was unable to explain the presence of this compound in the rail. Altogether, the report leaves the questions raised at the inquiry exactly where they were before. The investigation, lasting so long, and carried out by the ablest metallurgists and metallurgical chemists at the command of the Board of Trade, revealed nothing new of the slightest value in relation to the manufacture or the use of steel rails, or of any other variety of structural steel.

#### "Mond" Gas-Power Stations.

Discussing the engineering problems presented by British electrical power schemes, the "Engineer" finds a possible means of cheapening power production in the use of large gas-engines, like those made by the Cockerill Company, for working direct with blast-furnace gases, driven by the Mond variety of producer gas. It is hinted that a scheme of this character is actually being arranged. Powerful gas-engine plant, probably in 1000-horse power units, is to be put down in colliery districts; and electricity is to be generated at high tension for transmission to manufacturing centres. Mond gas, with recovery of the bye-products, is to be the fuel. This can be made from any grade of bituminous coal. There is a suspicion of amateurishness about this story in the incidental remark that "the gas produced may in a sense be regarded itself as being merely a bye-product." Of course, only that which is not the chief article of manufacture desired can be regarded as a bye-product; and in this scheme the gas is the chief thing wanted. It is estimated that, under favourable conditions of the coal and residuals markets, Mond gas can be made at a cost of 2d. per 1000 cubic feet. If it takes 100 cubic feet of such gas to yield 1-horse power, we have here the prospect of generating-horse power at a cost of 0.2d. for fuel. It is the opinion of the "Engineer" that, if such a result could be obtained regularly in practice, then the most economical steam-engines ever made would appear to be exceptionally wasteful machines. This hardly appears correct, in the comparative fuel costs alone; because the best steam-engine practice shows a consumption of about 15 lbs. of steam per horse-power-hour, which should be had for burning 2 lbs. of coal. In practice, however, steam power costs a good deal more, over a term of years, than appears from the results of short-time tests.

**Professor Hull on Our Coal Reserves.**—At the annual general meeting of the Victoria Institute, held at the rooms of the Society of Arts on Monday last week, under the presidency of Sir G. Gabriel Stokes, an address on "Our Coal Reserves at the Close of the Nineteenth Century" was delivered by Professor Edward Hull. The speaker said he had selected this subject for the annual address because public attention had recently been directed to the question of our coal reserves, chiefly owing to the increase in the price and to the unprecedented output of that mineral from British mines, amounting in 1899 to 220,085,000 tons, or about 18,000,000 tons excess over the previous year. Since the report of the Royal Commission on Coal, presided over by the late Duke of Argyll, had been issued in 1870, the coal production had doubled; and it was now a matter of anxiety to many as to how long a period our coal reserves would be able to bear the increasing drain. He strongly advocated the imposition of an export duty of at least 5s. per ton—to be paid at the port of export—on coal shipped to Continental States, which were taking from us about 40,000,000 tons annually, or nearly one-fifth of the total output. The proceeds of this duty would form a fund towards the relief of our increasing taxation. The best steam coal was of such primary importance to foreign countries that even with this duty there would be no lessening of the demand. He pointed out that, in the case of a European war, we should be in the position of having supplied our antagonists with a most important power of action against the ships of our own Navy. He suggested that there should be a new Commission on our coal resources, to investigate, among other things, the quantity of coal available for naval, commercial, and ordinary purposes, in the United Kingdom.

## TECHNICAL RECORD.

### THE ANNUAL MEETING OF THE SOCIETY OF CHEMICAL INDUSTRY.

In the historic theatre of the Royal Institution, Albemarle Street, the members of the Society of Chemical Industry gathered last Wednesday for their annual meeting. Among the numerous throng were noticed scientists whose voices have been frequently heard in the building; and a few whose names are indelibly associated with it. In the person of the President, too, more than ordinary interest centred. Five years ago, a Section of the Society was formed in New York; and it has thrived until it ranks next to London in membership. With a desire to honour such a young but influential Section, the Society invited Professor Chandler, Ph.D., M.D., LL.D., of Columbia University, New York, to be their President during the current year; and he accepted the position, although, in the circumstances, it was one which entailed more than ordinary personal inconvenience. Professor Chandler's work in connection with the development of the study of the science of chemistry in America is alone monumental, and has gained him fame among chemists the world over. When he took the chair on Wednesday, his reception gave him, as he himself confessed, supreme gratification.

There was little of the formal business which first claimed attention in which readers of the "JOURNAL" are concerned. Two or three points, however, in

#### THE REPORT OF THE COUNCIL

may be noticed. The number of members on the register is now 3459, as compared with 3312 at the last annual meeting. During the past session, 81 papers appeared in the Society's "Journal," as compared with 89 last year. The expenditure for the year amounted to £5330; leaving a small deficit of £127. But there were exceptional charges amounting to about £760 in connection with the compiling and printing of a collective index. One paragraph stated that it had been felt for some time that it would tend to the advancement of applied chemistry if the Society were to encourage manufacturers to bring their problems and difficulties under the notice of men of skill and experience, such as may be found in works, technical laboratories, universities, and colleges. The Council accordingly announced that they were prepared to consider applications from manufacturers and industrial associations who desired to avail themselves of such assistance. The first to make application under this scheme was the Scottish Papermakers' Association, who offered prizes to the value of £100 for solutions of certain problems connected with their industry.

#### THE PRESIDENT'S ADDRESS—TECHNICAL EDUCATION, WATER GAS, INCANDESCENT GAS MANTLES, AND OTHER TOPICS.

The address which the President delivered after the transaction of the general business is encyclopædic in character. It traverses over something like sixty to seventy subjects, and administers to the tastes and interest of the chemist in nearly every branch of the profession. The address contains no scientific revelations, or record of purely personal investigation; but its value lies in the fact that it is an *exposé*, from the pen of a leader, of the exact present state of chemical knowledge and attainment of our American friends. Much, however, as the President had tried to compress his review, it covered such a vast expanse, that he could not do more than give a digest of what he had prepared. Nothing could have been more appropriate than that Dr. Chandler, occupying the eminent position he does, should devote the first portion of his address to the rise and progress of chemical and technical education in the United States. He relates how, when he started out in the autumn of 1853 to secure a chemical education, there were only three or four places in the United States which were available; and even in those, students soon found the want (at that time) of a systematic, organized course of study. This lack of means for organized study resulted in the early exodus of students to European schools, more especially in Germany, in which country the President himself sojourned for some three years in the quest for knowledge. Returning to America in 1856, he found interest was already increasing in the subject of chemical education, and that several universities and colleges were opening chemical laboratories for practical instruction. We have not space to follow Dr. Chandler closely in his account of the growth of chemical and technical education in the States. It may be mentioned, however, that in some incidental remarks he strongly advised the combination of chemical and engineering studies. Another point which should be known far and wide is that the President possesses a list of the sums of above \$5000 that were given to the colleges, universities, and technical schools of the United States in 1899, and which total to the magnificent sum of \$33,111,000. The President thinks he is safe in saying that they have now more than 100 schools of chemistry in the States. In all, there are 480 universities and colleges, and 43 technical schools. There are 89 schools or universities teaching some branch of engineering professionally; 63 of these have courses in civil engineering, 56 have courses in mechanical engineering, 49 have courses in electrical engineering, 30 have courses in



mining engineering, and 9 have courses in architecture. All the engineering courses include considerable instruction in chemistry, so much so in many cases as to qualify the graduates to fill positions as chemical engineers. Dr. Chandler has been informed by Professor Baker, President of the Society for the Encouragement of Engineering Education, that in 1899 there were 9784 students pursuing professional courses in the schools of engineering, and that 1487 graduated that year, receiving the degrees of civil engineer, mechanical engineer, electrical engineer, or mining engineer. No one can estimate the value to the industrial development of the United States of the education of such an army of thoroughly trained engineers and chemists. Passing from educational matters, the President gives some information regarding the chemical societies of America, which have already accomplished a great deal that has benefited and consolidated the profession in that country. It was in 1895 that the Council of the Society of Chemical Industry authorized the establishment of a New York Section; and already 738 members have been enrolled. The American Chemical Society, which was created in the seventies, numbers 1544 members.

Investigations in agricultural chemistry receive very full treatment by Dr. Chandler. It appears that the example set by Lawes and Gilbert in the noble work which they have accomplished at Rothamsted during the last half century has led to the establishment of agricultural experimental stations all over the States; and a large amount of original investigation in subjects more or less allied to agricultural and physiological chemistry has been accomplished at these stations, of which there are now 59. There are 148 chemists connected with them, all devoting their entire or chief attention to chemical work. One of the most important objects in view in establishing these stations was to protect the farmer from the cupidity of dealers in artificial fertilizers. Every fertilizer sold in the United States is now subject to careful chemical analysis; and the results are published in the bulletins issued from time to time by the stations. The amount of money which has been saved to the farmers by this work alone is incalculable.

In a section on sanitary chemistry, the President tells us, among other things, that within the last few years, the increase in population and the increase in manufacturing establishments has forced the subject of the pollution of streams upon the public mind. At present action is being taken in several States to compel cities, towns, and villages to purify their sewage before permitting it to be discharged into the streams; and there will be in the near future a demand for chemical and engineering skill to carry out the requirements of legislation in this direction. For similar reasons the purification of water supply is now attracting a great deal of attention; and systems of coagulation and filtration have been introduced which greatly simplify the problem. The addition of a fixed but small amount of alum to the water on its way to the filters, together with certain mechanical devices in connection with the filters themselves, has made it possible to filter the water supply of cities of any size with certainty and with great rapidity. The first large water purification plant in the United States was built at Poughkeepsie, N.Y., in 1872; and since that time the number of works built for the filtration of water has exceeded 175. Of water-filters there are at present 20 plants operating upon the English or slow system, supplying an aggregate of 260,000 people, and 154 mechanical filter plants, supplying an aggregate of 1,600,000 people. Water-filters are projected or under construction to supply the cities of Louisville, Cincinnati, and Pittsburg, with an aggregate of 700,000 inhabitants.

Under the heading of the chemical industries of the United States, Dr. Chandler presented a considerable amount of information as to the production of ores and minerals, and of metals and secondary mineral and chemical products. In the coal production, he states, there has been a large increase within the last year. Over 218,000,000 short tons have been produced, of which 191,500,000 tons were bituminous coal, 36,000 cannel, and 60,577,000 tons anthracite; and there are still most extensive tracts of coal lands which have not been disturbed by the miner's pick. The coke industry has also increased; 18,000,000 tons now being manufactured.

Liquefied gases and electro-chemistry find a place among the next few subjects; and in connection with the last-named, it is recorded that the calcium carbide industry continues to prosper in the United States. It is controlled by the Union Carbide Company, which operates two plants—the larger at Niagara Falls, the other at Marie, Michigan. In Canada two plants are also in operation—one at St. Catherine and a new one at Ottawa. Mr. James L. Willson, who was the pioneer in the manufacture of calcium carbide and acetylene, is interested in these Canadian plants. The output at Niagara for 1898 was from 8 to 10 tons a day, using 2500 electrical horse power. In 1899 the yield was increased to from 20 to 30 tons a day, with the use of 5000 electrical horse power. The present production of the Union Carbide Company is about 1000 tons a month. The continuous Horrey furnaces are in operation in the two plants; and the price now of the carbide in carload lots is \$70 a ton. The carbide is guaranteed to yield 5 cubic feet of acetylene per pound. At St. Catherine, Canada, with the use of 1200 electrical horse power, the output is 1200 tons of carbide per year. The export price is \$60 per ton in carload lots. Much of the product is sent to Germany, Japan, and South America. Owing to the fact that the carbide is classed with dangerous

chemicals and explosives, the business is very much hampered by the high insurance rates and the high freights. Little progress has yet been made in the establishment of plants for lighting villages and towns with acetylene; but there seems to be a constantly increasing demand for it for isolated plants and other purposes.

In the succeeding section of the address is given a mass of information as to the oil production of the States; and then comes the most interesting part for gas engineers. It is headed "Water Gas," and reads as follows: Parallel with this development of cheap oil for burning in lamps, we have had corresponding improvements in the manufacture of illuminating gas. Prior to 1870, illuminating gas was manufactured in the United States exclusively from bituminous coals, largely from the caking coals from Nova Scotia and the Western States, enriched with cannel coal from Virginia or Pennsylvania, or with Albertite from Nova Scotia, Grahamite from West Virginia, Boghead coal from Scotland, or similar materials. The gas averaged about 16-candle power; and the price in New York City was \$3.75 per 1000 cubic feet. The new departure in gas making began with the establishment of the TESSIÉ DU MOTAY process of making water gas in New York City. The subject of water gas was an old one, and had been discussed and experimented upon for fifty years more or less; but there were two or three difficulties in the way of its manufacture in Europe. The decomposition of steam by red-hot carbon was perfectly feasible with the production of a mixture of hydrogen and carbonic oxide; but there was no convenient economical method for imparting to this non-luminous gas the power of giving light. There was no material cheap enough for the purpose. The petroleum industry made this possible in the United States. We had an abundance of cheap petroleum naphtha, which could be obtained at from 3 to 5 cents per gallon; and 5 gallons per 1000 feet were sufficient to impart to the mixture of hydrogen and carbonic acid the necessary illuminating power. In the TESSIÉ DU MOTAY process, the non-luminous water gas was manufactured from steam and anthracite coal, and was stored in a gasholder. It was impregnated with naphtha by passing it through a carburetting machine which contained a large number of flat trays charged with naphtha. In order to fix this naphtha, and prevent its being condensed in the mains, the mixture of gas and naphtha vapour was passed through long gas-retorts maintained at a red heat, in order to crack up the naphtha and convert it into permanent gases. The product was then washed and purified in the usual way to remove tar and sulphur, &c. Great difficulty was at first experienced in regulating the temperature of the fixing-retorts, which were heated by external fires. If they were not hot enough, the naphtha was not cracked into permanent gases. If they were too hot, the rich light-giving gases were destroyed, and carbon was deposited in the retorts. A very ingenious device was hit upon by Mr. Bradley, the Superintendent, for regulating the temperature. He placed on the exit-pipe of each fixing-retort a small stopcock, and provided the foreman with pieces of paper lined off in squares corresponding to the number and position of the fixing-retorts. At regular intervals the stopcock was opened, and the gas from the fixing-retort, without being lighted, was allowed to impinge upon the proper square of the piece of paper. A spot was produced varying in colour from yellow, through different shades of brown to black. The medium shade was the proper one; and the foreman was expected to so regulate the fires in the benches as to secure the proper shade of colour on the testing-paper. This process of TESSIÉ DU MOTAY was afterwards introduced by the New York Gas Company on the east side of the city. As this water-gas process was controlled by patents, it was quite natural that the old Gas Company should be very much opposed to its introduction; and every effort was made to secure legislation from some authority to prevent it. The matter came before the Health Department of the city, of which I was at that time the President; and, after careful investigation, the Health Department decided that the gas was such an improvement in quality and price, and the increased danger from the gas over the old-fashioned gas was so slight, that it was not wise to interfere with it.

This gas resulted in reducing the price ultimately to about \$1 per 1000 cubic feet, and the average quality is between 26 and 27 candle power. This in place of bituminous coal gas at \$3.75 per 1000 feet, with an illuminating power of 16 to 17 candles. Appeals were made to the Board of Aldermen and to the Legislature to put a stop to the manufacture of water gas; but the consensus of opinion in the United States has been in favour of the new gas; and we do not believe that its use entails any great increase in the danger attending the use of any illuminating gas. It is true that it contains from 25 to 30 per cent. of carbonic oxide; while the old-fashioned gas contained from 7 to 13 per cent. It is also true that we have a certain number of deaths, accidental or suicidal, and perhaps occasionally criminal, from breathing illuminating gas—more, probably, than we had fifty years ago; but I think not many more than properly corresponds to the greatly increased use of gas, resulting from its cheapness and brilliancy. While the TESSIÉ DU MOTAY process did not extend beyond New York City, the water gas industry has taken almost complete possession of the entire country. There are thirty or forty different forms of apparatus for manufacturing it; but they are almost without exception applications of the invention of Thaddeus Lowe.

The Lowe process consists in employing a fixing-chamber,



previously heated by internal combustion, in contradistinction to a fixing-chamber continually heated by an external fire. The Lowe apparatus consists of a generator filled with anthracite or coke, through which air is first blown to bring the fuel to a high state of incandescence. Air is admitted above the coal, to support the combustion of the generator gas in the adjacent fixing-chamber. At the end of a few minutes, the air-blast is turned off, steam is turned on, and the exit to the gasholder is opened. At the same time, there is injected above the mass of incandescent fuel the necessary quantity of either crude petroleum or some cheap petroleum product—such as gas oil or naphtha. This oil is immediately vaporized and mixed with the water gas. It then passes into the fixing-chamber, which may be either above or at the side of the generator. This fixing-chamber, having been previously heated by the combustion of the generator gas, is at a proper temperature for cracking and fixing the oils; and the finished illuminating gas is delivered from the apparatus.

In 1896 Mr. Walton Clarke made a careful inventory of gas companies in the United States, and found the processes in use divided as follows:—

Companies using coal gas (generally small) . . . . .	418
Companies using water gas . . . . .	296
Companies using water gas mixed with coal gas . . . . .	116
Companies using oil gas . . . . .	108
Companies using miscellaneous processes . . . . .	13
Total . . . . .	951
Total using water gas . . . . .	412

During 1897, 1898, and 1899, and the first five months of 1900, the United Gas Improvement Company erected or are now erecting 133 sets of water-gas apparatus. Of these, 11 are for new companies, and 23 are additions to original installations. It seems safe to say that there are at least 500 gas companies using water gas wholly or in part. It is estimated that there were sold in the United States in 1899 70,000 million cubic feet of gas, of which 75 per cent., or 52,500 million cubic feet, were carburetted water gas.

During the last year or two the price of petroleum products has advanced to such an extent that the manufacturers of water gas are beginning to question the possibility of continuing to supply water gas at current prices; and as the public would never consent to have the price of gas raised, they have been looking about for some substitute for the present process. The great improvements in late years in the coke-ovens designed to save the bye-products of bituminous coal—that is, the gas and ammonia—have made it possible to manufacture the old-fashioned bituminous coal gas at a much lower price than formerly; and it is quite probable that, if the high price of petroleum products continues, we may see a gradual abandonment of the water-gas industry and a return to the old-fashioned coal gas. This change has been already accomplished for the city of Boston. There has been erected at Everitt, near Boston, large works for supplying the city.

I am informed that, at the Everitt works, the coke-ovens of G. Hoffman are employed, and that 400 of them are now in use. These retorts are rectangular, about 60 feet long. They are provided with Siemens regenerative furnaces. Each retort is charged with 6 tons of bituminous coal from Cape Breton, Nova Scotia, which can be delivered in Boston for less than \$2 a ton. The process of coking begins with generator gas from a special furnace. The combustion takes place in a series of flues which pass around and through the retorts. When the temperature reaches a red heat, a portion of the gas generated from the coal is switched into the furnaces, and the coking is continued with this material. I understand that from 30 to 50 per cent. of the gas produced is employed in heating the retorts. About 2400 tons of coal are coked daily; and the coke is employed in the locomotives of the Boston and Maine Railroad. The tar and ammonia water are collected; and it is estimated that 12,000 tons of sulphate of ammonia will be produced per annum at these works, and a corresponding quantity of coal tar. The Solvay Alkali Company of Syracuse has also established a large coking plant, primarily to secure ammonia for its alkali process. The retorts employed are shorter than those in use at Everitt, having a capacity of  $4\frac{1}{2}$  tons of coal.

The President next speaks as follows on the subject of incandescent mantles: The efficiency of gas lighting has been wonderfully increased by the introduction of the incandescent mantle invented by Auer von Welsbach. By the use of this beautiful device, the light-giving power of gas has been increased enormously. Water gas, which in the old-fashioned burners of the best kind yielded an illuminating power of 5 candles per foot of gas consumed, yields with the Welsbach mantle from 15 to 20 candle power, and with the improved mantles now being manufactured by the Welsbach Company at Gloucester, nearly 25 candles per cubic foot of gas consumed. I had occasion recently to test one of the new mantles taken from the regular stock; and with a consumption of 5 feet of gas, I obtained 122.5-candle power, or 24.5-candle power per foot of gas consumed. This great increase in the light produced by the incandescent mantle is due to Welsbach's latest discovery of the fact that the greatest amount of light can be obtained when the mantle consists of from 98 to 99 per cent. of thoria, which by itself emits little light, but has the advantage of making the toughest and most durable mantle, and from 1 to 2 per cent. of ceria,

which in combination with the thoria exhibits the greatest light-giving power. The introduction of thoria and ceria into the affairs of everyday life is a very striking illustration of the advance of modern chemistry. In my student days, ceria, and particularly thoria, were regarded as extremely rare earths; and I remember that Professor Woehler placed in my hands, in 1854, a few grammes of thorite from Sweden, from which I prepared thoria.

When Welsbach began his experiments upon thoria, it seemed impossible to procure anywhere in the world a sufficient supply of this material so as to make it available for use in the arts. But as soon as a demand was created, Nature responded; and vast quantities of monazite, containing 5 or 6 per cent. of thoria, and much larger quantities of ceria, were discovered, first in the mountain streams of North Carolina, and later in the seashore sands of Brazil. There is every reason to suppose, therefore, that these and other localities will supply all the thoria that may be needed for the manufacture of these mantles. I visited the works of the Welsbach Company recently; and my friend Waldron Shapleigh, the Chemist of the Company, who has worked up the methods for extracting chemically pure thoria from the monazite, showed me through the works. It was interesting to see streams of monazite running into the digesters in charges of half a ton each for the extraction of the thoria and ceria. I also saw hundreds of tons of the bye-products, consisting of the salts of cerium, lanthanum, neodymium, and praseodymium, stored up in the hope that sooner or later some use will be found for them in the arts or in medicine.

The latest novelty in incandescent mantle lighting is the new Welsbach student lamp, which burns gasoline of 74° Baumé under a Welsbach mantle. The amount of light produced is incredible; it almost equals a moderate sized arc light. The lamps are made portable and stationary. It seems incredible that anyone should be willing to bring 74° gasoline into his dwelling-house; but I am told that in the West this new lamp is meeting with great success. It is really astonishing how reckless people are with regard to the use of inflammable oils. Gasoline cooking-stoves, particularly for summer use in country houses, are meeting with considerable success.

An address of this varied character from an American scientist would have been incomplete without a reference to natural gas. On this subject the President says that the supplies continue to decline in quantity and pressure. Occasionally new territory is opened, and supplies are obtained but never in sufficient quantity to maintain the pressure. There is a gradual falling off in the yield; and it is evident that the supply of natural gas will be sooner or later practically exhausted. The value of the gas obtained in 1898 was \$15,296,000, of which nearly \$7,000,000 came from Pennsylvania, \$5,000,000 from Indiana, \$1,500,000 from Ohio, and  $1\frac{1}{2}$  millions from West Virginia. New York supplied only \$229,000 worth. Next in order came Kansas, Kentucky, California, Utah, Colorado, Illinois, and other States.

For his address, Dr. Chandler was very heartily thanked on the proposition of the President-Elect, Mr. J. W. Swan, of electrical fame.

#### MISCELLANEOUS MATTERS.

Interesting presentations followed. The Society's Medal was awarded to Dr. Edward Schunck, F.R.S., for his researches in connection with technical chemistry; and the President and ex-President (Mr. George Beilby), who has acted as Deputy-President during the year, were handed beautiful albums as souvenirs of their exceptionally interesting terms of office.

This concluded the technical and formal business of the meeting; and the remainder of the week was spent in pleasure. There was a luncheon at the Criterion on Wednesday, by invitation of the London Section; and the annual dinner took place in the evening at the Hotel Cecil. Visits to works, a reception by the Lord Mayor, and an excursion to Oxford, formed prominent items in the programme. On Saturday, a considerable number of the members left London for Paris, where arrangements had been made for a reception by the President on Sunday evening.

#### THE FILTRATION OF WATER FOR PUBLIC USE.

In the "JOURNAL" for July 10, a general notice was given of the proceedings at the annual convention of the American Society of Civil Engineers, held the previous week at the Institution of Civil Engineers, Great George Street. One of the subjects considered was the filtration of public water supplies; and we now give a *résumé* of the very full discussion which took place.

Mr. RUDOLPH HERING (New York) introduced the question. In his early remarks, he claimed that America had contributed much to the elevation of the practice of filtration from an empirical to a scientific basis. Coming to the methods now practised, he said they were substantially divided into two classes. One required a large bed of fine sand, through which the water was allowed to percolate at the rate of, roughly, 5 to 10 cubic feet per day per square foot of filter surface, or a column  $2\frac{1}{2}$  to 5 inches in depth per hour. The other, with a much smaller bed of sand or similar material, required from (say) 200 to 400 cubic feet per day to pass through one square foot of filter surface, or a column of water of from 8 to 16 feet in



depth per hour, which was, on the average, a rate some forty times faster than in the first case. As the chief difference was this rate of speed, the two systems had been called respectively slow and rapid filtration, and the appliances sand and mechanical filters. The efficiency of the slow or sand filters depended upon a number of conditions, the most important of which were: (1) The size of the sand grains. It was found that fine sand of uniform size, and several feet in depth, gave the best results. It was further found that the number of bacteria in the effluent water increased with a decreasing thickness of sand bed, and with an increasing size of sand grains. (2) The rate of filtration. A rate of from 2 to 3 million (U.S.) gallons per acre per day, or a column of water about 3 to 4½ inches in depth per hour, was found most satisfactory as a rule. The number of bacteria passing through the filter increased rapidly with the rate of filtration, which should in any case be kept uniform to get the best results, and to accomplish which the use of controlling devices was required. (3) The free withdrawal of the water from the under-drains, to secure the same rate in all parts of the filter. (4) The temperature of the water should not vary greatly, since it controlled the pressure required to effect a given rate of filtration, and as the bacterial efficiency decreased with the temperature. (5) The age of the filter-bed. New or freshly scraped filter-beds gave a higher number of bacteria in the effluent water than old and well-compacted sand layers. The slow method of filtration had been practised according to two methods—the continuous and intermittent. When the amount of dissolved oxygen contained in the water was sufficient for the necessary bacterial action, the continuous method was preferable, because it was simpler and cheaper. When the water was highly polluted—requiring a large amount of oxygen for the proper bacterial action—the intermittent system might be preferable. Or when the water was highly polluted, a double continuous filtration might be practised, as in several cities of Holland. Still another variation was practised in Altona, where the first filtrate coming from the filter just after it had been cleaned, and therefore generally not sufficiently pure, was passed through another one that had not been recently cleaned, before it entered the city's mains. In climates where water froze frequently during the winter, and to a depth of at least several inches, it was customary to cover the filters, in order to obtain the best results. Where it was impracticable to do so, as was the case in Hamburg, special allowance had to be made for decreased bacterial activity in the colder water, as well as for mechanical difficulties resulting from the ice. When the water to be filtered had a high degree of turbidity, economy demanded that it be allowed to deposit most of its suspended matter before it was run upon the filters. Settling-basins were therefore a necessary adjunct to almost all filters for river water. When this contained finely divided clay, the filter might allow the water to pass through without giving it a thorough clarification. One day's settling was usually sufficient for the purpose, as by far the largest proportion of suspended matter, and all the coarser matter, was removed within that period. While the custom to provide one day's settling prevailed in America and Germany, it had been preferred in England to build storage reservoirs sufficient in size to hold water for a much longer period. Rapid or mechanical filters were first introduced in America. They acted on the principle of straining, by which the suspended matter and the bacteria were kept substantially on the surface of the filter material. The rapid rate of the passing water did not allow of much organic action below the surface, and required also a rather coarse filtering material. In order to keep back the fine matter held in suspension—such as clay particles and bacteria—coagulating substances were added to the water in definite quantities, depending chiefly upon the amount of lime and organic matter contained in the raw water. The resulting flocculent matter settled upon the surface of the filter-bed, and then acted chiefly as a strainer sufficiently fine to hold back the minute particles, including a percentage of bacteria which, under favourable conditions, might be as large as that removed by the slow filters. The conditions for a successful operation of such filters were now much better understood than formerly. It was possible now to arrange their operation so that, from a water of a given quality, fairly definite results could be obtained. The efficiency depended mainly on the size and character of the grains, upon the rate of filtration, the constancy of this rate, the proper admixture of the necessary coagulants varying with the quality of the water, and upon the arrangements for properly withdrawing the filtered water. Two kinds of rapid or mechanical filters had been used—those acting under the slight pressure of the water contained in an open filter, and those acting under a high pressure in a closed filter. Although in many cases convenient and economical, the high-pressure filter could not give equally good bacterial results, because the delicate film of coagulants was easily ruptured. High-pressure filters should therefore only be used for waters not seriously polluted. From this review of the characteristics of the two principal methods of filtration now in use, it would be gathered, said Mr. Hering, that both might satisfactorily purify water under ordinary conditions. The criteria which should guide the selection of one or the other method for a particular case were their relative sanitary effect under expected conditions, the reliability of their operation, and their cost. As to reliability of operation, it seemed to him (Mr. Hering) that the slow filters should be given the preference;

and regarding cost, it had been found that often the two methods were about equally expensive. The required investment was usually greater for slow filters; but the cost of operation was correspondingly less, and *vice versa*. They might therefore expect that both the slow and rapid filters would be used in the future with good results in their respective spheres.

Mr. W. H. LINDLEY then gave an elaborate description of the water purification plant at Warsaw. The water was taken from the River Vistula, which contained an average in the year of between 3000 and 4000 bacteria per cubic centimetre. It was necessary to adopt a system of intense settling, if he might so call it—that was, the settling had to be carried out as rapidly as possible. For this purpose, the settling-tanks had been constructed on a different system from that usually adopted—that was to say, they had large tanks into which the water flowed at one end and out at the other. The tanks, which were divided by longitudinal walls into narrow chambers were about 80 yards long. By the aid of diagrams, he explained their internal construction, and showed that they were fully occupied and utilized both horizontally and vertically. The velocity of the water in the tanks was about 1 mm. per second. Owing to the Russian climate, the tanks were all vaulted—in fact, they were the first vaulted settling-tanks on a large scale that had been carried out. They were designed to deal with 22 to 30 million gallons per day; and only one-half of this capacity was at present utilized. The filters, on to which the water passed from the tanks, were likewise vaulted. They contained 2 feet of sand and 2 feet of gravel, carefully increasing in coarseness downwards. They were on the principle of slow filtration; about 4 inches per hour being the maximum rate. It was considered necessary to regulate each filter according to its condition; and for this purpose an automatic apparatus had been constructed, by means of which perfect regularity was ensured. Mr. Lindley next spoke of the importance of distributing the water equally on the filter surfaces, and said the manner in which they avoided a greater head on one part of the filter than the other had been obtained by making the drains of very large section. About the time these filters were put down, the bacteriological question was raised; and one interesting fact was at once elicited at Warsaw—that the number of bacteria bore more or less direct relation to the velocity of the filtration, and inverse ratio to the thickness of the sand. In their new filters, they had reduced the thickness of gravel to 6 inches and 1 foot, and increased the thickness of the sand to 4 feet. Allowing for the scraping off of 1 foot, the minimum thickness obtained was 3 feet, against 1 foot formerly. Corners were a weak point in filters; and in the new ones, they had been done away with. The air-outlets had been combined with the drains, which were very large—2 feet wide and 2 feet high. A special system of ventilation had also been arranged from the water-level. Ventilating-shafts, about 10 feet high, had been raised; and very active ventilation went on. As to the results of the working during the four years 1895-8, they had four settling-tanks, the total contents being 47,000 cubic metres. The average quantity of water pumped was 43,000 cubic metres, the maximum 58,000 cubic metres, and the minimum 31,000 cubic metres. So the average duration of settling was 25 hours. The suspended matter deposited in the settling-tanks varied from 79·9 to 82 per cent.—that was, 80 per cent. of all the suspended matter was retained by the settling-tanks. The matter retained by the filters was 20 per cent. These were important figures to be considered relatively to the cost. The cost of clarifying the water by settling, in spite of these rather expensive works (which had to be constructed on account of the climate of Warsaw), was one-fifth of that by filtration. The water was not what would be exactly called a good water. It contained 3480 and 3800 bacteria per cubic centimetre. After settling, this was diminished to 3000 and 2600; and, after filtration, it averaged 40, 70, 81, and 41 germs per cubic centimetre. In other words, the average proportion of bacteria retained by the filters was 98, 97, 97·4, and 98·5 per cent. The rate of filtration was small—viz., 4 inches per hour.

Mr. G. F. DEACON paid a tribute of admiration to the way in which American engineers have recently taken up the subject of water purification. In regard to sand filtration, there was one element which was not completely settled, and that was the part that the sand itself really played in the process. This they did know, that the sand was not much more than a strainer, that it served to support the film which was formed on its surface, and which really constituted the filtering medium. Nevertheless, they could not do without a considerable thickness of sand, because the film was exceedingly thin, and was subject to rupture from many causes. He had found in a great number of filter-beds, made in the old style with a considerable thickness of sand—say, 4 feet—that, unless the sand had in it elements such as lime or iron, which tended to a certain extent to its cohesion, or unless the particles of that sand were exceedingly uniform in size, the moment filtration started, a movement of these particles began. In such filter beds, by cutting down to a vertical surface, they would find a lenticular formation of the redisposed grains—coarser grains and finer grains, and a certain amount of pitting in lenticular and angular forms. He had come to the conclusion that, instead of the water going down vertically as one felt disposed to think it would, it did nothing of the kind. It was just as erratic as a piece of paper let fall from the hand and passing through the air, and the velocities were very much greater in the sand than was generally supposed.



Following up this observation, he had found that effect upon a surface just over a place where the larger grains were left, and from which smaller grains had been washed; and he believed this phenomenon was more readily created in a thin bed of sand than in a thick one. Referring to Mr. Lindley's remarks, he stated that in recent practice in this country automatic regulation had been adopted, but the flow was not made uniform under all circumstances—it depended upon the condition of the filter. In addition, he (Mr. Deacon) now measured the flow on a diagram; and this he considered was a great safeguard—giving as it did a sudden indication of a condition which could pass bacterial life.

Mr. G. W. FULLER (New York) thought that, in considering the various systems of filtration, the quality and composition of the water to be filtered was a factor of prime importance; and this was particularly so in America, where they had wide ranges in the character of surface waters. There the question of the appearance of the filtered water was one of the most unsettled conditions that water engineers had to face, because there were no other means by which the consumer could form an opinion of the water than by the colour it possessed. The speaker proceeded to supply a vast amount of information regarding the types of waters with which American engineers had to work, and which showed that they were of a character very difficult to deal with in regard to their purification. He commented on the meagreness of analytical evidence concerning these waters, and especially with respect to samples which represented normal and maximum conditions, and which the engineer must consider in designing his purification works. He also complained that there was a lack of uniformity in the analytical methods that were used to obtain the results. An effort to correct this was being made by the American Public Health Association. The English system of sand filtration was regarded most highly in America. But they had little information to guide them as to the practical operation of any kind of filters; being dependent upon results of investigation carried on on a small scale. There were really not more than twelve or fifteen sand filters worthy of the name in America. There water purification was really in its infancy; and it had not developed to the point to which they hoped to attain in a few years. Mechanical, or rapid, filtration was the method which had been used in comparatively small plants during the last twelve or fifteen years. It was a proprietary device, of which the patent expired next year. Its introduction had been slow, beginning with the purification of industrial water for the removal of vegetable stain and turbidity. For waters comparatively free from turbidity, American engineers were practically unanimous as to the English system of sand filtration being preferable. Their practice was to have a very thin layer of gravel under the sand—viz., 6 inches, and over the collecting-pipes 12 inches. The almost universal custom was to provide for the filtration of 3 million gallons of water per acre per 24 hours. But during extremely warm and cold weather, the consumption ranged from 40 to 50 per cent. above the average; and then the rate of filtration would be increased to  $4\frac{1}{2}$  or perhaps 5 million gallons per acre. Changes of this kind were made in a progressive and careful manner. He thought covers would be used in America in the majority of cases where sand filters were adopted, and gave his reasons for this opinion. There were many waters in America containing so much stain that sand filters were not applicable; and in these cases rapid filters and the use of a coagulant were found preferable.

Dr. S. RIDEAL pointed out that the American engineers had given sand filtration a trial; and it seemed only fair that English engineers should return the compliment, and give mechanical filters a proper trial here. It appeared to him that the upland surface and moorland waters would be very amenable to this mechanical filtration. Mechanical filters in which a coagulant was added would also, he felt sure, correct the fault of plumbism. On the whole, the method of sand filtration gave better bacterial purity than mechanical filters; but he took it this was only due to the fact that mechanical filters had been worked at a much greater rate, and perhaps with a minimum quantity of coagulant for the specific purpose for which they had been required in the States, without due regard to the reduction of bacteria. Although sand filters had been brought to a high state of perfection, there was still an odd balance of organisms passing through them; and these might be pathogenic organisms. He believed the question of the sterilizing of water would be brought forward very shortly for the reduction of bacterial impurity. He believed this could only be effected by "heat sterilization." He knew he was using the wrong phrase, but he did so purposely. It was not a question of heat sterilization at all; but what he meant was the temperature condition at which organisms were killed. He thought it would be well if the engineers of this country and of the States paid some attention to the problem of bringing very small bodies of water—2 or 3 pints per head of the population—to a temperature that would ensure the killing of any pathogenic organisms they contained.

Mr. HENRY DAVEY (Birmingham) emphasized the importance of sedimentation in regard to the improvement of the quality of water, and the reduction of work on the filters. As had been pointed out, it was only the thin layer on the surface of the filter that did the work; and the object of this was primarily to maintain the thin structure in a quiescent state, so that the bacteriological effects might take place. As to the rate of filtration, according to his experience 4 inches per hour was

good practice, and should be the maximum with a water containing a large amount of bacteria. Good management of filter-beds he referred to as a necessity. As to the thickness of sand, although a thin layer was all that was necessary to maintain the surface film, a considerable thickness was desirable for safety. If they took a section of a filter-bed having (say) a depth of 4 feet of sand, they would find streaks of pollution almost all through it. A point in a filter which gave considerable trouble was the inlet. If it were not properly constructed, the water around the inlet disturbed the sand; and the water found its way down without a surface film being formed.

Dr. AD. KEMNA (Antwerp) considered that the most important part of the work of a sand filter was the biological one; and it seemed to be true that the organic matters in the water were destroyed by fermentation. Colour matter was not dealt with by sand filtration; and the explanation was a very simple one. Animal or nitrogenous organic matter was an unstable compound, and very easily destroyed; while organic carbonaceous vegetable compound was much more troublesome to deal with. Therefore the fermentation that went on on the surface of a sand filter destroyed the one, but did not touch the other. He alluded to the importance and usefulness of a microscopical examination of the upper layer of sand filters. The sand filter was really a simple appliance; but Mr. Lindley had placed before them a very complicated arrangement for subsidence and an automatic regulating apparatus for filters. Mr. Deacon had pointed out that the latter was insufficient; and Dr. Rideal said that, while sand filtration did very well, he wanted to kill the odd microbe that was left in the water. If they took all these processes together, they would get a long list of appliances. There were practical limits to which they as water engineers could go; and he should suggest that these proposals required a certain amount of modification. Mr. Lindley's arrangements for subsidence were good for working on the continuous system; but, in his (Dr. Kemna's) opinion, subsidence was much better performed if they could give the water complete rest. Speaking of the thickness of sand, he thought there was some physical action behind the mere extraction on the surface of some of the soft matter in the water. Sand was an inactive substance; so that the value of an increase in its thickness did not lay in that direction. But there was a mechanical reason—that, with a thick bed of sand, the rush of water was diminished, and so, in the event of the film being ruptured, there would not be such a great rush of polluted water through it. He regarded the measurement of the rate of filtration as absolutely necessary.

Professor HILDYARD supplied some particulars of the sand filtering arrangements for the city of Zurich, which was supplied with water from Lake Zurich. Owing to the character of the water, the filters used to require frequent cleansing; but, by the adoption of primary filters, the final ones ran for much longer periods. The primary filters were cleaned by a current of air, which was mixed with the water and pressed through the filter-beds. The rate of filtration was 7 metres per 24 hours; and the supply varied between 6 and 7 million gallons per day. There were ten filtering chambers altogether.

Mr. WALTER HUNTER (Grand Junction Water Company), referring to Dr. Rideal's remarks as to sterilization, admitted that engineers owed a good deal to chemists and bacteriologists who set up an ideal to which they (the engineers) strove to attain; but he thought the bacteriologists strained beyond what it was possible to attain in practice, and beyond that which was really desirable. The wonderful statistics regarding the health of the people and the death-rate in London, testified to the admirable way in which the filtration of the water supply was carried out. The Thames had been greatly improved by the action of the Thames Conservancy; and it was now 33 per cent. better than it was. By filtration, the Companies removed 98 or 99 per cent. of the microbes; and the chemical analyses of Sir William Crookes, Professor Dewar, and Dr. Thorpe were most satisfactory. Dr. Thorpe had dropped the microbial examination of the late Sir Edward Frankland, and confined himself entirely to the chemical analysis of the water.

Mr. ANDREW JOHNSTON (London) gave some results of experiments with polarite, in comparison with sand filtration; and he claimed for the former that it did at least 500 per cent. more work than the latter. The greater work that polarite could perform, in comparison with sand, more than counterbalanced its greater cost. He explained that polarite was an oxide of iron. It was treated in retorts; and the carbonic acid gas was driven out. The material was of a highly porous nature.

This concluded the discussion, which had occupied a considerable length of time.

A congress will be held at Aberdeen from the 2nd till the 7th prox., under the auspices of the Royal Institute of Public Health. Among the papers promised is one on "Sewage," by Professor Percy F. Frankland, F.R.S. The Council of the Sanitary Institute have arranged to hold a meeting in Paris from the 7th to the 9th prox., which will immediately precede the meeting of the International Congress of Hygiene and Demography, also to be held in the French capital. The Société Française d'Hygiène have offered to the members of the Institute a cordial reception, and are providing a reception-room, and making arrangements for special visits and excursions for the benefit of the members attending.



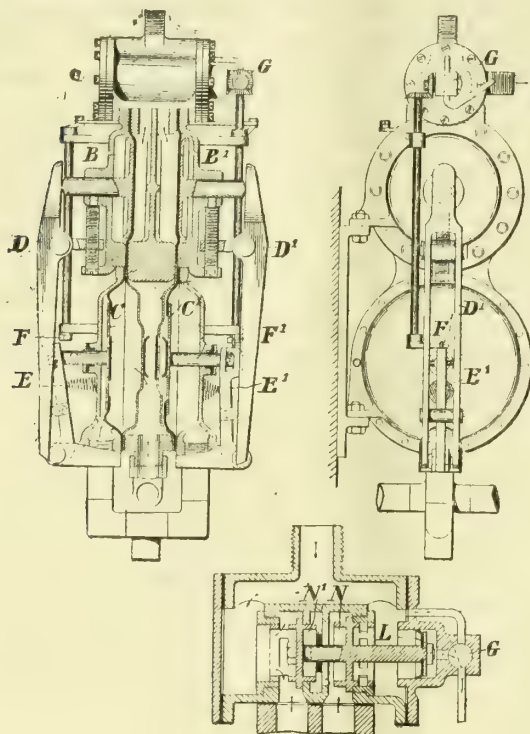
## REGISTER OF PATENTS.

**Compressing Gas.**—Snell, C. G., & F. A., of Saltash. No. 12,921; June 21, 1899.

This invention relates more especially to appliances adapted for increasing the pressure of gas for incandescent gas lighting.

It will be seen that the frame used has two faces, each recessed to accommodate a gas diaphragm and a water diaphragm, so that the pulsation or motion derived from the latter (B B<sup>1</sup>) is conveyed to the former (C C<sup>1</sup>) through rocking-levers D D<sup>1</sup> and E E<sup>1</sup> oscillating on knife edges or centres.

Extensions of the levers actuate the controlling valve (see the enlarged section) at the head of the machine—striking at the end of each stroke, the arms F F<sup>1</sup> alternately. These are connected by other arms and rocking-bars to each other and to a tap G, the actuation of which allows the fluid to operate the valve.



While the gas diaphragm C is being driven in by the water pressure on the diaphragm B, the water is entering through the corresponding port; its exhaust-outlet being closed. Water is meantime being expelled from the other water division by the power of a spring; the exhaust aperture being open, and the water-inlet closed in that case. This latter division remains inoperative until the full stroke of the first division nearing completion causes the tap G to be reversed. The pressure is thereby admitted to the head of the piston L; and the valve therefore reverses itself on account of the extra area of the disc N over that of the disc N<sup>1</sup>. The valve is so proportioned that, in reversing, it opens the water supply to one division before closing the other—ensuring continuity of water-feed.

**Purifying Hydrocarbon Gases.**—Exley, J. H., of Huddersfield. No. 15,239; July 25, 1899.

The patentee proposes to filter hydrocarbon gases by causing them to pass through "a porous earthenware body formed by burning in a kiln or otherwise an intimate or kneaded mixture of a suitable earth (such as porcelain or common clay, steatite, or the like) and granulated or sub-divided combustible material; such mixture being moulded into any desired shape for use." The porous earthenware body is made of a mixture of finely divided sawdust, bran, flour, or other combustible material with porcelain, common clay, steatite, or other suitable earth—the mixture, when subjected to the action of burning in a kiln, having "the effect of destroying to a more or less extent the combustible material that has been intimately mixed with the earth as described."

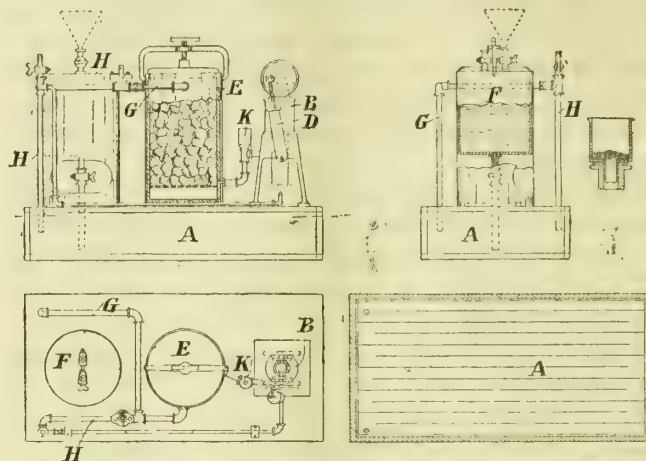
A porous body, made as above, serves, the inventor remarks, as a very efficient filtering medium for breaking up and removing impurities—such as coal tar, benzene vapours, and other impurities from coal gas, acetylene, and other hydrocarbon gases—and thereby reducing the tendency of such gas to burn with a smoky flame in an ordinary burner; and, on account of its absorbent nature, it also serves to effectually remove any moisture there may be in the gas. It is, therefore, especially suitable for filtering acetylene from any suspended solid matter carried away from the calcium carbide, and also moisture due to contact of the gas with the water used to decompose the carbide.

As a further medium for the purification and drying of acetylene or other hydrocarbon gases, the porous earthenware may be saturated with sulphuric, hydrochloric, or other suitable acids, so that the gas, in forcing its way through the porous material, is split into numerous streams, and thus brought into intimate contact with the acid, "which not only absorbs the ammonia and moisture, but a large proportion of other impurities which may be present."

**Production of Illuminating Gas.**—Schwander, F., of Durlach, Germany. No. 16,147; Aug. 8, 1899.

This invention relates to a method of producing a combustible gaseous mixture by passing moist air over calcium carbide, and then carburetting the resultant mixture of acetylene and air by passing it over petroleum-

ether or other volatile hydrocarbon. It is chiefly based on the observed fact that the natural amount of moisture in the air is sufficient to cause the generation of acetylene if the air is conducted through, or over, a large quantity of carbide; the necessity of moistening the air before passing it through the carbide container arising only if the air be extremely dry. The process, it is said, offers (when compared with known methods) the following advantages: (1) Complete consumption of the carbide, coupled with the best results as regards the production of acetylene; 1 kilo. of carbide producing nearly 330 litres of acetylene. (2) Generation of the gas in a regular manner, and completely devoid of the danger consequent on the after-generation of acetylene gas within the carbide container. (3) The obtaining of a residue in the container in the form of a fine, dry, and dust-like powder of lime, which may be employed for many technical purposes, instead of a useless sediment or mud as hitherto.



D is a pump operated by a hot-air motor B, and drawing in air through a non-return valve beneath the cup K, which preferably contains shot, which, by being kept wet, would serve to moisten the air (in case the latter is too dry) before it passes into the carbide container E. The acetylene, as generated, flows through the pipe G, and is discharged into the carburetter A. This carburetting apparatus consists of an airtight casing, in which pieces of felt are suspended with their bottom extremities dipping into a stratum of petroleum-ether or the like. The pieces of felt are so arranged as to alternately leave a space between the wall of the casing and themselves, so that the gas is compelled to follow a zig-zag course in passing through the casing. The petroleum-ether is supplied to the carburetter A through a pipe which dips slightly into the ether at its lower extremity, and is connected at the top with a reservoir F which, when once filled, can be closed airtight. A cock is provided for the regulation of the direct supply of the crude gas to the service-pipe, by means of which the operator is enabled to introduce more or less of the crude gas (that is, the mixture of acetylene gas with air before being carburetted) into the mixture of gas passing into the service-pipe.

The apparatus is worked in the following manner: First, the hot-air motor is started; and as soon as the generation of acetylene begins (which occurs after a few minutes), the gas for feeding the flame of the hot-air motor, being produced by the apparatus itself, may be allowed to pass to the motor flame by way of the branch-pipe, whereupon the entire process proceeds automatically.

**Gas-Meters.**—Leckband, T. H. J., of Adair, U.S.A. No. 4739; March 13, 1900.

This "measuring machine for gas" consists of a pair of telescoping holders, each provided with a suitable service-pipe and sleeves, and connected to each other and with the burners. Depending sleeves in connection with the service-pipes, a pair of pivoted levers each carrying a sealing cup designed to co-operate with the sleeves, and suitable means intermediate of the levers designed to utilize the downward movement of each bell, complete the arrangement.

**Production of Combustible Gas from Refuse Sweepings, Waste Products, and the like, Free from Carbon Monoxide, and with or without the Simultaneous Production of Cyanogen Compounds.**—Imray, O.; a communication from G. Ottermann and Co. and Professor Victor Loos, of Vienna. No. 6625; April 9, 1900.

In their specification, the patentees point out that a process has already been proposed for the production of combustible gas free from carbon monoxide from refuse and waste products, by using retorts the walls of which contain iron, and are permeable to carbon monoxide. According to this invention, a combustible gas free from carbon monoxide (suitable for lighting and heating) can also be produced from refuse and waste materials when using fire-clay retorts that are impervious to gases.

The process for this purpose is carried out as follows: (1) The gaseous mixture obtained by heating the refuse in a fire clay retort is led into a second retort, in which are contained suitable reagents arranged in a particular manner. (2) Both the generation of the gas and also its conversion in the second retort are effected at a temperature which (owing to the short duration of the gas production—namely, 1½ hours) is higher than that employed for illuminating gas. The inside of the retorts is maintained as uniformly as possible at a temperature of from 700° to 800° C. (3) The gases and vapours generated from the refuse in the first retort are caused in the second retort—in which the conversion of the gases is to be effected—to pass over hot paper ashes, so as to be raised thereby to the dissociation temperature; and they are then led, in a completely or partially dissociated condition, over coke or other carbonaceous material. By this means, the conversion of the gases is effected.

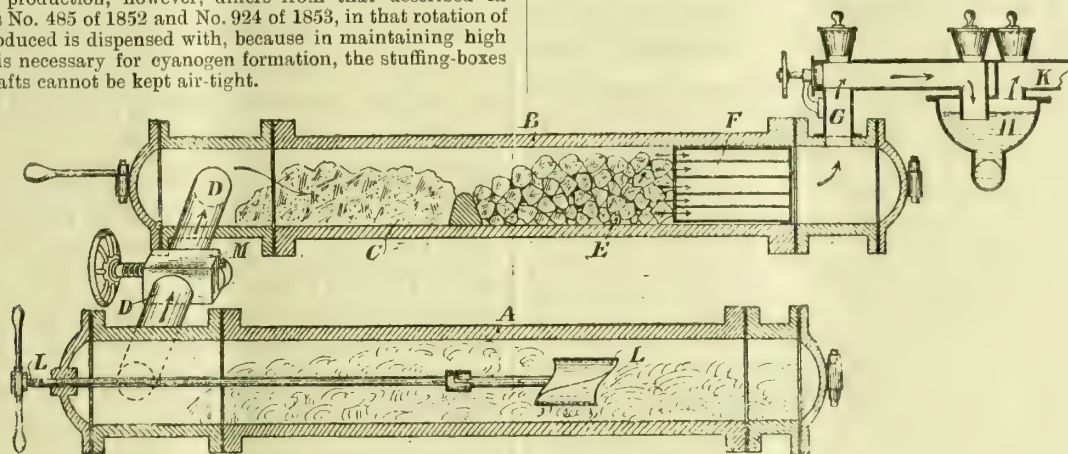
In order to procure the conversion of the gases obtained by distillation, they were first led over some heated substance having no chemical action—such as pieces of fire-clay—or over coke. The conditions of the present invention, on the other hand, consist in the combination of the use of the



chemically neutral materials with the use of carbonaceous substances. It has been proved that the refuse gas, when only passed over red-hot neutral substances, is not materially improved, because, unlike the gases produced from richer materials, there are too few convertible hydrocarbons present; and for the want of carbon, water and carbon dioxide cannot be converted into combustible gases. On the other hand, when leading the refuse gas over carbon alone, the conversion does not take place to a sufficient extent to furnish a useful heating gas, because the fire-clay retorts conduct the heat badly, and the coke has to furnish both the heat for raising the temperature of the gases and vapours and the heat required for the dissociation. In consequence of this double duty, the temperature of the coke rapidly sinks (in particular during the first energetic evolution of the gases) below the dissociation temperature, while the fire-clay walls insufficiently make good this loss of heat. On the other hand, by the combination of the above described operations, a useful heating gas is obtained.

The process is based on the fact that, by first leading the poor gas over neutral material, it is raised to the dissociation temperature, and by then passing it over carbon its conversion is effected. The heating and the conversion are therefore effected by different materials. At the same time, a gas is obtained that is practically free from carbon monoxide, as the gas only contains from 0.3 to 0.7 per cent. of it. The gas, however, contains a notable quantity of nitrogen—namely, up to 10 per cent.; but this can be extracted, and at the same time rendered useful, by passing the refuse gas in a heated condition over a red-hot mixture of alkali-carbonates and carbon, or a mixture of potash, carbon, and pulverized iron or iron oxides. These mixtures are heated to the melting point in an iron vessel in the front end of the converting retort. By the reaction of the nitrogenous gases present, cyanogen compounds are produced under the conditions existing in the retorts.

This cyanogen production, however, differs from that described in Souchoy's patents No. 485 of 1852 and No. 924 of 1853, in that rotation of the material introduced is dispensed with, because in maintaining high temperatures, as is necessary for cyanogen formation, the stuffing-boxes of the rotating shafts cannot be kept air-tight.



In the illustration, A is a fire-clay retort, in which the distillation of the refuse is effected; B is the second fire-clay retort, into which the gases produced in A are led by the connecting-pipe D. The retort B contains, in the space C, paper ashes or other chemically neutral material; while the space E contains coke. In the space F of the retort B is arranged an iron receptacle, which is divided into compartments, and is intended to receive the substances for combining with the nitrogen, and forming cyanogen compounds. Both retorts are built into a generator furnace. The gas generated in A flows into the transforming retort B, where it first passes through the mass of paper ashes, then over the coke, and finally through the receptacle F, whence it passes off, through the discharge-pipe G and the hydraulic main H, into the pipe K leading to the condenser and scrubber.

An essential feature for facilitating the gas formation, and for effecting a rapid distillation process, consists in the provision of a stirring apparatus L projecting into the retort A. This consists of a rod provided outside with a handle, and inside with a stirring blade, which preferably has the form of an inclined surface. The rod passes through the cover of the retort; and by rotating it and pushing it backwards and forwards, the material to be distilled is kept in motion.

The charging of the retort A is effected through the opposite end of the retort, which is provided with a hinged door for this purpose. The charging of the paper and coke into the retort B is effected at suitable intervals through that end to which they are nearest. When recharging with coke (which is effected after about 24 hours), the vessel F serving for the production of the cyanogen is removed and emptied (the contents being further treated in any known manner); and a new vessel charged with fresh material is introduced into the retort. In order to avoid as much as possible any access of air, which would be injurious for the cyanogen compounds, a slide M in the connecting-pipe D is closed during the time that the retort A is being opened and closed.

**Manufacture of Water Gas.**—Pettibone, H., of New York. No. 7423; April 21, 1900.

This invention relates to the manufacture of water gas. One object is to provide for producing an increased volume of gas from a given quantity of fuel, and to utilize all the producer gas given off from the generator by burning it in superheaters, and then superheating both air and steam, by passing through the superheaters, on the way to the generator. Another object is "to provide an improved construction and arrangement of the generator and connected superheaters and certain pipe and valve connections, by means of which the body of fuel may be blasted with hot air, passed both upward and downward through it, and by which superheated steam may be passed both upward and downward through the body of incandescent fuel, and the gases passed off both at top and bottom of the body of fuel at alternate periods."

The generator A and the superheaters E and F are constructed of fire-brick, and enclosed in tight iron jackets in the usual manner. The generator is provided with a fuel-opening at the top, and with the clean-out openings near the bottom, in the usual manner. The grate is prefer-

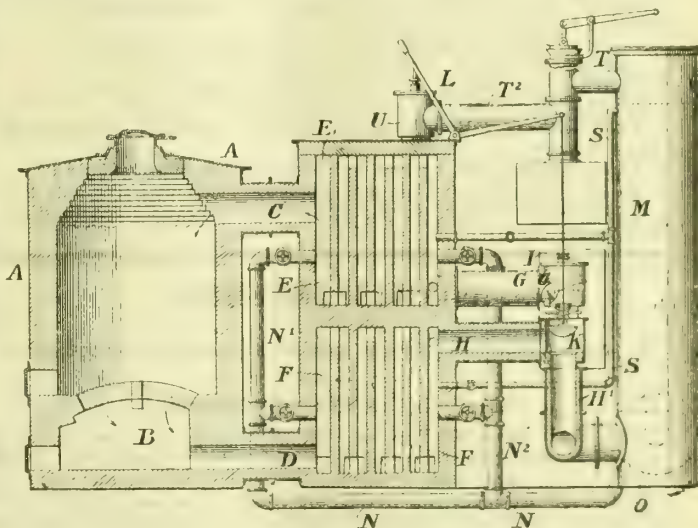
ably constructed of fire-brick arches, and separates the fuel-chamber from the usual ash-pit B. The generator is provided at the top with a gas-outlet C, and at the bottom or ash-pit chamber with a gas-outlet D. An air and steam superheater E connects with the upper gas-outlet C, and a separate air and steam superheater F connects with the lower gas-outlet D. The superheaters E and F may be constructed in separate shells, and each rest on its own foundation, if desired; but they are preferably built in one structure, one above the other, with a thick horizontal partition between them, as shown.

The superheaters are preferably constructed with fire-clay partitions forming numerous vertical, connected flues, as illustrated. The superheater E is constructed with the fire-clay partitions forming the vertical flues, and having connecting passages alternately at top and bottom. The superheater F is constructed in a similar manner, with vertical fire-clay partitions forming vertical flues, and having connecting passages alternately at top and bottom. At the bottoms of the superheaters, and in the side walls, are provided clearing-out openings with doors for removing the dust and ashes. A gas-outlet opening and pipe G connects the discharge side of the superheater E with a valve-chamber, and a separate gas-outlet and pipe H connects the superheater F with a valve-box. Both valve-boxes connect with the gas-discharge pipe H<sup>1</sup>, which connects with a gas-chamber at the lower end of the steam-boiler M. One valve-box is provided with the usual annular seat and a ball or disc valve K, to which is attached a rod connecting at its upper end to the pivoted lever L. The other valve-box is provided with a similar seat and valve. The valve-boxes are surrounded by the water-tank I, through which water is circulated.

The steam-boiler M is of the tubular kind, and is provided with gas-chambers at the lower and upper ends. A gas take-off pipe T connects the upper gas-chamber with the stack or blow-off pipe. A branch-pipe

with a valve-box and valve U controls the flow of water gas to a holder or place of immediate use.

The air-blast is supplied to the generator and to the superheaters under pressure, by means of the blower O (indicated by dotted lines). An air-blast pipe N leads from the blower, and connects with a vertical branch N<sup>1</sup>, from which short branch-pipes connect, respectively, with the superheaters E and F near the connection of the upper and lower



gas-outlet pipes C and D, leading from the top and bottom of the generator. A second air-blast pipe N<sup>2</sup> leads from the pipe N, and is provided with short branches, which connect with the gas-discharge sides or ends of the superheaters E and F. A steam-supply pipe S from the top of the boiler is provided with a branch-pipe, connecting with the superheater E at its gas-discharge end; and also with a second branch-pipe which connects at the gas-discharge end of the superheater.

**Bunsen Burners.**—Lacroix, P., of Paris. No. 7505; April 23, 1900.

The patentee—experimenting with bunsen burners—claims to have found out that it is necessary to adjust the mixing-tube to a more or less eccentric position in relation to the stream of gas supplied from the gas-jet, especially in the case of small consumptions, as this "constitutes an indispensable condition for the perfect working of the burners." Experience, however, has shown that, in practice, the displacement of the mixing-tube parallel to the axis of the tube is sufficient for securing a



perfect result, if care be taken to avoid the use of very defective gas-jets; and this has enabled the patentee to considerably simplify the method of regulating his burners.

Fig. 1 illustrates the theoretical arrangement of burner. O is an ordinary bunsen gas-jet (of soapstone or any other similar substance), with a simple hole formed in the body. It is fixed on a nozzle through which the gas enters, and is directed into a mixing-tube C at the top of which combustion takes place. A tube A, perforated at a suitable height with air-holes, connects the tube B of the jet with the chimney C. This latter is supported by means of six set-screws arranged in two rows of

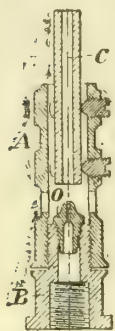


Fig. 1.

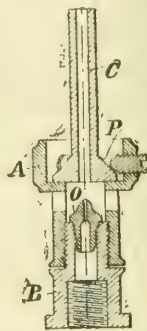


Fig. 2.

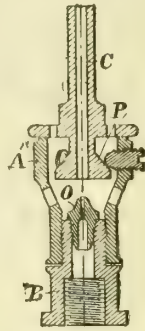


Fig. 3.

three. Thus, the jet being ignited, it is always possible to adjust the mixing-tube C in relation to the direction of the stream of gas from the gas-jet—the necessary position for ensuring the mixing of the air and gas under the most favourable conditions, and “consequently the absolutely perfect combustion of the carbon.”

Figs. 2 and 3 represent the two forms very commonly employed by the patentee in his experiments. The mixing-tube C terminates at the bottom in a cone P, against which three screws keep it fixed in the required position in the tube A. The results obtained with these simple and easily regulated arrangements were most satisfactory; but the patentee declares, nevertheless, that the principal object of the present invention consists, not in the particular arrangements described, but “in the possibility of regulating the position of the mixing-tube in relation to the direction of the stream of gas furnished by the gas-jet.” Thus, this object may be attained in many ways, independently of those just explained. The cone P could, in fact, be replaced by a seat or base against which a screw in the tube A would act. The screws might thus be arranged perpendicularly to the bottom of the cone P. Or, again, the mixing-tube C might be furnished at the bottom with a screw-thread formed eccentrically in relation to its axis, and screwing on to a nut likewise made eccentric, which would connect it with the tube A. Moreover, the mixing-tube C could be simply fixed to the tube A by soldering as soon as the suitable position had been determined. Finally, the displacement of the mixing-tube C obliquely to the axis of the tube A could be effected by some flexible-connecting arrangement or similar contrivance.

#### APPLICATIONS FOR LETTERS PATENT.

- 12,367.—VOLLMAHN, C., and THIELENHAUS, F. W., & E., “Time gas-lighters.” July 9.  
 12,381.—ESTCOURT, E., “Gas and oil motors.” July 9.  
 12,390.—GRAY, H. E., “Burners.” July 9.  
 12,438.—LAKE, H. H., “Gas-burners.” A communication from G. S. Terry. July 10.  
 12,444.—MELHUISH, A. G., “Gas and oil engines.” July 10.  
 12,491.—SEAL, J. W., “Oil and gas engines.” July 11.  
 12,512.—GRANGER, W. A., “Oil and gas engines.” July 11.  
 12,529.—DAWES, M. G., “Gas and like stoves.” July 11.  
 12,578.—COLLINS, R., “A tubular boiler for gas-retort and other furnaces.” July 12.  
 12,581.—TALBOT, H., “Lighting incandescent burners.” July 12.  
 12,671.—HEALD, A., “Illuminant appliances for burners.” July 13.  
 12,738.—LIEBERMANN, L. S., “Mantles for incandescent lighting.” July 14.

### CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

#### The Rating of Water Undertakings.

SIR,—I have read Mr. Wilkins's letter and proposal in your issue of July 19, regarding the rating of water undertakings; and, so far as my knowledge of such matters extends, the method he suggests seems to afford a fair basis for simplifying the rating of concerns belonging to companies. But I agree with you that it would be difficult to apply the system so as to produce equality between the rating of water undertakings which are the property of local authorities and undertakings which are owned by companies.

To your objection, Mr. Wilkins asks whether the cases of local authorities would not be met by taking “a simple percentage on the structural cost.” I am afraid Mr. Wilkins made that suggestion without due reflection. What is wanted is something approaching uniformity for all undertakings of a similar class—whether the proprietorship is vested in a local authority or a company. A basis for one distinct from that applied to the other would, I am afraid, be liable to create unfairness between the two, and would tend to the raising of difficulties and issues which would be perplexing and troublesome.

But there is an objection to Mr. Wilkins's “simple percentage on the structural cost” for local authorities undertakings which may be considered fatal. To make such a system fair, the product for a given amount of structural cost should be equal in all cases. But it is not. In one case the works may cost considerably more than in another per million gallons of water yielded or delivered into the town's mains. For

instance, I know of one case where water in such abundance is secured from wells that no reservoirs are needed; and that is a town of considerable importance. In another case, large reservoirs have had to be constructed in a rock-bound formation, and the excavation has been a costly matter. In a third case, a large amount of capital has been spent in sinking wells for water which refused to appear except in disappointing quantities. Such widely differing cases as these are not uncommon in water-works construction. And would it (one would like to ask Mr. Wilkins) be fair that the comparatively low structural cost per million gallons yielded in No. 1 case should be placed on the same footing as the high structural cost incurred per million gallons in cases Nos. 2 and 3? I say it would not.

The only way in which I can see that the new suggestion could be applied would be by having a sliding-scale of percentages on the structural cost governed by the yield of water—that is to say, a percentage decreasing with the rise of structural cost per million gallons of yield, with the addition (as Mr. Wilkins suggests) of a specified proportion of any profit derived from supplying water to outlying places. Even then I am doubtful, without extended investigation (for which I have not the time), that this would secure justice between the local authorities.

July 11, 1900.

AMICUS.

### PARLIAMENTARY INTELLIGENCE.

#### Gleanings from the Committee Rooms.

Our record in the last issue of the “JOURNAL” of the proceedings on the Wandsworth and Putney Gas Company's Bill took us to the point at which the Committee, presided over by Lord Brougham, declared the preamble proved. From the demeanour of the Committee, we had concluded that the Company, having such a respectable record, were going to be allowed to leave Parliament free from the imposition of any harassing conditions; but on the consideration of clauses yesterday week, the Committee were more bountiful to the Local Authorities than was expected. In the first place, the Company are to provide a new road as compensation for the gain which will result from the closing of useless thoroughfares intersecting their works; and they have conceded to the Wandsworth Board a site for a new wharf owing to the loss of access to their existing one. Thus far, no doubt the Company anticipated they would have to go. But then the Board caused the infliction of an additional testing-station farther removed from the works than the one they had granted to them in the Lower House. The consumer had ample protection in this respect provided in the Bill as it came before their Lordships; and we fancy that time will show that the Authority have been mistaken in their view that a station at a distance from the works would be an advantage to the consumer. The illuminating power will now have to be such as it leaves the works that it will reach the distant station at the specified power; and the consumer will, or may, according to circumstances, have to pay the price of this doubtful luxury. The new station is to be located at Putney; and there will also be the one (given to the Board when before the Commons Committee) at the Wandsworth Town Hall. But the Company have the option of deciding whether or not they will continue the one at the works. The Board have also secured the right of instituting testings for pressure at the public lamps; but two hours' notice of intention to do this is to be given to the Company.

The Corporation of London (Various Powers) Bill, which, as our readers may remember, contains a clause enabling them to construct subways in the existing thoroughfares of the City, to prevent the various gas, water, hydraulic, and other companies from breaking up the streets, has passed the House of Lords Committee practically as an unopposed measure. The chief objectors to the Bill in the Lower House were the Charing Cross and Strand Electricity Supply Company, who are now in the City in competition with the City of London Electric Light Company. The Gaslight and Coke Company, who were represented in the Commons by Mr. Pope, Q.C., practically raised no objection, though they are the greatest users of subways. The same Bill also contains a clause (53) with regard to the fixing of public lamp-brackets on the walls of private property. It runs as follows: “The Corporation may affix to the external wall of any building fronting any street within the City any brackets, wires, pipes, lamps, and apparatus which may be necessary or convenient for the public lighting of streets within the City.”

#### HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

- Bill brought from the Commons, read the first time, and referred to the Examiners; Paisley Water-Works Provisional Order Bill.
- Bill read a second time and committed: Perth and Paisley Gas Provisional Orders Bill.
- Bills reported, with amendments: East London Water Bill, Portland Urban District Gas Bill, South Metropolitan Gas Bill, Wandsworth and Putney Gas Bill.
- Bills read the third time and passed: Lambeth Water Bill, Portland Urban District Gas Bill.

#### HOUSE OF COMMONS.

Tuesday, July 17.

#### THE DUNGANNON GAS ORDER CONFIRMATION BILL.

To-day the debate was resumed on Mr. P. C. Doogan's amendment to reject the motion for the second reading of the above-named Bill; the matter having stood over for a fortnight in order that, if possible, satisfactory terms might be come to between the parties (see *ante*, p. 93).

Mr. T. W. RUSSELL asked leave to make a statement. It would be remembered, he said, that when the matter was before the House a fortnight ago, he suggested an adjournment in order that negotiations might go forward for the purchase of the gas undertaking by the Local



Authority. That suggestion was agreed to; and he was now in a position to state what had been done. The original offer of the Town Commissioners of Dungannon was to purchase the undertaking for £7000. The Gas Company asked £9000 for it, but consented to refer the difference to an arbitrator to be appointed by the Government. In the time which had elapsed since the adjournment, the local Committee had increased their offer to £8000, and the Company had reduced their demand from £9000 to £8500. There was thus a difference of £500 between the parties; and, although he had worked very hard, he had been unable to get rid of the difficulty. The Order must, therefore, now be approved or rejected by the House. He must say that the Order was a very serious thing for the town of Dungannon, because it fixed the capital of the Company at £9000, the price of gas at 5s. 10d., and the dividend at 10 per cent. As far as he was concerned, he intended to vote against the Bill. The whole Irish representation, north and south, were against it. It was not a Government matter.

Mr. DILLON said the Bill proposed to maintain the maximum price of gas at 5s. 10d., for the purpose of giving the shareholders a dividend of 10 per cent. The accounts of the Company were before them on the last debate, and it appeared that the cash capital outlay was only £4200. All other expenditure had come out of profits over and above the 10 per cent. dividends. The ratepayers had offered to buy out the Company at £8000, which was nearly double the amount of capital put into the concern by the shareholders. Were the unfortunate ratepayers in the future to be forced to pay the enormous price of 5s. 10d. per 1000 cubic feet?

Mr. S. YOUNG suggested that the second reading might be allowed, and the contentious matters left over until the third reading. In the meantime an arrangement might be come to.

Mr. RUSSELL said he could not consent to this course. The third reading might not be reached till the end of the session, when Irish representatives might be absent. The Company would not be in any way prejudiced by the rejection of the Bill.

Mr. JESSE COLLINGS, on behalf of the President of the Board of Trade, supported the second reading. He suggested that contentious matters might be dealt with in Committee.

Mr. MACARTNEY said he proposed to vote against the Bill. Who would be damned, he asked, if the second reading were refused? Not the consumers, and not the Company. Next year, if the Local Authority chose to apply for powers, the Company would be able to prove the value of their property in a far more satisfactory manner than now.

The motion for the second reading was rejected without a division.

#### Thursday, July 19.

##### MUNICIPALITIES AND THE PAYMENT OF INCOME-TAX.

Sir A. HICKMAN asked the Chancellor of the Exchequer whether he would state the reasons why income derived from payments for interest made by municipal authorities was charged with the full duty of 1s. in the pound for the whole period in respect of which it was payable, whereas income derived from similar payments made by public companies or private persons was calculated at the increased rate only since the date when the higher duty was imposed.

The CHANCELLOR OF THE EXCHEQUER: The distinction which leads to a difference of treatment in respect of income-tax between income derived from payments for interest made by municipal authorities and income derived from similar payments made by public companies or private persons lies in the fact that in the latter case the interest is paid out of profits and gains assessable to income-tax, while in the former it is (as a rule) paid, or partly paid, out of rates which are not so assessable. In this latter event, sub-section 3 of section 24 of the Customs and Inland Revenue Act, 1888, applies; and this distinctly prescribes that the rate of income-tax shall be that in force at the time of payment. I think that some public inconvenience is caused by the existing difference of treatment in this matter; and I propose to examine the possibility of adopting a uniform system.

#### Friday, July 20.

##### THE SUPPLY OF CARBURETTED WATER GAS.

Mr. J. W. WILSON asked the President of the Board of Trade whether, having regard to the report and recommendations last year of the Departmental Committee appointed in 1898 to inquire into the manufacture and use of water gas, and also to the fact that such gas, made from coke and oil instead of coal, was being increasingly and profitably produced by gas companies, while local authorities having their own gas-works were now debarred from erecting such plant owing to the refusal of the Local Government Board to sanction loans for this purpose until the regulations recommended for the use of carburetted water gas were laid down, the Board of Trade would take steps to frame such rules and regulations at an early date.

Mr. RITCHIE: The Board of Trade cannot give effect to the recommendations of the Departmental Committee by rules and regulations. Legislation would be necessary; and on this point I can only say, as I did in reply to a question put by the honourable gentleman the member for Stepney (Mr. Steadman) on the 25th of May, that in any general legislation the Home Secretary and the President of the Local Government Board would probably have a larger interest than the Board of Trade, and that I cannot make any promise on the subject.

Mr. T. M. HEALY: May I ask whether it is not a fact that analysis showed that in Dublin 20 per cent. of water gas was used contrary to the recommendations of the Home Office Committee?

Mr. RITCHIE: I shall inquire into that.

The following further progress was made with Private Bills last week:—

Bills read a second time and committed: Morley Corporation Bill [Lords], Paisley Water-Works Provisional Order Bill.

Bill reported: Paisley Water-Works Provisional Order Bill [Provisional Order confirmed].

Bills read the third time and passed: Falkirk and District Water Bill [Lords], Gas Orders Confirmation (No. 1) Bill [Lords], Westgate and Birchington Water Bill [Lords], Paisley Water-Works Provisional Order Bill, Water Orders Confirmation Bill [Lords].

#### HOUSE OF LORDS COMMITTEE.

Monday, July 16.

(Before Lord BROUGHAM, Chairman, Earl of Mayo, Earl of DENBIGH, Marquis of ZETLAND, and Lord PLUNKET.)

##### WANDSWORTH AND PUTNEY GAS COMPANY BILL.

The Committee this morning entered on consideration of the clauses of this Bill, the preamble of which was found proved on the previous Friday.

Mr. VESEY KNOX, for the Wandsworth District Board of Works, in respect of clause 8, which provides for the closing of certain thoroughfares, proposed two additions under which the Company would have to provide a new road through their works, and certain other road improvements, as compensation for the gain which would result to them from the shutting up of the thoroughfares.

The matter was argued at some length, and evidence taken on the point; the result being a compromise under which the Company, in addition to laying out a new road, conceded a site for a wharf on the easterly end of their property, which would remove the objection the Board entertained owing to the loss of access to their wharf.

Another clause was then agreed to, giving the Local Authority power to say at what depth pipes should be laid in streets not yet taken over by the Local Authority—a matter to which the Gas Works Clauses Act did not apply.

Mr. VESEY KNOX said there were now only two points as to which he and his learned friend had to take the decision of the Committee. The first was as to testing-places; and the second as to gas testing for pressure, as distinct from purity or illuminating power. One of the witnesses for the promoters had said he would have no objection to one of the testing-places being at Putney, which was a portion of the Wandsworth Board's area, and a district further from the gas-works than Wandsworth. At present, there was only one testing-place, which was at the works; but under the Bill there was to be another at Wandsworth Town Hall, which was not far from the works. On reflection, the Wandsworth Board thought there was no public advantage in maintaining two testing-places so near to one another. They therefore asked that, while the testing-place at Wandsworth Town Hall should be adhered to, there should be another at Putney; it being left to the Company, as they might think fit, to maintain or abolish the one existing at the works.

No evidence was called in support of the proposition.

Mr. H. E. JONES, for the promoters, objected to the proposal. He said in a gas undertaking of this size it was almost unique to have more than one testing-place. He agreed in the other House to give another place where the petitioners liked; and they chose the Wandsworth Town Hall. If the station at the works were done away with, the Company would not be conveniently placed for watching their gas; and, further, the Company were bound to maintain the station at the works for the benefit of Battersea and other consumers. He strongly objected to giving two stations outside the works.

Mr. VESEY KNOX intimated that Battersea acquiesced in the present proposal.

The CHAIRMAN (after further discussion) said the Committee were inclined to give the testing-place at Wandsworth and one at Putney; and it would rest with the Company to decide whether or not they would have one at their works.

Mr. VESEY KNOX then submitted the following as additions to clause 38:—

(b) The testings for pressure shall be made at any of the public lamps, at such times and in such places as the Board of Works for the Wandsworth District may from time to time determine; and it shall not be incumbent upon the Board to give notice to the Company of the time and place at which such testings shall be made.

(c) From the observed pressure, one-tenth of an inch shall be deducted to correct for the difference between the pressure of gas at the top of the lamp-column and that at which it is supplied to the basement of neighbouring houses.

He explained that at present the Local Authority, in order to test, had to give notice to the Company, and dig up the main. This was most inconvenient, and practically led to the very infrequent testing for pressure. They held that, as a matter of public convenience, the testing should be done at the lamp post. The only point in dispute, he thought, was as to whether the Board should or should not give notice of intention to test.

Dr. Wilson Hake, Gas Examiner to the Wandsworth Board, explained the convenience of the proposal; and, on the point of notice, said it was not at all difficult to alter the pressure in a very short time.

Mr. MOON, for the promoters, contended that the Company should be given notice of intention to test, if penalties were to be proceeded for, as was provided under the General Gas Acts, so that a representative of the Company might be sent to witness the conditions under which the test was made. He did not in the least object to the tests being made at the lamp-post. Surely there was no reason to alter the general law in respect of this particular Company and Local Authority.

A MEMBER OF THE COMMITTEE remarked that if the Local Authority had good reason to think the pressure was low, and then gave notice to the Company of intention to test, the Company could increase the pressure; and so it seemed the Local Authority would have no hold over the Company.

Lord R. CECIL, for the promoters, said if the Committee had good reason to believe that the Company had been behaving badly, they might have some reason to put upon them this surprise testing; but the reverse was the case here. Obviously, if this power were given there would be risk of great unfairness, because the test might not be carried out justly. He pointed out that, under the Act of 1871, a representative of the Company was entitled to be present at such testings, but not to interfere. In reply to the Chairman, he stated that even the Metropolitan Gas Companies had the right to be represented at such tests.

Mr. VESEY KNOX said the position of the Board was that they would be very glad to give the Company any notice they could which would not allow them time to increase the pressure.

Eventually, the Committee granted the clauses brought up, but altered



so that the Local Authority should give the Company two hours' notice of intention to test; and the same protection was given to Battersea.

The clauses were then gone through and adjusted; and the Bill, as amended, was ordered to be reported.

## HOUSE OF LORDS COMMITTEE.

Wednesday, July 18.

(Before the Earl of CAMPERDOWN, Chairman, the Marquis of BATH, Earl TEMPLE, Lord DE RAMSEY, and Lord MONK BRETON.)

### EAST LONDON WATER BILL.

This Bill, which had already passed the House of Commons (see "JOURNAL," Vol. LXXV., p. 1504), came to-day before the above-named Committee of the House of Lords.

Mr. PEMBER, Q.C., Mr. CLAUDE BAGGALLAY, Q.C., Mr. TALBOT, and Mr. GULLY appeared for the promoters; Mr. EARLE represented the Middlesex County Council.

Mr. PEMBER, in opening, said the object of the Bill, briefly stated, was to authorize the East London Water Company to construct additional storage reservoirs and other works, to take further water from the River Thames in cases of exceptional drought and other emergency, to raise further money, and for other purposes. The preamble of the Bill recited that, by an Act of 1886, the Company had been authorized to raise capital to the amount of £1,220,560; that they had secured this amount and expended it, together with £394,440 borrowed on mortgage and £350,000 of debenture stock; and that, by an Act of 1894, the Company were empowered to raise a further sum of £500,000 by debenture stock. In 1897, the population of the district having increased, and being then increasing, the Company were authorized to construct additional storage reservoirs. The experience of late years had shown, however, that the storage reservoirs authorized in 1897 ought to be further supplemented. The preamble further set forth that the Company, in a period of extreme and exceptionally long continued drought in the year 1898, had been obliged temporarily to suspend the constant supply of water to the consumers, and also to restrict the supply. In a like period in 1899, the Company were forced to obtain water from the other Metropolitan Companies, to enable them to ensure the continued maintenance of the constant supply; and such water might not always, in cases of emergency, be available. The Company ought to be always empowered, subject to the assent of the Local Government Board, to draw from the Thames and its tributaries a further quantity of water, and to enter into agreements with other Companies for the purpose of taking their excess water. The present proposal was opposed in the House of Commons by the London County Council and other interested persons; but all the opponents had now retired, with the exception of the Middlesex County Council. The Bill had been before Parliament last year, when, after it had passed the Lower House, it was, to the surprise of most people, rejected by a Committee of the Lords presided over by Lord Brougham. The reservoirs now proposed were a further instalment of the works all along contemplated by the Company. It would be necessary, for the carrying out of the scheme, to acquire certain Lammas lands belonging to private owners, but subject to grazing rights of commoners; and in respect to the taking of these lands, the House of Commons last year had decided that compensation lands should be given to the commoners. Accordingly, in the present measure provision was made for 10 acres being given elsewhere to the commoners. After dealing at some length with the failure of the Company's supply in 1898, Counsel said that probably a further drought would have occurred last year but for the Act passed by Mr. Chaplin, enabling the other Water Companies of the Metropolis to lend assistance. It had been known, ever since the time when Lord Balfour of Burleigh's Commission sat, that the East London Company's storage was insufficient. At that time, it was 610 million gallons only, which was raised by an Act providing for additional storage to 1200 million gallons. The Act of 1897 still further raised the storage to 2440 million gallons. The present was the third and last instalment of the works proposed to the Royal Commission, and would give increased reservoir capacity of 5300 million gallons, which, together with the 2440 million gallons authorized, would give a total capacity of 7700 million gallons; and thus the scheme of Mr. Bryan (the Company's Engineer) which was placed before the Royal Commission would be completed. The estimated cost of the works now sought to be authorized was £1,338,000, which was slightly higher than the estimate of last year; the cost of materials and labour having increased since that time. If the present powers asked for were granted, and the works carried out, East London would be safeguarded from any scarcity of water for many years to come. Although perfectly satisfied with the plans drawn up by Mr. Bryan, the Company had, for the satisfaction of others, consulted Mr. Mansergh, Mr. Hill, and Mr. Eaton, who were probably the three best-known water engineers in the country; and all these gentlemen had reported favourably of Mr. Bryan's scheme. Mr. Mansergh was unfortunately unwell, and Mr. Eaton was detained in Manchester; so that it was impossible to call them. Mr. Hill, however, would give evidence to the Committee. It was significant of the temper of Parliament, with regard to this and other Water Bills of this session, that they had been allowed to proceed, though Lord Llandaff's Commission had reported in favour of purchase, while, on the other hand, the Bills of the London County Council for purchase had been stopped. Under the Bill, it was proposed that from time to time, with the consent of the Local Government Board and the Thames Conservators, the Company should have power to take 10 million gallons daily from the Thames, either by means of their own or other Companies' intakes, more than they were at present entitled to take. It might be possible for the Staines Reservoirs Committee or one of the Companies to give the Company a supply of water; and if this were done, it would not count as part of the 10 million gallons. For this privilege, the Company had to pay £1000 annually to the Thames Conservators. Included in the Act was the seven years, or "sterilization," clause—providing that the power to take this extra water was not to enhance the value of the undertaking if it were bought up within seven years. Turning to the petition presented by the Middlesex County Council, he said they objected to

the power taken to break up, and otherwise interfere with, their roads, bridges, and other property, and in particular to the proposed alteration of Lea Valley Road and Marsh Lane. On this point, evidence was taken in the other House; and he should be surprised if Mr. Bryan was not able to prove the necessity for these proposals. The petitioners stated that the proposed works would involve the alteration or diversion of the River Lea, in places where it formed the boundary of the county; that no provision was made for filling up the bed of the old river, from below the reservoirs to where it joined the Lea navigation; and that the Bill should contain a provision to this effect.

The CHAIRMAN: They must propose the provision.

Mr. PEMBER acquiesced. The County Council then alleged apprehension that the construction of the reservoirs would diminish the rateable value of the county, and throw an increased burden upon the ratepayers, without conferring upon them any compensating advantage. He doubted very much whether, considering the way reservoirs were rated, there would be any loss; and if there were, it was a thing which had to be borne by countless places all through the country. The petitioners went on to state that clause 23 empowered the Company, in case of emergency, to take water from the Thames (which was true); and that, by clause 30, it was proposed to empower the Company and any one or more of the Southwark and Vauxhall, the West Middlesex, and the Grand Junction Water Companies to enter into agreements for the taking of any excess water through their intake or intakes. Of the Companies referred to in the Bill, the East London Company and the West Middlesex Company supplied water, not only to the Metropolis itself, but to a large area adjoining, including a considerable portion of the county of Middlesex; and some of the Companies drew their supply, either in whole or in part, from the Thames, the Lea, and other sources in Middlesex. Under the Bill, such of the Companies as obtained supplies from the Thames and other Middlesex sources, but who at present distributed water only within certain defined portions of the Metropolitan water area, would be enabled to deliver water drawn from the several sources referred to in other parts of the said area. The petitioners strongly objected to these extended powers, and to any water to which (as the petitioners submitted) the inhabitants of Middlesex had a prior natural right being used for any purposes, or for the supply of any district, outside the county, other than the districts in which the Companies drawing the supply from those sources were at present under obligation to afford a supply. He thought it was a little late for Middlesex to say the water of the Lea and the Thames was not to be taken for the supply of London. Commission after Commission had said they were to be used for the purpose; and in two Acts the water of the Lea had been handed over to the Water Companies at a price which had just been doubled. Moreover, the essence of the present scheme was that the Company were to store flood water principally. Then the petitioners said the question of the London Water Supply had for some years been under their consideration; and they had arrived at certain conclusions to which, in the interests of Middlesex, they submitted regard should be had—included in them being the necessity for making provision against the sinking of any new wells in the county, the deepening of any existing wells in the county, and for limiting the abstraction of water from Middlesex for the London or any other external supply. They held that provision should be made to secure these objects. The Company, however, were not going to hand water over to the London County Council; and any such provision as that asked for would be fatal to the measure. With regard to the right to limit the sinking of wells, this had been asked for over and over again by Hertfordshire and Middlesex, and refused. The idea was suggested in the most elaborate manner to Lord Balfour's and Lord Llandaff's Commissions; and they declined to adopt it. It would involve a most serious alteration in the common law of England—such as ought only to be made by a General Act, and after full discussion. Obviously, such a principle, if sanctioned, would be applicable, not only to the East London Company, but to all other water companies depending upon wells.

The CHAIRMAN said the petitioners alleged that there were clauses in the Bill carrying out these objectionable things. They said the Bill was defective in this respect. If it was defective, it would be for the Company to establish that such protection was required.

Mr. PEMBER agreed; and he pointed out that new wells were expressly excluded from those things to which the Company might devote the capital raised under the Bill.

The CHAIRMAN remarked that it did not appear, from the petition of the Council, that they alleged that the water the Company wished to take was in excess of needs, or that the Company were asking for undue storage or anything that was unnecessary. It would be a great assistance to the Committee if they knew exactly the points the Council were relying on.

Mr. EARLE said the Middlesex County Council were not going to contend that the principle of storage—if the waters of the Lea were taken—was not a right one; but he was going to say that, in face of the report of Lord Llandaff's Commission and Mr. Chaplin's Act of last year, there was no pressing necessity for the Bill. He was going to submit that the Company were seeking to take water from the Thames, and practically the whole of the further water which was obtainable from the Lea. As the Bill stood at present, the Company were prevented from supplying anything in bulk, whatever the emergency, in Middlesex; and therefore the Middlesex County Council said the Bill was inequitable.

Mr. W. B. Bryan, Chief Engineer to the Company, gave evidence in support of the Bill. He said the total population supplied by the Company numbered 1,350,000. As regarded the Middlesex and London portion of the Company's district, there was not likely to be any increase; but rapid increase was taking place in the Essex portion of their area of supply. There the population had increased by nearly a quarter of a million during the last ten or eleven years. The total reservoir capacity of the Company constructed, or in course of construction, was 2400 million gallons, and power was now sought to provide capacity amounting to 5100 million gallons. He estimated that this would carry them on to the year 1919—assuming that the population of the district increased at the decennial rate of 18·2 per cent. At the end of this period, the provision would be equal to a supply of about 64 million gallons a day, which would be needed on the basis of 35 gallons per head per day, which figure, like the 18·2 per cent. of the increase, was accepted by the two last Royal Commissions on the Water Supply of London. The



estimate for the works was £1,338,000. Other items making up the £1,800,000—the total capital power sought—were for engines and machinery, mains and services, ordinary working capital, costs of the Act, completion of wells now under construction, &c. With regard to the temporary supply, it was proposed to take power to abstract further water from the Thames, either through the Company's own intakes or second hand through the intakes of other Companies. This was principally to enable the Company to tide over difficulties which would arise in the course of the next seven years, before they got the reservoirs constructed. He estimated that by or before the end of this period of seven years, the excess water which the Companies now took would be required for their own districts. This water—10 million gallons a day—could only be taken from the Thames on an average of the number of days in the half year; and the Company could not in any one day take more than 30 million gallons. This provision was to enable the Company to get water when the stream was flowing fairly strong.

In cross-examination, witness said the reservoirs would cover about 800 acres, three-fourths of which were in Middlesex. Mr. Chaplin's Act providing for interchange would not meet the case of emergency. This Act would carry the Company over several years, but how long he could not say, because he did not know how fast the population would increase. The promoters would be willing to supply Middlesex in bulk in time of emergency, if they had water to spare.

The CHAIRMAN pointed out that clause 21, as it stood, enabled the Company to enter into agreements to supply water beyond their limits—to the Urban District Council of Cheshunt, which was part of Herts, and any local authority in certain parts of Essex. Was that an agreed clause with Cheshunt or with somebody else? What was the reason the clause was limited in this way; and at what period was it so limited? If he remembered rightly, the Bill, as originally introduced, contained general power to supply water beyond the Company's district.

Mr. BAGGALLAY said, as originally introduced, it was a proposal that the Company might enter into agreements to supply with water in bulk any local authority, company, or person either within or beyond the limits of supply of the Company. This was a general power. In the other House, Hertfordshire appeared; and they objected very strongly that, under the powers of this clause, the Company might take a great deal more water, particularly by pumping from the subsoil, and so affect wells in Herts. Therefore they asked that the power of the Company to supply in bulk outside their district should be restricted. Negotiations followed, with the result that the clause was cut down to places from which applications had already come to the Company for assistance. Cheshunt was one; and Herts agreed to the clause in the modified form.

The CHAIRMAN: Were Middlesex heard upon the point?

Mr. BAGGALLAY: I do not think Middlesex took any part in this question in the other House.

Mr. EARLE: We knew nothing of it till the last moment. I said I objected most strongly to the clause, and left it there.

The CHAIRMAN: I will tell you why I made these remarks. I infer, from what you said some time ago, that it is possible when we come to this clause (if we ever reach clauses) Middlesex may ask us to make it a general clause.

Mr. EARLE: I am going to ask a little more than that.

The CHAIRMAN: I am giving notice now that if Herts and Essex have argued for the limitation of the clause, and been successful, it is well that they should be informed that the clause may be attacked here.

Mr. EARLE: Essex never appeared on this clause at all.

Mr. BAGGALLAY: I think I can save trouble. I have anticipated somewhat what was passing through your mind. While Mr. Pember was speaking, I had an opportunity of talking to Mr. Earle. I thought there was a means of settling this matter. A representative of Herts is in the room, and says he has no objection whatever to making the concession to Mr. Earle which Mr. Earle has asked for. What I offered my learned friend, and what he, I think very reasonably, said he would accept, was this—that the East London Company should by the Act be empowered and required to supply water in bulk in case of emergency anywhere in Middlesex, subject first to the requirements of the Company's districts, secondly to the consent of any local authority or company authorized by Parliament, and thirdly to there being a physical connection by which the supply can be given. This offer, I understand, is satisfactory to my learned friend; and Herts say they have no objection to the insertion of a clause which will give effect to it.

Mr. EARLE said this met his most substantial objections; and although there were other matters which he might have hoped to successfully bring before the Committee, he should not press them.

The CHAIRMAN then formally announced that the Bill might proceed.

The consideration of clauses was postponed.

#### Thursday, July 19.

The Committee this morning entered upon consideration of the clauses.

Mr. BAGGALLAY, on clause 21 being reached, said it would stand as it was, and the clause with regard to Middlesex would be the next one. It was as follows:—

As to supply to local authorities in Middlesex. In case of emergency only, and so long as such emergency exists in any of the urban and rural districts hereinafter mentioned or any part thereof—that is to say, Friern Barnet, South Mimms, Finchley, Hornsey, Tottenham, Wood-Green, Enfield, Edmonton, Southgate, Hendon, Kingsbury, Wembley, Harrow, Wealdstone, Southall-Norwood, and Willesden, all in the County of Middlesex—the Company shall, on the demand of the Middlesex County Council or the District Council of any of the said districts, as soon as the Company are in a position to supply water from the reservoirs by this Act authorized, supply in bulk by agreement, or failing agreement at the rates mentioned in section 79 of the East London Water-Works Act, 1853, to any such district or part of a district such daily quantity of water as any such Council may from time to time require not exceeding 35 gallons per head per day of the estimated population of such district or districts: Provided always that such supply shall not be given in any district without the consent of the local authority of such district and of the Company (if any) authorized to supply and supplying water within such district: Provided also that such supply shall not be given if, and so long as, such supply would interfere with the supply of water to the district for the time being supplied by the Company: Provided also that the Company shall not be bound to lay down any pipes or make any connection for the purpose of giving effect to this section, but shall give all reasonable facilities to the County Council or to any District Council for making connections with the

mains or pipes of the Company for the purposes of giving effect to this section at the cost of the County Council or such district Council making the demand, and under the supervision and to the reasonable satisfaction of the Company. If any question arise between any such Council making the demand and the Company as to whether the Company can supply water under this section without interfering with the water required for their own district of supply as aforesaid, or as to whether such emergency as aforesaid exists, the same shall be determined by an arbitrator to be appointed by the Local Government Board under, and in accordance with, the provisions of the Arbitration Act, 1889.

Counsel said he was only waiting to hear if Hertfordshire agreed.

Lord R. CECIL (representing Herts): No; we do not agree.

The CHAIRMAN: Yesterday somebody appeared, or was said to have appeared for Herts, and agreed.

Lord R. CECIL: I do not think so.

The CHAIRMAN: That was so.

Mr. BAGGALLAY said the Parliamentary Agent for Herts had told him he agreed with the principle of the settlement. He thought it was now only a question of the details of the clause.

Lord R. CECIL: It is very difficult to deal with these things strictly on principle. It all depends on detail what the effect of the clause is. The substantial point is that we are very reluctant, in Herts, to see any increased draft on the underground water in the county; and we feel that this clause will affect that draft.

The CHAIRMAN: Then we will go through the rest of the Bill first.

Other clauses having been adjusted,

Lord R. CECIL informed the Committee that the clause was settled so far as Herts was concerned.

A slight alteration, it transpired, had been made to meet Herts, by inserting the words "from such reservoirs" after the words "section 79 of the East London Water-Works Act, 1853, to any such district or part of a district such daily quantity of water."

Mr. CRIPPS (Parliamentary Agent to the London County Council) interposed at this point, and informed the Committee that the Council opposed this Bill in the other House, terms being agreed. An important matter affecting London was the extent to which water was taken from the Thames. He had only a few moments before had put into his hand the new clause, which he understood had been agreed.

Mr. BAGGALLAY (in reply to the Chairman) said the principle of the clause was, first, that the Company were only to give a supply in case of emergency, and so long as the emergency existed.

The CHAIRMAN: They are to be compelled to do it.

Mr. BAGGALLAY: They are to be compelled to do it, but subject to their having sufficient water for the supply of their statutory districts.

The CHAIRMAN: Do the words "district for the time being supplied by the Company" mean the whole of their statutory district?

Mr. BAGGALLAY: No; that part of the district they are supplying when the emergency arises elsewhere. He added that it was necessary to put it in this way, because the districts of the London Water Companies to some extent overlapped; and under certain Acts the Company were relieved of the obligation of supplying within parts of their district which were being supplied by another Company. All the Company asked was that they should first supply that part of the district which they were *de facto* supplying; and the Company were only to supply outside districts from the proposed new reservoirs.

Lord R. CECIL said Herts did not wish to stand in the way; and therefore, while not altogether thinking it right that this power should be given, they would not offer further opposition.

Mr. CRIPPS asked the indulgence of the Committee. He represented generally the London County Council, and put in an appearance in the House of Commons; but he had not done so here, because the Council, after considering the terms of the Bill—on the assumption that it would pass in the form in which it was brought into the House of Lords—had no ground of opposition.

The CHAIRMAN said no one had any right to assume anything with regard to a Bill. No one could know what a Committee would do.

Mr. CRIPPS suggested that the Committee were here putting in a clause affecting absent parties, of which no notice had been given to those parties. This clause would authorize the abstraction of a larger quantity of water from the river for a district in Middlesex which at present had no right to take that water.

The CHAIRMAN said it was not true that no notice of the clause had been given. Notice was given in the petition of the parties who appeared against the Bill.

Mr. CRIPPS: That does not come before other parties.

Mr. PEMBER: Yes; they had seen the petition in the first House.

Mr. CRIPPS said if he represented any other than a large corporate body, he would be able to at once put in a petition against alterations. With the London County Council it was impossible to so act in five or ten minutes. The point raised was just such a one as had been discussed between the County Council and the Companies for years past. He believed he was right in saying that this Bill was discussed in the House of Commons between those who represented the Council and those who represented the Companies in that House; and he understood it was a matter of arrangement in the House of Commons.

The CHAIRMAN said he had nothing to do with private members, but only with the proceedings before the Committees in either House. What went on in the House of Commons, he had nothing to do with. He (Mr. Criggs) must prove his right to be heard.

Mr. CRIPPS said he quite admitted that he had no petition. He held, however, that he was entitled at that moment to present a petition against alterations, although he could not do it on behalf of the London County Council, because that body only acted by resolution; and it was necessary to obtain the seal of the Council to a petition.

Mr. PEMBER said his position was simply that in the last House the Middlesex, London, and he believed Herts County Councils had petitions against the Bill. He opened the Bill; and on the "sterilization" clause being put on the Company, the Council withdrew from further opposition. He had no arrangement with them at all. The Council knew of the other petitions, and must be taken to have known what was in those petitions. If they had any interest in the Bill, they ought to have guarded it in the ordinary way. They were not present with a petition on the merits of the Bill or against alterations; and he did not see why they should be heard.

Mr. CRIPPS said, although the Council differed from the Company as



to the desirability of taking more water from the sources proposed, yet, having regard to recent decisions, they were satisfied that the Bill should go on as it left the House of Commons. They did not petition against alterations; relying on the usual practice in the House of Lords.

The CHAIRMAN said every Bill which came to the House of Lords had to be considered, and might be altered.

Mr. PEMBER remarked that clause 21, as it stood originally in the Bill, was a general clause allowing the Company to supply in bulk. It was the Herts County Council who led the Company to modify it so that, even with the Middlesex provision in, it would not be as wide as originally.

The CHAIRMAN informed Mr. Cripps that so far he had not established a *locus*; and he asked if he had any further argument.

Mr. CRIPPS said he had nothing more to say. This was a new power inserted in the Bill which would affect his clients.

The CHAIRMAN (after briefly consulting with his colleagues) announced that the clause was accepted.

Mr. PEMBER said that, having regard to the fact that an attempt might be made elsewhere to strike out this clause, on the ground that the County Council had been taken by surprise, he wished again to point out that the addition allowed by the Committee did not make the clause as large as it was originally.

The CHAIRMAN: Certainly not; and I wish further to say that any parties who desire that the Bill should remain in the form in which it came to this House ought, according to the ordinary practice, to have put in a petition against alterations. If they chose not to watch the Bill, it is their fault, and their fault alone. This House, of course, in any Bill which comes before it, has power to make amendments. What is this Committee appointed for, except to make amendments, if necessary?

The remaining clauses were then gone through and adjusted; and the Bill, as amended, was ordered to be reported.

### THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons who are inquiring into the subject of municipal trading (see *ante*, p. 166) held a further sitting last Tuesday, under the presidency of the Earl of Crewe; the other members of the Committee present being Viscount Peel, Viscount Hampden, Lord Rothschild, Lord Windsor, Sir W. Foster, Sir W. Dunn, Mr. Grant Lawson, Mr. H. Hobhouse, and Mr. Lewis Fry.

The first witness called was Mr. John Moore Hayton, Town Clerk of South Shields, whose evidence bore upon the practice of paying Town Clerks inclusive salaries. He was followed by

Mr. George Livesey, who was examined by the CHAIRMAN. Witness said he was Chairman of the Gas Companies' Protection Association, and of the South Metropolitan Gas Company. He had had a life-long experience in the supply of gas generally.

The CHAIRMAN: What do you consider to be the first and chief public consideration in connection with the supply of gas?

Witness: The interest of the gas consumers, unquestionably.

Can their interest be best promoted by local authorities or by companies?—In my opinion, they can be best promoted by companies.

Do you found that opinion on any parliamentary return?—I have here a number of instances of prices charged, taken from "Field's Analysis."

Witness handed in the following table; explaining that these analyses of gas accounts were compiled by Mr. J. W. Field, the General Manager of the Gaslight and Coke Company, who first began them on a large scale in 1883.

TABLE A.—From "Field's Analysis."

Price Charged for Gas by Companies and Corporations in 1883 and 1899.				
	Per 1000 Cubic Feet.			
	1883.	1899.		
	s. d.	s. d.		Reduction.
GAS COMPANIES (METROPOLITAN)—				
Gaslight . . . . .	3 1½	3 0	0 1½	
Commercial . . . . .	2 10	2 6	0 4	
South Metropolitan . . . . .	2 10	2 1½	0 8½	
SUBURBAN—				
Brentford . . . . .	3 7½	2 11	0 8½	
Bromley . . . . .	4 0	3 0	1 0	
Croydon . . . . .	3 6	2 8	0 10	
Crystal Palace District . . . . .	3 1	2 6½	0 6½	
Lea Bridge . . . . .	4 10½	3 9	1 1½	
Mitcham . . . . .	4 3	3 8	0 7	
Richmond . . . . .	3 6	3 0	0 6	
Tottenham . . . . .	3 8	3 0	0 8	
Wandsworth . . . . .	3 4	2 2	0 10	
West Ham . . . . .	3 6	3 0	0 6	
PROVINCIAL—				
Bath . . . . .	2 6	2 4	0 2	
Brighton . . . . .	3 3	2 9	0 6	
Bristol . . . . .	2 7	2 3½	0 3½	
Newcastle-on-Tyne . . . . .	1 10	1 9	0 1	
Plymouth . . . . .	1 11½	1 9	0 2½	
Portsea . . . . .	2 11	2 4	0 7	
Preston . . . . .	3 1	3 0	0 1	
Sheffield . . . . .	2 3	1 9	0 6	
CORPORATION GAS-WORKS—				
Birmingham . . . . .	2 4½	2 2	0 2½	
Bolton . . . . .	2 8	2 6	0 2	
Leeds . . . . .	1 9½	2 0	0 2½	Increase.
Leicester . . . . .	2 6	2 4	0 2	Reduction.
Manchester . . . . .	2 8	2 3	0 5	
Oldham . . . . .	2 8½	2 1½	0 7	
Salford . . . . .	3 0½	2 1½	0 11	

The CHAIRMAN: Mr. Field's figures are undisputed?

Witness: They are always accepted before Parliamentary Committees. It is a difficult matter to make selections of companies and corporations; and I have taken every one given in "Field's Analysis," both in 1883 and

1899. I selected 1883, because that was the first year in which Mr. Field's returns were published, except as regards the London Companies. I find that the average reduction made in the case of the companies is a trifle over 6d. per 1000 cubic feet; while the average reduction in the case of corporations is barely 4d.

Sir W. FOSTER: What is the first year in which the corporations began to supply gas?

Witness: The first figures we have relate to 1883.

There were then comparatively few of them supplying gas?—There are only seven dealt with in the "Analysis." They began before 1883; but we have not the figures prior to that.

The CHAIRMAN: Have you anything to say on the actual price, as distinct from the amount of the reduction; because the value of a reduction depends on the figures in each case?

Witness: Yes; it does. It is, of course, much easier to take 6d. off 3s. 6d. than off 2s. 6d. I have ascertained from the latest parliamentary returns the number of gas companies and of local authorities supplying gas, and the quantity sold in each year. The returns relate to the year 1898, when there were 439 gas companies, with an annual sale of 80,077 million cubic feet; and 222 local authorities owning gas-works, and selling 47,287 million cubic feet in the year. The companies therefore, roughly speaking, are nearly double the number of the gas-selling local authorities; and the quantity they dispose of is not far short of double that sold by the latter.

What do you say are the main reasons given in favour of ownership of gas undertakings by local authorities?—The first reason given is that they alone should have the right of opening the public streets. More can be said against this contention than in its favour. It is often said that, no sooner have a local authority repaved a street than the gas and water companies tear it up again. This has happened in some cases; but I think it would have occurred in as many instances if the local authority had owned the undertakings. The companies receive notice when the streets are to be opened up; and they take advantage of the opportunity to do whatever is necessary to their mains, and whatever they think may be needed for some years to come. So that it is very rare indeed for a street to be torn up unnecessarily. There is another thing to remember. If the local authorities had the gas and water pipes, they would not be nearly so considerate of the welfare and convenience of the public as a company, in the matter of taking up the roads. They are masters of the roads. They would stop a road altogether, where a company would not be allowed to do so. If a company want to stop a road, they have to give notice to the local authorities; and the local authorities exercise a very stringent control over them. They will not allow them to interfere with the public traffic any more than is necessary; and a company will often employ double gangs of men, in order to get the work done as soon as possible.

Do you approve of the practice of a corporation undertaking work for a company with their own men?—No. The fact is that the London County Council men are becoming a bye-word and a laughing-stock to the man in the street.

Sir W. FOSTER: Is your evidence as to local authorities founded on London alone?

Witness: Yes. I may say that, as I was riding on the top of an omnibus recently, the driver said to me: "Look at those men all standing there—London County Council men. If that work had been put in the hands of Mowlem, it would have been done before now; whereas the London County Council men have been at it for a fortnight, and they have only done one-third."

The CHAIRMAN: They were not laying gas-mains?

Witness: No; they were at work at the end of the Tottenham Court Road, where a block of buildings had been removed. I think it is far better that such work should be done by a company, who have somebody to look after them, and to compel them to do the work as expeditiously as possible in the public interest.

It is also contended that corporations can raise money at lower rates than companies?—That used to be the case. Prior to the introduction of the auction clauses, in 1877, all gas capital was issued to the shareholders at par; and the minimum rate of interest was 7 per cent. Such capital was issued whenever extensions of business took place; and, of course, the consumer had to pay the 7 per cent. on the increased capital. At that time, local authorities could raise money at much lower rates—2 or 3 per cent. lower, probably. Since the auction clauses were introduced, all new gas capital has had to be raised by auction; and the result is, in the case of my own Company—the South Metropolitan—that we are raising all our capital for extensions of works now at something under 4 per cent., taking share and loan capital together. Local authorities cannot do it any more cheaply. About 3 per cent. is the rate at which they can raise money; and then there is a sinking fund of 1 per cent., which brings the interest up to about the same rate as that of a company.

What do you consider to be the main reason for the desire of corporations to own gas-works?—In England, unquestionably, the desire to appropriate the profits out of the pockets of the consumers to aid the local rates. If they were not allowed to take excess profits in aid of the rates, there would be very few transfers of gas companies' undertakings to corporations.

In Scotland that does not apply?—No; no surplus profits can be legally so used there.

Do you find that local authorities are willing, in Scotland, to buy out the gas companies?—Nearly all the Scotch gas companies were taken over many years ago. Glasgow, for instance, purchased theirs in 1870; and they were really ahead of England in managing corporation gas-works. It is since that date that the greater number of English corporations have taken over gas-works.

I do not know that I quite follow your argument. Why should not the contention that you say affects English corporations not apply to Scottish corporations?—There are very few gas companies taken over by Scottish corporations. The argument used by an English corporation when introducing a Bill or promoting an agitation for the purchase of a gas undertaking is always: "We shall have so much profit to go in aid of the rates."

Now, what objection do you take to the allocation of profits to the rates?—My objection is that the profit comes out of the pocket of the consumer of gas—that the gas consumer has to bear all the burden of



interest on capital, sinking fund, depreciation, and everything else. By their Acts of Parliament, local authorities are allowed to charge a price for gas which will be sufficient to pay interest on the capital outlay, to provide a sinking fund to redeem the capital in a certain number of years, and, in some cases, to provide for the depreciation fund. Should the profits of an undertaking at any time not be sufficient to meet all these charges, the local authorities, of course, have the power at once to raise the price of gas; so that, whatever may happen, the consumer has to pay all these charges. To charge him a price in excess of what is necessary, and to make him pay for the redemption of the capital, is, in my opinion, most unjust.

Witness went on to refer to a discussion which took place recently at a meeting of the Manchester City Council, as reported in the "JOURNAL" for May 22 last. A proposal was, he said, made that the price of gas should be raised, in order that the Committee might continue to pay over to the borough funds £50,000 a year.

Viscount HAMPTON: Was that owing to the increase in the price of coal?

Witness said that was the case. It was proposed to increase the price of gas by 3d. per 1000 cubic feet, in order to hand over the £50,000. Alderman Gibson, the Chairman of the Gas Committee, was not present when the recommendation was made by the Committee; but at the meeting of the Council he made a speech that was very much to the point. He expressed the opinion that they had no right to tax one class of the community for the benefit of another; and he said that, by raising the price of gas without any necessity, they would be taxing the poor shopkeeper, who was already overburdened by what he was paying.

The CHAIRMAN: But, as a rule, the objection taken in a case of this kind is that it is hard on the large consumer, rather than on the small consumer, is it not?

Witness: Sometimes. At any rate, the incidence is altogether unfair. If everybody burnt gas, and the rate at which they used it corresponded with the rateable value of the houses they live in, it would be as broad as it is long; but, of course, that is not the case. Gas is not burnt in anything like equal quantities by different consumers. The small shopkeeper burns a great deal more than his proportion, compared with his rateable value.

Have you anything more to suggest as to why corporations interest themselves in these enterprises?—Well, I have watched this thing very closely; and I have noticed that a considerable number of Socialists, and men with socialistic tendencies—a number totally out of proportion to those in the community—get elected on local boards and corporations. They push themselves forward. These men have an idea that collective ownership is the right thing. What they want to see is the application of collective ownership to the manufacture, distribution, and exchange of all commodities. I am satisfied that a number of these men on town councils go in for schemes for the purchase of gas companies for the purpose of carrying out their favourite idea of collective ownership. I was talking recently to a prominent gentleman—a member of the London County Council—about the South Metropolitan Company's system of inducing the workmen to become shareholders, and of offering our stock to the consumers of gas; and I said: "I think you approve of that." He replied: "No; I do not. What I want is to see collective ownership of gas-works—not that the consumers and workpeople should own them, but that they should be owned by the ratepayers."

But it is not the case that the people holding these Collectivist views are in a majority on any body?—Well, on some bodies they are. They are at West Ham and in the parish of Bermondsey. They do not avow their views. In advocating a purchase, they do not avow their Collectivism; but they take a strong line in favour of purchase. I think the tendency is most mischievous.

Sir W. FOSTER: Is there any other instance you can give of local authorities in the country generally having a majority of that class of representatives?

Witness: I do not know.

You only know of two?—Well, they are giving a good deal of trouble, even in a place like Glasgow. They are trying to get the control of the gas-works into the hands of the Trades Unions. They have made a determined effort this year in that direction. The gas-works there are administered by a very able, thoroughly honest, and capable man; but the Trades Unions want to get control. For instance, in the winter time many more men are employed than in the summer. Some members of the Trade Union were dismissed, as men must be when the long days come in; and these people got up an agitation, stating that they were wrongfully dismissed. There was really a hard fight in the Council about it.

But surely you would give liberty to every class to ventilate a grievance, if they have one. You cannot treat these people differently from others?—All I can say is that if they get control of the gas-works they will not be managed as well as they are now.

The CHAIRMAN: What do you say on the monopoly argument?

Witness: The argument is that the supply of gas, being a monopoly, should be in the hands of the local authority. Shortly, I say that it is necessarily a monopoly; but it is a monopoly that has been regulated by Parliament. If you are to have a monopoly, you will fare better if you have some control over the monopolist than if you leave it an uncontrolled monopoly. If the gas supply were put in the hands of corporations, they would be absolute masters of it. A monopoly controlled by the local authorities is far more likely to serve the public well than a monopoly in the hands of the local authorities, and therefore without control. I say that a consumer is far better served under a company than under a corporation. He counts for nothing under a corporation; but under a company, in London, for instance, he can go to the London County Council, and the County Council, being a powerful body, can take measures to bring the company to book. If the London County Council had the supply of gas in their hands, the individual consumer would have no one to appeal to against them. It is because corporation monopolists are in this position, that they take large sums of money from the consumer in aid of the rates. That is done in Manchester, though Manchester is not the worst case. The worst case is Bolton, where the amount taken in aid of the rates is 7d. per 1000 cubic feet.

One would have supposed that, if the gas consumers as a body considered themselves aggrieved, they would have been able to alter the composition of the Corporation?—No; I think not.

Not if all the gas consumers in Bolton combined?—The interest of the individual gas consumer is too small to induce him to take it up as a public question.

If he does not mind, where is the grievance?—Well, I think he does mind. He grumbles and pays.

Still, he has that remedy. You rather seem to imply that the corporation could not be touched in any manner. The consumer has that remedy, if he gets others to combine with him?—Yes; but there are so many questions—political and others—brought forward when an election takes place, that the gas consumer is relegated very much to the background.

It is contended that consumers derive greater benefits under municipalities than under companies. What have you to say about that?—It has been said that they get their gas cheaper; and in proof of that reductions in price have been quoted. Well, the tables I have prepared on this point are only good as far as they go, because comparisons are exceedingly difficult to make. The circumstances of the gas undertakings in one town and another are very different. Take, for instance, the difference in the supply of coal. You cannot compare a gas undertaking in the South of England, hundreds of miles from a coal supply, with one (say) in Durham. There are also other circumstances to take into account; and it is therefore very difficult to produce any proof on the point. In Table B, I have endeavoured to take companies whose circumstances are comparable.

Witness put in the table, which was as follows:—

TABLE B.—From Parliamentary Returns, 1899.

Prices charged for Gas by certain Gas Companies and Corporations under somewhat similar conditions.

Companies.			Corporations.		
NEWCASTLE DISTRICT.					
City or Town.	Millions of cubic feet sold.	Price of Gas. s. d.	City or Town.	Millions of cubic feet sold.	Price of Gas. s. d.
Newcastle-on-Tyne . . . . .	2305	1 9			
Sunderland . . . . .	783	1 9			
South Shields . . . . .	443	2 3	Middlesbrough . . . . .	432	2 0
Hartlepool . . . . .	319	2 1	Stockton-on-Tees . . . . .	339	2 6
Tynemouth . . . . .	258	2 0	Darlington . . . . .	245	2 0
YORKSHIRE.					
Sheffield . . . . .	2304	1 9	Leeds . . . . .	2650	1 11
York . . . . .	416	1 10	Bradford . . . . .	1620	2 1
Derby . . . . .	457	2 5½	Nottingham . . . . .	1503	2 3
WARWICKSHIRE.					
Leamington . . . . .	186	2 4	Coventry . . . . .	480	2 4
LANCASHIRE (all over 300 millions).					
Liverpool . . . . .	3330	2 9	Manchester . . . . .	4194	2 3
Preston . . . . .	402	3 0	Salford . . . . .	1264	2 3½
Ashton . . . . .	302	2 0	Oldham . . . . .	1101	2 1
			Bolton . . . . .	889	2 6
			Blackburn . . . . .	540	3 3½
			Burnley . . . . .	472	2 3
			Rochdale . . . . .	451	2 7½
			Southport . . . . .	389	2 9
			Blackpool . . . . .	371	2 4
			Wigan . . . . .	327	2 7
			Bury . . . . .	326	2 2
KENT.					
Margate . . . . .	190	2 6	Ramsgate . . . . .	178	2 8

The CHAIRMAN: The prices you give are in some cases the average of several prices?

Witness: In some instances they are; but I think it may be taken that they are fair, representative prices.

Viscount HAMPTON: What is the South Metropolitan Company's price?

Witness: We have raised our price to 2s. 8d. per 1000 cubic feet from Midsummer. We reduced it to 2s. 1d. last Midsummer. We raised it to 2s. 4d. in March; and we have now raised it again to 2s. 8d.—a total increase of 7d. per 1000 cubic feet.

And do you know whether corporations have done the same thing?—Some of them. It would be altogether misleading to take the year 1900 for purposes of comparison, because some coal contracts expire in June, some in March, and some in November. Our contract terminated in March. Some have contracts running to 1901.

The price of the Leeds Corporation gas is very low?—Yes; Leeds is one of the lowest. In 1883, Leeds was selling gas at 1s. 9d. per 1000 cubic feet. The Corporation did not at that time appropriate anything in aid of the rates. Since then the Sheffield Company's price has come down, and the Leeds Corporation's price has gone up. Leeds is now appropriating some of the profits in aid of the rates. I say generally that companies can supply the public better than local authorities.

The CHAIRMAN: You say that corporations ought to be able to charge less than companies?

Witness: Yes; because all the capital of corporations has been raised at a low rate, and is constantly being reduced, through loans repaid and annuities redeemed. Consequently, the charge per 1000 cubic feet to pay interest on capital is generally much lower than with companies. "Field's Analysis" for 1899 gives an average of 4.79d. per 1000 cubic feet sold in the case of English corporations, for interest, depreciation, and sinking fund; while for English provincial gas companies the average given is 7.92d.—a difference of over 3d.

Have you ever worked out the prices at which corporations could supply gas, supposing they devoted the whole profit to reduction?—I have a table here about the appropriation of profits. It shows that Birmingham, in 1899, appropriated 1½d. per 1000 cubic feet in aid of the rates, so that the Corporation could have supplied gas at 1½d. less. Bolton, in the same year, took 6½d. in aid of the rates, and Carlisle 5½d.

What was Bolton charging then?—2s. 6d.; and therefore they could have sold at 1s. 11½d. Birmingham was charging 2s. 2d., and could have supplied at 2s. 0½d. Carlisle was charging 2s. 3d., and could have sold at a little over 1s. 9d. Leicester took 4.39d., and sold at 2s. 4d.; so that they could have sold at 2s. Manchester took about 3d., and charged 2s. 3d.; so that they could have sold at 2s.

That will do for instances. Can you give reasons why corporations



do not as a rule make any lower charge, as you state, than gas companies?—They have really no inducement to charge at the cheapest rate; and gas companies have. Since the introduction of the sliding-scale in 1876, the interests of consumers and companies have become identical. The sliding-scale allows an additional dividend to be paid for every penny of reduction in the price of gas. This does not operate in the case of corporations. Companies have very serious competitors. Mineral oil is perhaps the most serious competitor they ever had. In many cases, they have to compete with the electric light too; and in order to hold their own, it is necessary that they should sell gas at the lowest possible price. This is an inducement which, I think, does not apply to corporations.

What do you think influences corporations in fixing the price?—I think they are influenced by the charges made by companies and corporations in neighbouring towns. If the companies in their neighbourhood are selling gas at a much lower price than themselves, they will try to bring down their own price. Otherwise comparisons are instituted by the consumers—say, as between Leeds and Sheffield. Another influence is the price charged by other corporations. Take Nottingham, Birmingham, and Leicester. In 1898, both Birmingham and Nottingham charged 2s. 3d., and Leicester 2s. 4d. If Leicester were selling gas at 2s., Nottingham consumers would not be content to pay 2s. 3d.

What have you to say as to the position of the gas committees of corporations?—I say that for efficient management you want something like continuity; and with the constant changes that take place in corporation committees, you cannot have this continuity. Moreover, it has been noticed for many years among gas people that the corporations are not willing to treat their responsible officers with sufficient liberality to get the best servants. Many of them treat them as well as the best companies; but, speaking generally, they do not. I refer both to rates of pay and general consideration; and I know that most of the officers of corporations would be very glad to exchange into the service of companies, where they would obtain more encouragement to do their work with intelligence and enterprise than they get under corporations. Leeds is very much under the control of Trades Unions. I think that if all the gas undertakings of the kingdom were in the hands of corporations, there would be very little further improvement in the gas supply; and I am pretty safe in saying that reductions in price would practically cease. The companies, in fact, set the pace; and the corporations follow.

You think that, the supply of gas being necessarily a monopoly, it should be regulated by Parliament and controlled by the local authorities?—Yes.

You think that companies have greater inducements than corporations to serve the public well?—Yes; and that they have greater inducements to enterprise. I would mention the slot-meter system. I have been in the gas business all my life; and I can say that there has been nothing like the development in the use of gas in the whole history of gas supply, that has resulted from the introduction of this system. It has all been in the last ten years; and I know of companies who have doubled their number of consumers in that period. The South Metropolitan Company have obtained 100,000 slot-meter consumers in eight years. It was the companies who were the pioneers in this matter—Liverpool taking the lead. If the gas supply had been in the hands of corporations, there would have been nothing like the progress that has taken place. The companies started it, and the corporations have followed; but they have not progressed to anything like the extent that the companies have.

You regard gas shares as a very good form of investment for various people?—I think they are a very popular form of investment. If they have not such investments, what are people to do with their savings?

Of course, to some extent corporation stock would take its place?—Well, the London County Council recently offered stock; and, on going through the list of applications, I found that they were for very high amounts. I know, as a matter of fact, that gas companies' shares are very popular in provincial towns, and that consumers are very ready to take gas stock when it is offered them.

You consider that companies can deal much better with labour questions than corporations?—Unquestionably. There are only two companies who have adopted the profit-sharing system; but what two have done, there is no reason that all should not do. The South Metropolitan workpeople hold £100,000 worth of stock; and nearly all the workpeople of the Crystal Palace Gas Company are shareholders.

Why has not this system been more largely adopted?—It is owing to the innate conservatism of the British race. The other companies are waiting to see whether it is a success.

And you think companies have more reason to serve their customers well, and to please them, than corporations have?—Undoubtedly.

Lord ROTHSCHILD: Do you think that the sale of bye-products, and the use of them, would be greater if gas undertakings were in private hands than if they were in the hands of municipalities?—I think it would be better to have them in the hands of gas companies, who have a direct interest in selling their bye-products to the best advantage; because if they can get a higher price for their bye-products, they can sell their gas more cheaply and obtain an increased dividend.

Viscount PEEL: I understood you to say that the poor shopkeeper was very often charged unduly for gas, while the great manufacturer who consumed electricity paid nothing at all towards the rates in that way?

Witness: I was quoting from Alderman Gibson.

Do you think this prevails in many corporations?—Well, I will take London. In the north of London, a very large amount of electricity is used. The small shopkeepers burn gas. If the supply of gas were in the hands of a corporation, and a great amount of profit were taken in aid of the rates, the small shopkeeper would have to contribute more towards the rates than the man who used electricity.

Are there many cases where corporations manufacture both gas and electricity?—They do it in Manchester.

Do they get profits out of the electrical supply?—I do not know. I am afraid not.

That is an argument that corporations should only supply one form of light and power?—My argument is that corporations should supply nothing that can be done by private enterprise.

Have you ever heard any complaint from the consumers of gas in Birmingham that they are not fairly treated, and that they ought to get

their gas at a much lower rate?—No; but the difference would be only 1½d. per 1000 cubic feet. If there were a difference of 6d., I think that the Birmingham constituencies, being enlightened, would not have stood it.

Sir W. FOSTER: They would have changed the Corporation.

Viscount HAMPTON: Your evidence is directed against the policy of Parliament encouraging corporations to take over gas and water supplies?

Witness: With all due respect to Parliament, I think it is a mistake.

Do you think it within the region of possibility that Parliament will go back on the policy it has pursued for a number of years, with respect to the supply of gas and water?—Water is different from gas. I do not say it is possible to turn back the policy of Parliament, though we have done it this year in regard to illuminating power. I think it would be possible to induce Parliament to say to a corporation: "You may have the gas supply if you like; but you must not make a profit out of it."

Why should not a corporation deal with the profit as they wish?—Because it is an injustice to the gas consumer to make him pay in aid of the rates.

But surely the remedy is in the hands of the ratepayers. Why cannot you leave it there?—Experience shows that the gas consumer, as a ratepayer, will not take it up.

There is an old saying that the gods help those who help themselves.—I am afraid that they cannot help themselves.

Sir W. FOSTER: Is it not within your knowledge—and I think within your personal experience—that in many provincial towns, where the corporations have taken over the gas-works there has been an improvement in the supply?

Witness: Yes.

If you look round these Parliament Houses any evening, do you think there is any large city in Europe where the lighting is so bad?—That is entirely the fault of the Local Authority.

But the Local Authority do not supply the gas?—They say how much has to be supplied; and the Gas Company have nothing to do but carry out the order of the Local Authority.

And have you noticed the burners?—Yes; and I have noticed your magnificent lighting in Birmingham. The parish authorities in London control the lighting absolutely. London, I am prepared to admit, is one of the worst lighted places to be found; but that is not the fault of the Gas Companies.

London has not had corporations, and has had no opportunity of exercising the same kind of municipal enterprise as Birmingham and Glasgow have exercised?—The public lighting of some provincial towns is what is called free. No charge is made; and this means that the private consumer must pay for it.

You think that a small retail shopkeeper in a back street has more influence over a company than he would have over a corporation?—I think so.

He may be an active politician?—Oh, then he would have more influence over a corporation.

Lord WINDSOR: Supposing corporations were debarred from making a profit, would you not say that they could supply gas cheaper and serve the public better than companies?

Witness: I say they ought to; but they have not the inducement of self-interest.

You say that other things come in; and that, as a matter of fact, they do not?—I say that there are certain corporations (and I am very glad to say that Birmingham is one of them) who treat their officials well, and have good and enterprising officers, but that, speaking of corporations generally, there is no inducement to their officers to do their best.

The CHAIRMAN: Do you know of any cases of actual mismanagement of gas undertakings by local authorities?

Witness: I think so; and I know of cases of mismanagement by companies too.

Can you give instances of actual mismanagement of gas undertakings by local authorities?—There are local authorities who have muddled things very much.

But you are not prepared to give any evidence on that point?—I think it is rather an invidious task to mention names.

It does not occur to you that it would strengthen your case, because I am bound to tell you that the evidence we have had so far is that gas undertakings have been exceedingly well managed by corporations?—Many have been. The undertakings of Glasgow, Nottingham, Birmingham, and Leicester are very well managed; but there are others that are not, though I should not like to give the names.

At the close of Mr. Livesey's evidence, Mr. James H. Kelly, of the Traders' Defence Association of Scotland, was called. He said he represented the views of that body, the members of which numbered 2800. He considered that municipalities had facilities which established unfair conditions in trade and commerce. He regarded it as a menace to the State that a municipality, working with the object of having little or no profit, did not contribute to the State by paying income-tax, with the result that traders had to pay increased taxation. The same thing happened with regard to local rates. The Association admitted the municipalization of water and gas undertakings, as these did not lend themselves to competition; and, as far as Glasgow was concerned, the citizens were very well served in respect of both gas and water. He had not the same opinion regarding the tramways or the building operations which the Corporation of Glasgow had undertaken. Tramways were merely a means of conveyance, and were a form which could be taken up by anyone. Their building operations were unfair competition with private enterprise. As far as the object of the operations might be to clear slum property, he had no objection whatever to a corporation putting up a cheap class of house, such as private enterprise would not undertake to do; but, in the case of Glasgow, they were putting up substantial houses. Proceeding to speak on the question of municipal employees, he said he regarded the risk attending the employment of a large number as very considerable, and this condition existed in Glasgow. Municipal employees, as a rule, gave their votes in favour of the nine members of the Town Council who were Trades Unionists; and not only so, but they induced other labour parties to do the same. What he was speaking against was the growing evil of increasing the number of employees, so that they might have undue influence on the Council. The Lord Provost



of Glasgow had stated in his evidence that the municipal debt of the city had been more apparent than real. In the last ten years it had risen from £5,000,000 to about £10,000,000, and the taxation of the city had risen 5d. in the pound. This was real enough for those who had to pay it; and in the face of the increased taxation and debt, it was scarcely wise for a Corporation to devote their attention to other enterprises. There was not much to be said on the electric system of Glasgow. The Corporation took powers to prevent a company from getting in. His complaint was that, having obtained the powers, the Corporation did not use them. As to telephones, he did not think it was necessary to take over a telephone system if a company could conduct it as well as any other body. Gas and water supplies were about the limit to which he was inclined to allow corporations to go in respect of trading. He would not necessarily include electric lighting. Admitting the extent to which corporations had taken up municipal trading, there were so many auxiliary trades involved that the difficulty of defining a limit was increased.

The Committee held a further sitting on Friday, when Dr. Kingsbury, Mayor of Blackpool, stated that the Corporation's undertakings included gas supply, electric lighting, &c. The gas-works had been established for upwards of forty years. The capital was £144,000; there was an accumulated sinking fund of £26,000; and the income during the forty years had been equivalent to the present capital five times over—namely, £728,000. The gross profit was £214,000, equalling  $1\frac{1}{2}$  times the capital; and there was a net profit practically equivalent to the capital employed. The Corporation had much reduced the price of gas, and had improved their plant very materially. They had devoted a certain amount of profit to the relief of the rates. In 1864, the price was 5s. 10d. per 1000 cubic feet; while at present it was 2s. 4d. They were not thinking of making any increase in the price. The gas consumers numbered 9994, or over one in every five of the inhabitants. The average annual net profit from the works had been less than 8 per cent. To the working classes the Corporation supplied slot-meters; and to the public they supplied burners free. They also supplied "grillers" free to working people. The public lighting, which was very well managed, was carried out at practically cost price. Mr. Livesey, at the last sitting of the Committee, made a number of statements which were not quite accurate. He had spoken of continuity in control being an essential to successful management, and had said that continuity did not exist with corporations, whereas it did with companies. His (witness's) experience was that the same continuity, practically, that was obtained in a company existed in municipal life. Certain men laid themselves out to become specially efficient in particular departments. In Blackpool, for instance, there were men who had been members of the Gas Committee for ten or twenty years. It was quite a common thing throughout the country for a man to remain chairman of the same committee for many years. Mr. Livesey had also said that the companies could beat the corporations in regard to the price of gas. Other witnesses had, however, refuted this statement, and had shown that the price of corporation gas throughout the country was some 2d. per 1000 cubic feet less than that of company gas. Asked to speak as to the Blackpool electric lighting works, witness said that they had been established for some seven years. The capital was £117,000; and there was an accumulated sinking fund of over £9000. The income in the seven years had been £74,000, the gross profit £28,000, and the net profit £6200. The average net profit had been 1 per cent. of the outlay. The street-lamps were supplied at cost price; the meters being free. In 1894, the Corporation started with some 56 customers; and the price was 6d. per unit. Now there were over 900 customers; and the price varied from 7d. to 2d. per unit. The customers numbered one in fifty of the population, and one in ten of the inhabited houses. In Blackpool, there were no manufactures; but some small works—such as printing establishments—were supplied with electric power. Asked whether he had anything to say to the suggestion that the fact of the Corporation having gas-works of their own had hampered electrical development, witness replied that he could give a negative to that at once. The Corporation owned both undertakings. There was friendly rivalry between them; and, so far from hampering, one stimulated the other. He thought the public greatly benefited from having the two concerns in the same hands. His was the first borough in the country to adopt public electric lighting. Though they only secured the Order for the domestic supply seven years ago, their streets had been lighted by electricity longer than those of any other town in England.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, July 18.

(Before Mr. Justice BUCKLEY.)

In re Kern's Patent No. 293 of 1897.

This case, which occupied his Lordship from the 29th ult. to the 9th inst. (see *ante*, pp. 34, 96), was in the paper to-day for judgment. On its being called,

Mr. MOULTON, for the Welsbach Company, said he was glad to announce that in this matter, as well as in the patent action which had been fixed for the 23rd inst. (*The Welsbach Incandescent Gaslight Company, Limited, v. The New Sunlight Incandescent Company, Limited*), the parties had come to terms. These were actually drawn up and signed, but they required the sanction of the shareholders; and the meeting could not be held before the 27th. Under these circumstances, he asked that the case should stand over formally to Monday, the 30th inst.

Justice BUCKLEY: Do I understand that the proposed settlement will put an end to further litigation?

Mr. MOULTON said it would put an end to both actions. It was proposed that the patent action should stand over generally, and that relating to Kern's patent until the 30th.

His LORDSHIP assented.

### Steam Road-Roller Damages at Denbigh.

In the Denbigh County Court last Tuesday, before his Honour Judge Sir Horatio Lloyd, the Denbigh Water Company sued the Town Council of Denbigh for £13 2s. 1d. damages alleged to have been done to the Company's pipes by the steam-roller recently purchased by the Corporation. The Denbigh Gas Company sued the Council for £11 1s. 3d., alleged damage caused in the same way to their pipes. Both Companies also claimed an injunction. The Water Company's case was gone into first. Evidence was given by a waterman in the employ of the Company, who said that he had noticed fractures of the main pipes in certain streets, in all of which the defendant's steam-roller, which weighs 12 tons, had been working a few days previously. The pipes were laid at a depth of from 16 to 23 inches. Mr. F. Storr, the Secretary and Engineer of the Wrexham Water Company, said that the pipes were very good—much better, in fact, than most pipes now manufactured. There were marks of oxidation; but that did not in any material degree weaken the pipes. In all cases of frost, pipes would be split longitudinally; but in the pipes broken, as alleged, by the external pressure of the steam-roller all the fractures were transverse. In cross-examination, Mr. Storr said that 14 inches or even 18 inches was not deep enough to lay pipes, in a town of the size of Denbigh. Mr. McDonald Gaskin gave evidence as to the difference between fractures caused by external and internal pressure. He said that the pipes of the Denbigh Water Company were excellent, and better even than those manufactured now, even after being in the earth since 1864. In that year, 24 inches was deep enough for the traffic of the time; but now he would not be satisfied with less than 2ft. 6in. or 3ft. It depended on the amount of traffic. Mr. Evan Evans, the County Surveyor of Carnarvon, also gave evidence as to the effect of encrustation on the strength of pipes, and said that it did not weaken their power to resist pressure. Mr. Roberts stated, before closing his case for the Company, that his clients would abandon their demand for an injunction. Mr. Bankes, for the defendants, said that the serious case he was called upon to answer had gone—namely, the injunction. But he had further to contend that it was not proved that the steam-roller had been anywhere near the places mentioned. He had to plead: (1) That the Council were not liable under the Public Authorities Act, (2) that the steam-roller had not caused the damage, (3) that the pipes had not been properly laid, (4) that the pipes had not been laid at a proper depth, and (5) that transverse breakages had occurred long before the steam-roller had come to the town. Mr. Enfield Taylor, of Chester (called as a witness), said that he agreed with the expert witnesses on the other side that the pipes were made of good iron, but they had not been cast so well as pipes were now cast. They were not of uniform strength. The depth of the pipes was far from being adequate; and he thought breakages could occur, and probably did occur, from pressure from railway and other luries. He produced a piece of pipe which had one part of it  $\frac{1}{4}$  inch thick, and another part  $\frac{1}{2}$  inch. He thought that the Company should have re-laid their pipes in sections, and not have left them in the ground for 36 years. His Honour took time to consider his judgment; and the case of the Gas Company against the Corporation was adjourned.

### A Water-Rate Collector at Neath Convicted of Embezzlement.

Last Wednesday, at the Neath County Police Court, Frederick John Snow, for twelve years collector of water-rates at Neath, was brought up in custody and charged with embezzling certain sums of money belonging to his employers, the Neath Corporation. The prosecution proved that the prisoner went to his own printers and had books printed for the purpose of carrying out his nefarious schemes, which enabled him to make applications to consumers for payment of water-rates, and give receipts. The prisoner paid the printer for the books; whereas the official books formed part of a contract, and were paid for by the Corporation. The prisoner, like the Manager (Mr. Edwin C. Pole), had been taken over by the Corporation when they purchased the water undertaking in 1894. The frauds were discovered in April of this year, and Snow was suspended. A long and laborious investigation had taken place; but even after his suspension Snow had continued his malpractices. The frauds were discovered through an application being made by the Manager for payment of a water-rate. Snow, at first, had protested his innocence, but subsequently he had admitted his guilt, and had written out a list of cases in which he had committed frauds—in the aggregate to the amount of £254. A sentence of six months' hard labour was passed.

### Charge of Stealing Water.

At the Stratford Police Court, last Thursday, John Holland, builder, of Chadwick Road, Walwood Park, Leytonstone, appeared to answer an adjourned summons charging him with stealing about 900,000 gallons of water, valued at £45, the property of the East London Water Company. Mr. A. Gill and Mr. G. Kebbell prosecuted; Mr. Purcell defended the accused. On behalf of the Company, it was alleged that the defendant attached a  $\frac{1}{2}$ -inch lead pipe, capable of discharging 240 gallons of water per hour, to the domestic water supply of No. 8, Preston Road, Walwood Park, and that his workmen used the water from this source for building operations—drawing it through a pit, which had been dug for collecting the surface water, and in which the end of the pipe was laid. For the defence it was contended that there was no theft, and no intention to steal the water. The defendant had applied to the Company, and on two occasions had obtained a building supply; but subsequently they increased their charges to such an extent that he resolved to dig a well and collect the surface water. He did so, and found a supply which he used. In the course of the excavations, however, some of his men came across a buried pipe which was connected with the domestic supply of the above-named house. Thinking this was an old building supply which had been overlooked, the defendant ordered his men on no account to employ the water for building; but, at their request, he gave permission for them to use it for drinking instead of having to go to the occupied houses. Witnesses were called to show that, though water was drawn from the Company's pipe by the workmen, it was for drinking, and not for building purposes. The Bench decided that there was a case to go to a Jury; and the defendant was committed to take his trial at the Central Criminal Court. He was bound over to appear.







to be working more disadvantageously as time went on. He gathered from the figures that the consumers' share of the burden had increased. In 1876, it was 82·3 per cent.; and in 1898 it was 85·5 per cent. The Companies' share had decreased from 17·7 per cent. in 1876, to 14·5 per cent. in 1898. And it was stated in the report that it would seem that the result of this increase of 6d. per 1000 cubic feet would be a tax on the consumers of gas of no less than £788,942 a year, while the shareholders of the Companies would only suffer to the extent of £141,247. The Companies stated that, in accordance with their Acts of Parliament, the effect of this addition to the price of gas upon the dividend was a corresponding reduction in the rate payable, as from the 1st of January last. If Councillors would look at the large figures which were before them on the authority of the Comptroller, they would see that the correspondence was of a somewhat disproportionate character, and that the burden was borne more by the consumer than by the shareholder. He entirely sympathized with, and supported, the amendment moved by Mr. Organ, because when he was Chairman of the Public Control Committee he made himself conversant, not only with the figures to which he had called attention as to the enrichment of the gas being remarkably successful in the neighbourhood of the testing-stations and remarkably unsuccessful in the case of the consumer himself, but he also made himself familiar with the portable photometer; and he had no doubt whatever that the portable photometer test was a thoroughly fair and satisfactory one. It was a great misfortune that Parliament had not seen fit to give the test by the portable photometer legal sanction. All his experience in the matter led him to the opinion that one was being baffled by a vast deal of company-made law which, in the interests of consumers, had a most shocking effect.

Mr. B. S. STRAUS remarked that there was a great deal he wanted to say; but Dr. Collins had already said it in a very much more able manner than he would have been able to do. He would, however, like to say that Mr. Nathan Robinson seemed rather shy of offending or slandering the Companies. He was not a bit afraid of slandering the Companies. He thought, when one read the notice the Gaslight and Coke Company were sending out to those people who had to use the very inadequate quality of stuff that they were supplying, that it was absolutely a case of obtaining money under false pretences. It was conclusively proved by the report on the *agenda* that the Gas Companies of London were getting a profit of considerably over half-a-million, simply because coals had gone up. He meant their net profit would be over half-a-million; and yet they said that this was corresponding to the reduction to the ratepayer. Surely, if it was not an absolute concrete case of hoodwinking the public, this little paper would certainly suggest to anybody that the Companies were making nothing out of this extra cost of gas, but it was simply the extra cost they had to pay for the coal. On the report they had, it was absolutely untrue; and consequently he said it was a scandalous shame that they, at the end of the nineteenth century, had to put up with this kind of monopoly, which was simply proving conclusively every day they looked at it, how very much against the interests it was of the Metropolis, and the vast population who lived in the Metropolis. If it was necessary for gas companies to put up their prices on account of the war in South Africa, how was it that electric lighting companies did not suggest that they had to put up their prices, and were still paying very good dividends? Why should the Gaslight and Coke Company put up their prices while the Westminster Electric Lighting Company recently reduced their rate instead of increasing it? He hoped they would no longer submit to be hoodwinked by a Company who had always been badly managed. As long as there was a monopoly in the gas interests, they would be served badly. He said it was high time that the Council should take the matter in hand, and try to do something for those who simply paid the rates and got a notice of this kind, which led them to believe that the additional charge was to pay for the extra price of coal, which was absolutely and entirely untrue.

The Right Hon. J. G. SHAW-LEFEVRE entirely agreed with the observations made by Dr. Collins with regard to the past action of Parliament, especially in respect to the sliding-scale. The sliding-scale was adopted in 1875, after very long agitation on the part of the consumers of gas in London, and after a long course of legislation on the part of the Metropolitan Board of Works and the Vestries; and it was adopted with the object and the hope that it would offer great inducement to the Companies so to manage their concerns that the price of gas would be largely reduced. It was certainly a very serious matter that, in consequence of the very great rise in the cost of coal, the price of gas had now to be increased so largely, and a very little burden cast upon the shareholders of the Company, compared with the great burden which would fall upon the consumers. He did not, for his part, quite understand why the price of coal should have risen to the extent it had. He believed he was right in saying that the production of coal during the past year had been very much larger than ever before, and that in the year 1899 no less than 220 million tons of coal were produced in this country—namely, 20 million tons more than in any previous year. Why, in the face of this, there should have been a very large amount of rise in the price of coal, he could not quite understand. He could not but feel that, whatever the cause, it was undoubtedly the fact that the Gas Companies had been obliged to make contracts at a very much higher price. The question was whether, by care and good management of their concerns, they might not save a great deal of the extra cost which was thus thrown upon the public. He himself was a member of a Committee, which was presided over by Lord Cardwell, on the gas question so long ago as the year 1867; and very much the same complaints were then made—namely, that the Gas Companies were mismanaging their concerns, and that the gas was charged for at a very much higher rate than was justifiable. All these complaints were before the Committee; and the Committee then came to the conclusion that they were justified. At the same time, the Committee felt that they were not justified according to the practice of Parliament in forcing upon the Companies a new scale of prices. This was contrary to the tradition and practice of Parliament. But they also came to the conclusion that there was nothing to prevent the Metropolitan Board of Works, or any other Local Authority of London, establishing competing works against the Companies. And he should like to call the attention of the Council to what the Committee reported on that occasion. He might mention the fact that the Committee recommended to the Companies a particular scale of prices very much lower than they were then charging;

and when the Companies refused to adopt the scale, the Committee themselves recommended that there should be competition on the part of the Metropolitan Board of Works. They said: "The difficulty with which your Committee have had to contend will be found to apply to every General Bill which may be introduced without the concurrence of the Companies for the regulation of their present monopoly. But it will always be in the power of Parliament to prescribe terms of regulation as each Company comes before it to apply for new powers; and the necessity for such powers has usually brought the Companies to Parliament at no long intervals of time. Your Committee, however, do not think it would be just to the consumer to leave him to the casualties of this mode of remedy, and they recommend that, if the Companies decline to submit to general regulations such as Parliament may consider reasonable, measures should be taken for the introduction of a new supply in independent hands." The position at the present moment was very much the same as that mentioned in 1867. They had the report of the Committee of the House of Commons affirming the fact that the Gaslight and Coke Company had not conducted their business with due care and good management, and they had recommended a reduction in their scale of charges as reasonable and right. Well, so far, the Company had not adopted the new scale, and he believed they were anxious, if possible, to avoid coming to Parliament for raising fresh capital. He would advise the Committee who were to deal with this matter to carefully study the report of the Committee of 1867, and to consider whether it might not be right and wise, in the interests of the consumers of London, to bring in a Bill next session to sanction the establishment of a competing supply, at all events for the purpose of using it as a weapon against the Company, so as to enforce them to reduce their price. He thought it was monstrous, looking to the enormous increase which would be thrown upon the consumers, that the Companies should bear so small a portion of the burden; and he could only hope—that was the way in which he put it—that some remedy might afterwards be found.

Earl CARRINGTON said the report told the Council that the three Gas Companies paid 11, 12½, and 11½ per cent. His own position was this: He found he was paying 3s. 5d. for 1000 cubic feet for gas for his house leading out of Grosvenor Square. What he thought he had a right to complain of was that the Company who charged him this price charged the penny-in-the-slot people 4s. 2d. per 1000 cubic feet, or 9d. more. These consumers were described by the officials of the Company as the people living in artisans' dwellings, and the very poor. A high authority in the House of Commons had told them that they could not criticize an evil, they could only describe it. He did not presume to criticize the conduct of this Company; he thought it only needed description.

Mr. B. L. COHEN, M.P., thought perhaps the Council would allow him to say a few words, because it was on his motion in the House of Commons that the Committee was appointed to which reference had been made. He believed those who were familiar with the subject knew that he at least did not approach the question with any prepossession in favour of the Gaslight and Coke Company. It was impossible to follow the protracted, and he thought very diligent, inquiry held last year without coming to the conviction at which they unanimously arrived—that that Company, as distinguished from the Commercial and the South Metropolitan Companies, had not conducted their business with that care and good management which was a condition precedent to the sanctioning of the sliding-scale in 1867, and on the faith of which it had been granted. So far, therefore, the Gaslight and Coke Company came out with a bad record before the House of Commons Committee last year. But he did think the interests of the Council, and he was quite sure the case of the consumers, was not advanced by using violent language. It could not appeal to any, except a few members of the Council; and such expressions as "obtaining money by false pretences," and all that kind of thing, was, if his honourable friend opposite would forgive him for saying so, claptrap nonsense. He said this most distinctly, because the Gaslight and Coke Company, with whom he had not a shred of sympathy, had not levied, or, as far as he knew, tried to levy, anything which was not in strict conformity with the law of the land. Be it good or be it bad, they were entitled to it. He hoped the Legislature would vary their powers; but until they were varied, the Directors of the Company could not be blamed for pursuing the only course open to them if they consulted the interests of their shareholders, who had returned them to their positions. If it had not been that it was established, he thought conclusively, before the Committee of last year, that the Gaslight and Coke Company, alone of the three Companies indicted, had not managed their business with that care and economy which Parliament had a right to expect, he very much questioned whether the House of Commons would have felt justified in advising Parliament to vary the sliding-scale, on the faith of which many millions of capital had been subscribed. But when parties to a contract had failed to carry out one of its essential conditions, then—and, in his opinion, only then—was the case made out for varying the terms on which public money had been subscribed by the shareholders. Now they came to the great advance in the price of gas which had been announced by the Gaslight and Coke Company. There, again, he hoped he should be acquitted of any sympathy with the Company (who, he was quite certain, would charge him with being their opponent) when he said that, of all the mismanagement of which they had been proved to be guilty, the one thing for which he thought but little reproach could be brought against them was in the extra charge of 6d. consequent upon the advance in the price of coal. He said this because a similar advance had been made by the Commercial Company, and the South Metropolitan Company—whose record, so far as his knowledge went, was beyond suspicion—had gone higher. But he also said it because of the figures given in the Comptroller's report. It was true he had compared figures which Dr. Collins was not slow to seize, and which were a little bit captivating, when he said: "It will be seen that the result will be a tax on the consumers of gas amounting to no less than £788,942 a year, while the shareholders of the Companies will only suffer to the extent of £141,247." He said this was comparing or contrasting two figures which were not comparable. The amounts which the gas consumer had to pay as the extra price of gas could not go, would not go, *ex hypothesi* into the shareholders' pockets; and this £788,942 which would have to be raised from the consumers of the Gaslight and Coke Company's district was surely not a comparable figure, when it was found that the extra cost of coal to the Company, at an advance of 8s. per ton, came to £795,000, which, as nearly as possible was identical with



the amount of extra money which they would raise from the consumers. As he had said, he was not there to defend the Company—his desire would indeed much rather be to hold a brief for the prosecution; but he did not want to be unjust towards them. He wanted figures to be placed before the public which were comparable, and to have the Company convicted on evidence which he considered strictly justified their condemnation, and not on any other.

Mr. R. MELVILL BEACHCROFT thought it only fair to say, after most of the speeches on the subject—many of them on the Progressive side—that the proposal laid before them by the Parliamentary Committee had resulted from a motion of his in the Parliamentary Committee on the previous Thursday. The history of gas supply in London was really one of perpetual agitation followed by legislation. In 1873, the Metropolitan Board of Works joined hands with the Corporation of London and made application to Parliament; and he hoped that now, in 1900, the present Corporation might co-operate with the London County Council, and see whether something could not be done to recognize this undoubtedly most unsatisfactory state of affairs. For forty years prior to 1876, the Gas Companies proceeded on what was known as a fixed scale; but in 1867 the sliding-scale arrangement took its place, and it might be (for his part, he was not satisfied, after reading the Comptroller's report, that it was not so) that this arrangement was a wrong one. On the other hand, it might be that it was the best one. But, at any rate, he would be only too glad to see Parliament intervene in order to place the gas consumer in a more satisfactory position. He represented a district—Clerkenwell—where the gas question was a most serious one, as it was also in Holborn and other parts of the North of London. It affected in a large degree those workers who were dependent on gas for their means of support. He suggested that they should, if possible, be unanimous. Let them go as a united body, resolved that this state of things should be put an end to; and if they could now get the Corporation of London to join hands with them, as they did with the Metropolitan Board of Works in 1873, he was satisfied that some solution of the question would be arrived at.

Mr. E. A. CORNWALL remarked that the amendment which Mr. Organ had moved was an addition to what the Parliamentary Committee proposed in reference to the matter which would come before the conference of Local Authorities, if the Council agreed to authorize the Parliamentary Committee to convene one. Of course, speaking for the Parliamentary Committee, he had no objection whatever to adding the words suggested—in fact, he thought they were a very useful addition, and would enable the conference to deal with the matter in a larger way than perhaps would have been possible under the limited recommendation which his Committee had brought up. Since they had had a discussion in the Council, perhaps he might be allowed to mention very shortly what had taken place on the question of what had been done by the Council in relation to the Local Authorities and to the various Bills before Parliament. Some two years ago, the Gaslight and Coke Company took a very serious step, which the people of London in Parliament ought to have resisted more than they did. The Council opposed the Company's Bill; but it passed through Parliament. This Bill was to convert their capital from £11,000,000 to £25,000,000, making what was 10 or 11 per cent. on their £11,000,000 about 5 per cent. on the converted capital of £25,000,000. This would have been the real occasion, if Parliament had only listened to what the London County Council put before them, on which to have brought the Gas Companies to book. The Bill passed; and the Companies now said they only got a small dividend. Last year the Gaslight and Coke Company applied to Parliament for £2,500,000 of new capital. The Council opposed the Bill, and it was fortunately rejected. He thought it was rejected very much in consequence of what the Select Committee, who had been sitting in reference to the high prices then charged by the Gas Companies, reported. His colleague, Mr. Cohen, was perfectly entitled to say that he secured the appointment of the Committee. He thought they were under a considerable debt of gratitude to him for the part he took when the Committee was appointed, because of the then high prices charged by the Gaslight and Coke Company. He did not know what the Committee would have said had they been appointed to consider the much higher prices the Company were charging now. However, the Bill for further capital was rejected last year. Again this year the Company introduced another Bill to authorize them to raise further capital. With the opposition of the Council and the Local Authorities, the Bill was again rejected; Parliament being told what the conclusion the Select Committee came to last year was—that the high price charged then by the Gaslight and Coke Company was very much due to the mismanagement of their undertaking. When the question of the Gaslight and Coke Company and their charges was before the Select Committee last year, the Parliamentary Committee of the County Council were charged with getting up evidence to place before that Committee. They felt that it was their duty to confer with representatives of the Local Authorities, so that the evidence given might be in accord with the views, not only of the Council, but of the Local Authorities north of the Thames. The Parliamentary Committee thought that, in view of the steps which must be taken by the Council in the near future in regard to the Gaslight and Coke Company, it was desirable that they should again confer with the Local Authorities before deciding what course they should adopt. He might mention that the Company, failing to get new capital powers, had agreed a few days ago to accept a price from the South Metropolitan Gas Company for the portion of their undertaking south of the Thames. The Parliamentary Committee were led to believe that they only agreed to the figure offered by the South Metropolitan Gas Company because they were very anxious to get the money, as they could not obtain more capital from Parliament. The Council opposed the sale, unless they would incorporate some condition as to the price the Company should charge for gas north of the Thames; and they succeeded in getting the proposal rejected. It was pretty evident that the Gaslight and Coke Company must next year again go to Parliament; and it was also evident, from the report of the Select Committee last year, that the Select Committee were of opinion that, when the Gas Company did go to Parliament for further concessions, that was the time for re-arrangements to be made as to their powers. It was almost certain that, as the Company failed to get their capital the last two years, and as they failed to secure the money which they would have received by the sale of their district south of the Thames to the South Metropolitan Gas

Company, the Council would have an opportunity next year of asking Parliament to deal with the Company. That was why they thought a conference should be convened by the Council, so that the City Corporation and the other Local Authorities, and the London County Council, should be united in any course they might take. In reference to the actual wording of the amendment, "as to the quality of the gas," the Council would remember that they promoted a Bill to enable them to apply a portable photometer to gas testing; and after the Bill had been before a Committee of the House of Commons for ten days, unfortunately it was rejected. He did not want to repeat there what took place in that Committee; but it was not so hopeful to the Council as they should have liked it to have been. He might, however, say, as having been present on most of the occasions when the Committee were sitting, that this was not due to any want of energy or ability on the part of their officers, who stated the case for London and the Council, in his opinion and humble judgment, in a most able and competent manner; and he was in hopes that, after having listened to it, the result of the Committee would have been more satisfactory. As they knew, the merits of the case were as strong as ever. He entirely agreed with what Mr. Organ and Dr. Collins had said; he did not know that the opinion of the Council had in any way varied on the point. He was quite willing to accept the amendment which would include in the conference, when it was held, consideration as to the quality of the gas as well as the price charged by the Gaslight and Coke Company.

Mr. W. PEARCE said there was one fact he should like to bring before the notice of the Council. He did not think it appeared in the report. It bore very largely on what the sliding-scale ought to be—that was, the cost to-day of the production and distribution of gas. The facts could very easily be obtained; and he was convinced that, if they were obtained, the cost of the manufacture and distribution of gas in London would appear to be less than 2s. per 1000 cubic feet. This being so, any sliding-scale based on an initial figure up to 3s. 3d. proposed now, or on the old scale of 3s. 6d. to 3s. 9d., was bound to be an enormous disadvantage to the consumer; and he did think that those who had this question in hand should fix their attention sternly on the initial price of 2s., and get all the information they could. He was sure what he had said would prove to be true—that the cost price to the Gas Company of the article they were selling to the public was well under 2s. If they were able to make a bargain and establish 3s. 3d. as the initial figure they could pay dividends on, they would place themselves in a position exceedingly disadvantageous to the consumer.

On a show of hands, the amendment was adopted.

Mr. TAYLOR moved a further amendment. He did not wish to make a speech about it, as he was sure every member of the Council would admit the amendment to be very necessary. It was to add the following words to Mr. Organ's amendment: "and also with regard to the quantity supplied by their meters." He moved this amendment—which he hoped would be in order—in the interests of many thousands of working-class consumers especially, who were now using gas by means of the penny-in-the-slot system. He had received many complaints with regard to the quantity supplied; and it did seem to him that, if they held a butcher, a baker, a greengrocer, or a publican, responsible for his weights and measures, the Gas Companies should be brought under exactly the same law. Now, as a matter of fact, there was a very big difference between a Gas Company and a small tradesman. The consumer had to pay the charges that were levied by the Gas Companies; they might increase them, and the consumer had no means of knowing, by looking at the meter, what the quantity of gas supplied was. It could only be discovered by there being a very big difference in the bill for one quarter as against another. Then, if the consumer complained, the Gas Companies sent down and had the meter disconnected; and the consumer had to send it to be tested at his own cost.

A COUNCILLOR: No.

Mr. TAYLOR happened to have had to pay himself, so he was speaking of what he knew something about. The Gas Company disconnected the meter. He had to send the meter away at his own cost to be tested; and it was returned as not passing gas. The fact remained that the meter was either injured by the Gas Company's officials in disconnecting it, or in transit to the gas-testing station; but, any how, he had nothing to do but to pay the charges that were levied. This was only one instance. There were thousands who had practically the same thing to put up with. At one time, when the penny-in-the-slot meters were first introduced, any consumer could read the meter and see whether he got his 25, 27, or 29 cubic feet for a penny; but now he found that the Gas Companies were introducing new meters by which the consumer could not read the amount of gas that he consumed, or that he received for his penny. Under these circumstances, he did hope the Council would pass the amendment, so as to bring the Gas Companies in some way under the Weights and Measures Acts which applied to other trades and people.

Mr. DEW seconded the addition.

The CHAIRMAN put the further amendment, and it was adopted.

The recommendation of the Parliamentary Committee, as amended, was then put to the Council, and unanimously agreed to.

**Starting the New Gasholder at Maidstone.**—The ceremony of laying the foundation stone of the new gasholder which is being built on land adjoining the Maidstone Gas Company's works in St. Peter Street was performed last Tuesday by Mr. George Marsham. There were several of the Directors of the Company present, as well as Mr. Henry Smythe, the Manager. Mr. Marsham was presented with a silver trowel by the contractor; and a luncheon in the Company's board-room at the works followed.

**The Alcester District Council Threaten the Water Company.**—At a meeting of the Alcester District Council last Wednesday, the question of the inefficiency of the water supply was considered. It resulted in the Clerk being directed to write to the Water Company to the effect that, unless they agreed to the Council acquiring their works at the market value, the Council would avail themselves of the provisions of the Public Health Acts to provide Alcester with an adequate supply of water from another source—the Council being unable to tolerate the constant complaints received as to the supply.



## JUBILEE PRESENTATIONS TO MR. JESSE HALL.

Mr. Jesse Hall, who recently completed his jubilee of service as Manager and Secretary of the St. Andrews Gaslight Company, on Friday presented with testimonials from former assistants and other friends. The ceremony took place in Mr. Hall's private residence, and the subscribers were represented by Mr. J. W. Carmichael, of Barrhead, Mr. D. M. Nelson, of Glasgow, and Mr. R. S. Carlow, of Arbroath. Mr. T. Douglas Hall and Mr. David Hall (Mr. Hall's sons) were present.

Mr. NELSON, in handing over to Mr. Hall a beautiful illuminated address, referred to his long acquaintanceship and friendship with him, and to Mr. Hall's kindly courtesy, genial friendship, and native modesty. The address set forth as follows:—

A number of former assistants, now managers of gas-works in various towns of the United Kingdom, along with other friends, desire to congratulate you as Secretary and Manager of the St. Andrews Gaslight Company, upon the recent completion of your jubilee of service in that undertaking, and on the faithfulness and efficiency with which such service has been rendered, as manifested by the spontaneous recognition by Directors and shareholders alike during that very long period. These friends regard with pleasure their sense of the good work done by you to further the interests and to promote the happiness of others during a long life of earnest, untiring industry; and they cordially convey at the same time their best wishes for your health, happiness, and prosperity. Signed, on behalf of the friends above referred to, James W. Carmichael, D. M. Nelson, at St. Andrews, this the 20th day of July, 1900.

Mr. CARMICHAEL then asked Mr. HALL to accept as a further token of their appreciation of his worth a handsome easy chair and a set of footstools. Mr. Hall, he remarked, had not eaten the bread of idleness, but had been a very active and busy man all his days, as a slight acquaintance with the many public offices he had filled fully testified. Mr. Carmichael expressed his pleasure at having served his apprenticeship under Mr. Hall, who instilled into him as well as others the high ideal that if a thing was worth doing, it should be done well.

Mr. HALL, in reply, said he felt very grateful for, and proud of, the honour done him, the more so when he considered the source whence that honour came. He said that he had been connected with a gas-works, and that he had been a gas manager, gas engineer, or architect. He, however, had conducted the St. Andrews Gas Company during the past 40 years with fair success, and had had the confidence of his Directors. He did not think there were at present in St. Andrews half-a-dozen people who were resident in it when he came to the city; but there were associations round about it of which he could not get quit. The work, though hard, had been a pleasure; and it had borne its own fruits. He had been a worker all his days, and they could not force him into a worse position now than to be idle.

Mr. CARLOW, on behalf of the subscribers, presented Miss Hall with a gold and pearl mounted umbrella.

Mr. T. DOUGLAS HALL acknowledged the gift on behalf of his sister.

The company were entertained to luncheon by Mr. Hall.

Among others who have entered the profession under Mr. Hall's tuition may be mentioned Mr. A. MacPherson, Kirkcaldy; Mr. John Swan, Ulverston; Mr. James Carmichael, Barrhead; and Mr. James Auchterlonie, of the Crystal Palace District Gas Company.

## FACTORY INSPECTORS AND CARBONIC OXIDE POISONING.

The recently issued report of the Chief Inspector of Factories and Workshops (Dr. Arthur Whitelegge) for the past year contains a memorandum issued by the Home Office on the subject of water gas. The attention of the inspectors is directed to the increasing manufacture of this gas, not only by municipalities and gas companies for purposes of domestic heating and lighting, but also in factories for driving engines, welding, and other purposes. It is pointed out that the Departmental Committee appointed by the Home Secretary, whose report has been fully dealt with in the "JOURNAL," investigated this question from the domestic rather than from the industrial side; and the authors of the memorandum (Drs. Legge and Whitelegge) therefore consider it from the latter standpoint. Having shortly described the method of making water gas and producer gas, they state that the particular danger associated with these gases is that of poisoning by carbonic oxide, which is a constituent of coal gas as well as of water gas. But whereas the proportion in coal gas varies from 4 to 12 per cent., in carburetted water gas it reaches 30 per cent., and in uncarburetted water gas amounts to nearly 50 per cent.; Dowson gas usually containing 25 per cent. The authors go on to say that, though the danger attending the use of these gases is one chiefly affecting persons sleeping in a room in which gas charged with carbonic oxide is escaping, there have been fatal mishaps from this source in factories; and it is highly probable that others, in factories as elsewhere, are not recorded. Fatal poisoning in factories has resulted from cleaning out Dowson tanks before a sufficient time had been allowed for the gas to escape, from repairing faulty connections in pipes containing the gas, and from the gradual escape of the gas into the confined atmosphere of a small engine-room through defective valves in the engine itself. It is pointed out, however, that carbonic oxide poisoning may occur in other ways, without inhalation of water gas or coal gas. In the report for 1897, particulars were given of the death of a man while engaged in repairing a tar-still in Dublin; and in another instance two men lost their lives while repairing a line of tubes in connection with a blast-furnace. Carbonic oxide is found in lime-kilns and where braziers and coke-fires are used in confined spaces. Danger of carbonic oxide poisoning may arise in laundries from the use of gas-irons, and in workrooms from defective gas-fittings and from gas-stoves, especially when no provision is made for the products of combustion to be carried away by a flue or chimney. The absence of a chimney in a room greatly increases the risk.

After dealing with the action of carbonic oxide on the blood, and the examination of the latter, the authors go on to remark that the first symptoms produced by the inhalation of the gas are throbbing of the blood-vessels of the head, giddiness, palpitation of the heart, and weakness of the limbs. These become greatly aggravated after any exertion.

Owing to the readiness with which carbonic oxide enters the system, the possibility of the limbs may come on without attracting notice, so that the person affected is unable to make good his escape from the poisonous atmosphere. It is pointed out that the danger of poisoning is not only alleged to result from the long-continued breathing of the gas in amount too small to produce immediate effects, such as might occur from defective gas-fittings in workrooms. The appropriate remedies for poisoning by carbonic oxide are fresh air, artificial respiration, administration of oxygen, and the application of warmth.

The authors say that the precautionary measures to be considered must vary somewhat according to the different manner in which the gas is manufactured and used in one and another factory; but they think the following are of general application:—(1) Notices should be posted up stating the deadly nature of the gas, the symptoms produced by its inhalation, and the best means of rendering aid to those who are 'gassed.' (2) Persons in charge of any engine worked by water gas, or of any apparatus in which it is stored, or otherwise exposed to risk of inhaling carbonic oxide, should be free from any disease of the heart or lungs. Employers would do well to cause such persons to be examined and certified by a medical man. (3) No engine in which water gas is used should be in a confined space. (4) A competent and responsible person should, at stated short intervals, inspect all valves and connections, to see that there is no escape of gas; and a signed record with the dates of such inspections should be kept. (5) The openings giving access to any part of the water-gas circuit should be few, and in positions as safe as possible, and opened only in cases of real need and by responsible persons. (6) No workmen should enter, or approach when opened, the holder or other part of the water-gas circuit until the gas has been well flushed out by fresh air. (7) A cylinder of compressed oxygen, fitted with a piece of rubber gas-tubing and a mouthpiece, should be kept in constant readiness. Such cylinders can be obtained fitted also with a reducing-valve. (8) Medical aid should be summoned immediately; and in the meantime, if no medical aid is obtainable, the workmen employed should be instructed by a medical man in the manner of administering the oxygen and of performing artificial respiration. They should be especially warned of the danger of exposing the patient to cold.

Respirators are of no avail as a protection against carbonic oxide poisoning, and the authors recommend that every person who enters a confined space should carry a long safety rope, which may be used by a person outside, or, preferably, by the use of one or other of the special rescue appliances used in the mines. The principal danger to be guarded against in the case of carbonic oxide poisoning is that of the person affected being unable to get out of the confined space, and the authors recommend that the person in charge of the engine should be instructed in the use of the safety rope, and that the person in charge of the engine should be instructed in the use of the safety rope, and that the person in charge of the engine should be instructed in the use of the safety rope.

## GAS AFFAIRS AT BIRMINGHAM.

Cost of Coal and the Price of Gas. Retirements of Mr. Edwin Smith.

At the Meeting to-day (Tuesday) of the Birmingham City Council, the Gas Committee will submit the following recommendations: That the price of gas be increased by 3d. per 1000 cubic feet, with a proportionate increase for public lighting, from the September reading of the meters. That the Committee be authorized to advertise for, and appoint, a Secretary of the gas undertaking, at a salary of £1000 per annum, in the place of Mr. Edwin Smith, who desires to retire early next year under the superannuation scheme. The Committee, in their report, state that they have made contracts for the coal required in the coming year at a considerable advance on the prices of last year. The average price per ton for coal in the coming year will probably greatly exceed that paid in any year since the Corporation have had the administration of the gas undertaking. The Committee have given most careful attention to the question of the provision to be made to meet the very heavy additional cost of the manufacture of gas. While there will be an increased cost of manufacture over the whole year, it will not be possible to increase the price of gas before September; and in the current year the increased prices of gas can only apply to the winter quarters. After taking into consideration the additional sources of income which may be looked for, and which are mainly to be derived from an enhanced value of coke and tar, it appears that, by suspending in the present year the usual provision for depreciation of plant, an increase of at least 5d. per 1000 cubic feet would be required to meet the increased working charges and to maintain the usual balance on the revenue account. The Committee desire, however, in the permanent interests of the department, to avoid, if possible, such an abnormal increase. They fear that it would tend to check the substitution of gas-engines for other forms of motive power which is now in progress on a considerable scale; and it would, moreover, tend to check the use of gas in other directions. In order, therefore, to meet the exceptional circumstances which have arisen, the Committee, having already provided the contribution to the improvement rate for the year 1900 from the profits of the department in the previous year, propose, until they experience more favourable circumstances, to revert to former practice by providing the contribution to the rate for 1901 from the income of the department in that year. In this way, it will be possible to limit, at any rate for the present, the increase in the price of gas to 3d. per 1000 cubic feet.

Concerning the proposed retirement of Mr. Edwin Smith, the "Birmingham Daily Post" mentions that he was originally Secretary to the Midland Institute, and was appointed Secretary of the Gas Department in 1878, on its transference from the old Birmingham Gas Company. Mr. Smith's management of the Gas Department has been characterized by consummate ability; and his relations with the Gas Committee and with the employees of the department have been singularly happy. To him are due various reforms in the administration which have ministered to the convenience of the public and to very large savings of expense. There is no detail of the department which is not at his fingers' ends; and he will be exceedingly difficult to replace.



## MANCHESTER CORPORATION GAS SUPPLY.

## Annual Report—Extensions at Bradford Road—Re-arrangement of Collectors' Districts, &amp;c.

The annual report of the Manchester Gas Committee has been adopted for presentation to the Council. The quantity of gas transmitted from the works shows an increase of 268,771,000 cubic feet, or 6.03 per cent., as compared with an increase of 303,553,000 cubic feet, or 7.31 per cent., in the previous year. The number of gas consumers on March 31, 1899 and 1900, was respectively as follows: 1900, 126,191; 1899, 118,958. The number of automatic meters in use at the end of the financial year was 31,436, as compared with 26,751 in the previous year. The total amount of revenue was £654,527, as compared with £594,970; being an increase of £59,557. The gross profit on the year's working was £149,051. The net profit amounted to £73,964. Of this amount, £52,000 is paid over to the city fund; £1758 has been placed to suspense account towards the outlay on carburetted water-gas plant; and the balance—£20,206—has been carried to the contingent fund.

At the meeting of the Gas Committee of the Manchester Corporation, held last Friday, plans were approved of for the extensions, including stables and sheds, at the Bradford Road works, necessitated by the prospective increase of business in the carburetted water-gas department. A discussion took place with regard to a suggestion to re-arrange the collectors' districts, owing to the increasing number of accounts to be dealt with; and ultimately changes were made by which there will in future be 33 instead of 30 districts. A resolution was also passed instructing the Finance Committee to borrow £100,000 on gas-works account, out of the recently-sanctioned loan of £250,000.

## THE GAS AND WATER ORDERS OF THE PRESENT SESSION.

The Board of Trade have issued further memoranda relating to the Gas and Water Orders of the session. They set forth the nature of the proposals contained in the Orders comprised in the Gas Order Confirmation (No. 2) Bill and the Water Orders Confirmation Bill. The Order in the first-named Bill is to empower the Dungannon Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas within the town of Dungannon (Co. Tyrone). The Orders comprised in the second Bill are to enable the East Surrey Water Company to purchase additional lands by agreement, and to raise more capital; to authorize the South Hayling Water Company, Limited, to raise further capital, and grant an extension of time for the construction of works; to empower the Maidenhead, Sevenoaks, and South-West Suburban Water Companies to raise additional capital, and, in the case of Sevenoaks, to sell the undertaking to the Urban District Council under certain circumstances; and to confer power upon the Tonbridge Water Company, Limited, to construct works, extend their limits of supply, purchase lands by agreement, raise further capital, &c.

## METROPOLIS GAS SUPPLY.

## Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult.

**Illuminating Power.**—The average illuminating power in standard sperm candles at each of the testing-places was as follows:—

## The Gaslight and Coke Company—

Fenchurch Street, E.C.	17.1
Kinghorn Street, Cloth Fair	16.7
Dorset Buildings, Salisbury Square	16.4
Ladbroke Grove, W.	16.5
Vincent Terrace, Islington	17.0
Carlyle Square, S.W.	16.2
Camden Street, N.W.	16.3
Graham Road, Dalston, N.	16.9
Kingsland Road, N.E.	16.7
Vinery Villas, St. John's Wood	16.6
Lambeth Road, S.E.	16.6
Hornsey Road, N.	16.5

## Commercial Gas Company—

Wellclose Square, E.	16.4
Parnell Road, E.	16.6

## South Metropolitan Gas Company—

Hill Street, Peckham	16.7
Bedford Road, S.W.	16.5
Stoney Lane, Tooley Street	16.7
Blackfriars Road, S.E.	16.5
Burrage Road, S.E.	16.6

It will be seen from these results that the average illuminating power at all the testing-stations was higher than the parliamentary standard of 16 candles.

**Purity.**—Sulphuretted hydrogen was not reported to have been present in the gas on any occasion. The average amount of sulphur in other forms was considerably less than that permitted at all the testing-places of the Companies. Excesses of sulphur were reported by the Official Gas Examiners at the following stations:—

	Grains.
Ladbroke Grove	18.22
Kingsland Road	18.50
Hill Street	17.40
Bedford Road	20.00
Stoney Lane	20.00
Blackfriars Road	17.60
Burrage Road	17.80

The limit allowed is 17 grains per 100 cubic feet.

Ammonia was generally present in the gas throughout the quarter at all the testing-stations, but only in slight quantities. The amount allowed—viz., 4 grains—was not exceeded on any occasion.

## STRANGE DEATH AT ASHTON-UNDER-LYNE GAS-WORKS.

## An Open Verdict at the Inquest.

Early last Tuesday morning, one of the employees at the Ashton Gas-Works was found dead, under circumstances detailed at the inquest held the following day. Deceased, who was named Edwin Andrew, was seen about 7 o'clock in the new retort-house, engaged in running off water from the hydraulic main. A quarter of an hour afterwards he was found dead, lying on his right side near the engine used for filling the hydraulic main with ammoniacal liquor. It was his duty to start the pump; and he was found lying on the top of a pipe with which the engine was occasionally started.

At the inquest before Mr. J. F. Price, the Coroner, Mr. C. H. Booth watched the case for the Gas Company and supplied the Coroner with a plan of the place where the deceased was found. Mr. Richard Hooton, the Manager of the gas-works, was also in attendance.

Mrs. Annie Andrew, the first witness, said the deceased was her husband. He was 27 years of age, and had always had good health. He never complained of anything. He had been about five years at the gas-works, labouring for the stokers. He had never had any fits that she knew of, and he never complained of his head. He had not said anything about the heat being oppressive to him.

Lewis Hall, a stoker at the works, said he last saw deceased alive in the new retort-house at about seven o'clock on Tuesday morning. He was running water off the hydraulic main, and seemed to be all right. He was about 120 yards from where he was afterwards found dead.

W. Samuel Bennett, a labourer at the works, said deceased passed him at half-past six o'clock with a rake in his hand. Between a quarter and twenty minutes past seven o'clock witness was crossing the yard near to the liquor pump, and saw the deceased lying on the ground partly on his right side, and inclined towards his face. He went and looked at him, and seeing there was something amiss ran for the foreman, and afterwards fetched a doctor. He noticed there was a piece of piping under the deceased—he was lying across it. He had at times seen men moving the flywheel of the engine round with the piping, but not the deceased. He had only seen it done when the mortar mill had been going; and he did not believe the mortar mill was working that morning. The deceased's head was towards the mortar mill. When the mortar mill was not working, a man ought to be able to turn the wheel with his hands.

Mr. Hooton said the bar was about 7 feet long, and was 1½-inch piping.

Joseph Townsley, yard foreman at the works, said he saw the deceased the previous day about a quarter-past six. It was his duty the first thing every morning to run tar out of the hydraulic main; and to do this, he had to set the liquor pump running. At 20 minutes past seven o'clock witness's attention was called to the deceased by Bennett. He was lying on the ground, 7 feet off the liquor pump, on his right side, inclining towards his face; the largest part of his body being behind the wall at the side of the pump. He turned him on his back, and saw that his face had changed to a darkish blue. He was not bleeding at all. He did not think he was alive. There was a piece of iron piping, 7 feet long, which he was lying on lengthways, not across. The pipe was used sometimes to turn the pump flywheel round when they could not start it by hand. It was not necessary to use it except when the mortar mill was working. After he had examined the deceased, witness looked at the flywheel, and saw that it was going very slowly. The mortar mill was not working at all that morning.

Dr. W. Mann said he was called in the previous morning about half-past seven o'clock to see the deceased at the gas-works. He was dead. He was bluish in the face, and there was a slight mark on the bridge of his nose and another over the right eye. He had since made a post-mortem examination. Externally there were no other marks of violence, and neither of these was sufficient to cause death. They were superficial. He opened the head, and found there was no fracture or injury to the skull. He removed the skull cap, and a good deal of blood and serum escaped—more than usual in quantity. The membranes were very much congested with venous blood. There were no blood clots in the brain; but the membranes were congested. The heart was empty both on the right and left side; and the right side was a little more fatty than it should have been. The heart was normal, and the valves were not diseased. The lungs were dark like a coalminer's; but there was nothing to cause death. The liver was healthy. The stomach was empty, but normal. The kidneys were both slightly congested, and the spleen also. There was no dislocation of the neck. It was impossible for witness to say whether the deceased had died from a fit or from shock through an injury; but if the latter he should have expected to find some external marks, especially if he had been struck by the piece of piping shown.

After consideration, the Jury (at the suggestion of the Coroner) returned an open verdict.

## EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Monday last week, at the London Offices, Finsbury House, Blomfield Street, E.C.

—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. W. Williams) read the notice convening the meeting, and also the following report of the Directors:—

The Directors again have the satisfaction of reporting a steady increase in the business of the Company. At Amiens, the consumption of gas was 10 per cent. more than during the previous year. At Boulogne, there has been an advance of 9½ per cent. in the gas sold, although the amount actually received for rental has been less, owing to the reduction in price, to which reference was made in the last report. At Bolbec, the consumption has been stationary; but the other works—Caen, Havre, Nantes, and Rouen—show an increase of 3 to 4½ per cent. The improvement in the sale of gas represents, in the aggregate, an increase of revenue of 3½ per cent.

The returns for coke, tar, and sulphate all show an improvement, which, together, fully covers the increased cost of coals during the year; but the Board fear that this will not be the case when the new coal contracts at further advanced rates (which, in common with other companies, the Directors have had to accept) come into force.

New purifiers have been erected at Havre; and the new gasholder at the same station was completed in December last.



Allusion was made in the previous report to a claim formulated by the French Government for a tax on the Company's shares held in France. The matter has been fully investigated; and the amount of the claim was eventually fixed, as a compromise, at £4675, which amount the Company has been obliged to pay. The proportionate amount of the tax for the past year will be deducted from the final dividend on shares held in France, in respect of which the duty has been paid, and a similar deduction will be made in future to cover this annual tax. The profits for the year under review, which without this claim would have shown a moderate increase on the previous year, have been materially affected by the above charge. Having regard, however, to the exceptional nature of the claim, the Directors propose that £4073 19s. 1d. be taken from the reserve of undivided profits, which will allow of the payment of the usual dividend and bonus.

They accordingly recommend that a dividend be paid of 20s. per share on the fully-paid shares and 15s. per share on those £7 10s. paid, less the interim dividend of 8s. and 6s. per share respectively paid on 1st of February last; also that a bonus of 1 per cent. be paid on all shares, according to the amount paid thereon—subject, however, to a deduction for French stamp and transfer duty of 1s. 1d. per fully-paid share, and 10d. per share £7 10s. paid, in respect of all shares held in France.

Notice has been given that two Directors (E. T. E. Besley, Esq., Q.C., and E. F. White, Esq.) and both Auditors (J. Reeson, Esq., and F. M. Fry, Esq.) retire from office at this meeting; but, all being eligible, they offer themselves for re-election.

The CHAIRMAN, in moving that the report of the Directors and the statement of accounts be received and adopted, said the former entered very fully into everything that had taken place during the year; and therefore he need only perhaps direct attention to the most interesting of the matters referred to in it. He thought all the shareholders present must be very satisfied with the report, which was an excellent one. He had often mentioned, and the shareholders knew well, the keen competition from electricity which the Company at all times experienced in the towns they supplied; and when they recollected this, and saw that they had had such a good year (showing an increase of 3½ per cent. in the rental), he thought they must feel it was a matter upon which they might fairly congratulate themselves. There was, of course, always some misfortune connected with these things; and the most disagreeable feature was the unfortunate claim they had had to pay to the French Government for the duty upon the shares held in France. It arose from the fact that the shares were quoted on the Nantes Bourse. This brought it to the notice of the French Government; and it was then ascertained that the duty had not been paid upon the shares held by the French shareholders. The Directors put the matter into the hands of a most able French barrister; and it appeared that the Government might, if they had so chosen, have inflicted a fine, besides the sum of money they had to pay—viz., £4675, which had been paid out of the profits of the past year. In future, the Board would obtain this duty from the French shareholders. Turning to other matters of interest, he said that the Company had now nearly 60,000 stoves out on hire, and 475 engines. Their consumers, who previously numbered 43,140, had increased to close upon 50,000. The bad debts showed a decrease of £124; and they amounted to only £547, which, on a rental of £262,992, he thought the shareholders would agree was very satisfactory indeed. The mileage of mains was now 470; and it had increased by 8 miles during the year. The profit was £78,605; and had it not been for the fiscal duty to which he had referred, they would have earned their dividend and bonus and been able to carry a small sum to the reserve of undivided profit. But inasmuch as they had to pay this duty, they had to take from their reserve of undivided profit sufficient to pay the usual dividend of 10 per cent. and 1 per cent. bonus. To this he thought the shareholders would have no objection. The Directors thought they could, under the special circumstances, take the money very justly from the undivided balance, which stood at a good sum. The investments had not changed; they were the same as last year. Regarding the concessions, they had an average length of 26 years to run. That which had probably given the Directors more concern than anything else during the year had been the coal question. Coal last year cost the Company £10,400 more than in the previous year. Of course, more coal was carbonized, and more gas sold. But they did very well out of their residuals. An extra £590 was made from tar, £2190 from sulphate of ammonia, and £9600 from coke. So that, although coal cost an additional £10,400, nearly £12,400 more was received for residuals. But he was afraid the shareholders must not look forward to such a happy state of things in the present year, because, as they were aware, the Company, with others, had been—he was going to say—very much “had” by the gentlemen in the North; and they had had to pay an increased price for coal. The Metropolitan Gas Companies had contracted at something like 16s. per ton free on board; whereas last year, the price they paid was only 8s. In their own case, they had come off pretty well. Their average, he found, was about 15s. 4½d. per ton, which was somewhat better than the London Companies. The present state of the coal market had arisen from a variety of causes—the great demand for coal on the Continent, the wonderful business done in the iron and steel trade (where a large quantity of gas coal had been turned into furnace coke), and the improvement in trade brought about by the requirements for the war had all contributed to the bringing about of this great rise in price. He was, however, afraid they could not hope to go back to 8s. per ton again; but he did hope that at this time next year, their contracts would be made on easier terms than this year. Their Company stood in a different position to the London Companies, because they were not able to raise their charges for gas. They had to make agreements for terms of years; whereas the London and other gas companies in this country could increase their prices whenever the condition of their business demanded it. But the European Company could not do so. Indeed, in one case this year (Havre), they had had to lower the price, according to their contract, for lighting the town; and it became a matter of grave consideration whether it would be wise to pay this high figure for coal, or to wait. But the Directors felt that they were under an obligation to the municipalities, and that it would be perhaps culpable on their part not to make the gas supply perfectly safe by entering into contracts sufficient to tide them over a certain time next year. The new gasholder at Havre had been finished, and it was a very great improvement and a great advantage to their principal station. He (the Chairman) had not visited the works this year; he generally went over every two years. But this year Mr. Garey and Mr. Williams had visited them, and found everything in perfect order, and everything going on in a satisfactory manner. He

might say the Directors had been making efforts to renew the treaty with Amiens. The Authorities had given up lighting the town by gas, and had taken to electricity. He could not say the Directors were particularly sorry for this; as they received little profit from the public lighting there. They wished, however, to enter into a treaty with Amiens to supply the shop people and private consumers; but they found it very difficult indeed to come to an arrangement, because the Municipality did not seem inclined to take the matter in hand. He knew the Company's price there was somewhat high; but they were quite willing to come down considerably, if their concession were extended for a certain number of years. He daresay the shareholders had noticed that their shares were not so high in the market as they were some time ago; but this was no doubt accounted for by the fear of the coal trouble, and possibly by a certain amount of unrest in France. But the position of the Company could not be better. It was perfectly sound and good; and if they could manage, as time went on, to get their coal at a little easier rate, there was no reason why they should not have years of prosperity in store.

Mr. N. E. B. GAREY seconded the motion, which was unanimously carried.

The CHAIRMAN next moved the declaration of the dividends and bonus mentioned in the report, subject to the deduction of the French stamp and transfer duty in respect of all shares held in France. He pointed out that the shareholders got a little extra pull in having their income-tax paid, now that it was rather more than before. When dividends were paid free of income-tax, shareholders were apt to overlook the fact that it really added considerably to their dividends.

The Directors retiring by rotation (Messrs. E. T. E. Besley, Q.C., and E. F. White) and the Auditors (Messrs. J. Reeson and F. M. Fry) were next re-elected.

On the motion of Mr. J. COPPEN, seconded by Mr. W. D. BEARD, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN made suitable acknowledgment; and then proposed a similar complimentary vote to the Secretary and General Manager and his staff, and to the Managers, Engineers, officials, and staff abroad. Referring to the London staff, he mentioned that two of the clerks visited the stations every month or two, and went through the books, stocks, and everything with the greatest possible care and minuteness; and therefore it was necessary for this work that they should have men of some capacity, upon whom they could rely. He also referred to the excellence of the work of the Managers abroad; one and all of whom were striving to do their best to make the Company as big a success in the future as it had been in the past.

Mr. E. F. WHITE seconded the motion, which was cordially endorsed by the shareholders.

A brief response by Mr. WILLIAMS concluded the proceedings.

## THE LIGHTING OF SYDNEY (N.S.W.).

### The Progress of the Australian Gaslight Company.

The “Town and Country Journal” of Sydney (N.S.W.) recently devoted some space to the above subjects. Two of its large pages were occupied with illustrations showing the operations carried on at the works of the Australian Gas Company in Kent Street, Sydney; and these were accompanied by a letterpress description. The centre picture was a view of the interior of one of the retort-houses at night, while the charging and drawing of the retorts were in progress; and surrounding it were views of one of the large holders, with an oxide of iron purifier in the foreground, the arrangements for discharging the coal at the wharf, filling the coke-trucks in the yard, and raising them by a hydraulic lift to the level of the street. From the description accompanying the rather striking group of illustrations, we take the following particulars.

It appears that as far back as 1826 people began to talk about the lighting of Sydney; but it was not until some ten years later, when the scheme was taken up in earnest by the Rev. Ralph Mansfield, the founder of the present Company, that matters began to make any substantial progress. The then Governor of the colony was Sir George Gipps; and he rendered every possible assistance to the Company in getting their Bill through the Legislative Council. The Charter of Incorporation was obtained on Sept. 7, 1837; and since then the progress of the Company has been a record of perseverance and enterprise, often in the face of almost insurmountable difficulties. So great were these, that nearly four years elapsed before the Company were able to supply the new light in place of the dim and smoky radiance cast by oil and tallow. The choice of a site, owing to the restrictive conditions in this respect of the Company's Act, had proved a matter of no little difficulty. Eventually, however, land was purchased for the purpose in Jenkins Street on the foreshores of Darling Harbour; and there was erected the nucleus of the great works now known as “the head station.” The first consignment of machinery arrived on May 13, 1839. The first night upon which Sydney shone with the new illuminant was that of Her Majesty's Birthday, May 24, 1841; and to show their loyalty, the Directors authorized the supply of gas for the night to be furnished free of charge. There was naturally much rejoicing at the welcome change, and the Press was particularly jubilant over it—Directors, shareholders, and the public being alike heartily congratulated. During the first year of the Company's existence, they manufactured 12 million cubic feet of gas; and their revenue from all sources amounted to £12,125. Their storage capacity was in these early times 90,000 cubic feet—the holders being described as “cut out of the solid rock.” Now the Company's largest holder—that at Mortlake—will contain 3,750,000 cubic feet.\* The number of private consumers in 1897 was 34,667; and there were nearly 10,000 public lights. The quantity of coal carbonized was 130,000 tons, and the make of gas 1,445,246,000 cubic feet, or about 11,000 cubic feet per ton. The total revenue was £330,300.

It will be interesting to trace the progress of the undertaking through the intervening years. Consequent upon an influx of population, it was found necessary in 1852 to purchase land at Woollloomooloo Bay as a

\* An illustrated description of this holder, which was erected by Messrs. C. & W. Walker, has been given in the “JOURNAL” (see Vols. LII. and LIII.)—ED. J.G.L.



site for another tank and gasholder. Two years later, ground was secured at the Haymarket for still another out-station. In 1861, more Haymarket ground was bought, and the works at the head station were also enlarged. Even then, with all these additions, the Company's mains were severely taxed to cope with the ever-increasing demand. At the end of 1865, the manufacturing power had augmented 25 per cent., and the storage capacity was 295,000 cubic feet. Towards the end of 1869, the Company, having reclaimed the water frontage of their head station at Darling Harbour, put no less a sum than £50,000 into new works and plant, comprising the new retort-house (182 feet long, 80 feet wide, and 60 feet in height), condensers, scrubbers, retorts, purifiers, &c. Balmain at this time was a rapidly-growing suburb, and, finding it impossible to spare gas for it from the head station, the Company purchased 2½ acres for an out-station on the foreshores of White Bay. Here works were in operation until 1887, when the suburb was supplied from Mortlake. Further extensions were also made to the frontage in Jenkins Street. At Five Dock, works were entered upon to supply Ashfield and Burwood, at a cost of £23,000. These, however, were subsequently dismantled when the Mortlake station was established. At this last place no less than 80 acres were secured, and 60 set apart for manufacturing purposes; the remainder being used as a water reserve and a dam for storing fresh water, holding, when full, 7 million gallons. The whole of the work cost £150,000. Finding that even the new holder, containing 2,750,000 cubic feet, erected on the first occupation of Mortlake, did not suffice, a second—that already referred to—was erected, and also a new retort-house. The holder was first used on New Year's Day, 1889; and it has been worked successfully ever since. These additions cost about £60,000. In 1890, the Company purchased the goodwill and property of the Parramatta Gas Company; and as soon as the transfer was completed, an 18-inch main was ordered from England, and connected with the Mortlake works. Then, in 1891, mains were laid to Ryde, Gladesville, and Hunter's Hill; and in 1893, gas was first supplied to the public lamps and to private consumers in these suburbs direct from Mortlake. Still, in response to the ever-increasing demand, the Company, in 1897, finding the wharfage area at the head station insufficient, purchased more land giving them an extended water frontage of 40 feet, in addition to increased storage space. The latest improvement in public lighting which the Company effected was the installation, during the same year, of the Welsbach incandescent burners in the public lamps of the city and suburbs. This conversion cost about £10,000, and was not only effected without charge to the municipal authorities, but was accompanied by a reduction in the price per lamp. This liberal and spirited undertaking fitly celebrated the Company's diamond jubilee 1837-1897. As showing what a great increase in the business has taken place during those sixty years, it may be mentioned that the Company's mains pass through 41 suburban boroughs and municipalities in addition to the city proper. The whole cover an area of nearly 100,000 acres, carrying a population of 400,000. One of the longest extensions is to Guildford—20 miles from Sydney. In all, there are nine gasholders, with a capacity of 8,635,000 cubic feet; and although it may be considered that the present storage is more than adequate for all the wants of Sydney for many years to come, experience has shown that the Company will probably have to once more falsify the often-made prediction. With regard to residuals, in 1897 there was an output of 73,756 tons of coke, 11,442,877 gallons of tar, and 1400 tons of sulphate of ammonia, for all of which a ready market was found. In order to be quite up to date, the Company have introduced the prepayment system. It was first tried in the suburb of Balmain, and was found so satisfactory that it will be adopted in course of time in most of the other suburbs, as well as in the city itself.

Coming to the financial position of the Company, the capital paid up when operations were commenced was £34,600; it now stands at £681,798, with a debenture issue in London of £300,000. These figures speak for themselves. In the Board-room of the Company hangs an interesting memento of early gas days. It is an account for a quarter's gas presented to the Treasurer of St. Philip's Church, dated Dec. 30, 1843, by the Australian Gas Company. The quantity burned was 4706 cubic feet, at 25s. per 1000; totalling £5 17s. 6d. In 1840, however, it was still dearer; the charge for a "ten-hole argand burner, from dusk till nine o'clock, six nights a week," being £1 10s.; and for ten nights, £2—early hours in those days, if measured by artificial light. A 15-hole argand burner for ten nights meant £2 10s. for the same hours. "If burned on Sunday, one-sixth was to be paid in addition to the above prices; while a modest hall jet, from dusk till eleven, seven nights a week, cost £1. The charge at per light continued for some ten years before meters came into general use. Now, through successive reductions, it has fallen from 25s. to 4s. per 1000 cubic feet; and the public lamps, which were formerly rated at £10 each per annum, are supplied at £4, the Company providing the columns. The first dividend was declared in 1841; the rate being 10 per cent. per annum. For the following eighteen months, the shareholders received no return. Since then, however, dividends have been regularly paid at rates varying from £6 18s. 11d. to 15 per cent. per annum. Once, and once only, a dividend of 20 per cent. was declared. The present rate of 15 per cent. may seem large; but the fact must be remembered that the price of £17 obtainable to-day for the £6 shares only yields the investor just over 5 per cent. Of original shareholders there is not one left.

The rest of the article deals with the manufacturing operations of the Company, and is explanatory of the illustrations. This does not call for notice. In closing the historical portion of his article, the writer acknowledges his indebtedness to the interesting volume written by the Secretary of the Company (Mr. R. J. Lukey, J.P.) to commemorate the diamond jubilee of the undertaking, a notice of which appeared in the "JOURNAL" for May 17, 1898.

"Vulcan," writing in the "Ironmonger," says: "One of the latest triumphs of chemists is the manufacture of alcohol from the smoke of blast and other coal furnaces. Coal smoke of the kind contains ethylene, from which alcohol is readily made by simple means; and it is recognized that ere long the smoke of blast furnaces, coke-ovens, and gas-works will be turned to account in this way. I see already, in my mind's eye, my Scottish readers looking wistfully at the chimney-stacks of 'St. Mungo' or 'Auld Reekie,' deploring 'the waste o' a' the gude whusky feein' up the lum.'"

## ELECTRIC LIGHTING NOTES.

At the Bradford Town Hall last Friday, Mr. G. W. Willcocks, one of the Local Government Board Inspectors, held an inquiry into the application of the Corporation to borrow £56,315 for electric lighting and power extensions. The Town Clerk (Mr. F. Stevens) appeared for the Corporation, and stated that the rateable value of the city was £1,335,515. The sum asked for, he explained, was to be expended on plant and meters, with the exception of somewhere about £15,000 which was required for mains extensions.

Colonel Coke considered an application of the Worksoop District Council for power to borrow £15,579 for purposes of electric lighting. The Council do not seem to have made a careful inquiry as to the likely support the undertaking will receive; but if the report of the proceedings which we have received is to be relied upon, there is a little peculiarity about the estimates of the advising Engineer. He calculates that the expenditure during the second year's working will be £2578 13s. 4d.; and the revenue for the same year £2578 13s. 4d.! This is, if correct, a very neat balance.

Through deficient estimates, there has been a considerable excess expenditure on the electric lighting scheme which the Monmouth Corporation are carrying out; and references to the matter were made at an inquiry held by Mr. E. A. S. Fawcett, of the Local Government Board, last Thursday. The Corporation had made application for power to borrow £28,000 as a supplementary loan for the purpose of completing the undertaking. It was explained that the original estimates were £20,000; and a loan for that amount had been obtained. The Corporation had since borrowed some £9000 in addition from a local bank, and wanted to borrow £28,000 to repay the bank and complete the work. There was no direct opposition, but a good deal of dissatisfaction was expressed. The Inspector promised to obtain from Messrs. Bramwell and Harris an explanation of the large discrepancy between their original estimate for electric lighting and the actual cost.

On Monday afternoon last week, the foundation stone of some new and extensive electricity works at Black Lake, West Bromwich, was laid by the Mayor (Alderman S. Pitt), in the presence of a large company. The works, which are situated on the main road from West Bromwich to Wednesbury, are being built on the most modern principles, at an estimated cost of £30,000, and provision is being made for future extensions. The work is in the hands of Mr. R. C. Quinn (Electrical Engineer); Mr. J. Mallin having charge of the building operations. Prior to the ceremony, the Mayor entertained the members and officials of the Corporation at lunch in the Council Chamber of the Town Hall. Mr. H. T. Jefferson proposed "Success to the Corporation Electricity Works," observing that it depended greatly upon the Committee who had charge of the works whether the undertaking was a success or a failure. As a ratepayer, he was extremely glad the Corporation had kept the supply of electricity in their own hands, for it had become as much a necessity as gas and water. He felt sure that if the Corporation would sell it at a reasonable price, manufacturers would gladly use it. The Mayor, in response, said they had not entered upon the undertaking without great thought and much anxiety. They had been compelled to do so chiefly in self-defence, several private companies having endeavoured to secure powers to supply electricity. They did not hold out any large promises to the ratepayers, and they must expect little or no profit from the undertaking for the first year or two; but he believed they would make a profit afterwards. In the negotiations between themselves and the Tramway Company they had detected a most remarkable opening for the supply of electricity. No less than 300,000 units would be annually required to drive the trams in the borough; and, on the whole, he considered they would have a most favourable commencement. They intended to do all they could, not only to encourage small consumers, but to help the industries of the town. They had also obtained power to make regulations with regard to the wiring and fitting up of houses with electricity; and they were determined to do all they could to protect the inhabitants from the serious dangers of bad workmanship.

At a recent meeting of the Portsmouth Town Council, Alderman G. Ellis submitted the report of the Superintendent of the electric light works (Mr. E. Price). It showed that the year ending the 31st of March last had not been so profitable as the previous one, owing to the increased expenditure for coal. During the twelve months, the Committee had spent £5616 for coal, and sold 1,393,091 units of electricity, as against £3798 and 1,224,949 units in the preceding period. Another cause of the falling off in the net profit was that for some reason the current sold per lamp connected had decreased. This diminution of income, added to the increase in the price of coal, accounted for more than £1900. Explaining what he considered the cause of the falling off in the quantity of current sold per lamp, Mr. Price thought it was due to consumers exercising more care in switching off lamps when they were not required. During the year they had connected 7090 lamps of 16-candle power; and although this was 192 less than the number put on in the preceding twelve months, they had connected more consumers, the figures for 1898-9 being 7282 lamps and 413 consumers, and for last year 7090 lamps and 426 consumers. This Mr. Price regarded as a good sign, as he thought it due to a greater proportion of domestic lighting having been reached—a fact which was borne out by figures. During the year the capital outlay had been increased by £20,277, which meant a further contribution of £1719 from the revenue for interest and sinking fund. In moving the adoption of the report, Alderman Ellis claimed that the electric light undertaking had been a success, and that if it was worked on the basis of a private company with a capital of £160,000 (the amount of the Committee's loans) their income would allow of a dividend of 5½ per cent. being paid to the shareholders, and of £2000 being carried to the reserve fund. Discussing the increase in the price of coal, he pointed out that this could not possibly have been foreseen by the Committee. He quoted from the reports of all the large towns in which the electric light is used to show that, even in places situated near the coal-fields, the profit was smaller, or smaller in proportion, than at Portsmouth. Dealing with the cause of the falling off in the quantity of current consumed, he said the Committee suspected that some of the meters were slow. In conclusion, he expressed the hope that the price of coal would fall, and that next year the Committee would again be able to hand over a cheque to the Finance Committee.



LEICESTER CORPORATION WATER SUPPLY.

An Appreciation of the Derwent Valley Water Board—Difficulties in the Future for Leicester.

At the invitation of Alderman Wood, Chairman of the Water Committee of the Leicester Town Council, the members of the Corporation last Tuesday made their annual inspection of the water-works. The party rode first to Swithland—the site of the newest reservoir—and then to Cropstone, where luncheon was served. The journey was subsequently continued to Thornton, where a brief inspection of the sand-working operations was made; and then the party returned to Leicester.

In the speeches at the luncheon, some points of interest came out. Sir Thomas Wright, in proposing "The Derwent Valley Water Board," dwelt upon the importance of the principle which was represented by that body—namely, combination in matters of municipal enterprise. The Derwent Board was, he said, one of the latest instances of combined municipal work they had been privileged to take part in. Municipal life, while very excellent in itself, was rather apt to be narrow and selfish; and one of the great things to be done in the present day was to break down that vestry-like wall of exclusiveness which corporations had, unfortunately, from time to time set up around themselves, and to show that municipal interests might best be served by the association of communities in the carrying out of great works of a quasi national character. Describing tersely the extent of the work which the Board had taken in hand, Sir Thomas pointed out that they were dealing with a gathering ground of some 30,000 acres, which had a rainfall equal to 53 million gallons per day. The competitors for this water were at an early stage each desirous of securing a monopoly; but Parliament came to the rescue, and wisely apportioned the share which should go to each community. The total cost of the scheme was estimated at £6,000,000 or £7,000,000; and all he hoped was that it would not cost more. The Board were happily falsifying the expectations of those pessimists who predicted that an amalgamation of this kind would not work. It was working most harmoniously, and there was every reasonable expectation that it would continue to do so. Alderman Gainsford (of Sheffield) whose name was associated with the toast, said he felt that the Water Board was the precursor and pioneer of many amalgamated Boards of a similar character in the future. He believed the system of municipal federation, which was exemplified in that Board, had a great future before it. The difficulties which faced them at the outset of the great fight for the Derwent watershed were only overcome by accepting the common-sense principles of combination and compromise. Alderman Wood, who also replied to the toast as Vice-Chairman of the Board, expressed most emphatically the obligation he was under to Alderman Gainsford and the Corporation of Sheffield for the fairness and straightforwardness exhibited by them throughout the whole of the negotiations and controversy leading up to its formation. So far as Leicester and Sheffield were concerned, an agreement might have been arrived at at a very early stage; and if it had been left to them, some £70,000 or £80,000 might have been saved. They had, it was true, got

hold of a very good thing now, and they had had to pay a very high price for it; but having got it, he believed the advantage to the various municipalities would be very great indeed. To Leicester the importance of the advantage could hardly be over-estimated. To prove this, he had only to tell them that while in a dry season the yield of their present watershed was but 4,700,000 gallons of water per day, they were now consuming something like 5,300,000 gallons.

At a subsequent stage of the proceedings, in response to the toast of "The Leicester Water Committee," Alderman Wood said the Committee were fully conscious of the responsibility which rested upon them. He warned his hearers that he had a statement of a somewhat unwelcome character to make. It would be nine years before they could get their new water supply from the Derwent Valley, and he was sorry to say that the growth of Leicester was so great that they would be compelled within another year, or perhaps earlier, to look out for a temporary source of water. He knew this would come to many as "a bolt from the blue;" but the facts could not be got over. The population of Leicester last year increased to the extent of 10,000 persons, following upon an increase of 10,000 in the previous year; and it was patent that the present water supply would not be equal to the demands of the borough until the year 1909. However disagreeable the information might be, he was bound to tell them that they could not hold out until the year 1909 if the town grew beyond its present limits; so that if they heard in the course of another year, or less, of new proposals by the Water Committee for acquiring a temporary source of supply, they must not be surprised. They must not blame the Water Committee, but the increase of population. The Committee were only trying to keep pace with the enormous growth of the town. When they did get the new source of supply from the Derwent Valley, it would serve all their wants for fifty years to come; but, as was foreshadowed at the outset, they would not be able to draw upon that supply for another nine years. Parliament, in apportioning Leicester's share of the Derwent water, made an allowance for an increase of population at the rate of 2·47 per cent.; but, as a matter of fact, the increase of the water population of Leicester—which was what they had to deal with—had been at the rate of 4·85 per cent., and when he told them this, they would appreciate the difficulties of the Water Committee.

HALIFAX CORPORATION WATER SUPPLY.

The Walshaw Dean Reservoirs.

In the "JOURNAL" for the 3rd inst., we announced that the Halifax Corporation had accepted a tender for the construction of three reservoirs at Walshaw Dean for £170,766; this being the lowest of five offers submitted. They will have a capacity of 650 million gallons; and will complete the Walshaw Dean and Widdop scheme, which was initiated in 1868. The gathering-ground is all moorland, and is said to be the purest in Yorkshire. There are no farms near, and consequently no sources of pollution; and no land will have to be purchased for the protection of streams. It is expected that the first turf will be cut in

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 209.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18-19	+½	5 10 6	60,000	6	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	13-14	+½	5 7 2	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2
800,000	100	July 2	5	Australasian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	10-10½	..	6 13 4
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100-102	..	3 18 5
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	10	Apl. 11	8	San Paulo, Ltd.	11½-12½	..	6 8 0
880,000	Stk.	Feb. 23	13	Brentford Consolidated	250-260	..	4 12 4	209,058	"	"	10	Sheffield A.	245-247	..	4 1 0
270,000	"	"	9	Do. New	182-187	..	4 16 3	447,427	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	"	6	Do. 5 p.c. Pref.	140-145	..	3 9 0	5,600,000	Stk.	Feb. 23	5½	South Metrop. 4 p.c. Ord.	126-129	-1	4 2 7
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	1,520,000	"	July 12	3	Do. 3 p.c. Deb.	95-98*	..	3 1 3
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	225-235	..	4 17 10	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
226,320	"	"	8½	Do. A. Ord. Stk.	165-170	..	5 0 0	70,825	"	July 12	4	Do. 4 p.c. Deb.	117-122	..	3 5 7
999,500	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	120,000	Stk.	Mar. 14	6	Tottenham A. 5 p.c.	103-108	-17	5 11 1
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	250,520	"	"	4½	and B. 3½ p.c.	85-90	-8	5 0 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	55,100	"	June 14	5	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	83-91	-½	6 9 9	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	99-101	..	3 19 3								
150,000	20	July 12	8½	Cagliari, Ltd.	23-25*	..	6 12 0								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13½-14½	..	5 10 4								
60,000	60	May 2	6	Do. 6 p.c. 1st Mort.	55-57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock	275-285	..	4 14 9								
236,425	"	"	10½	Do. New do.	265-215	..	4 17 8								
288,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	155-160	..	5 12 6								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0								
51,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	780,404	Stk.	June 28	11	Chelsea, Ord.	293-303	..	3 12 7
173,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 5	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p.c.	113-118	..	4 9 0	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
60,000	"	"	5	Do. 5 p.c. Pref.	130-135	..	3 14 1	175,785	"	Mar. 29	4½	Do. 4½ p.c. Deb.	145-150	..	3 0 0
486,090	10	Jan. 26	11	European, Ltd.	19½-20½	..	5 7 4	1,720,560	Stk.	Apl. 11	7	East London, Ord.	187-192	..	3 12 11
854,060	10	"	11	Do. £7 10s. paid.	14½-15½	..	5 6 5	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	142-147	..	3 1 3
14,993,075	Stk.	Feb. 9	4½	Gas- 4 p.c. Ord.	97-99	-1	4 8 10	890,000	"	"	3	Do. 3 p.c. Deb.	96-98	..	3 1 3
2,600,000	"	"	3½	light 3½ p.c. max.	95-97	..	3 12 2	700,000	50	June 14	7½	Grand 10 p.c. max.	104-107	..	3 10 1
8,799,735	"	"	4	and 4 p.c. Con. Pref.	117-119	..	3 7 3	810,000	Stk.	Mar. 29	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	95-98	..	3 1 8	708,000	Stk.	Feb. 23	14	Kent	307-312	..	1 9 9
70,000	10	May 31	8	Hongkong & China, Ltd.	134-14½	..	5 10 4	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	..	3 6 8
8,800,000	Stk.	May 16	10	Imperial Continental	197-202	-1	4 19 0	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	283-290	..	3 12 5
478,600	Stk.	Feb. 9	10	Do. 3½ p.c. Deb. Red.	100-103	..	3 8 0	406,200	100	"	8	Do. 7½ p.c. max.	203-208	..	3 16 11
75,000	5	June 14	6	Malta & Medn., Ltd.	44-5	..	6 0 0	850,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	130-133	..	3 0 2
560,000	100	Apl. 2	5	Met. Jf ½ p.c. Deb.	107-110	..	4 10 11	500,000	Stk.	Feb. 23	13½	New River, New Shares	420-425	-2	3 3 6
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	106-108	..	4 3 4	1,000,000	Stk.	Jan. 26	4	Do. 4 p.c. Deb.	130-135	..	2 19 3
541,920	20	May 31	3½	Monte Video, Ltd.	10½-11½	..	6 1 8	922,300	Stk.	June 14	7½	South Ord.	193-200	..	3 15 0
667,946	Stk.	Feb. 23	9½	Newcastle & Gateshead Con.	215-220	..	4 4 1	125,500	100	"	7½	wark 7½ p.c. max.	182-187	..	4 0 3
299,855	Stk.	June 28	8½	Do. 8½ p.c. Deb.	104-107	..	3 5 5	489,200	Stk.	"	5	and 5 p.c. Pref.	155-160	..	3 2 6
150,000	5	May 16	8	Oriental, Ltd.	7½-7½	..	6 8 3	1,019,585	"	Apl. 11	4	Vauxhall 4 p.c. A Deb.	129-134	..	2 19 9
135,000	5	"	8	Do. New, £4 10s. pd.	6½-6½	..	5 6 8	1,155,066	Stk.	June 14	10	West Middlesex	270-275	..	3 12 9
15,000	5	"	8	Do. do. 1879, £1 pd.	14-14½	..	4 11 5	300,000	"	"	4½	Do. 4½ p.c. Deb.	145-150	..	3 0 0
								300,000	"	Mar. 14	8	Do. 5 p.c. Deb.	99-101	..	2 19 5

\* Next dividend will be at this rate.



September, and that the reservoirs will take four years to complete. The following are the constructional details respecting them: Top reservoir—Area, 21 acres; capacity, 146 million gallons; length of embankment, 230 yards; height of embankment, 76 feet; greatest depth of water, 70 feet; quantity of material to be used in the construction of the embankment, 121,000 cubic yards. Middle reservoir—Area, 46 acres; capacity, 340 million gallons; length of embankment, 320 yards; height of embankment, 74 feet; greatest depth of water, 68 feet; material to be used, 182,000 cubic yards. Third reservoir—Area, 27 acres; capacity, 164 million gallons; length of embankment, 230 yards; height of embankment, 72 feet; greatest depth of water, 66 feet; material to be used, 200,000 cubic yards. The total length of the reservoirs will be about 1½ miles, while they will be situated about 1000 feet above the sea. It is interesting to compare the capacity of the proposed reservoirs with those which the Corporation already possess. Walsbaw Dean, 650 million gallons; Widdop, 640,511,000 gallons; Ogden, 221,806,000 gallons; Ely, 193,251,000 gallons; and Upper and Lower Deanhead, 122,155,000 gallons. The Walsbaw Dean reservoirs will have a total drainage area of 2325 acres, and will provide an available water supply of 2½ million gallons per day, in addition to about 1½ million gallons per day as compensation water. The conduits from these reservoirs will join the Widdop system, and the water will be conveyed thereby to Halifax.

#### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

That grand old man of the community of gas managers in Scotland—Mr. Jesse Hall, of St. Andrews—was yesterday the recipient of valuable tokens of respect and esteem from former assistants and other friends. The ceremony is referred to in another column. To be able to create and to retain the affection of colleagues and subordinates, is a power which is only possessed by those who live a useful and an unselfish life. That Mr. Hall has done so, is evidenced by yesterday's proceedings. There are few gas managers—I question if there are any—who will not unite in congratulation to Mr. Hall upon completing the long and honourable connection of half-a-century with the St. Andrews Gas Company.

At a meeting of Greenock Police Board, on Tuesday, Mr. Mitchell proposed that Mr. A. M'Kenzie, first clerk in the gas office, be appointed Clerk and Collector at a salary of £150 a year, in opposition to a recommendation of the Gas Committee that Mr. M'Kenzie be appointed Collector and Mr. M'Culloch Clerk. Mr. Mitchell held that he was merely asking the Board to continue an arrangement that had been found to work well for over sixty years. Mr. M'Culloch (Town Clerk), in reply to statements made by Mr. Mitchell, said the late Mr. Chalmers was appointed Secretary to the Gas Trust; he being Clerk only under control of the Clerk of the Police Board. The whole thing raised by Mr. Mitchell rested on a fallacy; and he asked whether there were not certain family reasons why the matter was being pushed on. Provost Black characterized the bringing forward of Mr. M'Kenzie as Clerk as an

attempt to snuff out Mr. M'Culloch, and moved that, as Mr. M'Culloch was Clerk to the Board, there was no necessity to appoint Mr. M'Kenzie Clerk to the Gas Trust. Bailie Campbell seconded; and the Provost's proposition was carried by 15 votes to 2. The Board afterwards confirmed the appointment of Mr. M'Kenzie as Collector, and agreed that Mr. James Campbell should take the position at present held by Mr. M'Kenzie, at £110 a year, and that Mr. Robert Smith should be appointed, at £100 a year, to fill the position held by Mr. Campbell.

The accounts of the Paisley Gas Trust for the year ending May 28 were before the Gas Commissioners on Thursday. The gross revenue amounted to £49,943, and the gross expenditure to £45,633; leaving a balance of profit and loss of £4310. From the profit and loss account, £2358 was absorbed by interest on mortgages, &c., £1079 was carried to sinking fund, and £1888 was transferred to the electric lighting authority to meet the deficiency for the year on that account. These various sums amounted to £5326, which exceeded the balance of profit and loss for the past year by £1016. This sum was regarded as the deficiency for the year against the Gas Trust. A year ago, there was a credit balance of £6916, from which there has been voted to public parks £1000, and the deficiency referred to (£1016) deducted; leaving at credit of profit and loss account the sum of £4900. It was reported by the Finance Committee that, after considering the balance-sheet, it was agreed to recommend that the sum of £1888, shown in the profit and loss account as paid on account of the deficiency on the electric light account, be placed to a suspense account, and that one-fourth thereof only be charged coal and the probable requirements of the electric lighting department, the against last year's profits. Also, that in view of the increased cost, the price to be charged for gas supplied during the current year by ordinary meters be increased 2d., and that the price for public lamps be increased 2d. per 1000 cubic feet. This recommendation was agreed to, excepting as regards the price of gas for public lamps, which was, on the motion of Bailie Eadie, fixed at 3d., instead of 2d. as recommended. The cost of gas to consumers is now 2s. 9d. per 1000 cubic feet. Last year the price was 2s. 6d.

There comes out, in the newspapers, a letter by the relentless critic of the Corporation gas undertaking—a Mr. John M'Andrew—which contains some figures not given otherwise, but the argument running through which I do not profess to understand. I therefore give the communication in full: "Turning to our Town Chamberlain's record, I venture to say it is strictly correct, and may be thus given: Total income from all sources amounting to £138,389; the total expenditure to £138,071. This, of course, includes extension of works, £11,887; and oil plant that is practically useless and of no value as stock plant, £1800. The income taken, as shown, £138,389, and expenditure, £138,071—gives a balance at credit of £218. The official statement shows a balance at credit of £399 17s. 2d., against which there is a debit charge of £472—being one-fourth of loss by the electric branch; and leaves a balance at the debit of the gas-works of £72, pence and shillings omitted. Adopting the figures found from the Gas Manager's record, as given monthly, they stand thus: Gas made in 1899, 396,443,000 cubic feet; less for loss by leakage and condensation (40,443,000) gives 356,000,000 at 2s. 6d.

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per 1000 cubic feet, amount, £41,500; rents received, including arrears, £43,137; then excess of gas made over 1898-99, 55,000,000; loss by leakage, &c., 5,000,000, leaves 50,000,000 at 2s. 6d. per 1000 cubic feet, gives £6250, to realize which cost for coal, oil, and wages, £6675—thus showing a loss by the extension of the works of £425. Then add for interest at 3½ per cent. on £11,887, less cost of extension—amount £402—and which falls to be added for oil plant that is useless £448—making together an amount that is lost sight of as £2627. I now take the coals carbonized for 1899, 42,853 tons. Average cost 12s. 6d. per ton, £25,140; wages and salaries, £15,865—making, together, £41,005; and the contract for coal for the current year is (say) 40,000 tons, at an average of 17s. 6d. per ton, gives an amount of £31,250—a difference in excess of the previous year of £6110. This somewhat darkens the picture for any surplus for even the current year. There is another point that I take leave to refer to. I find the Convener of the Gas Committee reports gas made and accounted for 333,644,000 cubic feet, which includes 5,120,921 cubic feet for works and workshops; while leakage and condensation unaccounted for amounts to 11.75 per cent. This is clearly an error, and not in harmony with the Gas Manager's returns—showing a difference of 22,356,000 cubic feet unaccounted for; and in money value is equal to £2794 lost, and doubtless through a still defective holder." The closing sentence refers to a gasholder which was found to be leaking.

The annual meeting of the Montrose Gas Company was held on Wednesday. The report of the Manager (Mr. T. D. Hall) stated that there had been an increase of consumers during the year, to the number of thirty. There were 2950 tons of coal carbonized, being an increase of 105 tons; and the gas manufactured amounted to 31,618,000 cubic feet, an increase of 720,000 cubic feet. The average illuminating power was 24.94 candles. The report and the balance-sheet of the Treasurer were adopted, and a dividend at the rate of 50s. per share was declared.

At the recent annual meeting of the Renton Gas Company, the report and accounts for the past financial year were submitted and approved. The gas manufactured amounted to 12,647,400 cubic feet—an increase of 20 per cent. over that of last year. A dividend of 5 per cent. was declared, and a balance of £230 carried forward. The extensions undertaken during the year have been completed at a cost of £4800. The Manager (Mr. W. Whyte) was highly complimented by the Directors on the successful completion of the work, and an *honorarium* of £25 and an increase of £20 in his salary were unanimously voted him.

The following statement appears in the "Falkirk Herald" of to-day: "On Saturday last the Davis Gas-Stove Company, Limited, the address of whose registered office is 200, Camberwell Road, London, S.E., came into possession of Springfield Foundry, which they purchased some time ago from M. Cockburn and Co. The new firm had their first cast on Monday. The name of the works has been changed to that of the Diamond Foundry; the name taking its origin from the 'Diamond' gas-stove, which the firm have for a number of years produced. Mr. Harold Davis, one of the partners, a gentleman who was formerly connected with the town, and who is known to a large number of friends here, will be the General Manager; and Mr. John Prentice, formerly Works Manager at the Springfield Foundry, will continue in that capacity

at the Diamond Foundry. Messrs. Davis are large and well-known makers of gas-stoves, having works at Luton, England, besides obtaining large supplies of gas-stove metal from firms in Scotland. A great deal of their work has hitherto been done at Springfield; and the intention is to devote the Diamond Foundry entirely to the making of gas-stoves, and to do in it the work hitherto done for the firm in Falkirk and other parts of Scotland, while, of course, the works at Luton will also be continued. The probability is that Messrs. Davis will soon find that the Falkirk works are small enough for their trade; and that the ground available for extension purposes will be built upon, and a largely increased number of hands will have to be employed."

At a meeting of the Glasgow Town Council on Thursday, Treasurer Murray called attention to the circumstance that the Gas Committee have already spent £670,000 of the £1,000,000 for which they hold borrowing powers; and he asked where they were to obtain all the money which would be required for the new electricity works and the new gas-works at Provan. What were they to do when the remaining £300,000 had been spent? There was no reply on behalf of the Gas Committee; but Bailie Maclay, who is Convener of the Electricity Committee, said they had always obtained the money they wanted from the Gas Committee, and he had no doubt the Committee would provide any further money that might be required.

At the last meeting of the Dumfries Gas Commissioners, Bailie Currie, the Convener of the Works Committee, moved the adoption of the accounts for the past year. He said it was thought at one time that they would require to raise the price of gas by 6d. per 1000 cubic feet; but they were in the happy position now of only requiring to make an increase of 2d., which was one of the smallest increases in Scotland. They began the year with a credit balance of £895, which came in very handy now. If they did not increase the price, the revenue from gas would be £12,331. They expected to realize £2462 from coke and £231 as the rents of cookers. This would make a revenue of £15,919. The Manager's estimate of expenditure was £13,879, to which there fell to be added £945 for interest, £1092 as the contribution to the sinking fund for the redemption of annuities, and £250 which they proposed to place to reserve fund. This made a total expenditure of £16,165, and brought out a deficiency of £246. But by raising the price of gas 2d. per 1000 cubic feet, they would increase the revenue by £584; and they would thus have a surplus of £338. The accounts were adopted; and the price of gas was raised from 3s. 4d. to 3s. 6d. per 1000 cubic feet.

In the Glasgow Town Council last Thursday, Mr. McCutcheon, in moving the adoption of the accounts of the Water Department, said the outstanding feature of the accounts was the elasticity of the revenue. Owing to the reduction of rates, amounting to about £17,000 per annum, the revenue, exclusive of the hydraulic power supply and river supply, showed a decrease of £5741. The hydraulic power revenue showed an increase of £1706, and the river supply an increase of £24, which reduced the decrease in the total revenue to £4010; so that, but for the reduction in rates last year, the increase in the revenue account would have been upwards of £12,000. The expenditure during the past year had been particularly heavy. The increase in interest, consequent on the South

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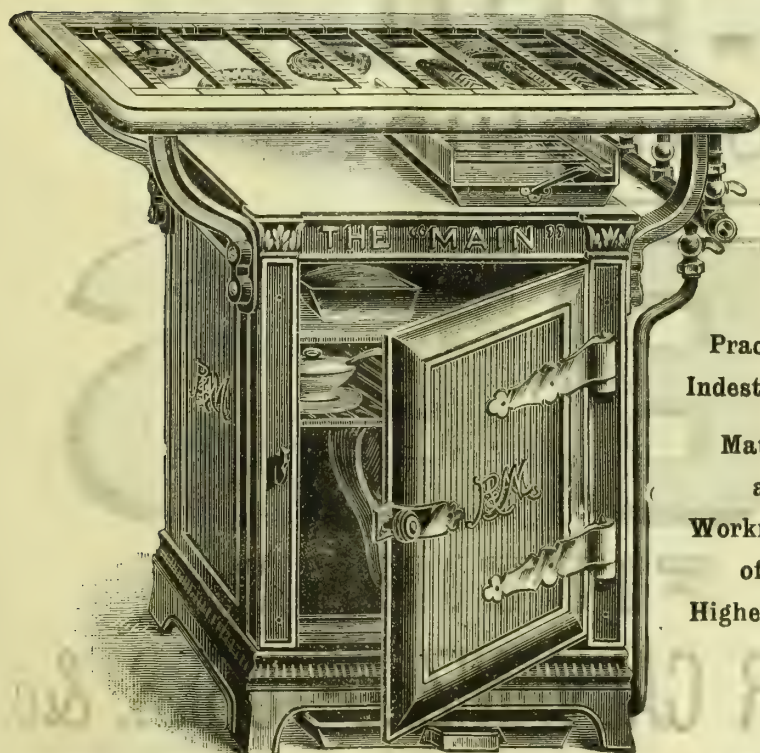
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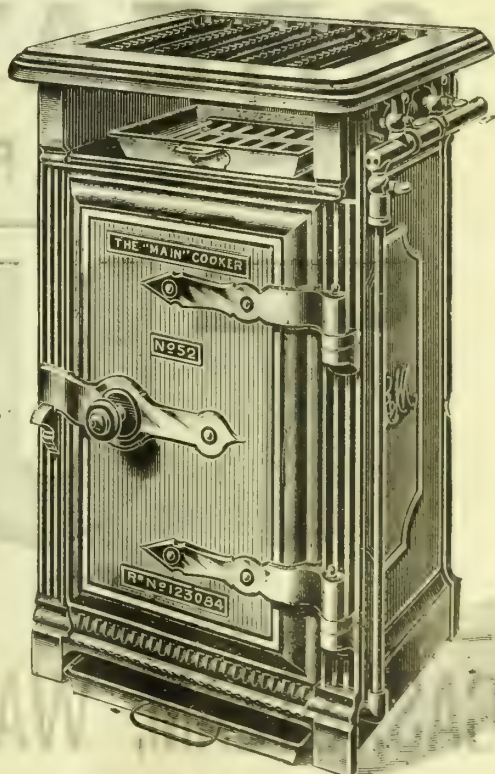
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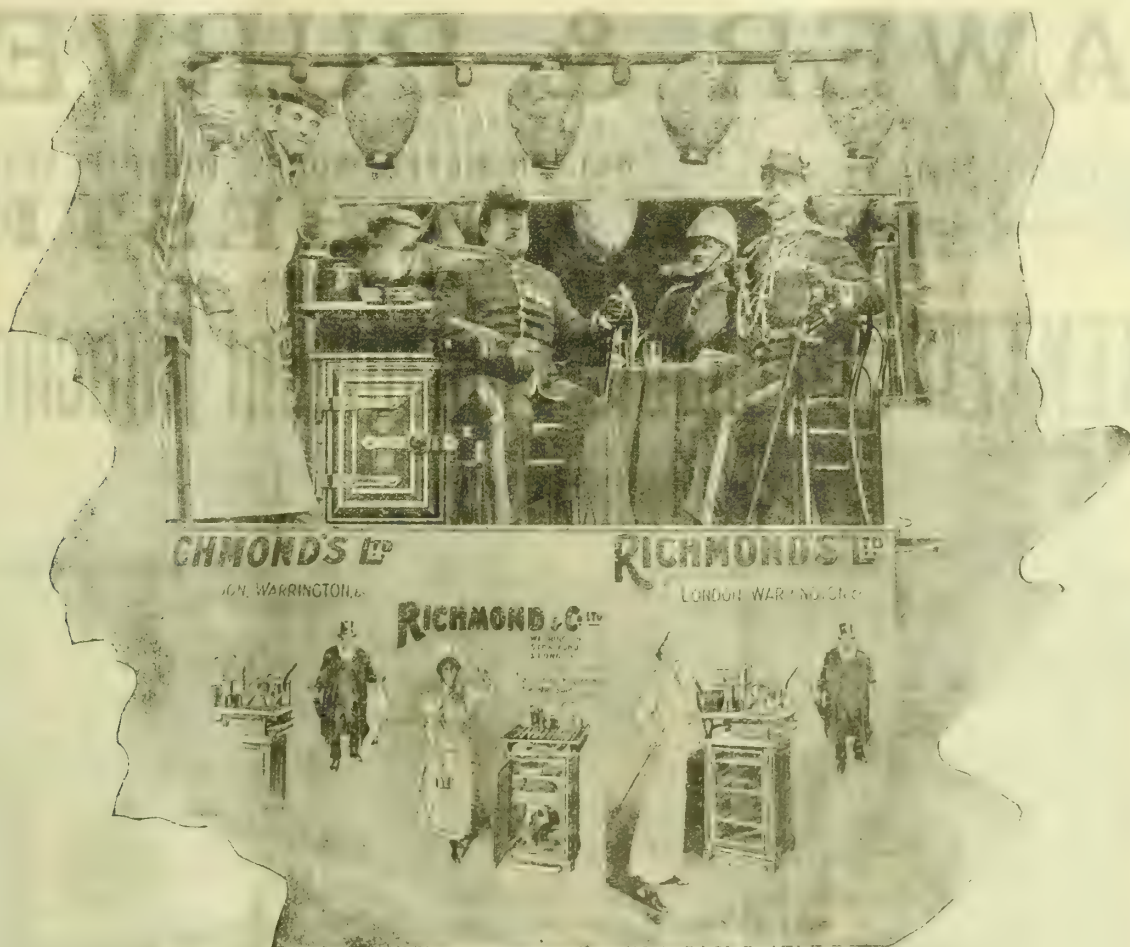
and forge qualities of fuel, which just now are being sold for immediate delivery at 6d. to 1s. below the full prices that have been obtained on contracts with the railway companies, and to a corresponding extent on the contracts for gas coals. But it is not at all likely that any further advance will be made upon the maximum rates for steam and forge and gas-making coals. Engine classes of fuel are not in the same strong position as round coals, but, notwithstanding a very keen competition by outside districts from which considerable surplus supplies have been sent in to Lancashire at 1s. below local quotations, the Lancashire collieries do not as yet consider themselves as under the necessity of reducing the relatively high price of slack. For the present, the position remains that house-fire coals are in active request; and with the certainty of a further advance in prices before the winter, no doubt the pressure from house-coal consumers will increase. For steam and forge coals, there is also a good inquiry. Engine fuel is in fair demand; and generally Lancashire collieries are moving away most of their output, though considerable business is being diverted to outside markets by the lower priced supplies from other districts. Current prices remain at 15s. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s. 6d. to 14s. 6d. for Pemberton four-feet and seconds Arley, 13s. for common house coal, 12s. 3d. to 12s. 6d. for steam and forge coal, and from 10s. 6d. for common to 11s. and 11s. 6d. for best slack. The shipping trade is generally brisk, with 15s. 3d. per ton as the minimum for screened steam coal, and 15s. 6d. to 15s. 9d. obtained in many cases for good qualities delivered at the Mersey ports. Coke is in active request at the full rates of 24s. and 24s. 6d. per ton for furnace, to 31s. and 32s. for good foundry sorts at the ovens.

**Northern Coal Trade.**—The course of the coal trade of this district has been influenced by a serious strike at Rotterdam, which is a large customer for gas, bunker, and steam coals; and the stoppage of the sending of cargoes to that part has influenced the trade here and reduced the prices temporarily for some classes of coal. Best Northumbrian steam coals are quoted at 18s. per ton f.o.b.; and the collieries are fully at work. As to gas coals, the quietness is marked; for a fair amount of gas coal is usually sent at this season to Rotterdam, and for such quantities fresh markets have had to be temporarily found. For occasional amounts of gas coals, the price may be put at from 16s. to 16s. 6d. per ton f.o.b.; but it is quite possible that, when trade is fully resumed with Holland, there may be a return to slightly higher prices. Stockton is now in the market for its supply of gas coals. In the coke market, the demand is very full; and prices are firm all round. Best Durham coke for export is quoted at 35s. per ton f.o.b.; and locally the quotation is 29s. per ton free on Teesside. For gas coke, the demand is steady, and there is only a very limited supply at present; so that the prices are high, but very irregular.

**Scotch Coal Trade.**—Last week was the holiday one in Glasgow, in consequence of which there was an extensive suspension of business. For the same reason prices cannot be quoted. The shipments for the week were 197,582 tons—a decrease of 35,749 tons upon the preceding week, but an increase of 3861 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,690,123 tons—an increase of 1,114,281 tons upon the corresponding period of last year.

**The Exmouth Water Company and the District Council.**—The dispute between the Exmouth Water Company and the District Council has resulted in the Company serving a second writ upon that body. It is in respect of the Company's claim for the half year ended June; and the question in dispute is practically whether the Company have a right to demand the sum of £10 which they claim for water supplied in addition to the quantity provided for in their agreement with the Council. In a letter which was read at the last meeting of the Council, the Secretary to the Company said: "As to the charges being excessive, the Council and the Surveyor must be perfectly aware that the sum charged by the Company was far below the value of the water supplied; but the Company quite appreciate that the objection to pay was raised not for *bonâ fide* reasons, but only with the desire of prejudicing the interest of the Company when the time comes for fixing the sale price of the Company's undertaking." The writer went on to point out that the Council need not take the Company's water except for statutory purposes. If they did, the Company, as sellers, named the price, and the Council must pay. The reply of the Council is in the form of a renewal of their offer to have the question of the amount determined by two Justices, as provided by the Act of Parliament.

**The "Lancet" on the Control of the Metropolitan Water Supply.**—The current issue of the "Lancet" contains the report of the Special Commission appointed by the conductors of that paper to inquire into the subject of the control of the Metropolitan Water Supply. It states that control, as applied to the Metropolitan Water Companies, means that some superior authority should have statutory powers to enforce obligations which have been imposed by law on the Water Companies. Additional powers of control have been recommended by the last two Commissions; but up to the present the Government have made no attempt to translate these recommendations into statutory life. Our contemporary thinks the matters of greatest urgency in respect to the control of the London Water Companies are these: The Auditor appointed by the Local Government Board should be in all respects an officer of that Board, and his salary should be paid from public sources. He should, when he wishes it, in the case of any difference with the Companies have the advice and help of the Law Officers of the Crown. The Water Examiner appointed by the Local Government Board should have access to all parts of the Companies' undertakings; and he should be entirely responsible for the report he issues monthly. The Companies should be obliged to place at his disposal every facility for making the several investigations he wishes. Every investigation that the Examiner makes should be done either by himself or by officers appointed by him. Any analyst he may employ should be nominated by himself, and all the expenses entailed in carrying out the work necessary for him to give full and accurate information should be paid by the Government Department. The Special Commissioners think that the Government, having appointed and received the reports of two Royal Commissions, have no legitimate reason for delay in passing a simple measure which will carry out the distinct recommendation of these Commissions that the power of the Water Examiner should be increased in the direction indicated.



**RICHMOND'S TRIUMPHAL CAR IN STRATFORD WAR CARNIVAL.**

**MEMBERS OF THE STAFF REPRESENTING,**

1. MR. CHAMBERLAIN.
2. SIR REDVERS BULLER.
3. SIR GEORGE WHITE.
4. LORD ROBERTS.



**Heckmondwike and Liversedge District Councils and the Gas Supply.**—A special meeting of the above-named bodies is to be held this week, to discuss the advisability of jointly acquiring the Heckmondwike Gas-Works, the capital value of which, according to the last balance-sheet, is nearly £58,000. The Heckmondwike authority have also in hand an electric light scheme, which is estimated to cost £15,000.

**Recent New Issues of Capital.**—According to the list of new capital issues in the first half of the current year recently published in "The Times," the total amounted to £74,156,075, of which £15,000 was for the Cobham Gas Company, £6000 for the Cranbrook District Water Company, and £198,788 for the East London Water Company. The principal issues offered by tender reached the nominal amount of £7,490,875, of which £75,000 was for the Lambeth Water Company, £300,000 for the Staines Reservoirs Joint Committee, and £100,000 for the West Middlesex Water Company.

**Gas and Water Main Extensions at Llandudno.**—The Water and Gas Committee of the Llandudno District Council have exceeded the sum borrowed in 1895 for new water and gas mains by £1141; and the Engineer has presented a plan showing further new mains which will be probably required within the next five years, at an estimated cost of £8142. At the meeting of the Council on Tuesday, the Committee reported that they approved of the plan, and recommended that an application be made to the Local Government Board for power to borrow £9283 for extensions of gas and water mains. They further recommended that sanction be asked to borrow £13,500 for completing the second section of the scheme for the extension of the 15-inch water-main. After a prolonged discussion the report was passed.

**Gas Affairs at Mansfield.**—Application having been made to the Local Government Board by the Mansfield Corporation for sanction to borrow £6600 for the provision of mains and other gas-works apparatus, and £2600 for the purchase of the gas undertaking of the Mansfield Woodhouse Gas Company, Colonel Coke, M.Inst.C.E., attended at the Town Hall on Wednesday, and held a public inquiry. Mr. J. H. White (Deputy Town Clerk) was present on behalf of the Corporation; and Mr. W. F. Warner on behalf of the Mansfield Woodhouse Gas Company. Mr. White explained that the apportionment of the £6600 was as follows: £2000 as part cost of the new purifying-house, new gas-mains £3600, and new meters £1000. The purifying-house, as a matter of fact, was completed; this being rendered necessary on account of the great inadequacy of the old plant. The balance of the cost of the purifying-house would be paid out of the revenue; the actual cost being £4500. There was a debt on the old house; but this was included in the original purchase. The building was still intact, but was being used for other purposes, and the old purifiers were disposed of for £200. Coming to the application for the purchase of the Mansfield Woodhouse undertaking, Mr. White stated that the sum of £2500 was agreed upon between the Corporation and the Company; the extra £100 being for legal expenses and stamp duties. Confirmatory evidence was given. The previous afternoon, the new purifying-house, to which reference is made above, was formally inaugurated. The Contractors were Messrs. C. & W. Walker, Limited.

**Suffocation by Gas.**—An old lady, named Isabella Cole, 76 years of age, was found dead in bed on the morning of the 10th inst., at a house in Norwich, under circumstances which left little doubt that she had been suffocated. Her habit was to keep a small jet of gas alight till day-break, and then put it out. When the body was found, the tap was full on, but there was no light; and the assumption was that deceased had turned the tap two ways by mistake, and had been overpowered by the escaping gas. The medical evidence was to the effect that death was due to an escape of gas; and a verdict in accordance therewith was returned.

**Divination for Water.**—The Wallingford Board of Guardians, having for some little time been put to considerable inconvenience and expense by the flooding of a boiler-house at the Workhouse, have had under consideration the plan of sinking a deep well, with the view of supplying the building with the water now wanted. The services of a water finder were called into requisition, and, in the presence of the Chairman and members of the Board of Guardians and others, he soon, by the aid of his forked hazel twig, came upon three springs, and the best site for a well was marked out. He estimated that water would be found at a depth of 30 to 35 feet, and that the yield would be 4000 gallons an hour.

**A Water Scheme in Weardale.**—According to information received by the "Newcastle Chronicle," the immense quantity of excellent water suitable for domestic purposes which has been so long wasted on the moorlands in Upper Weardale, is likely to be conserved, and practically utilized in the near future. The representatives of a local Water Company have been investigating the higher regions of the dale; and from the various sources of mountain streamlets inspected, the general opinion points to Burnhope Seat as the probable base of operations. Here, in addition to a series of fine springs, three riverlets rise beyond a plateau; and it only needs a breast wall of about 20 feet to obtain an admirable site for a reservoir which will be fed naturally.

**Hoylake and West Kirby Gas and Water Company.**—At the 23rd annual general meeting of this Company, to be held on the 1st prox., the Directors will report a balance of £414 at the credit of the profit and loss account, after payment of the dividends in respect of the year ending June 30, 1899. Adding the net revenues for the period ending at the corresponding date this year—£2232 for gas and £2689 for water—there is a total of £5335; but as £1805 was paid by way of interim dividend in January last, there is left a sum of £3530 available for distribution. The Directors will recommend a dividend of 9 per cent. on the original, and 4·2 per cent. on the additional gas capital, and 6 and 4·2 per cent. respectively upon the water capital. The payment of these dividends will absorb £3348, and leave £182 to be carried forward. The dividend on the "A" gas and water capital will be 13 and 10 per cent. (equivalent to 11·2 per cent. on the original shares), on the additional and new gas capital 10 per cent., and on the additional and new water capital 7 per cent. Owing to the increased cost of coal and cannel, the Directors have deemed it expedient to advance the price of gas to ordinary consumers to 3s. 9d. per 1000 cubic feet, which does not compensate for quite one-half of the additional cost of manufacture.

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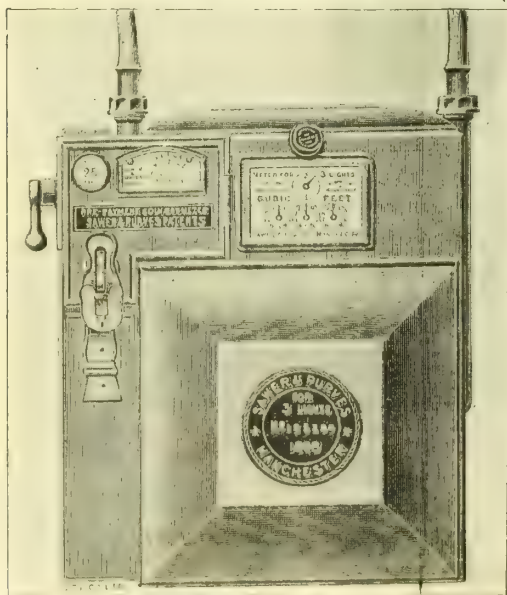
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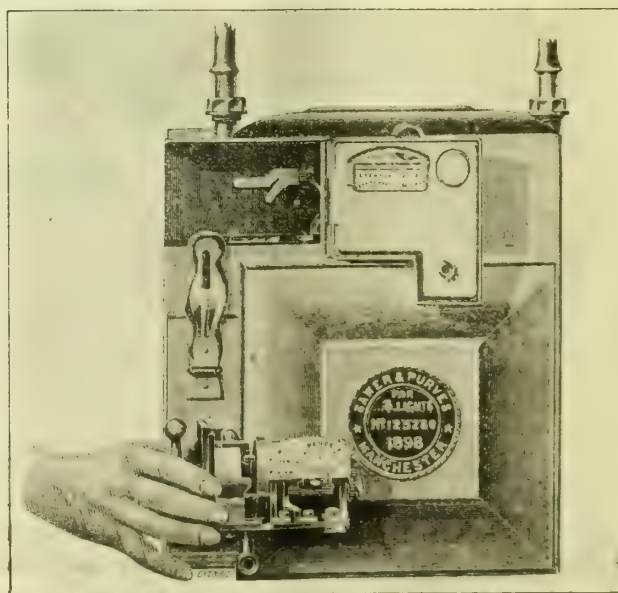
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**Gas-Motors Wanted in Greece.**—The "Ironmonger" says that at present Greece offers a very good market for gas-motors of all kinds. They may be imported duty free, and the gas-works at Athens and the Piræus supply gas for industrial purposes at very cheap rates. The Greek mining-works also have an increased demand for these motors. Gas stoves, too, could probably be advantageously sold in Greece. The catalogues and price-lists should be compiled in French.

**Sales of Shares.**—Messrs. Pendered and Son recently offered for sale some £25 "A" shares in the Wellingborough Gas Company, which realized £63 10s. each; a few £10 "C" shares fetching £20 apiece, and £100 of 4 per cent. debenture stock changing hands at £98. Last Thursday, a number of 6 per cent. preference shares, of £20 each, in the Gravesend and Milton Water Company were sold at prices ranging from £35 15s. to £37 per share. The same day, Messrs. Garrod, Turner, and Son put up to auction £2500 worth of new ordinary "C" stock of the Ipswich Gas Company. The dividend for the past five years has been 9 per cent. per annum. The stock was offered in £10 lots, and was sold at the following prices per lot: 70 at £21 10s., five at £21 12s. 6d., 37 at £21 7s. 6d., 10 at £21 6s., and 128 at £21 5s.

**The Testing of Gas at Coventry.**—The discrepancies between the results of tests made of Coventry gas at the works and at the Technical Institute have for some time been a cause of trouble, as our readers are aware; and it became so acute that it led to the resignation of the Chairman of the Gas Committee (Alderman Andrews). The services of Mr. J. F. Simmance, of Messrs. Alexander Wright and Co., have been called in, and he has reported on the condition of the photometer-room at the Institute. His report was presented at the meeting of the City Council last Tuesday, and was referred to a Sub-Committee, who are to confer with representatives of the Gas and Technical Instruction Committees on the matter. Alderman Andrews asked for some explanations from the Chairman of the Watch Committee (Alderman Webb Fowler), who stated that about a couple of months ago the Watch Committee received a report which showed that the illuminating power of the gas examined at the Institute differed to a considerable extent from that of the gas tested at the works. The desire of the Watch Committee had always been to maintain the amicable relations which had hitherto existed between the two Committees. They thought, therefore, that the better plan would be to ascertain why there should be so large a discrepancy. Both sets of instruments had been either made or designed by Mr. Simmance, who was consulted with the Gas Examiner and the Gas Engineer—the Town Clerk also being present. He reported that the conditions under which the gas was examined at the Technical Institute were not the same as those at the gas-works. He stated that there was more vibration in the room at the Institute, and the temperature of the two places varied to a great extent. He suggested that another room, where there would be less vibration, and where the temperature would be more even, should be chosen. He also pointed out that the service-pipe from which the gas to be tested was taken, was a long one. These matters were under the consideration of the Sub-Committee; and it was for this reason that the report was referred to them. The matter now awaits the result of their deliberations.

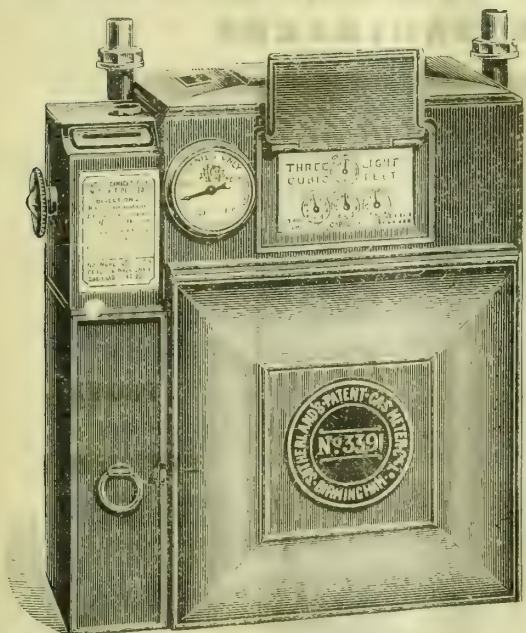
**The Uppingham Gaslight and Coke Company, Limited,** has been registered with a capital of £4000, in £10 shares, to take over the business carried on by the Uppingham Gaslight and Coke Company, constituted by Articles of Association on July 23, 1839.

**Barry (Glam.) Water Supply.**—The work of sinking an additional well at Biglis, in connection with the water supply of Barry, is nearing completion. The well is 40 feet to the bottom of the sump, and 11 feet in diameter. A new engine and pumping house has been erected, and the cost has been about £6000. The work is being carried out from plans prepared by, and under the superintendence of, Mr. E. W. Waite, the Water Engineer to the Barry District Council.

**The Tropical Weather and the Consumption of Water in Manchester.**—At the fortnightly meeting of the Water Committee of the Manchester City Council, last Thursday, Alderman Sir John J. Harwood presiding, it was reported that the stock of water at Longdendale was 3122 million gallons, which is equivalent to an estimated consumption extending over 76 days. A fortnight ago there was deemed to be a sufficient supply for 82 days; so that the position has become slightly worse. On the 19th of July last year, the storage amounted to upwards of 3800 million gallons, or 700 million gallons more than at the present time. The consumption last Wednesday was over 39 million gallons, or some 8 million gallons in excess of the daily average consumption throughout last year.

**The Falmouth Corporation and the Water-Works.**—Further evidence of the division of opinion among members of the Falmouth Corporation on the subject of the purchase of the water-works was afforded last Thursday. At a meeting of the Corporation on that day, the General Purposes Committee, which consists of the whole of the members of the Council, recommended that, owing to the expense of the new sewerage scheme, the question of the purchase of the water-works be deferred for the present. Mr. Williams proposed the adoption of the Committee's recommendation, and said that, now the Water Company had commenced the laying of new mains, they might hope for an improved supply. So far as the Corporation were concerned, the sewerage of the town was more important than the purchase of the water-works. Mr. T. J. Thuell expressed surprise at the attempt to shelve the water purchase scheme; while Dr. Banks contended that the necessity for dealing with the sewage was not an adequate reason for postponing the other scheme. Mr. Grose moved an amendment by which the Council were invited to disapprove of the Committee's recommendation, and to proceed with the necessary measures for the purchase of the water-works under the guidance of gentlemen whom he named as Engineers, Solicitor, and Parliamentary Agents. The latter part of the amendment was ruled out of order, on the ground that the Council had left the appointment of Engineer to the General Purposes Committee. Several members protested against the Council stultifying themselves by taking the course recommended by the Committee. Mr. Grose's amendment was not seconded; but by nine votes to five the Council adopted a further amendment, instructing the Committee to select an engineer by that day week, failing which the appointment is to be made by the Council. There may now possibly be some progress made in the matter.

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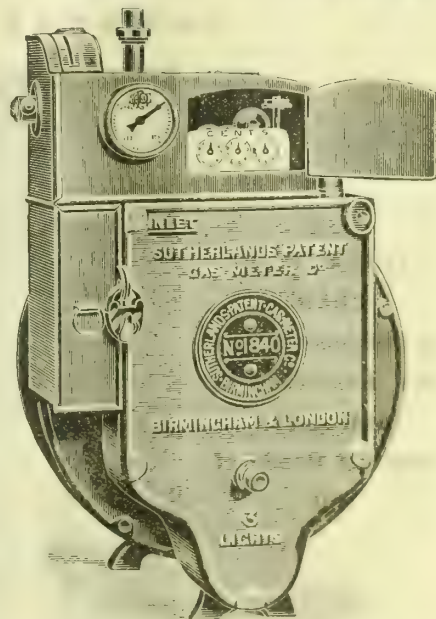
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**New Water-Works for Rhyl.**—The Rhyl Town Council have decided to promote a Bill in Parliament for the construction of a new reservoir and other works for improving the water supply of the town and district, and to amend the water rates and charges, whereby the minimum will be 10s. 10d. for cottages, with a graduated scale; the charge for property above £25 per annum rental being 8½ per cent. This, it is calculated, will yield an annual increased rental of about £1000.

**The West Surrey Water Company's Supply.**—A deputation representing the Weybridge, Chertsey, and Walton District Councils recently waited upon the Directors of the West Surrey Water Company, at their London offices, to lay before them certain facts relative to the supply of these districts. In the course of the proceedings, reference was made to a report submitted by Dr. Rideal, F.I.C., in April last, in which he stated that the results of his examination showed the water to be unsuitable for drinking purposes. It was suggested that the Company should construct a large impounding reservoir. The Chairman (Mr. A. T. Simpson), in answer to the deputation reminded them that it was very difficult to attain perfection, either with water or anything else; but as far as the article supplied by the Company went, it was of fair average quality, and as good as any sent out by the London Water Companies. He could not but think that the District Councils, by the action they had taken, were raising needless fears; and it would be much better if they took steps to allay any restless feeling in the matter of the supply. He and his colleagues had listened attentively to the arguments of the members of the deputation, and they would consider them. To carry out the idea of an impounding reservoir would require money, which would take some time to obtain. After the matter had been discussed, they would communicate with the Councils. The deputation thanked the Directors, and withdrew.

**New Water-Works for Earlestown and Newton.**—The new water-works which, after being under consideration for something like five years, were resolved upon a few months ago by the Earlestown District Council, have been commenced, and the first of the three sections into which the entire scheme is divided is approaching completion. Two boreholes have been made, 100 feet apart, and the water will be raised by two 13-inch pumps of 4-feet stroke, actuated by a horizontal condensing engine, with helical gearing. The water will be discharged into a covered concrete tank, capable of holding 200,000 gallons, or a day's supply. From this tank it will be raised by a pair of double-acting horizontal pumps, and discharged direct into the mains. Mains 8 inches in diameter will be laid from the works to join the old mains at Newton Bridge. The two townships have for the past thirty years been indebted to the London and North-Western Railway Company for their supply of water. The relations between the District Council and the Company are of an amicable nature, and it is solely out of consideration for the rate-payers that they decided on the erection of their own water-works. The scheme is mainly due to the efforts of the Chairman of the Water Committee, Mr. C. B. F. Borron. The works have been designed by, and carried out under the supervision of, Mr. D. H. Lloyd, the Gas and Water Engineer to the Council; and the estimated cost is £23,000. The first section will cost about £6000.

**Dursley Water Supply.**—At the last monthly meeting of the Dursley Parochial Committee, considerable progress was made with the scheme to supply the town with water. Plans, specifications, and estimates were produced from the Engineers (Messrs. Taylor and Santo Crimp) for the carrying out of the work. Mr. Phelps, J.P., of Chistal, who is giving the necessary land and water in return for a free supply to his house, insisted that, unless a reservoir was constructed to contain 200,000 gallons, he should require an independent pipe from the tank to Chistal; so the Committee had to decide between a storage of 90,000 gallons (three days' supply), with an independent pipe for Mr. Phelps, or 200,000 gallons without the pipe. The former scheme being estimated the cheaper by £700, and strongly recommended by the Engineers, it was decided to adopt it. The motive power is to be gas.

**Glyncorrwg and District Gas Supply.**—The Glyncorrwg Urban District Council, who intend lighting and supplying gas to Glyncorrwg, Cymmer, and Abergwynfi, and who are now supplied by the Maesteg Gas Company, about the middle of last year invited an expert on gas and also one on electricity to report, with the object of showing which was the better system. Mr. R. A. Browning, Assoc.M.Inst.C.E., of Neath, was appointed; and the Council unanimously adopted his report, and he was instructed to prepare plans, &c., for new works complete for producing 10 million cubic feet of gas, to be erected at Cymmer. After advertising, Messrs. R. & J. Dempster, Limited, of Manchester, submitted a tender, which was accepted, it being the lowest sent in (£8880). At the meeting of the Council on the 12th inst. the Clerk reported that the Bill only awaited the Royal Assent; and he was instructed to take steps to borrow the necessary money.

**The Rickmansworth Water Company and the Uxbridge Water Supply.**—At the last meeting of the Middlesex County Council, the Solicitor presented a report on the Rickmansworth and Uxbridge Valley Water Company's Bill. It set forth that the Bill was considered by a Committee of the House of Commons on the 21st and 22nd of May, and was opposed by the County Councils of Middlesex and Hertfordshire. It proposed to extend the limits of the Company (who have power under their Act of 1844 to supply water in bulk) into Bucks and elsewhere. Sir Frederick Dixon-Hartland induced them to consent to the repeal of the powers referred to; but as the Company were at present supplying water in this way to the Uxbridge District Council, it was arranged that the repeal should not apply to their district. The opposition of the two County Councils resulted in clauses being inserted in the Bill to the following effect: (1) To repeal the power of supplying water in bulk, except as regards the district of the Uxbridge District Council. (2) To restrain the supply of water from the Company's wells or works to 300,000 gallons a day from the valley of the Colne or the county of Middlesex, except for use in that valley and in Middlesex, and except in case of emergency, when the Company are to deliver to the County Council of Middlesex a statement in writing of the nature of the emergency, and, when required, of the quantity taken in excess of the 300,000 gallons. (3) To keep and furnish to the County Councils of Middlesex and Herts certain records of all pumpings whenever they are in excess of 1,000,000 gallons a day.

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## EDITORIAL NOTES.

## The Report and Accounts of the Gaslight and Coke Company.

THE report of the Directors and the statement of accounts relating to the past half-year's working of the Gaslight and Coke Company have been issued; and the ordinary general meeting of the proprietors will be held on Friday. The report states that, after providing for fixed charges, there will remain a balance available for distribution of £626,602, out of which the Directors recommend the payment of a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, carrying forward £296,755. It is next stated that the sales of gas show an increase of 3.3 per cent. for the half year, which is the best thing in the whole story. Not another gleam of sunshine is to be found, either in the report or the accounts; and it will tax to the uttermost the official optimism which has so often stood in the way of reform at the Horseferry Road, to extract much satisfaction from the existing facts. Coal has been bought at an advance of 8s. a ton, only one-fourth of which can be recovered in higher returns from residuals. Mention is made of the increase in the price of gas by 6d. per 1000 cubic feet as from last month; it being explained that this is only a "net increase of 5d., "having regard to the reduction of 1d." made last January. The effect of the increased price on the dividend is also stated; and the Directors remark that their action "in raising the price of gas has been criticized by Local Authorities and others, who have evidently failed to appreciate the fact that, under present legislation, the consumers of gas cannot be subjected to an increase in the price they have to pay without the proprietors of ordinary stock being at the same time subjected to a corresponding reduction "in the rate of their dividend." This is childish. Do the Directors imagine that it would cause the smallest pang to a consumer of gas whose bill had been suddenly and largely increased, to learn that the shareholders were getting no dividend at all? On the other hand, can it be supposed that the shareholders' loss of dividend affords the slightest gratification to the consumers of gas? The report seems to imply that the essence of the sliding-scale consists in its vindictive aspect; but this is to sadly misunderstand the position. When this aspect of the matter is in question, the comparison of effects cannot be excluded; and it is not to be supposed that the grumbling consumer will be placated by being told that, for every sixpence extra he pays, the shareholders forfeit a penny.

"It is with regret" that the Directors have to report the rejection once more of a Money Bill of theirs by a Committee of the House of Commons. This is a mild confession, to say nothing more. We notice that a financial newspaper calls "a very clumsy joke" the remark of the Directors in this connection that the lost Bill was drawn up "to secure, in the interests of the consumers, the raising "of the necessary capital at the lowest possible rate." But the statement is strictly and literally true. There is an unctuousness about the way of putting it which had been better avoided; but there can be no question as to the fact. Unhappily, this is the worst of it. In itself, the Bill was unexceptionable; and it was a necessary measure. But Parliament would not trust the Directors with any more money. That is the position which, as we observed last week, the Chartered proprietary has to face. Of course, there is nothing reassuring about this state of things in the report. The Directors could hardly be expected to say that the persistent hostility of Parliament to their Bills had cast upon them the responsibility for seriously considering their position. These gentlemen, honourable and well-meaning men as all the world concedes, may be doing so, for all that is known. It cannot be pleasant for them to realize that the undertaking for which they are answerable to the owners is floundering on from one parliamentary rebuff to another. On the other hand, the smooth paragraphs of the report may equally cover an advanced state of dry-rot in the Board-room. Mention is made of the other parliamentary concerns of the Company for the session; and the report concludes with the usual assurance that the plant of the Company is in good order.

The accounts show that a net amount of £68,690 was added to the capital expenditure during the past half year, mostly for new and additional mains and services, meters, and stoves. No fresh capital has been received; and there remains unissued £250,000 of 4 per cent. ordinary stock



and £200,000 of 3 per cent. debenture stock. In the revenue account, gas stands for £1,629,434, which is about £20,000 to the good; while residuals have brought in £592,971, as compared with £438,231. All the items show considerable advances; but, of course, the greatest is in coke, which has improved by upwards of £100,000. On the other side of the account, coals and other materials for gas manufacture have risen from £682,741 to £833,451—a sharp advance, seeing that the coal contracts were at the old figure. Probably the carburetting proved an expensive luxury. Wages (carbonizing) went up from £161,548 to £174,194; and purification cost considerably more, probably through the dearness of lime. Repairs and maintenance, both of works and mains, have dropped. For the first time, a separate entry for “Gas-Fittings (Automatic Meter ‘Supplies’)” accounts for £26,574, which would seem to indicate that a serious attempt is to be made to reduce the outstanding credit under this head. Rates and taxes have gone up again, badly as the concern can bear the impost. It is satisfactory to note that only £886 has gone for workmen’s compensation, as it speaks well for the care which is being exercised over the Company’s industrial operations. On the whole, the leading feature of the accounts is the advantage that has been reaped already from the improved state of the residuals market; while the coal does not show the full effect of the advance. The dividend payable is decreased from £367,330 to £329,847, or by £37,483, which is the price the shareholders pay towards squaring the account on the new basis. There is nothing to be said regarding the other accounts, except perhaps that the details of the “oil-gas” manufacture are not at all intelligible as they are now given.

#### The Report and Accounts of the South Metropolitan Gas Company.

THE Directors’ report and the half-yearly accounts of the South Metropolitan Gas Company have also come to hand. The document begins with the somewhat abrupt remark—“History repeats itself—but with a difference.” This observation pleasingly excites interest in what is to follow, which proves to be the necessary, but by this time familiar, explanation of the reason for the increased price of London gas. As might be expected, the matter is dealt with in an illuminating style by Mr. George Livesey, Chairman of the Company, who happens to be one of the veteran band of gas managers that bore the brunt of the coal famine of 1873. From coal famine to sliding-scale is but a step; and, again, Mr. Livesey is the man who made it. For this reason, among others, he treats the great gas settlement of 1876 with a grasp of the principles involved which few other gas directors can hope to equal. He is the master, while they are necessarily but amateurs. Very remarkably, the additional storey which Mr. Livesey added to the structure of 1876—the South Metropolitan profit-sharing scheme—so far from overloading the original foundation, seems to have added stability to the edifice. Is it not the truth that, when a building is in danger of being shaken by those “rhythmic oscillations” which proved so destructive to the walls of Jericho, a good remedy is to put a heavy weight on the top? In the case in point, the experiment has succeeded to admiration. Profit-sharing added 9 per cent. to the earnings of the Company’s officers and servants—a very handsome premium on good service. The present year’s increase of price has swept it all away. Do the men complain? Not they. Like Englishmen all the world over, when face to face with the stern realities of things, they are prepared to take the rough with the smooth. So with the South Metropolitan consumers of gas. Served with notices of the heaviest increase of price in all London, they know that it cannot be helped. Such is the reward of a good commercial reputation.

A truly wonderful statement is made in the report respecting the growth of the South Metropolitan undertaking. For the half year, the increase in consumption has been at the rate of 12 per cent.—in actual amount, 590 million cubic feet. The growth of the Gaslight and Coke Company for the same period is 359½ million cubic feet. So the smaller undertaking is overtaking the larger. Well may the report state that the proprietors may be assured “that they need ‘have no fear as to the stability of their property, that the ‘cloud will pass, and that when coal returns to a reasonable price—certain to come—their old prosperity will be ‘renewed.’” A very modest reference is next made to the success of the Company’s Bill this year; but this reticence is made up for by some hearty abuse of the London County

Council for promoting the Portable Photometer Bill. The concluding paragraph of the report is devoted to an explanation of the dividend; making it clear that the Midsummer increase of price will only be felt by the proprietors to the extent of the fall of dividend from 5½ to 5 per cent., owing to the full dividend not having been paid heretofore.

The accounts exhibit the rate at which the undertaking is forging ahead. A net capital expenditure of £82,101 has been necessitated. The form of accounts now includes a statement showing the actual amount of money raised and expended, which obviates all mystery by reason of stock conversion. The revenue account gives the numbers of meters, stoves, and fires in use, in their different categories. The receipts from gas amounted to £589,887, as compared with £521,551 for the corresponding period of last year. Residuals brought in £303,747, as compared with £223,626. Gas manufacture cost £606,931, instead of £448,092; thus showing that the effect of dearer coal had already been felt. Distribution actually cost less. Rates and taxes have gone up slightly. The gross profit balance is £176,617, as against £192,174. The balance-sheet shows that the Company are working with a temporary loan of £140,000. The dividend is just cleared, and that is all. The amount of workmen’s bonus and savings deposited with the Company has risen to £40,879. It is not surprising, in the circumstances, that at the meeting authority will be taken to raise £250,000 of further capital by the creation and issue of ordinary and debenture stock. We regret that it was not permitted to the Directors to announce to the proprietors that the Nine Elms works and district would shortly become their property; but the Fates, in the bodily shape of the House of Lords Committee, denied them this gratification, and it is by no means clear that the bargain is not indefinitely postponed.

#### The North British Association Meeting.

THE North British Association meeting in Edinburgh last week was eminently satisfactory from the point of view of the person who looks at the outward appearance of things. There was a more than usually full attendance; a programme which, had it been possible to carry it through, would have been (to say the least) more than a fair day’s work; subjects some of which were new, and others of which were sufficiently important to be worthy of subjection to the kaleidoscopic treatment of public discussion; there was abundance of discussion; there was, moreover, much harmony; and there was nothing tiresome. These things all go to make a successful meeting; and that the meeting was successful, in very large measure indeed, there is no gainsaying. There is no disposition here to belittle the proceedings. But does not a closer look at what took place go to show how far Scotland has travelled away from the unique position which she held in gas matters, and held till quite recently? When was there ever a meeting of gas managers before, in Ultima Tweed, at which the subject of the illuminating power of the gas was not mentioned? It was not on the agenda this year—it was not even mentioned; and probably for the first time the members were not reminded that it was light they sold and not gas. These were some of the things which were not. Of those which were, were observations upon the working of inclined retorts and the use of carburetting in the improvement of coal gas—subjects which, a quarter-of-a-century ago, would have made a cannell man (metaphorically) take a pinch of snuff and mutter “humph.”

There is a proverb about necessity and strange bed-fellows which receives application here. Were it not for the rapid exhaustion of cannel coal in Scotland, there would not be the same earnest attention among Scotsmen to projects for cheapening the production of gas which the Edinburgh meeting shows to exist. There is in this, to be sure, no sign, by any means, of decay. It is the other way. The old trunk of sturdy Scotch gas management—independence—has vitality enough left to graft upon itself the vigorous saplings of what has hitherto been regarded as the undergrowth of gas production. It is the change to which we wish to draw attention; and our reason for doing so is that this meeting emphasizes that there is a change more than any previous one has done. It has been borne in upon some minds of late years, but it has never yet been acknowledged, even tacitly, that the ground was shifting. Scotch gas managers have not been finding their way South in recent years. Rather managers from the South have been going North. This state of matters will now cease, it is to be presumed. But, for the present, the distinction



of Scotch gas has departed; and gas managers in Scotland will be as they are in other lands—except, it may be, for that *perferendum ingenium* which their race is reputed to possess, and which they may be trusted to apply in this as in other matters.

To treat of the individual papers in a word or two. Mr. Herring's was an educative production—very much so. By means of it he gave his northern colleagues a standard by which to measure their own attainments—needless to say almost entirely measuring downwards. Mr. Lighbody made out a good case for giving better treatment to the consumer by prepayment meter, who, it is to be feared, is, in many cases, being looked upon as the milch-cow of the undertaking. Mr. Forbes Waddell's paper was more of a theorem, notwithstanding that it was based upon experiment. Had it been practice instead of experiment, it would have been more useful. The paper which was contributed by Mr. W. Young, of Peebles, but which, it is to be regretted, he was unable to be present to read, was a characteristic production of the fertile brain of the distinguished gas philosopher who lives by the Tweed. His writings require the application of mind. They are more suited for fireside reflection than for off-hand discussion; and it is fortunate that the Association resolved to accept the paper and to publish it. It will be of more real service in present study than it would have been in prospective reading followed by remarks evolved on the spur of the moment at next year's gathering.

#### Parliament and the Coal Question.

At the fag end of a listless session, efforts are being made to enlist the interest of the House of Commons and the Government in the present abnormal condition of the coal trade, especially with regard to the question of the enormously increased quantities of coal that are being exported to other countries. Questions have been put both to Mr. Balfour and to the President of the Board of Trade, not so much for the purpose of eliciting information (which is available to everyone), but in order to bring the fact before the public that the present high price of coal is due to a scarcity caused by heavy exportations. We cannot but think that the attempt on the part of some Members and of a section of the Press to alarm the public by representing that European nations in general, and France in particular, are sucking this country dry of smokeless coal, while they themselves are piling up great stocks of that commodity, preparatory to making war upon us, is entirely unjustified by ascertained facts, and is highly discreditable to the alarmists. Nothing is more likely to bring about an absolutely causeless war than the preaching in both England and France—as is most certainly being preached in each of these countries—the doctrine that the other is anxious to wound and is preparing to strike.

The statement has been sedulously circulated that steam coal from Wales is pouring into Calais daily, and is being immediately whisked off to some secret storage-place for use when the "Gallic horde" is ready to descend upon our defenceless shores. Yet what do we find when coming to close grips with facts? Turning to the consular reports, we learn that the great increase of coal imports into France from this country in 1899 was, in one district, "attributable to the remarkable development in the metallurgical industries;" in another, "to the demand of the factories at Hennebont." While, further, Mr. D. A. Thomas, M.P., who of all men is in the way of knowing, says that "France is not taking more steam coal than usual." If, again, we turn to the details contained in some of the would-be alarmist reports, it is found that, out of five large vessels stated to have been recently unloaded at Calais, two were from Newcastle, two from Sunderland, and only one from Wales. Doubtless France—in common with other countries—is buying Welsh coal for her Navy as she always has done; but where is the evidence of abnormal purchases of sinister significance? No one but the coalowner, miner, and merchant is pleased at the present price of coal; but that is no reason why we should create bogeys for our own alarming—fraught as the useless process is with the risk of turning imagined into realized peril.

Apart, entirely, however, from the alarmist agitation stands the legitimate demand, which we have consistently supported, for an official inquiry into the question of our coal resources, consumption, and export, in the course of which special heed might and certainly should be given to

the necessity of our retaining a proper supply of steam coal for use by our first line of defence, the Navy. That is one of the principal points made by Mr. A. D. Provand, the member for the Blackfriars division of Glasgow, in a letter which he has addressed to Mr. Balfour (to be found in another page of this issue) in continuation of his former plea for the appointment of a Royal Commission. Mr. Provand puts the case for the institution of a commission of inquiry on very much the same grounds as those on which we have always recommended such a step—viz., that, "even if no recommendations of moment are made by the Commission, it would, generally speaking, still be of enormous advantage for us to know the truth as far as it is ascertainable, so that we might set our house in order," or, we may add, set our minds at rest. Mr. Provand also refers to another aspect of the question that is of much interest and importance to coal consumers in this country—that of the growth of the American coal trade and the prospects of considerable competition of American with British coal in the future. So many conflicting opinions are expressed by interested persons—opinions doubtless, if perhaps unconsciously, coloured by the direction of their interest—as to the probabilities of such competition, that it would be of no little value to have the question fully and impartially investigated as regards the cost of mining in the two countries, the cost of transit from America to ports now supplied by British vessels, and the relative quality of the coals of this country and of the States.

We certainly do trust that the Government will be persuaded to grant the asked-for inquiry; but, unless the Commission be speedily appointed and conclude its labours within a reasonable period of time, the exciting cause of the present agitation—the high price—will have passed away before the report appears. The coming winter may, indeed, witness a continuance or even a surpassing of the ruling abnormal prices. The loud proclamations of famine prices by the coal merchants are possibly inspired rather by the wish than by the certainty; but there can be no doubt that the impending severe "slump" in the iron trades (a "slump" that will be the more severe the longer that coal remains dear) will in the course of no very long time react sharply upon the coal market. No careful observer can have failed to realize that the iron and steel trades are at the present moment in a position as doubtful and unpromising as that in which they stood twelve months ago appeared assured and cheerful. Coal buyers will not have to play second fiddle to coal owners for an indefinite period.

#### The Coke Market.

OF importance to the gas industry almost equal to that of the future of the coal market are the prospects of the coke trade; for thereon depends whether the demands of the coal-owners spell serious diminution of profits or merely contra entries in the accounts. These prospects being affected in no small degree by the operations of the Gaslight and Coke Company, the results of the tenders recently invited by that Company in the advertisement columns of the "JOURNAL" will be of considerable interest to our readers. The coke offered for sale was the Beckton and some of the Nine Elms manufacture for the year commencing on the 1st of October next—in all, we take it, rather more than one-third of the Company's sale coke for that period. The minimum price fixed for tenders was 22s. per ton; and, judging by the allotments that have come to our knowledge, the quantity offered was fully tendered for. When it is remembered that the minimum tender price a year since was 15s., and that the same coke was selling three or four years ago at well under 10s., it will be seen that the increase in the price of coke has exceeded the rise in the price of coal. This, of course, is not the same thing as saying that the enhancement of coke values has compensated for the advance in coal, as every shilling on to coal requires for its counterbalance practically two shillings a ton on coke. But it is obvious that the estimate of the possible recoupment from residuals during the year to June, 1901, which we put forward in our issue for the 3rd of April last, was well within the mark. It does not, we know, follow that because the Chartered Company have been able to sell a third of their coke at something over 22s. a ton, the same price will be obtained throughout the next twelve months for day-to-day sales at the works. But the knowledge that contracts have been closed at such prices will tend to sustain the market for some time to come; and there will be little fear of the Metropolitan and other Gas Companies not realizing good returns



from coke so long as coal keeps at or above its present level. The economic effects of these tremendous prices for fuel will be, and are being, widely felt. The cement maker will be hard hit, and will naturally try to get some of his money back from the gas companies in the price of lime for purification and cement for building; the laundry proprietor is putting up his prices (so the coal merchant, in common with the rest of us, will have to pay more for the luxury of clean linen); while the nurseryman declares that a pound a ton for greenhouse fuel spells workhouse for him. The coal and coke merchant is, we fancy, in for a big gamble this winter; and it is well for the community that the weather clerk is beyond the reach of cajolery or corruption. An open winter will see some of the coke and coal grumblers with lengthened faces. Meanwhile the Westminster authorities have certainly secured a comfortable price for their next year's contract coke.

#### Trade Unionism and Railways.

ANOTHER example of Trade Unionism "in being" has been afforded for the instruction of the British public during the past week or two, in the threatened strike of railway men belonging to the Great Eastern system. For some time subterranean mutterings "might have been heard," as the old school of novelists would have said, in the neighbourhood of Liverpool Street and Stratford. Originally, the servants of the Great Eastern Railway Company, of the Metropolitan and Suburban sections, wanted more money and some other advantages. The Directors of the Company were prepared to meet their employees, and were also willing to grant them as many concessions as the condition of the affairs of the Company permitted. The Amalgamated Society of Railway Servants, although not commanding the allegiance of a majority of the Great Eastern Company's men, undertook to work this agitation for all it might be worth, including possibly that meed of "recognition" for which all such Trade Unions pine. Organization proved good for something; and, somehow, when the men employed on the line elected their first set of 19 delegates to meet the Board and talk over their differences, these proved to be with one exception members of the Society! But this was not all. With a degree of arrogance which is Trade Unionism all over, these delegates demanded to be received as ministers plenipotentiary for the whole body of the Company's servants. The object of this bit of "try on," as the men would call it, was clear enough. It was to be a Society show; and everything the men might get would go to the credit of the Union. But the Directors did not see it. They called up 140 other representative men, and discussed grievances with them; leaving the Society 19 to go off and complain to their head and chief, Mr. Richard Bell, the General Secretary of the Society. Thereupon this outraged magnate set about his preparations for a strike of all hands in defence of the sacred principle of recognition of the Union; and a large number of silly men were found willing to arm Mr. Bell with signed strike notices. In order to further magnify the Society in the eyes of the world, it was ostentatiously arranged for the strike to begin just before the Bank Holiday, when the maximum of inconvenience and risk would have come on the travelling public. The Directors, however, stood firm, and set Mr. Bell and his anarchical scheming at defiance, with the result that this would-be dictator of the line has "seen the red light," and run away from his own threats. Not, however, before he had managed to advertise himself as having negotiated a settlement of the dispute with the President of the Board of Trade. The main point is that the strike has been declared "off" for the present; and the joke is that several people are claiming the honour and glory of bringing about this result. In fact, the Society have given in because they saw that it would never do to precipitate a disastrous conflict on a mere point of Trade Union punctilio.

The weakness of the Society's case was plainly pointed out in a dignified—almost sternly-worded—letter of the President of the Board of Trade, replying to a request from Mr. Bell that the Department should set the Conciliation Act of 1896 in motion. This application was a piece of impudence on Mr. Bell's part, because he is neither an employer nor an interested workman, and consequently has no *locus standi* in the affair. Still, some license is always taken by a professional agitator; and upon this occasion Mr. Bell had a number of strike notices in his pocket which he might have used to the ruin of the men who

signed them, if not to the detriment of the Railway Company. As if this irregularity were not enough, the Editor of the "Daily News" must needs have a hand in the deal, and he claims to have been the intermediary between the Company and their men for the conveyance of messages which resulted in agreement on a basis for future negotiations. Meanwhile, the only persons who do not appear to have had a say in the matter are those most seriously concerned for the preservation of peace—the non-Society men who constitute the bulk of the Company's servants. The Directors and the chief officers will look after them, of course, and see to it that the Sim Tappertits do not get all the profit out of the situation. They have had their advertisement, which is more than good enough for them.

#### Mutual Schemes Under the Compensation Act.

WE publish to-day in another column some particulars, taken from the annual report of the Registrar of Friendly Societies, regarding the mutual schemes substituted by employers and employed for the exact provisions of the Workmen's Compensation Act. The report covering the first six months during which the Act was in force (noticed in the "JOURNAL" last October) did not indicate that this method of meeting the obligations of the new law was being at all generally adopted; and the statistics for the following twelve months now before us—that is to say, for the year 1899—naturally show even less indication. We say naturally, because the bulk of employers favouring such schemes were certain to formulate them soon after, or even before, the Act came into operation; and it is, we fear, too soon for the benefits accruing from the adoption of the mutual agreement plan to have made themselves sufficiently manifest to employers who, from a desire to be saved trouble—for the successful establishment and working of a mutual scheme requires preliminary and continued thought and care—or because of a prejudice against the Act and all its provisions, have elected either to insure against its risks or stand the racket themselves, to induce them to adopt what we deem the wiser course.

The schemes certified up to the end of 1898 embraced about 100,000 workmen; those sanctioned during 1899 about a further 10,000, *plus* all Government employees. The men, or at least their Unions, in some cases seem—judging from the Registrar's account of his correspondence with them—to have had serious doubts as to whether they might not really be compromising their interests by what is generally, but erroneously, known as "contracting out," in spite of the fact that no mutual scheme can be brought into operation unless the Registrar be satisfied that its provisions are at least as favourable to the men as those of the Act, nor, even if so approved, can be made compulsory. But it is evident, from the reports of the past year's working of the schemes sanctioned in 1898, that the operation of these agreements soon commends them to the workmen interested; for in the case of 72 per cent. of the schemes reported on, the whole of the men in the particular employment had become contracting parties, while in no case had less than 83 per cent. of the employees signed the agreements.

The whole cost of the schemes to the employers was, on the average, 19d. per man per week, more than one-third of which was carried forward as surplus. This payment, *plus* 14d. per week from each man, provided not only benefits equivalent to those granted by the Act, but also accident allowance in such cases as did not exceed two weeks in duration (and they were more than half of the total number), and for the first two weeks' disability in all other cases, as well as other benefits not contained in the schedules of the Act. Most of the agreements—among them that of the South Metropolitan Gas Company, which is still the only gas undertaking that has been enterprising enough to adopt a scheme—provide for the pensioning of the widows or other dependants of men accidentally killed, an arrangement which has always appeared to us to be infinitely preferable to the less troublesome, but also much less beneficial, provision made by the Act for the payment of a lump sum down. The French law, which was explained at considerable length in the "JOURNAL" some time since, combines most happily both plans—providing that the recipient of a pension may claim to commute one-fourth of such allowance, thereby obtaining a small amount of capital wherewith to buy a business (or mangle) without being afforded the opportunity to squander the whole of the awarded compensation.

We feel strongly disposed to reiterate the many arguments in favour of the mutual-scheme method of meeting



the obligations of the Workmen's Compensation Act which have been more than once urged in these columns, but will refrain from mentioning more than the one important advantage emphasized by the Registrar, and which might well be noted by His Honour Judge Parry and other critics of the Act—namely, the entire absence of any litigation in the settlement of claims. Nothing, as we have said before, is more fruitful of bad blood between masters and men than litigation over trivial amounts involving, maybe, large questions of principle; and bad blood is as great a source of weakness in the corporate as in the individual body.

#### The Amalgamation of the Incandescent Gas Companies.

ON Thursday last, the shareholders in the New Sunlight Incandescent Company were called together to consider the agreement which had been provisionally entered into with the Welsbach Company for the amalgamation of the undertakings. The position of affairs was very clearly put before the meeting by the Chairman (Mr. J. H. Duncan), who said that, after many futile efforts on the part of the Directors of both Companies to come to an arrangement, the present negotiations had been brought to a successful issue by the intervention of a "mutual friend." It is, however, only fair to assume that the Kern patent case recently tried was an equally important factor in the settlement arrived at. Mr. Duncan stated that, although judgment in this action would now in all probability never be given, it was the opinion of those in Court during the trial that the Sunlight Company had won "hands down." Highly important as this action was, however, there was another one pending—that relating to the Welsbach 1893 patent—which, had it come to trial, would, in any event, have been fraught with far more serious consequences. A decision in favour of the Welsbach Company would have had the effect of stopping the Sunlight Company's trade; while a victory for the latter would have resulted in practically throwing open the incandescent mantle business to all comers. The two courses open to the shareholders were to ratify the agreement with the Welsbach Company or to provide further capital for the carrying on of their own business; and, under these circumstances, it is hardly matter for surprise that they decided to part with their undertaking on the terms proposed. The result is that all the outstanding actions between the rival Companies (Mr. Duncan believed there were eleven) will be dismissed. What golden opportunities are thus lost to the lawyers! Mr. Duncan thought that after this amalgamation the Welsbach Company would have nothing to fear from other rivals, "but would easily beat anyone who came into the field." Time may prove this view to be correct; but it does not seem to us to be by any means certain that the Law Courts will not again be called upon to decide questions in regard to incandescent gas patents.

#### Washing-Up!

So the New Australia community broke down because nobody would consent to do the washing-up! This was the curious bit of news which last week arrested the attention of many newspaper readers, and took their thoughts for a moment from khaki and China. It was announced that the community in question—one of the numerous Collectivist experiments, one may reasonably suppose, which have been tried only to fail in all parts of the world—had nothing to complain of as regards site, or climate, or means of subsistence. But the washing-up was the rock on which the ship of the new State actually split. It is the great bottom difficulty of human society. It underlies the domestic-servant question, the question of elementary education, and all other social questions. Mr. George Griffith complained in a newspaper the other day that the money spent by the London School Board is worse than wasted; and the Duke of Devonshire said last week that the dislike of farmers to what is called "education" in the country is not wholly irrational. The doctrinaire view of elementary education is that it is an elevating influence. But when this elevation goes just far enough to make boys and girls despise honest work and feel "above" their fathers and mothers, practical-minded persons may well ask whether it is a good thing in the main. It is the artificial connection that has been established between schooling and getting on in the world which is one of the reasons for dissatisfaction with the present working of the Elementary Education Act; and the failure to adapt the school system scientifically to the true needs of the population is another. So the country spends many millions in fostering

a distaste for washing-up. Yet there is always washing-up to be done; and who is to do it? All communities cannot avoid the difficulty by breaking up and going away. We shall all be dwellers in the New Australia by-and-by. Gas-stoves are a great boon in the kitchen; but, unfortunately, they themselves need an occasional washing-up, which they do not often get. The state in which these articles return from hire is a striking commentary on the superficiality of our boasted sanitary civilization. People are lashed into fury over the idea of an extra microbe in the town's water, which they never drink if they can get anything else; while if they could take a census of the bacterial population of their own kitchen, the revelation would be something worth notice.

### WATER AND SANITARY AFFAIRS.

It is an unfortunate circumstance that the expressions of gratification in which we indulged in the last number of the "JOURNAL," at the absence of complaints in regard to the supply of water in the Metropolis, cannot be emphasized this week by repetition. Almost simultaneously with the appearance of those remarks, an apology was offered in the London papers, by the Secretary of the Lambeth Water Company, for a short supply in their district, and an appeal made to consumers to exercise economy in the use of water. Upper Tooting was the locality most seriously affected. The intense heat caused such an abnormal demand upon the reservoir there, that towards the close of the week ending the 21st inst. the pressure failed altogether. The measures resorted to by the Company of shutting off at intervals the supply to the low-lying parts of the district for the benefit of the higher portions—inconvenient, as they no doubt were, to many of the consumers—would have had the effect of more equally distributing the available supply of water, if a serious accident had not happened which disorganized the system. Last Sunday week, two mains burst, and then it was deemed advisable to explain the circumstances through the medium of the Press, and ask for the indulgence of the consumers. Meanwhile, efforts were made to minimize the inconvenience as far as possible by arranging for a service of water-carts to call several times daily at the houses in the district most seriously affected, and by promptly setting about repairing the damage. It was hoped that the usual supply would be restored by last Sunday. It is scarcely necessary to say that some of the papers did not fail to make a good deal out of this lapse on the part of the Company—opening their columns freely to the complaints of "disgusted" and "indignant" consumers. It is certainly remarkable that a few days of unusually hot weather, but by no means a period of drought, should have put such a strain on the resources of a London Water Company as to cause a breakdown. It is one of those "regrettable incidents" which naturally evoke hostile criticism, whether they occur in the conduct of a water undertaking or of a campaign, and give rise to demands for change of administration.

Fortunately, London has not suffered from a short supply of water so much as Paris, where the hot weather has threatened the city with a water famine. A fortnight ago the public were informed by the municipal authorities that the greatest possible care would have to be exercised to prevent waste; and on the 22nd inst. the water was shut off from eleven at night till six in the morning. The consumption during the period of the heat-wave was far greater than had ever been experienced; and, curiously enough, it was higher at night than in the daytime. This is attributable partly to the quantity of glass-washing done in the restaurants after eleven o'clock, and largely to the custom prevalent among the residents of letting the water run all night over bottles of wine, milk, or water, to keep them cool. The bakers have been unable to carry on their work owing to the water being cut off; and it has not been possible to operate the hydraulic lifts. Worse than all, there has been no water available for fire extinction; and, according to the "Matin," a house on the Boulevard de Belleville was recently burned down from this cause, while the firemen stood looking on. It was understood a few months ago that the Municipality had made special arrangements for the supply of the city during the period of the exhibition, when there would necessarily be a large influx of visitors. They must have sadly miscalculated the extent of the demands, or the present scarcity would not have arisen. It is rumoured,



however, that it has been brought about not so much by the increased consumption—though this is responsible to a large extent—as by the use of filtered water for street-sprinkling and industrial purposes. The efforts of the Municipal Engineers are now being directed to replenishing the reservoirs which have been so heavily drawn upon; and the stoppage of the supply during the night hours has already increased the store. As with us, when trouble arises in connection with the water service, people begin to talk of the advisability of going to a distant source for an additional supply; and consequently a suggestion has been again made to bring water to Paris by gravitation from the Lake of Geneva. But there are political difficulties in the way.

Although the report of the "Lancet" Commission, of which an epitome is given in another part of the "JOURNAL," does not add much to the stock of knowledge upon the Metropolitan Water Question, it is a valuable document from the fact that it embodies conclusions, arrived at by independent inquirers, similar to some of those come to by the last Royal Commission. The "Lancet" investigators think that more power to control the London Water Companies should be conferred upon the Water Examiner. Lord Llandaff's Commission were precisely of this opinion; and there were other matters, such as the prevention of waste, the regulation of fittings, &c., in respect of which they considered that more control might be exercised, whether the water undertakings remained in, or were taken out of, the present hands. As far as the Water Examiner is concerned, the proposal of both Commissions is that he should be able to do as of right what he now does only by courtesy. We do not suppose the Water Companies would raise any great objection to the Examiner being invested with such additional powers as might be deemed necessary to safeguard the public health; but we doubt whether the Government will consider the existing arrangements affecting him as well as the Official Auditor so inadequate as to call for special treatment apart from the general question, which, it seems to us, will have to be taken up sooner or later—by them or by their successors.

**The Gas Examinerships of the London County Council.**—Mr. J. Wade, the Gas Examiner at the Wellclose Square testing-place, will resign this position on the 30th of September next; and the Council have lost by death Mr. A. H. Boylan, the Examiner at Lewisham. Mr. A. W. Mitchell has succeeded Mr. Boylan; Mr. J. F. H. Gilbard will be transferred from Old Ford to Wellclose Square; and Mr. Martin Priest will take charge of the Old Ford station as from the 1st of October.

**Manchester and District Junior Gas Association.**—Some of the members of the above Association paid a visit to the Thorncliffe Iron-Works of Messrs. Newton, Chambers, and Co., last Saturday, where they were accorded a most hearty welcome by Mr. G. Dawson, the Managing-Director. The visitors were then conducted round the works by Mr. Froggatt and Mr. Goddard, who explained the work in hand in the different departments, from the metal in the rough to the finished article. Mr. Dawson then kindly invited the members to lunch, which was provided at the Midland Hotel, Chapeltown. At its close, Mr. R. H. Garlick, the President of the Association, proposed a vote of thanks to Mr. Dawson, Mr. Froggatt, and Mr. Goddard, for the courteous way they had received and entertained the members. Mr. Froggatt, in reply, gave an interesting account of the life of the firm and the work they turn out.

**The Prize Winners at the City and Guilds Examinations.**—We have received from Sir Philip Magnus the list of prize winners in the last technological examinations of the City and Guilds of London Institute. The following are the names of the successful students in "Gas Manufacture": Honours Grade—First prize (£2 and a silver medal), A. W. Hoggard; second prize (£2 and first-class certificate), D. J. Winslow. Ordinary Grade—First prize (£1, a silver medal, and first-class certificate), J. Holland; second prize (£1, a bronze medal, and first-class certificate), J. S. Thorman; third prize (bronze medal), F. V. Barnes. Three of the prize winners—Messrs. Holland, Thorman, and Winslow—were students at the Regent Street Polytechnic, where Mr. Winslow gained the silver medal in the Honours Grade with 88 per cent. of marks, and Mr. Holland a certificate and 55. in books in the Ordinary Grade. It must be highly gratifying to Mr. Walter Grafton, F.C.S., the conductor of the classes in "Gas Manufacture" at that institution, to find that 25 per cent. of the candidates who passed first-class, and a like percentage who passed second-class, in the Honours Grade at the last City and Guilds examinations were students there; while in the Ordinary Grade the percentages were 30 in the first and 17 in the second class. Among the prize winners in other subjects, we notice that Mr. John Power, Assistant to Mr. C. Taylor, till recently Engineer to the Derby Gas Company, obtained the first prize (£2 and a silver medal) in the Ordinary Grade of "Mechanical Engineering."

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 308.)

THE Stock Exchange had nothing befall it last week to put a brighter complexion on the markets; and pretty well everything continued in its old torpid, depressed condition. The intense heat of the weather, too, was indisposing to enterprise. Business generally was very quiet; and the greatest degree of activity was to be found in the railway market, where the ever varying reports from day to day of the chances of a Great Eastern strike were welcomed by bulls or by bears according to their tenor. But outside of this department most things were quite colourless; and in the absence of any important intelligence from China or South Africa, they remained in an attitude of expectation. Taken all round, prices have moved very slightly and also with a considerable degree of irregularity. In the Money Market, the tone was sharper. There was a good demand for the purposes of the Stock Exchange settlement; and discount rates were very firm. Business in the Gas Market was exceptionally quiet; even more so than can be accounted for by the near approach of the holiday season. Certainly it would appear that the present is not the time to sell gas stocks; and none but those who are absolutely compelled to realize should do so. The offer of a bit of stock in the market seems to be the signal for dropping the quotation to what is in some cases an unreasonably low figure. The general rise in the price of gas means reduced dividends; but it cannot be for long. Already there are indications of a turn in the coal market which alone is responsible for dearer gas. Besides this, the half-yearly accounts to hand show that the demand for gas continues to increase, and that the last half year has been a good one. Therefore let shareholders hold on tight to their scrip, and at no distant date they may be looking back with a smile at the clouds that have rolled away. During the week there were a few transactions in Gaslight issues at good steady figures; the ordinary opening and closing at about 98½, and quotations being unchanged. South Metropolitan was hardly touched until just towards the close, and did not vary. But the debenture fell a point. A bargain at a low figure depressed Commercial old; but subsequent dealings commanded a higher price. Further attacks were made on Suburban and Provincial quotations; and Brighton, Crystal Palace, and Tottenham gave way. Among the Foreign undertakings, Continental Union alone changed. The Water Companies showed great weakness; and there were one or two sharp falls.

The daily operations were too small for detailed notice. The following reductions in quotation occurred: On Monday, Continental Union 2. In Water, Chelsea 5½ and Lambeth 5. On Tuesday, Commercial old 5. Southwark Water 2. On Wednesday, Crystal Palace 3. In Water, Chelsea 5 and Lambeth 2½. On Thursday, South Metropolitan debenture 1. New River 3. On Friday, Brighton "A" and Tottenham "B," 5 each. New River 2.

### ELECTRIC LIGHTING MEMORANDA.

**The Electric Lighting of Small Towns—The Second Period of Municipal Enterprise—The Leaky Capital Account—Depreciation or Life Insurance.**

A SUBJECT that greatly interests and concerns electricians is the electric lighting of small towns. Papers on different aspects of the subject were recently read before the Municipal Electrical Association by Mr. C. S. Vesey Brown, of Lincoln, and Mr. G. M. Harris, of Bray. The papers were discussed by the Association, and also by the "Electrician." The core of the matter, of course, is the difficulty of making small electricity supply works pay. It is by this time recognized that small electric lighting companies do not pay, and that the only hope of escaping bankruptcy in their case lies in timely purchase by the local authority. One can say of this class of enterprises, without fear of contradiction, that even where they were not started with the overt or secret intention of passing them on at a premium to the local authority, there is not one in England the proprietors of which would not gladly sell at a discount now, if they could. The only chance there is now of starting new electricity supply undertakings in small towns is by winning over the local authority; and there are many consulting engineers of the genus tout who are still working this field for all it is worth. It is scarcely necessary to remark that, in the hands of these persuasive gentry, every electricity works estimate shows a handsome profit. But when the consultant has cleared his cheque and left the neighbourhood, disillusionment invariably comes in his stead.

The members of the Municipal Electrical Association know all about this second period of municipal electric lighting enterprise. Mr. Harris, for example, plainly says that small local authorities ought to be content if they can do their own public lighting at a reasonable cost, and provide those inhabitants of the district who like it with electric lighting at a fair price. "The measure of the success of such an undertaking should then be judged, not by actual return made in the shape of profit shown, but upon truly municipal lines—that is, by the efficiency and cost of the public lighting and the rate at which a supply of electricity is obtainable for private use." That is all right. Nobody would ever object to a local authority going into the trade with their eyes open, as Penzance and Ramsgate have done. The scandal is that they are



deceived from the first—led to deceive themselves, and wind up by deceiving the ratepayers. One of the freshest examples of this kind of municipal progress that has come under our notice is a place where an initial capital outlay of (say) £60,000 is to be increased to £100,000 at once; and then the district will not be half covered. This is the trouble of these small and scattered places. The mains have to be carried so far in order to pick up a decent amount of work for the central station. This sort of "extension" goes on from the very beginning, and the deluded, inexperienced town councillors fondly believe they are thereby enlarging their business, when the truth of the matter is they have a leak in the capital account. The touting electrician gets a local authority to say A—usually a very small *a*—and then while his mouth is yet open he is forced to say B. After a time, the ratepayers begin to use another letter of the alphabet; but by that period the electrical expert from London has packed his bag and departed in search of another job.

Mr. Harris observes that in these small places "the policy of laying the mains well in advance of the demand, though justified in wealthy areas, would not be so in small towns where the conditions are different." What the small local authority should be forewarned about, therefore, is the absolute necessity for their knowing precisely what to expect when they are invited to start electric lighting in a particular area. This is only as much as to say that they must possess a clear idea as to when their capital account will be closed. Of how many municipal undertakings can this knowledge be said to exist? An electric lighting company can easily see the length of their tether; but not a local authority, who begin with a false view of the possibilities of a local electric lighting business. Once such a body gets the smell of "profits" into its nose, it will go sniffing after them for years; and every sniff means cable extensions. Both Mr. Harris and the "Electrician" agree that at this time of day small towns would be well advised to wait until a big electric power company comes along and includes them in its area, rather than waste a large capital in establishing works of their own. But what is to become of the touting electrician, if all the towns are wise? Mr. C. S. Vesey Brown's paper on the same subject was written to order of the Council of the Association. He admits that on the capital sum of £406,175 which he ascertains to have been spent by fourteen local authorities in electric lighting of towns under 40,000 inhabitants, the ratepayers have to subsidize the earnings by the amount of the difference between the average profit of 4½ per cent. and whatever may be the actual cost of working the concerns.

This brings us to the gist of the whole matter, which is, what does it cost, on the capital outlay (whatever this may be), to run an electric lighting business on a sound financial basis? This is a universal question, capable of a general answer. We care not whether the particular example be Hastings—where the electric lighting party on the Council affect to dismiss our recent strictures on their finance as having been "somewhat disingenuously posted"—or Brighton, or anywhere else. Mr. Brown, who hails from Lincoln, says that a return of at least 5½ per cent. is needed to pay 3 per cent. upon, and redeem, corporation electric lighting loans in 25 years. We take his figure. How much must be added to it, for depreciation—meaning the necessary charge for maintaining the investment in its pristine, profit-earning value as a going concern? That is the query which, as we told the Hastings people, they and all other municipal suppliers of electricity shirk. A Hastings newspaper reporter has interviewed somebody connected with the electric lighting undertaking on our statement of what is necessary in this regard; and all he got was a vague protest that Professor Smith's estimate of 2½ per cent. for the depreciation of this class of property is a "theoretical figure." So are the rates charged for fire and life insurance. Seeing that municipal men do not seem to understand the meaning of the word depreciation, we will call it the premium for insuring the life of machinery and plant in use for business purposes. What is the tariff rate for this? That question is plain enough.

#### SOME CURIOUS TESTS OF THE AIR OF A ROOM.

MR. FRANCIS JONES, Chemistry Master in the Manchester Grammar School, has recently forwarded to us a pamphlet entitled "The Air of Rooms;" being an account of the results of an examination, made by himself, into "the effect produced on the air of rooms by the use of gas, coal, electric light, &c., for heating and lighting purposes." Our attention had previously been attracted to this research by a notice appearing in the "Manchester Guardian," which gave the cheerful intelligence that, according to Mr. Jones, the use of gas for heating or lighting "should be eschewed, so far as is possible, by all who wish to live in reasonably pure air." The newspaper went on to furnish some particulars of the dreadful results ascertained by Mr. Jones to be produced by the burning of gas in "rooms;" and we were naturally interested to learn whether these applied only to the burning of Manchester gas in its native air, or whether the consequences might be regarded as of general application. Accordingly, we have studied the original source of this information with an intensity of interest that almost deserves to be called morbid; for the "JOURNAL," as its regular readers know, has given more attention to the study of aerial sanitation than almost any other technical

periodical in English. We have followed the work of Carnelley and Haldane, in what may be called the criticism of house ventilation systems, and have only recently added an appreciation of the constructive work of Mr. T. W. Aldwinckle in this section of an architect's responsibilities. If anybody should take the trouble to go through the back volumes of the "JOURNAL" for the past twenty years, he would find a large body of literature of the same character; so that in welcoming Mr. Jones as one of the newest workers in this not very thankful field, which is so commonly neglected by competent and trustworthy scientific labourers, we are not without some warrant of experience of the subject.

Mr. Jones approaches the matter as a Chemist. As such, one would expect him to exhibit the usual defects of his qualities; and we frankly confess that it was with a suspicion of this sort at the back of our mind that we took up his pamphlet. How far the suspicion was justified will appear in the course of this article. To begin with, Mr. Jones very properly sets out all that the fathers of modern chemistry knew about the chemical composition of air. They thought that air is of pretty much the same composition everywhere and always; but this is now known to be not the case. One of the normal components of air, carbon dioxide, without which our atmosphere would not be air at all, nor capable of discharging a good half of its duty in the scheme of things, has come to be regarded by chemists as an "impurity." Mr. Jones does not fall into so vulgar an error. He admits that good air, away from towns, contains 3 volumes of carbon dioxide in 10,000. It does not sound much. Chemists have been obliged to state the composition of the atmosphere in terms of 10,000 volumes, in order to avoid having to give the proportion of carbon dioxide in less than whole numbers. Chemists, however, who are chemists first and men of good sound practical judgment afterwards, never stop to draw their readers' attention to the extent of the scale on which these figures are spaced. Three parts in 10,000! What does it mean? The plants know; but they cannot speak.

Having obtained his datum of the irreducible minimum of the quantity of carbon dioxide in normal country air, Mr. Jones next states that he has found 4.526 parts of carbon dioxide per 10,000 in the atmosphere of central Manchester. Without pausing to show that the difference is in any respect material, he immediately proceeds to state that "indoors, the gases given off in respiration and by the burning of gas, candles, and lamps are not rapidly removed even by the best systems of ventilation, and in too many cases they accumulate to such a degree as to be injurious to health." Observe the *petitio principii* of the conclusion. How do we know at what point the proportion of carbon dioxide in air becomes of itself injurious to health? If it be granted that there is a point at which the natural consequences of the absence of adequate ventilation in the case of occupied, warmed, and lighted rooms become injurious to health, what is the nature of the danger, and to what should it be ascribed? As a matter of fact, it is not known what the hygienic meaning is of the chemist's determination of the proportion of carbon dioxide in air which is being breathed by human beings, apart from other considerations. It is a far cry from the shed of a mineral water factory in England to the Black Hole of Calcutta; yet, in all probability, there would not be found a significant discrepancy between the amount of carbon dioxide usually present, quite harmlessly, in the former and in the worst-ventilated enclosed space ever occupied for ordinary purposes by human beings.

Consequently, it is usual now to regard the proportion of carbon dioxide detected in a sample of air by the use of the ordinary method of chemical analysis as an indicator of the efficiency of the ventilation. This is a very different thing from valuing it as something "injurious to health" in itself, or even as indicating the existence of accompanying atmospheric components and conditions in the apartment from which the sample was taken. The difference is in the point of view. The point of view we prefer is that of the sanitarian, who starts with the assumption that a reasonable requirement in regard to ventilation is that every inmate of a room shall have a fresh air supply of 2000 to 3000 cubic feet per hour. The test for carbon dioxide will tell whether this requirement is being satisfied or not. The chemist has a different standpoint. In the person of Mr. Jones, he remarks that "some chemists maintain that the carbon dioxide in the air of rooms is uniformly distributed; others that the air near the floor is much purer than near the ceiling; some consider that the carbon dioxide in the air of a room ought not to exceed that in the outer air by more than two volumes in 10,000; others would only condemn air containing more than 19 volumes in 10,000 of air." Well might he remark that these asserted results are contradictory. But he himself runs a risk of mixing up two distinct issues—one of fact, the other of opinion. The question of the distribution of carbon dioxide in the air of rooms should be one of fact susceptible of experimental determination; that of the justification for the "condemnation" of air containing a certain proportion of carbon dioxide per 10,000 parts, is something which cannot be settled merely by what some chemists "consider" correct.

In view of the uncertainty prevailing even among chemists on these vital matters, and in view also of modern changes in methods of heating, lighting, and ventilation, Mr. Jones undertook an investigation of the question. It is significant of the Chemist that the first thing he wanted for his purpose was a



laboratory. He did not begin by investigating the conditions prevailing in a private dwelling house, or a school; but he procured the use of a small room in the most central part of Manchester, in which the experiments were conducted. "The air space of the room was 935 cubic feet, it had one fire-place, one window, and a ventilator at the roof, opposite the door. This ventilator measured 18 inches by 9 inches, and was always kept open." Not to be captious, it is necessary to interpose at this stage a query as to how far this "laboratory" represents an ordinary room, and therefore how far the results obtained may be regarded as of general applicability to all rooms. It is a very small apartment, to begin with, and was at the back of the building, where there was little circulation of air outside. The unscientific way in which the existence of an open ventilator "at the roof, opposite the door" is noted is remarkable. Nobody knows whether this hole acted as an inlet or an outlet, or even if it acted at all. There is no reason why any of the results obtained here should be regarded as applying to any other apartment, especially to one much larger, or even as strictly comparable among themselves. Thus the title of the pamphlet itself is a misnomer. It has nothing to say about the air of "rooms," in the plural, but only of one particular room, very much in the singular.

The very first result determined in respect to this "laboratory" would be queried by every expert in ventilation. After starting with the just proviso that, "in order to make the results comparable, the tests must be taken under similar conditions," Mr. Jones jumps to the statement that "in an ordinary room the best air is near the floor, it becomes less pure a few feet from the floor, and is most impure at the ceiling." Not one test is adduced, as having been made in an ordinary room, to prove this. We have already stated some objections to the acceptance of this little box of a laboratory as an ordinary room; but even if it were to be so taken, the following table is Mr. Jones's idea of similarly made and conclusive tests:—

	Position.	Morning.	Afternoon.	Evening.
Carbon dioxide in 10,000 vols. of air.	Floor	5'117	6'639	Not observed.
	Table	7'999	8'510	Not observed.
	Ceiling	Not observed	Not observed	10'985

Surely, these "not observeds" militate somewhat against the clearness of whatever proof is intended to be deduced from this table. Mr. Jones cannot be ignorant of the fact that ventilating engineers and architects do not by any means hold that the air of rooms is purest at the floor level. On the contrary, they mostly believe that extraction of foul air at this level, if possible by an open fireplace, is very desirable. This is especially held to be true of apartments of any size. Even if the rising heated air is extracted at the ceiling level also, the assumed necessity of floor-level extraction is never ignored. Obviously, therefore, the limited value of this starting determination of Mr. Jones is more certain than its degree of approximation to general truth. He had better make a fresh start, and ascertain from wider experience the usual distribution of carbon dioxide in the air of ordinary rooms.

In this laboratory, a series of experiments numbered from A to K was started last November twelvemonth. In the first set, tests of the amount of carbon dioxide and of the humidity of the air of the room were taken as a rule at three periods of each day—morning, afternoon, and evening. The morning experiments were made before the fire was lit, or any gas burnt. The room was lighted by an ordinary No. 4 flat-flame burner, assumed to be burning at the rate of 4 cubic feet per hour. It was also noted if the room had been occupied. That the apartment was somewhat "stuffy" is to be inferred from the circumstance that invariably the proportion of carbon dioxide in its air exceeded the outdoor average by about 3 parts in 10,000. Usually, after about 8 hours' respiration of one person in the room, with a coal fire burning and gas alight for an hour or two, the proportion of carbon dioxide taken at the table level went up to 20 parts in 10,000 or thereabouts. On one occasion the proportion went up to 48, starting at 9.5 parts in 10,000. This was on Dec. 15, the day being qualified as "fine and bright." Two days later, the weather mended. It became "foggy and dark," and the proportion of carbonic acid sank to 6.13 at the starting, rising to 16 after four hours of gaslight. This illustrates the beautiful irregularity of these figures. As a rule, indeed, when the weather was rated as fine and bright, the starting proportion of carbon dioxide was higher than when it was dull. Thus, on Dec. 21 there was a thick fog all day; and we all know what that means in Manchester. The carbon dioxide was less than 9 at starting, and went up to 28.6 at night; whereas two days later, the weather being frosty and bright, the proportion started at about 10, but did not get beyond 19 parts in 10,000. Curiously enough, no temperature observations were made; and thus a simple guide to the state of the ventilation is not forthcoming.

The next set of experiments was made with the substitution of electric light for gas. This reduced the supply of extra carbon dioxide to respiration; while the fire and the open ventilator co-operated so efficiently that the proportion did not get much beyond 11 per cent. Mr. Jones remarks that the humidity is about the same in the ten sets of experiments. Next he had a gas-fire, with gas-light; the result being that the air was much drier, and there was more carbon dioxide in the room. He opined from this that the ventilating effect of the chimney was

diminished by the absence of the open fire. The actual proportion of carbon dioxide was not larger; but it rose with greater uniformity every day. When it came to putting a gas-cooker into the room, and turning on both oven and boiling burners, the result was nearly catastrophic. "No satisfactory determinations were made with both the oven and top burners in use, because the room became unbearably hot and suffocating, and it was impossible to remain in it." Just so. This result, in short, gives Mr. Jones's show entirely away.

For what do all his labours amount to, as regards telling us what we did not know before? He sets out with some pomp fourteen conclusions as based upon the results of this investigation; but they can all be summed up in the statement that, unless the ventilation is adequate, the occupation by human beings and the burning of lights and fires so that the products of combustion mingle with the air of a room increases the proportion of carbon dioxide in that atmosphere. And the smaller the room the more marked this effect is likely to be; until if you put too large a gas-kitchen into a box room and turn all the gas on you really will not be able to stay there! If this is not sheer pedantry, we should like to be made acquainted with a finer specimen of the demonstration of the truth of the obvious. Where did Mr. Jones think to arrive at, in this precious galley? We notice that the "Manchester Guardian" ignores the size and character of the room which only an open fire and electric light, with a good-sized hole near the top, kept decently sweet after an occupancy of seven or eight hours. The newspaper is sensible enough to express the wish that Mr. Jones had tried the effect of a common oil-lamp—it might have added, and of a candle or two, without the ventilating effect of a coal-fire. But this gleam of common sense is immediately obscured by the sapient observation that "it is easy to imagine the damage to health that must be caused by gas-stoves, which, as is too often the case, stand out in a kitchen with no flue at all; and when that is also the living room of the family, the gas cooking-stove is anything but the blessing to the poor which it is made out to be." In such cases, the "family" probably has enough wit to open the window and also the door, which performance was barred by the conditions of Mr. Jones's experiment.

No! One is reluctantly driven to conclude that here again the Chemist, clever enough in his way, has failed to carry his points, because he has endeavoured to fit every fact to laboratory conditions, instead of using the laboratory to reduce to order and method, if necessary, indications afforded by the actual experiences of every-day life. Of course, we all know that an electric incandescent light does not draw upon the oxygen of the apartment which it lights; and also that there is a limit to the number of people and of gas-burners that can be packed into an apartment 10 feet square, with door and window shut, without striking effects upon the character of the contained air. Has Mr. Jones told the world anything more than this? If he has, we will gladly give his contribution to the sum of human knowledge as great publicity as we now do to the statement that his pamphlet is useless, looked at from the point of view of the practical person who buys his gas for consumption in ordinary rooms under conditions from which common sense is not deliberately excluded.

#### THE GAS SUPPLY OF BOSTON (MASS.).

(Continued from p. 214.)

THE point reached at the close of the previous article was that at which, through the action of the Brookline Company in undertaking to supply the public lights in some of the districts of Boston (previously served by other Companies) at much lower prices than had ever been charged before, the price of gas in that city had been generally lowered, and the Bay State Company run by Mr. Addicks had been compelled to deflate its capital by three million dollars. We have now to trace—always, as we have said, by the aid of Mr. J. H. Gray's articles in the "Quarterly Journal of Economics"—the history of the gas supply of Boston through the period of competition so inaugurated, to the cessation of that competition, and down to the present conditions and relations of the several Companies.

The Bay State Companies did not submit without protest to the competition of the Brookline Company—necessitating, of course, the paralleling of many of their mains. They promptly appealed to the Gas Commission (who, however, were declared by the Attorney-General to have no jurisdiction in the matter), and then to the Board of Aldermen, whose consent, it was contended, was required before the Brookline Company could open the streets. The Aldermen agreed that their consent was so required; but all their resolutions to this effect were vetoed by the Mayor, by whose authority the Company had commenced the work of laying the duplicating mains. The point remained theoretically in dispute for years—until the Companies came to terms—but it was practically settled by the Brookline Company laying such mains as they required. The gainers by the dispute appear to have been the lawyers.

We have said that the zeal of the Mayor of Boston in 1893 (Mr. Matthews) on behalf of the gas consumer was due rather to political motives than to a disinterested concern for the public welfare. This is shown to have been the case by the fact that,



just before the expiration of his term of office, he accepted, at an annual salary of \$25,000, the presidency of the Bay State Companies, against which his campaign had been directed. He, however, only held the position for two months. "It was said that the magic of his name disappeared after the Republican victory in the city election." The incident concerns the history of the Boston Gas Supply but little; we mention it merely as throwing some light upon American methods of conducting both politics and business.

The laying of parallel mains and the competition in the supply of gas lasted until the end of April, 1896, by which time some 200 miles of mains had been duplicated, and almost every better-class house had a double service. Over and above the cost of these unnecessary mains and services, large sums of money had been spent by the Companies in soliciting custom, giving away gas-stoves, advertising, fixing and refixing meters, and putting in and taking out services. As a natural result, dividends dwindled considerably, and would have done so still further, so far as the Brookline Company were concerned, had that Company not, as was subsequently reported by the Gas Commission, carried to capital more than \$200,000 properly chargeable to revenue. Needless to add, the total capital employed in the supplying of Boston with gas was, under such circumstances, far higher than should have been the case.

The sequel to the period of competition was one of virtual, though not absolute, amalgamation; and the aim of the consolidators resolved itself into that of making the consumers pay interest on the whole of the duplicated capital that had, or was supposed to have, been spent during the era of competition. The financial expedients employed to this end equal in their ingenuity and tortuousness those resorted to by the Bay State schemers, in earlier years, for the purpose of obtaining dividends on their well-watered capital. The Brookline Company, in May, 1896, agreed to sell their interests to the Bay State Company; the sale to take effect at the end of six months. As a guarantee of willingness to complete the bargain, the Bay State Company allowed the Boston Gas Company (one of the Bay State group) to enter into a contract with the Brookline Company whereby the former agreed to purchase annually from the latter, at a price equal to that charged by the Brookline Company to the majority of their customers, sufficient gas "to enable the Brookline Company to maintain its plant, pay all its expenses of every sort and description, and then pay 10 per cent. dividend on its stock, 5 per cent. on all bonds [at that time] issued, 6 per cent. upon all existing indebtedness, and 4 per cent. upon all future indebtedness created for the extension of its manufacturing and distributing plants." The surplus profits of the Boston Company could, by this means, be used to pay interest and dividends on the inflated capital of the Brookline Company, as they had previously been made to pay interest on the over-capitalization of the Bay State Company.

Having got this very valuable contract assured, the Brookline Company evaded their obligation to sell themselves to the Bay State Company by the expedient of getting the latter—how, we are not told—thrown into the hands of a receiver; and then getting three of their own chief officials (Standard Oil magnates) appointed Trustees of the Bay State Company, with control over all the Boston Gas Companies—the whole of which (except the Brookline) had by this time come under the sway of the Bay State combination. The actual details of these transactions have never yet seen the light; and while Mr. Addicks is keeping up—Mr. Gray suggests merely *pro forma*—a public agitation against the Trustees (whom he accuses of having taken forcible possession of the Bay State Companies, and of corrupting the Press to support their action), the stock and bond holders of those Companies are challenging in the Law Courts his right to assign their interests to the Trustees; it being insinuated that Mr. Addicks received consideration for his action in so doing.

The moving spirit in these transactions was a Mr. H. M. Whitney, the owner of some considerable bituminous coal mines in Canada, who had that year (1896) obtained from the Massachusetts Legislature an Act incorporating the Massachusetts Pipe-Line Gas Company. The avowed object of this measure was to enable the promoters to manufacture, and sell in Boston, coke-oven gas, which it was declared could be sold at much cheaper rates than either coal or water gas. The real object was to form a nucleus for the consolidation of all the Boston Gas Companies. The Legislature, however, so amended the Act—which is said to have cost the promoters from two to five hundred thousand dollars, for "educating the Legislature and moulding public opinion!"—that consolidation was only possible thereunder on a basis of 60 cent gas, which the promoters had no intention of supplying. The franchise, which included the right to sell gas to other Companies, was eventually assigned to a further newly-founded undertaking, the New England Gas and Coke Company.

This Company was formed by Mr. Whitney and his friends the Standard Oil magnates, in conjunction with Messrs. Emerson M'Millan and W. J. Elkins, "two of the best-known developers of gas plants and gas stocks in America." It is not an incorporated Company, but in fact a partnership, and therefore exempt from the restrictions imposed on corporate undertakings. "Both the financial and industrial operations of the Company are as free from State control of every kind as if they were carried on by a single individual;" and the only limit to the capital

is the willingness of the public to subscribe. The Company are constructing, or have constructed, very large works; and the capital is \$35,000,000.

The present situation is, therefore, that in the hands of Mr. Whitney and his friends are this New England Gas and Coke Company, and all the previously existing Boston Gas Companies; that the former has an enormous capital, while no one knows the value of the assets; that the latter are largely over-capitalized; that it will be sought to make the Boston consumers pay dividends on this mass of inflated capital; and that the Gas Commission appear to be unable to protect the consumers from such imposition. In the words of Mr. Gray: "The gas consumers of Boston, as the result of their supposed gains from the agitation of 1893, will have to face an increase of \$35,000,000 or more of capital; and . . . the Companies are in such a situation now as to enable them to evade almost all the corporation laws of the State, and to nullify, or at least make very much more difficult than ever before, the attempts to control the gas industry in the public interest. . . . If the present unity of management be preserved, the Boston gas consumers must, until 1937 (when the Boston United Gas Bonds are paid off) pay dividends and interest on \$47,169,900. This includes simply that portion of the total capitalization—of, perhaps, \$160,000,000—which must have its reward in order to give no legal grounds for dissolving some of the Corporations or Trusts. . . . But even this minimum of more than \$47,000,000 is probably something like four times the actual investment in the field, and more than five times the amount of capital the Gas Commission . . . will allow the Massachusetts Corporations to issue. If the maximum capitalization . . . be included, the nominal (amount) is \$160,309,600, or more than seventeen times the amount necessary, in the judgment of the Commission, to supply the needs of the field."

Public opinion in Boston is much stirred by the existing state of affairs, but is not unanimous as to the remedy needed, nor as to the means of its application. We hope we have made a very complicated story sufficiently clear for the final outcome of the present difficulties and complications in which the supply of gas in Boston is involved, to be awaited by our readers with a considerable amount of interest.

#### UTILIZING THE WASTE HEAT FROM GAS-ENGINES.

IN an article on the above subject which appears in the current number of the "Engineering Magazine," Mr. Alton D. Adams points out that, though exhaust steam is now generally employed for heating purposes with good results, but little seems to have been done in the way of utilizing the heat from gas-engines; and he thinks this is partly due to the forms in which that heat is available. He goes on to show that exhaust steam contains substantially all the heat that can be recovered from steam-engines; but that the gas-engine heat appears in large amounts under two forms—the jacket water and the exhaust gases—and the problem is as to how to save it for useful purposes. He is careful to emphasize the fact that whatever is done as to the distribution of heat must not seriously interfere with the operation or efficiency of the engines; and therefore the effects on the exhaust gases and jacket water should be carefully considered. One of the first and most important points to be decided is the amount of heat per hour, or the extent of radiating surface, or the space that may be heated from a gas-engine of given capacity, when working at full load.

Mr. Adams proceeds to say that the efficiency of gas-engines—that is, the ratio of delivered work to the fuel energy of the gas consumed—varies with their size and construction. Inspection of results from a large number of tests, however, seems to indicate that the efficiency and losses, based on the total calorific power of the consumed gas, may be fairly assumed as follows for engines of moderate capacity: Efficiency, 18 per cent.; losses by conduction and radiation of heat from the engine-frame, 5 per cent.; heat escaping in the exhaust gases, 37 per cent.; heat in the jacket water, 40 per cent. As one horse-power-hour of work is the equivalent of 2545 heat units, the assumed efficiency of 18 per cent. corresponds to an hourly development of 14,139 units at the engine for each horse-power-hour of output. Of this amount of heat, 37 per cent., or 5231 heat units, escapes in the exhaust gases, and 40 per cent., or 5655 heat units, in the jacket water. The sum of these losses—10,886 heat units—represents the total heat added to the exhaust gases and jacket water per delivered horse-power-hour. About 150° Fahr. seems to be the present maximum temperature advisable for jacket water on leaving the cylinder. To raise water from 32° to 150° requires 118 heat units per pound, while 1028 units must be added to each pound of water at 150°, to change it into steam at atmospheric pressure. It therefore seems that only about one-tenth of the jacket water from a gas-engine can really be turned to steam by the entire heat in its exhaust gases, even if the whole of it can be extracted.

The author advises that in a hot-water heating system, operated from a gas-engine, the jacket water, after leaving the engine, should pass through pipes that are subject to the action of the exhaust gases. Leaving the gas-heated pipes, the hot-water supply should go to the radiators or other heating surface, and thence back to the water-jacket on the engine cylinder. He points out that the amount of heat that can be



extracted from the exhaust gases by the jacket water, with suitably proportioned heating surface, obviously depends to a large extent on their relative temperatures. There is much uncertainty about the temperature of a gas-engine exhaust, unless all the conditions of operation are known; but 1050° Fahr. seems to be a conservative estimate for an average case. Such a temperature should, he says, be selected for the water that leaves the gas-heated coils for the radiating surface, that it will reach the water-jacket at a certain point below 150°. The temperature of the water on entering the cylinder jacket should be such, at the maximum rate of flow through the system, that it will be 150° on leaving the jacket. If the exhaust gases are lowered from 1050° to 350°, they give up approximately two-thirds of their heat. As the total heat escaping in the exhaust was taken at 37 per cent. of the calorific power of the gas consumed in the engine, about two-thirds of this, or 24 per cent. of the heat of gas combustion, may be added to the jacket water under the conditions named. With 40 per cent. of the heat of combustion in the jacket water before it comes under the action of the exhaust, the contained heat of the water is raised to 64 per cent. of the total amount developed. Of the heat added to the jacket water by the gas-engine, the cylinder will supply 62 per cent., and the exhaust gases 38 per cent.

On the assumption that 14,139 heat units are developed at the gas-engine for each brake horse power delivered, the author finds that about 5655 of these pass into the jacket water. He shows that practically the whole of this heat is available in a hot-water heating system, save the small amount necessary to raise the circulating water to the temperature of the building heated or to the temperature at which the water flows from the heating coils. Of the 5231 units that escape in the exhaust gas for each delivered horse-power-hour, 66 per cent., or 3452 heat units, representing 24 per cent. of the total amount developed, can be added to the jacket water after it leaves the cylinder. The total heat available for general purposes from a gas-engine, under the stated conditions, is therefore about  $5655 + 3452 = 9107$  heat units per delivered horse-power-hour. One square foot of good radiating surface, when supplied with hot water from a gas-engine (the drop in temperature at the radiator being 40°), dissipates 150 heat units per hour in an atmosphere at 70°. For each horse power delivered by a gas-engine, about 60 square feet of direct radiating surface should be supplied. Allowing 10 heat units per hour for each cubic foot of space warmed as a rough approximation, 910 cubic feet may be heated for each horse power delivered by the engine. Mr. Adams says the heat from gas-engines may readily be applied to heating purposes by direct or indirect radiation or by the hot-air system.

In considering the amount of coal that may be saved by the use of the gas-engine exhaust, the author remarks that the heat developed by the perfect combustion of 1 lb. of coal may be taken at 13,000 heat units. The boilers of heating systems in buildings may be expected to deliver to steam and hot water hardly more than one-half of the possible heat from the coal, or 6500 heat units per pound of coal burned. As each horse-power-hour of operation by the gas-engine was found to deliver 9107 units to the circulating water, this amount of operation is equivalent in the heating system to  $9107 \div 6500 = 1.4$  lbs. of coal burned under the steam or hot-water boiler. In the case of a 100-horse power gas-engine operating the equivalent of 3000 hours at full load, or 300,000 horse-power-hours, the heat imparted by it to the circulating water would equal that from  $300,000 \times 1.4 = 420,000$  lbs. of coal. This coal, at \$4 per short ton, has a value of \$840, to say nothing of the labour necessary to operate the boiler and furnace where it is consumed.

Mr. Adams concludes by saying that so long as the gas-engine cylinder is kept within the desired temperature limits, the operation of the engine is obviously not affected by any use of the jacket water; so only the reaction of the heating system on the exhaust gases need be considered. In order to force the gas-engine exhaust through the bank of heating-coils in which the jacket water circulates, a light back-pressure must be set up in the engine cylinder. With properly-designed heating-coils, this back-pressure should, he thinks, be small, and thus increase the gas consumption but little. Assuming a mean effective pressure of 50 lbs. per square inch on the gas-engine piston, from the gas explosions, and 2 lbs. per square inch back-pressure, as a result of the heating-coils, there would be a loss of 4-horse power on the 100-horse engine. In order to bring the engine up to 100-horse power, the gas consumption must be increased by the equivalent of 4 (14,139) heat units per hour, by the assumption formerly made, or 81 cubic feet of gas, with 700 heat units per cubic foot. The value of this gas at \$1 comes to exactly 8.1 c. But the heat delivered by the gas-engine to the hot-water system during one hour amounts to that from  $1.4 \times 100 = 140$  lbs. of coal under a heating boiler. At \$4 per ton, the value of this coal is  $(140 \times \$4 \div 2000) 28$  c., or  $3\frac{1}{2}$  times that of the gas. With gas for gas-engines produced on the premises, the advantage in favour of the heating system would necessarily be greater. The author thinks there is little doubt that the large amount of heat now wasted by gas-engines will gradually be applied to useful heating operations, as in the case of steam-engines.

At the forthcoming meeting of the British Association at Bradford, Mr. Thomas Fairley, of Leeds, will deal with the relationship between the heating and lighting power of coal gas.

## MUNICIPAL GAS SUPPLIES IN GREAT BRITAIN.

THE Committee on City Affairs of the Reform Club, New York, have been circularizing Gas Engineers in England, giving a list of 36 questions, dealing with the above subject, which they desire to have answered. A glance at the list (which is given below) will show how deeply the matter has been studied by the Committee, who claim that municipal trading ought to be encouraged, and not retarded. They also desire detailed information regarding the special conditions applicable in individual cases, and would like, as far as possible, to receive any reports and accounts recently issued, copies of the laws under which local supplies are carried on, and any other papers that will assist in giving an accurate idea of the details of various undertakings. It can hardly be hoped that any one Engineer would fully reply to the list of questions; but probably some of our readers would like to help by replying, at all events, to a portion of them. Answers should be addressed to the Secretary of the Special Committee (No. 52, William Street, New York).

- 1.—Is there competition between gas plants in British cities?
- 2.—Is it the policy of Parliament to authorize a company to supply an area when a company is already doing so?
- 3.—Is there any Act of Parliament or Standing Order of the House of Commons prohibiting competition?
- 4.—Can municipal corporations establish gas-works without purchasing those already existing?
- 5.—Has the Borough Funds Act of 1872 practically made this impossible?
- 6.—Is competition considered advisable?
- 7.—If a company refuses to sell its plant to the town, can the town compel it to do so?
- 8.—If so, under what conditions?
- 9.—Do the Private Bills now passed usually contain clauses regarding purchase by the public?
- 10.—What means have been used to prevent over-capitalization or the "watering" of stock, and the consequent evasion of the sliding-scale or the statutory limits upon dividends?
- 11.—How far have they been successful?
- 12.—Has the sliding-scale proved satisfactory?
- 13.—What, if any, are its disadvantages?
- 14.—Has the limit upon dividends retarded the development and progress of the gas industry?
- 15.—Is the method of control considered satisfactory?
- 16.—Are the limits usually reached?
- 17.—Are the limits fixed by General Acts, by Provisional Orders, or by Local Acts?
- 18.—Is the limit upon the price of gas charged by companies effective? Would they charge higher prices if there were no statutory limits?
- 19.—Are prices lower under municipal or under private operations?
- 20.—Are prepayment meters more generally adopted by municipalities or companies?
- 21.—Are prices for meters, fittings, &c., lower under municipal or under private operation?
- 22.—Is the quality of gas better under municipal or under private operation?
- 23.—Are wages higher under municipal or under private operation?
- 24.—Are hours of labour less under municipal or under private operation?
- 25.—Do labourers work as efficiently under municipal as under private operation?
- 26.—Do municipalities set aside sufficient funds for depreciation, renewal, and sinking funds?
- 27.—Does the requirement that loans be approved by the Local Government Board have a beneficial influence?
- 28.—Are municipal or private plants the more progressive and the quicker to adopt new inventions?
- 29.—Do municipal or private plants secure more gas from the same quality and quantity of coal?
- 30.—Do municipalities or companies get more from the sale of bye-products? Is there any difference in management on this score?
- 31.—About what proportion of the gross profits ("receipts" less "expenditures" in Board of Trade returns) are used in aid of rates, or placed to the credit of the borough fund?
- 32.—Is it the policy of the towns to make this account large?
- 33.—Why is it that since 1883 the ratio of public to private plants has not increased?
- 34.—Are franchises for limited periods or virtually perpetual?
- 35.—What is the method of valuing private works for the purpose of taxation?
- 36.—In the returns made annually to Parliament as to gas undertakings, is the ton used long or short?



# PROCEEDINGS OF THE REGISTRAR OF FRIENDLY SOCIETIES UNDER THE WORKMEN'S COMPENSATION ACT.

THE report of the Chief Registrar of Friendly Societies for the year 1899—published, we note, some three months earlier this year than last, which is an example that might be followed with advantage in the case of other official reports—contains an account of the negotiations leading up to the certification, and a summary of the provisions, of a further sixteen mutual schemes adopted by employers and their hands under the Workmen's Compensation Act during the past year. These schemes include one applying to the employees of the Crown; the others were adopted by firms—chiefly collieries—employing somewhere about 10,000 workmen. The 55 schemes (reduced by the amalgamation of the Glamorganshire mines to 32) stated to have been certified in the Registrar's Report for 1898, included about 100,000 employees; so that the total number of workmen, other than Government employees, who had come to mutual agreements with their employers for the payment of accident compensation up to the end of last year, was somewhere about 110,000—not a large percentage of those who come within the scope of the Act of 1897.

In reference to the schemes certified during 1899, the Registrar observes that several were adopted by the virtually unanimous assent of employers and workmen; but that, even so, he, in one case at least, declined to grant a certificate until better terms than the workmen had stipulated for had been conceded—a pretty good indication of the thorough manner in which Mr. Brabrook fulfils the somewhat onerous—but to him congenial—duties of his position. He further remarks that in several cases ballots of the workmen were taken for or against the proposed scheme, but that the result was always inconclusive; for where the ballot was taken at the instance of the employer, the workmen, through their Trade Union, complained that it had been unfairly taken, and *vice versa*, while in one case two ballots were taken with contradictory results. It is evident from the report that the Trade Unions have viewed such schemes with suspicion, and even hostility—a fact which is scarcely surprising to those who, like ourselves, hold that the adoption of mutual schemes tends to diminish the possibility of friction between employers and employed. In no case has a certificate been granted for a longer term than five years, at the end of which time the Registrar will be in a better position to judge as to whether the requirements of the law, that no scheme shall be less favourable to the workmen than the provisions of the Act, have been fulfilled.

For the purpose of affording information upon which to base such judgment, annual returns are required from the employers as to the working of the various schemes; and these returns for the year ended June 30, 1899, are appended to the Registrar's report. From the returns, it appears that, although the Act provides that "no scheme shall be certified which contains an obligation upon the workmen to join the scheme as a condition of their hiring," yet in 23 cases (including that of the South Metropolitan Gas Company) out of a total of 32, the whole, or practically the whole, of the workmen in the employment joined the scheme; while of the remainder, in only three cases was the proportion of workmen joining less than 90 per cent. of the whole. During the year, the 100,397 hands concerned contributed to the various funds £30,220, or 1'4d. per man per week; and the employers £40,676, equal to 1'9d. per man per week. The payments on account of deaths amounted to £7867, for incapacity to £31,197, and for other benefits to £5327. The number of deaths resulting from injury was 102; and in 74 cases dependants were left, to nearly all of whom pensions were awarded, in addition to the sums payable on death. The number of cases of incapacitation from injury was 14,165, and the average duration of such incapacity was three weeks two days; the average weekly allowance being 13s. The cases in which the duration of incapacity was two weeks and under were more than half of the whole number.

The Registrar remarks that, "taking into account (a) the other benefits, (b) the payments during the first two weeks of incapacity, (c) the subsequent payments in excess of those provided by the Act, and (d) the increase of funds (£24,436), it would appear that in the aggregate the workmen derive from these schemes benefits considerably exceeding the amount of their contributions. The circumstance that the common interest of the employer and the workmen in the success of a scheme is in favour of that vigilance which would tend to diminish the number and severity of accidents, and the fact that there has been an absence of litigation in the settlement of claims, are also justly to be considered as advantages offered by the schemes."

The following are some of the particulars contained in the return made by the South Metropolitan Gas Company, which will be of considerable interest to our readers. The income of the fund for the year comprised £864 from the Company and £380 from the workmen; while the outgoings included £22 on account of the death of one man, who left a widow as his only dependant; £854 for incapacity allowances; and £361 for "other benefits," including pensions to widows of men accidentally killed in previous years. The surplus on the year's working was therefore only £7. Of the 260 non-fatal cases of incapacitation by injury, 129—or about one-half—were of only two weeks or less duration. Of the remainder, 65 were over two and

not over four weeks, 25 over four and not over six weeks, 19 over six and not over eight weeks, and 22 over eight weeks (4 cases extending beyond six months). The amount paid for cases of two weeks and under, and for which therefore the Company would not have been liable under the Act, was £105; while about £215 of the remaining £749 paid for accident allowances was in respect of the first fortnight's disability—making a total of £320 paid for periods not covered by the provisions of the Act. This, of itself, is practically equal to the amount contributed by the men. The average weekly payment during all cases of incapacity equalled 16s. 9d. As already stated, there was only one case of fatal injury.

## THE "LANCET" ON THE METROPOLITAN WATER SUPPLY.

IF the water supply of the Metropolis is not, within the next few years, settled upon a basis which will be satisfactory to everybody concerned, it will certainly not be because the subject has been insufficiently investigated. During the past ten years it has occupied two Royal Commissions, and, in one shape or another, has been inquired into by Parliamentary Committees and Inspectors of the Local Government Board; while a tribunal has been appointed to hear and deal with the grievances, real or supposed, of water consumers. As though all this were insufficient, our contemporary the "Lancet" must needs appoint a Commission of its own to look into the question; and their report, which was briefly noticed in the "JOURNAL" last week, appears in the number for the 21st inst. It deals at some length with the question of control; but we do not see that the conclusions arrived at are of so much more importance than those contained in the report of Lord Llandaff's Commission as to compensate for the expense incurred in arriving at them. Put shortly, the "Lancet" Commission consider that the matters of greatest urgency in respect to the control of the London Water Companies relate to the duties of the Official Auditor and the Water Examiner; and, as far as the latter official is concerned, they think that, in view of the recommendations of both the Balfour and Llandaff Commissions, the Government have no legitimate reason for delay in passing a simple measure to carry them out. This being the conclusion come to by the "Lancet" investigators, it may be of interest to indicate the nature of the inquiry which led them to it, as shown by their report. This is divided into three parts. In the first, they deal with the history and definition of control; in the second, they review the existing statutory provisions for it; and in the third, they offer recommendations and suggestions for further control.

In their introductory remarks, the Commissioners point out that within the past few years two of the London Water Companies have failed to furnish their customers with an adequate supply of water; and they go on to say that the fact that certain parts of London were imperfectly served, has brought into prominence the whole question of the Metropolitan Water Supply as it at present exists. But they hold the opinion that, in the case of a rapidly spreading city like London, a knowledge of present requirements merely is not sufficient; it is necessary to look to the future. They sketch what they consider would be an ideal supply of water for London. They say "the quality of the water should be pure, and derived from sources beyond the suspicion of pollution; and the quantity should be adequate, not only for domestic supplies, but sufficient to give an unstinted amount for municipal purposes." The public fountains should not be allowed to run dry, the ornamental waters should be clear and bright, and the whole flow of the Thames and Lea should be allowed to pass down to cleanse and scour the lower reaches of the river. The Commissioners evidently do not think this condition of things would be ensured by going to Wales, because they say that "a scheme which would give such results has yet to be devised;" and they realize the fact that if it were devised it would take many years to carry out. The question as to whether the people of London should obtain their supply of drinking water from some pure source at a distance is, they consider, not likely to be settled until the extent of the present sources of supply is definitely known; and, notwithstanding all that has been said, we are told that we are not yet in possession of "complete and accurate information on this matter." The Commissioners do not regard the results of the inquiries by Lord Balfour and Viscount Llandaff as thoroughly satisfactory. They say the report of the Commission presided over by the former is not "entirely reliable" on the subject of the available quantity of water; while "a careful study of the Llandaff report throws great doubt on the financial expediency of purchase," even if the Thames and Lea are equal to yielding a sufficient supply. As to control by a Water Board, they think that considerable opposition would arise if any attempt were made by the Government to carry out the recommendation for the formation of such a body; and also that it would be waste of time for Parliament, in the present state of knowledge, to attempt any legislation dealing financially with the water supply of London. The Commissioners are careful to point out that it by no means follows that nothing should be done. On the contrary, they express the opinion that information which is at present lacking should be collected and carefully considered before any decision is arrived at as to the future sources of water for London.



This information, they think, is only obtainable by instituting additional measures of control over the Companies.

The Commissioners next proceed to deal in detail with the existing statutory provisions for control. They discuss the obligations of the Companies to lay mains and provide and supply water for domestic purposes, and review the measures of control now exercised by the Local Government Board in respect of the quality and quantity of water to be supplied and of the financial proceedings of the Companies. This brings the Commissioners into touch with the Water Examiner and the Official Auditor. The provisions of the Metropolis Water Act, 1871, under which these officials are appointed and their duties defined, are given in full; and the rest of this chapter is devoted to a consideration of the Companies' powers in regard to the payment of dividends and the issue of new capital—the operation of the sinking-fund clause, now general in the Companies' Acts, being explained. This portion of the report does not call for further notice.

In their concluding chapter, the Commissioners set forth their recommendations and suggestions for further control. They deal first with the available sources of supply as submitted to Lord Balfour's Commission, and subsequently to Sir Joseph Pease's Committee in 1896; and they score a point in consequence of a discrepancy in the evidence given on behalf of the New River Company. Before the Commission, the Chadwell spring and wells were represented as capable of providing 34 million gallons of water daily; whereas before the Committee the quantity was put at 10 millions less—this allowance being said to be necessary for machinery not in use. Owing to this difference on the wrong side, the "Lancet" Commission consider they are justified in characterizing as "worthless" the conclusions arrived at by Lord Balfour's Commission on the quantity of water available; and they say no more about them. With regard to quality, they point out that the Commission recommended that greater power should be placed in the hands of the Water Examiner, and that regulations should be made with respect to the filtration of water. Another recommendation was that the Companies should be obliged to give accurate information as to the quantity of water pumped from their wells, and as to the height of water in them. The Balfour Commission offered two suggestions which they regarded as important factors in the consideration of the Metropolitan Water Question. They first recommended the extension of the jurisdiction of the Conservators of the Thames to all the tributary streams (which was done by the Act of 1896); and, next, the placing of the Water Examiner in such a position that he could exercise his authority in the direction of ensuring greater efficiency in the filtration of water.

The Commissioners now come to the long inquiry conducted by Lord Llandaff. After setting forth the terms of reference, they allude to the recommendation as to the intercommunication scheme, and commend the promptitude with which Parliament, in a case of emergency, passed a measure which was "undoubtedly for the public interest," and they trust this will encourage the Government to "deal without delay with the pressing needs of the people of London in regard to the water supply." Proceeding to review the recommendations of the report of Lord Llandaff's Commission, they dismiss as "impracticable at present" the proposal to establish a Water Board—the cases of Surrey and Kent being cited in justification of their conclusion. They point out that the Chairman of the Surrey County Council thought purchase of the water undertaking by any authority was undesirable; while purchase by the London County Council was, as far as Surrey was concerned, "the worst possible basis of settlement which could be arrived at." As to Kent, they think that if a water-bearing area were to be under the control of any authority other than the Council of the county, the interests of the people would be sacrificed to the wants of London. The suggestion made to Lord Llandaff's Commission was that the Kent Company's area should be left intact; and the "Lancet" thinks this would be the best solution of the problem as far as that county is concerned.

Coming to the question of the control recommended by the Balfour and Llandaff Commissions, the "Lancet" investigators consider that the things of greatest urgency may best be discussed under the headings of financial and general control. They acknowledge that the former is now in many respects satisfactory. Water-rents are not generally excessive; dividends are limited by Acts of Parliament; and fresh capital is subject to the sinking-fund clause. The unsatisfactory feature to their minds is that the Official Auditor occupies an anomalous position—being appointed by the Local Government Board and paid by the Water Companies, and having no power to incur expense for any legal advice he may require in the discharge of his duties. The Commissioners think this state of things should be altered without delay. They agree with Lord Llandaff and his colleagues that provision should be made for the Auditor to have Counsel's advice paid for by the Local Government Board; and they consider that he should also receive a liberal salary, which should not be paid by the Companies whose accounts he has to check in the public interest. The Water Examiner, too, occupies an equally anomalous position, inasmuch as, being a public official, he is paid out of the profits of private business, while the information which he furnishes to his Department is supplied to him by those who pay him. The "Lancet" Commissioners agree with the suggestion of Lord

Balfour's Commission that a distinct obligation should be laid upon any company or local authority pumping water from the chalk for purposes of public supply to keep accurate observations of the effect of these operations on the level of the water in the wells, and return the results to the Water Examiner under regulations to be framed. The suggestions for control which were made by the late Water Examiner (Major-General Scott) during the sittings of the Llandaff Commission are given; and the report closes with the following suggestions:—

The Auditor appointed by the Local Government Board should be in all respects an officer of that Board, and his salary should be paid from public sources. He should, when he wishes it, in the case of any difference with the Water Companies, have the advice and help of the Law Officers of the Crown.

The Water Examiner appointed by the Local Government Board should have access to all parts of the Metropolitan Water Companies' undertakings. He should be entirely responsible for the report which he issues monthly. The Companies should be obliged to place at his disposal every facility for making the several investigations which he wishes. Every investigation which the Water Examiner makes should be done either by himself or by officers appointed by him. Any analyst he may employ should be nominated by himself, and all the necessary expenses entailed in carrying out the work necessary for him to give full and accurate information should be paid by the Government department.

The Commissioners think that no member of Parliament representing any part of Water London, whatever may be his political conviction, could fairly object to the measures of control indicated above; and any member for a Metropolitan constituency who failed to support the Government in passing a measure for the benefit of the whole of the water consumers, would, they consider, richly deserve to lose his seat at the next election. They add that, though the Metropolitan Water Supply is not, as pointed out by Mr. A. J. Balfour, an Imperial question, it is one of great importance to the people of London, and should not be treated as a party matter.

#### PERSONAL.

Mr. JAMES CURRIE, Manager of the Inverkeithing Gas Company, has been appointed Manager of the Tranent Gas Company, in succession to Mr. J. Robertson.

Mr. J. BRUCE, of Coupar Angus, has been selected out of 26 applicants for the position of Manager of the Lockerbie Corporation Gas-Works, in succession to Mr. ROBERT YOUNG, who has obtained a similar appointment at Youghal.

Mr. W. A. SURRIDGE has been appointed Chairman of the Herne Bay Gas Company, in succession to Mr. A. V. Newton, deceased; and Mr. P. A. Newton has been elected a Director of the Company in the place of his late father.

The interment of the late Mr. EDWARD MARFLEET, the Secretary of the Newport (Mon.) Gas Company, whose sudden death was recorded in the "JOURNAL" last week, took place on the 23rd inst. at Cambridge, from which city he went to Newport early in 1872.

Mr. W. J. WARNER is about to tender his resignation as Engineer and Manager of the South Shields Gas Company—a position he has held since 1864; and it will be seen by an announcement which appears elsewhere that the Directors are inviting applications for the appointment.

It has been decided to invite the inhabitants of Stafford to subscribe to a fund for making a presentation to Mr. J. FERGUSON BELL, who, during the seventeen years he held the position of Gas Engineer to the Corporation, made, both in public and private life, a large number of friends by his high character and his kindly disposition. The proposal is, we believe, being very cordially received. Mr. Bell yesterday took up his new appointment at Derby.

Mr. A. HORACE BROOKMAN, eldest son of Mr. Alfred H. Brookman, Engineer and Manager of the Tenby Gas-Works, has secured the appointment of Manager to the Pembroke Docks and Town Gas Company. Mr. Brookman has been Assistant to his father at Tenby during the past seven years. At a meeting of the Directors of the Tenby Gas Consumers' Company on the 25th inst., the Chairman (Mr. H. T. Smyth), referring to Mr. Brookman's resignation, expressed their regret at losing his services, but at the same time heartily congratulated him on his appointment, and wished him success in his new position.

Mr. A. WADDELL, of Broughty Ferry, has been appointed Engineer and Manager to the Dunfermline Gas Commissioners, in succession to Mr. Hubert Pooley, who has been appointed to a similar post at Stafford. There were 38 applicants. Out of these a short list was formed, consisting of the following: Mr. John W. Allin, Assistant-Engineer at St. Helens; Mr. J. H. Brearley, of Longwood; Mr. G. Keillor, of Peterhead; Mr. S. B. Langlands, of Coleraine; and Mr. A. Waddell, of Broughty Ferry. These were asked to meet the Commissioners last Friday. Mr. Brearley wrote that he had received a substantial increase to his salary, and had elected to remain. The other four attended, and were interviewed by the Commissioners. It was agreed to put to the vote only the names of Mr. Allin and Mr. Waddell. At the first vote, Mr. Waddell received the support of eleven out of eighteen members, and was thus elected. Mr. Waddell enters upon his new duties in a month. Mr. Pooley left Dunfermline yesterday (Monday). Mr. Waddell was a pupil of Mr. G. R. Hislop, of Paisley. He holds Government



certificates for chemistry and drawing. In 1885 he was appointed Manager of the Newtownards Corporation Gas-Works, and remained there till he was appointed to Broughty Ferry, in 1893. During his management at Newtownards, the price of gas was reduced from 7s. 6d. to 4s. 2d. per 1000 cubic feet; the works being, in the same period, very largely altered and extended to about double their capacity. Since he went to Broughty Ferry, the gas-works have been almost entirely reconstructed; and the price of gas has been reduced from 4s. 2d. to 2s. 11d. per 1000 cubic feet.

#### OBITUARY.

We regret to learn of the death in Bombay, on the 25th inst., from cholera, of Mr. REGINALD ARTHUR GANDON, fifth son of Mr. Charles Gandon, M.Inst.C.E. Deceased, who was only 23 years of age, obtained early last year the appointment of Assistant-Engineer to the Bombay Gas Company.

Mr. GEORGE AULDJO JAMIESON, a Chartered Accountant widely known in Scotland, head of the firm of Lindsay, Jamieson, and Haldane, C.A., of Edinburgh, died very suddenly in the New Club, Edinburgh, on the evening of Thursday, the 29th inst. His family having gone to the country, he dined at the Club, and was intending to travel to London that night. At the close of the dinner, however, he was seized with apoplexy, and died in two hours. Mr. Jamieson was a member of the Town Council of Edinburgh from 1889 onwards. It was his intention to retire from the Council in November. At a recent meeting, he asked to be allowed to address the Council, as he said, "for probably the last time," which it has proved to be in another sense than was intended. Mr. Jamieson was an unflinching opponent of the scheme for the transfer of the gas undertakings to the Corporations in 1887, in which capacity he came prominently before the public prior to his entering the Town Council.

The death has occurred at Edinburgh, with almost tragic suddenness, of Mr. JAMES WILSON, M.Inst.C.E., the Engineer to the Edinburgh and District Water Trust. Mr. Wilson was trained in the office of Mr. James M. Gale, of the Glasgow Corporation Water Department, and was afterwards appointed Engineer and Superintendent of the Greenock Corporation Water Department. He served in that capacity for 25 years. On the death of Mr. Alexander Leslie, the head of the firm of Messrs. J. & A. Leslie and Reid, of Edinburgh, who had been for a long time the Engineer to the Edinburgh and District Water Trust, Mr. Reid became Engineer; and he took Mr. Wilson as partner. Mr. Reid only held the office for a few months, and on his death Mr. Wilson received the appointment of Engineer to the Trust. At that time the subject of the provision of an additional water supply was under the consideration of the Trustees. They had resolved upon impounding the waters of the Manor, a tributary of the Tweed; but on its being found that the supply was inadequate, the Trust fixed upon the Talla and other streams further up the Tweed as the new source. It was one of Mr. Wilson's first duties to prepare plans for the works connected with the additional supply. The works have been in progress for several years, under Mr. Wilson's supervision. The labour has been arduous, having been rendered more so by its being necessary to transfer one of the principal contracts from one firm to another. Mr. Wilson's health gave way under the strain, and he was allowed three months' leave. He returned from the South of France a few weeks ago, much improved in health. Last Friday week he went on a visit of inspection to the Talla works. When he returned on Saturday night, he appeared to be very much wearied; and sitting at tea he suddenly became unconscious. Medical aid was procured, but it was of no avail; and he passed peacefully away in little more than an hour. Mr. Wilson's advice was largely sought in matters relating to water supply. He was consulted by the Corporation of Belfast in their scheme for the compulsory purchase of the drainage area of their reservoir. He gave advice to the Falkirk and Larbert Water Trust in relation to their works at Little Denny. It was upon his advice that the Corporation of Stirling abandoned a proposal to provide the town with electricity generated by a turbine wheel driven by the town water. He advised the Corporation of Arbroath to adopt a gravitation scheme of water supply. The Corporation, instead, proceeded to develop a pumping scheme, which Mr. Wilson maintained, to the last, would be a failure. He was also one of the advisers of the opposition when the Highland water power scheme was before Parliament two sessions ago, and was rejected. Mr. Wilson's remains were interred at Greenock. He is survived by a widow, four sons, and one daughter.

#### NOTES.

##### Domestic Hot-Water Fitting.

The subject of domestic hot-water supply was brought before the recent summer meeting of the Institution of Heating and Ventilating Engineers, in a masterly paper, by Mr. Dye, which, with the discussion, is reported in the "Ironmonger" for July 14. It is safe to say that this important branch of household plumbing work is not well understood by people outside the trade. It

is also an accessory of modern houses which has not usually been developed beyond the barest elements of the successful supply of one bath and two or three hot-water taps. Mr. Dye remarks himself that ordinarily a domestic hot-water circulating apparatus is considered sufficient if the boiler is capable, the hot-water reservoir (cylinder or tank) of proper size, and the piping arranged to secure a free and efficient circulation. This combination is not always found; but, in addition, there is one detail which is frequently neglected. This is the connection of the branches so that the taps shall yield the hottest water only, and all there is of it. It is quite common to find the branches so connected that it is impossible for hot water to flow out without at the same time cold water coming with it; and sometimes, after a little hot water has run, it will be followed by cool and cold water, although there may still remain a fair store of hot water in the reservoir. Mr. Dye explains how the best results may be attained, both with the tank and cylinder systems. He appears to favour a combination of these two systems, with both tank and cylinder of half the ordinary size, so as to share the work between them. In the course of the discussion, it was stated that the smallness of the pipes is a common cause of dissatisfaction with hot-water systems; and also that in large houses, where there are two baths and more than three or four hot-water taps, the usual kitchen range boiler is not powerful enough. Nobody mentioned independent gas-heated boilers in this connection.

##### Paints Upon Iron.

The oil and paint expert of the "Ironmonger," discoursing on the subject of paint upon iron, makes a point of the difference between the surface of wrought iron and that of castings. As is generally known, cast iron has a hard skin which it should be the care of the founder to preserve by giving the castings an early coat of priming, before rust has had time to attack the metal. On the other hand, wrought iron comes from the mill with a scale on its surface which should be cleaned off before painting. Some rolling mills are said to paint their output while it is yet warm; but the practice is regarded as a questionable one, as the mill-scale is underneath, and may come off. It would be useful to know the truth about this matter; because it is notorious that the perfect cleansing from scale of heavy rolled girders, and similar unhandy pieces, is rather a counsel of perfection. Between two risks, probably that of painting while yet warm from the rolls is to be preferred. It must be remembered in this connection that the substance of which mill-scale is chiefly composed—the black oxide of iron—is in itself a protective against rust. If the scale were always firmly adherent to the metal beneath, no painting at all would be necessary for the purpose of protection; but it is not so adhesive, after the piece has been exposed to the atmosphere for a time. The question, therefore, remains whether quick painting is not on the whole the best treatment for large rolled sections. It is remarked that, in dealing with ironwork, the utmost care should be exercised to use only a thoroughly good and pure linseed oil—Baltic oil for preference—as elasticity of the medium is of the first importance. Just now, when pure linseed oil is fetching nearly £35 a ton in the wholesale market, it is vain to expect to buy it under 3s. per gallon; and best Baltic oil will cost very much nearer 3s. 6d. This is another instance of the greatly enhanced value of all gas-works and engineering supplies.

##### Orde's Liquid Fuel Burners.

A good deal of attention is being devoted, at this time of dear coal, to the oil-firing of steamships. The idea, of course, is old; but this is precisely one of those engineering expedients which wax and wane in attractiveness for commercial, rather than technical, reasons. According to a contemporary, some exceptionally large oil-tank steamers are being fitted for burning liquid fuel upon a system devised by Mr. Orde, Chief Engineer to Messrs. Sir W. G. Armstrong, Whitworth, and Co. The principal feature of the novel arrangement consists in the pre-heating of the air, steam, and oil, which is pumped to the furnace. The injector also consists of a triplicate concentric set of tubes, whereof the inside one conveys the oil, the next carries the steam for atomizing it, and the outside tube is for the air which supports combustion. The oil-pipes are carried in spirals through the smoke-box of the boilers; and the ordinary furnaces are simply provided with a brick bridge 3 ft. 6 in. deep where the oil burns. The only air supply is that carried in by the injector; so that a high degree of regulation is possible. The steam for atomizing is superheated; and it is claimed that the work is done with a consumption of 3 per cent. of the steam generated. From a test of several hours' duration, it appears that perfect combustion of the oil took place; the smoke gases showing 13 per cent. of carbonic acid, with about 4 per cent. of oxygen. The evaporation of the boilers (Scotch marine type) was at the rate of about 15 lbs. per pound of water from and at 212° Fahr. Not the smallest gain by this method of firing steamship boilers is the supersession of ordinary stoking, so penible in tropical climates. It has hitherto been understood that the necessity of making up for the steam lost by the oil-injectors is the chief drawback to the use of liquid fuel at sea. It is stated, however, that, whereas this loss used to be as much as something like 10 or 15 per cent. of all the steam made, it is now, by Orde's system, reduced to not more than 3 per cent., which is certainly within reason.



## TECHNICAL RECORD.

### NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

The Thirty-ninth Annual Meeting of the above-named Association was held in the Freemasons' Hall, George Street, Edinburgh, last Thursday. Mr. W. EWING, of Hamilton, the President for the year, took the chair at eleven o'clock, at which time there was a large and representative gathering of members present.

#### DEPARTED MEMBERS.

The PRESIDENT said that since their last meeting they had lost by death three members of the Association—Mr. D. Bruce Peebles, of Leith; Mr. J. Robb, of Haddington; and Mr. Graham Ross, of Stonehaven. Mr. Peebles, they well knew, was a man of very inventive mind; and Mr. Robb was twice President of the Association.

#### THE COMMITTEE'S REPORT—METER-UNIONS.

The SECRETARY (Mr. R. S. Carlow, of Arbroath) read the annual report of the Committee. It set forth that the benevolent fund had been drawn upon to the extent of only £10 during the year; this sum having been paid to one deserving case. The Committee expressed their pleasure in submitting the following intimation received from the Secretary of the gas-meter makers: "The gas-meter makers have had several meetings with the view of arranging to supply interchangeable unions in Scotland, and are glad to be able to state that, on and after the 1st of January next, they hope to be able to supply them."

Mr. T. NAPIER MYERS (Saltcoats) asked if this would be an appropriate time to put a question with regard to the matter of meter-unions. He would like to know if what had just been announced was in line with what had been already recommended to them, or if there was still to be a difference between the screws put out by the different makers, because this would be introducing another thread. It would be out of the line of meters in use, and it would not be as had been recommended to them.

The SECRETARY said he could not give any information regarding screws or anything else. He only got the intimation into his possession two nights previously, with the following letter—

Milton House Works, Edinburgh, July 23, 1900.

My dear Sir,—In reply to your inquiry, I have been asked to acquaint you with the present position of matters; and it is hoped that the enclosed intimation will prove a satisfactory solution of the question, on the lines agreed upon a year ago.—Yours truly,

for Jas. Milne and Son, Limited,  
D. MACFIE, Managing-Director.

About screws or threads there was no information whatever. They were to be "interchangeable unions;" but he could not give any details.

Mr. MYERS asked if it was expected that the Association would sanction or give its *imprimatur* to this proposal without knowing what was proposed, if the arrangement which was now suggested to be carried out was not in agreement with what they had already accepted and passed.

The PRESIDENT: It is only a proposal, so far as I understand; and it is optional whether we adopt it or not. We are not asked to adopt it.

The SECRETARY said if the meter makers had come to a decision among themselves that they were going to supply interchangeable unions, he did not consider that, in the meantime, they should interfere, because they might put the question just as far back as ever it was. He thought they should allow the matter to develop itself a little further before they interfered with it at all.

Mr. A. BELL (Dalkeith) said he thought what Mr. Myers wished to put was whether they were to understand that they were to have a special size of coupling for each meter. Their proposals were to restrict the number of couplings; three to five lights were to be one size, and five to ten lights another. He thought that what Mr. Myers meant was whether this was what was to be adopted, or whether it was simply to be an ordinary coupling, with a uniform thread. It was a great difficulty with them all that when they had to change from a three to a five light meter they were obliged to cut off the coupling, and put in a new one. In a small works, this was a great difficulty.

The SECRETARY said he thought that what the meter makers meant was that they proposed to supply couplings which were interchangeable; but he did not think they meant to adopt the standard couplings they had had before them. He had seen Mr. Macfie upon the subject, and what he gathered from that gentleman was that they had come to the decision that they would supply interchangeable couplings; but he gave no further information. They could shift any size of meter, either from a three to a five or from a five to a ten; they could take out the one and substitute another, either of the same or of a different maker.

Mr. MYERS suggested that inquiry might be made, and the result intimated in the afternoon.

This was agreed to; and it was subsequently announced that no further information had been obtained. Thereupon,

Mr. G. KEILLOR (Nairn) asked if they were to understand that the meter-makers were to make the unions so that they could attach a three-light for a two-light meter, a five-light for a

ten-light, or a fifteen-light for a five-light. If that were so, it would be very much easier for everybody.

Mr. A. MACPHERSON (Kirkcaldy) said that so far as he knew, the whole of the meter-makers were to make their threads so that they could exchange a two-light by Milne for one by Alder and Mackay or Cowan, or any other maker. At present they could not; they must cut the coupling off, and re-solder the coupling. He understood that what the meter-makers had consented to do was to make all the couplings for the different sizes interchangeable, so that they would not require to cut the couplings off.

Mr. KEILLOR asked if it would not be better to make the two-light and the three-light couplings the same size.

Mr. MACPHERSON said that certainly was not the remit which was made by the Association, which, he thought, was to try to get the one size of meter to interchange with the same size of another maker; and he understood they were prepared to do this.

The HON. SECRETARY said that the meter makers did not commit themselves in any way in the meantime. It might be the couplings for a two-light and a three-light meter would be interchangeable; and he had no doubt that this was the intention of the meter makers, because he thought they were going very much on the lines suggested by the Association. But what they wished to avoid was giving out that they were to furnish any special coupling, belonging to any particular maker, or even to the Association. He thought the best thing they could do was to leave the matter in the hands of the Association in the meantime, till they would see what was proposed to be done by the meter makers. He had no doubt but that the matter would work out satisfactorily in the end.

The report of the Committee was adopted.

#### THE ROLL OF MEMBERSHIP.

The SECRETARY reported that the year was begun with 245 members; and resignation and death led to the removal of 18. There were applications from the following for admission to the Association:—

*Ordinary Members.*—Cunningham, A. M., Kilmalcolm; Duncan, J., Kirriemuir; Fairweather, W., Kilmarnock; O'Neill, T., Dunbar; Shiell, J., Moffat; Turner, J. S., Thurso; Young, W., Penicuik.

*Associates.*—Campbell, J., Dunfermline; Milne, S., Aberdeen; Robb, D. J., Hamilton; Keillor, J., Falkirk; Stevens, J. S., Renfrew.

#### THE AUDITOR'S REPORT.

Mr. R. B. MAIN (Glasgow), the Auditor, then presented his report upon the accounts of the Association for the past year. He said that a year ago he had the pleasure of submitting a very satisfactory financial statement; and he was glad to say that this year it was very much better. There was somewhere about £45 more in hand than they had twelve months ago. This, he thought, was exceedingly satisfactory. He hoped the funds would go on increasing. He had nothing really to do further than to bear testimony to the excellent manner in which Mr. Carlow looked after the books and accounts of the Association.

The funds of the Association amount to upwards of £400, of which the benevolent fund comes to over £230.

The PRESIDENT proposed a hearty vote of thanks to Mr. Main, which was carried, and duly acknowledged.

#### THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

#### INAUGURAL ADDRESS.

Gentlemen,—Kindly accept my sincere thanks for the honour you have conferred on me by appointing me to be Chairman of this Association. It was an honour I had never looked for; and, consequently, it came as a great surprise to me to find myself so exalted. Words cannot express my intense feelings of thankfulness for the courtesy and kindness shown to me during my term of office; and should my humble efforts have fallen short of your expectations, I trust you will overlook any shortcomings.

It is not my intention to trouble you with scientific details of gas manufacture, which is always much better left in the hands of such able and energetic experts as Professor Vivian Lewes, Mr. W. Young, and others who have contributed many valuable papers to the different Associations connected with gas manufacture, the outcome of many years' experiment and study.

The gas engineer of to-day has many more working details to consider in his efforts to make good and cheap gas, as compared with several years ago, and therefore cannot find the requisite time to carry on experiments to a successful issue. Hence the reason of the extraordinary value of these contributions which often give the gas engineer, who is always more or less a chemist, a firm basis to start off with practical experiment. Allow me to draw your attention to a valuable lecture delivered last May by Professor Lewes before the Institution of Gas Engineers, on "Water Gas and its Continental Developments," which gives us the key to cheap gas, notwithstanding the exorbitant price we are now paying for coal; and I have no doubt, from the excellent working results shown, that the future of gas manufacture is brighter than ever.

Gas companies and corporations have taken advantage of the rise in price of coal to increase the price of gas, and, I think, in



many instances unjustly. It is natural for gas companies to have their "pound of flesh;" but why should so many corporations show this bad example? In considering the rise in price of residuals, and the yearly increase in consumption, I must say that the financial vitality of a gas-works must be very low if it cannot meet a rise of 4s. or 5s. per ton in the price of coal, with everything else in its favour. Even the "second city of the Empire," which has advantages over us all, has shown the "white feather." Better to risk a slight deficit than stem the increase in consumption, which is the greatest source of profit of all gas-works. We are in the happy position of being able to reduce the price of gas—the present figure being 2s. 1d. per 1000 cubic feet—notwithstanding the fact that we are now paying 15s. 6d. and 15s. 9d. per ton for third-class coals which were formerly bought at less than half these prices.

Gas cookers and fires are still in great demand in Hamilton, and greatly appreciated by those who have them in use; and it is very comforting to find that our day consumption of gas is larger than that during the night. The consumption varies in the daytime from 45 to 75 per cent. of the total output, which is certainly a step in the right direction.

Prepayment meters have not boomed with us, owing to circumstances over which I have no control. There are about 400 in use; and the charge made is 2s. 6d. per 1000 cubic feet, being 5d. over the ordinary rate. My feeling is that we are nearing the time when cookers, heaters, prepayment meters, and incandescent burners will be given free to consumers. I have always been an advocate of this policy; and I have great confidence in saying that the tendency of the times is towards the universal adoption of incandescent lighting, and consequently a reduction of illuminating power by mixing coal and water gas, which will be generally used in a few years. The remarkably cheap incandescent burners now in the market are a great boon to gas consumers, and should surely reduce the complaints of bad gas often needlessly made by them.

Hamilton is often spoken of as the "Widnes of Scotland;" but, unfortunately, we have to work under much greater difficulties than that far-famed town, or any other town of a similar size in Scotland. For instance, take last year: (1) We lost nearly 20 million cubic feet as leakage or unaccounted-for gas, instead of from 6 to 8 millions, the amount for a well-conducted works of a similar size; the balance being due to subsidences caused by coal mining. (2) There are no railway facilities in the works; everything has to be carted at the rate of 9d. to 1s. 1d. per ton. (3) The tar and liquor is sold at a low figure instead of being manufactured into sulphate ammonia, &c., on the works, which would have increased our profit last year by about £1700. In all, the working loss is equal to £3200, or 7d. per 1000 cubic feet. Had these works been conducted under ordinary circumstances, the gas consumers of Hamilton should have been supplied with 23-candle gas at 1s. 6d. per 1000 cubic feet. This disadvantage has to be made up before we can claim to be on the same basis as other works of a similar size.

Local circumstances sometimes help the economy of gas manufacture; and I can confidently say that, given the same facilities, paying the same price for coal, and receiving the same price for residuals at Hamilton as in Widnes, it would be an easy matter for us to supply 18-candle gas at 10d. per 1000 cubic feet, and that with no differential rate to ordinary or prepayment meter consumers, and leaving a record profit at the end of the financial year.

It may be interesting to give a few figures relative to last year's working results, which I consider much behind our present work, as we are now in thorough working order: Coal carbonized, 13,236 tons; gas made, 132,400,000 cubic feet; tar and liquor, 871,111 gallons (liquor over 4° Twaddell); and coke and breeze saleable, 6327 tons. This gives 9½ cwt. of coke and breeze per ton of coal carbonized; and if we consider that cannel coal yields from 2 to 3 cwt. less coke per ton as compared with coking coal, you will not be surprised if I still advocate the simple, "unscientific generator" setting of retorts, at 150 per cent. less cost of construction, against the "scientific regenerative" setting, which so often disappoints and gives inferior results. I have yet to find the regenerative setting which can even bear comparison in yield per mouthpiece, durability, saving of fuel, easy working, and cost of construction with the simple generator adopted at Hamilton.

It has often struck me most forcibly that in most gas-works with elaborate systems of machinery and plant where we expect excellent working results and economical working in every department, the results are most disappointing. Instead of 4d. or 5d. per 1000 cubic feet for total salaries, wages, and collection, it is oftener double that figure. Our salaries, wages, and collection were 5½d. last year, owing to extraordinary work; but in the current year, I do not expect they will reach 4½d. Of course, the extraordinary work caused by underground subsidences sometimes adds considerably to the wages bill. On more than one occasion I have had fifty men on streets searching for escapes.

It has often been said that our works are badly financed, and that we do not write off a fair proportion of our debt. In 1894, the loan capital was £15,350. Since then, there has been spent on ordinary and extraordinary extensions about £32,000; making a total of £47,350. The loan capital now stands at £35,550; showing a payment out of revenue since 1895 of £11,800. This is certainly more than ample, considering that we need only

clear off our indebtedness once in forty years. Since extending the works, their market value has been enhanced by £100,000—a very sound financial position for any community to be in. By the end of this year, the consumption of gas will have trebled as compared with 1892.

For some time past, I have been experimenting with a new form of producer bar, which has given excellent results, and practically does away with the laborious work attending the clinkering of producers—in fact, so far as my experiment has gone, I have seen no clinker. The object of the new bar is to reduce labour to a minimum, save fuel, do away with clinker, and prevent an inrush of cold air while removing ash. It does all that admirably; but owing to it having been only a short time in use, I shall defer giving details of its construction until I am absolutely sure that I can recommend it.

The Corporation of Hamilton have been considering the erection of a sulphate of ammonia plant for several years; and even after deciding to erect a plant, objection was taken to it by adjoining proprietors and tenants on account of a possible nuisance. However, the erection of the plant was delayed, and during the interval we have found a patent plant which exactly suits the circumstances. The patentees are Mr. E. Scott, of London, whose success with plants of a similar kind is a guarantee of its success.

The following is a brief description of the plant: The apparatus differs from the plants commonly in use in many ways which give it advantages worthy the consideration of all interested in the economical production of sulphate of ammonia. Without going into details, I may say that the distillation of ammonia from gas liquor is effected under vacuum instead of under pressure, as is the case with the ordinary type of distilling plant. A great reduction of temperature of volatilization consequent on working under vacuum renders the use of steam under pressure quite unnecessary, and the exhaust steam from the pump obtaining the vacuum is all that is required to effect the distillation of the ammonia from the liquor; and this can be supplemented, when desired, by exhaust steam from any other convenient source. It will therefore be evident that a very great saving in fuel is effected by this plant. Another point which has received special attention is the utilization of the spent heat, and especially the heat evolved from the chemical combination of the ammonia with the acid, which is used to effect the distillation of a further quantity of liquor. The absence of all smell is also an important feature; and as the whole process is conducted entirely under vacuum, it is impossible that any noxious vapours can escape into the atmosphere. The waste liquors are discharged by the pump direct into the sewer or other receptacle at a very low temperature; thus avoiding any smell that might otherwise arise. This matter is of great importance in gas or chemical works surrounded by, or in close proximity to, dwelling-houses, as is frequently the case. It may be mentioned that there is only one pump attached to each apparatus; thus reducing the working parts to a minimum. The whole apparatus, which is very compact and of simple construction, commends itself as a most ingenious arrangement; and I have great hopes that it will be an acquisition to the gas and chemical professions.

Gentlemen, permit me to thank you for your patient hearing; and as we have a long programme of excellent quality before us, I trust we will get through it in the usual expeditious manner, at the same time doing justice to all concerned.

Mr. HUBERT POOLEY moved a hearty vote of thanks to the President for his most interesting address.

Mr. A. MACPHERSON (Kirkcaldy), in seconding the motion, remarked that the address was unique in the list of President's addresses. He thought it was perhaps fortunate for the President that it was not usual to discuss these productions, because there were in it certain passages which he might find somewhat severely handled.

The PRESIDENT returned thanks, and explained that he was unfortunately out of tune. The address was rattled through in about three hours; and he had left out some important details which would certainly have made it rather better in appearance. But time would not permit; and his head was not in working order for figures.

#### THE PAPERS.

There was a list of four papers to be read at the meeting and these were dealt with in the following order: "The Construction and Working of Inclined Retorts." By Mr. W. R. Herring. "Automatic Meters: With a Comparison of Prices Charged. Slot *versus* Ordinary Consumers." By Mr. Thomas Lighbody. "Observations on Retorting and Condensing." By Mr. Forbes Waddell. "Jottings on Some of the Principles of Gas Manufacture, and their Practical Application." By Mr. William Young. In regard to Mr. Young's paper (which will be found in another part of this issue), it was, after some brief discussion, determined that, in the author's unavoidable absence from the meeting in consequence of ill-health, the communication should be taken as read, and included in the "Transactions" of the Association. The other papers submitted will be given, with a report of the discussion that took place, in a subsequent number of the "JOURNAL."

#### ELECTION OF OFFICE-BEARERS.

The PRESIDENT announced that the ballot had resulted in the



following having been elected office-bearers for the coming year :—

*President.*—Mr. W. R. Herring, of Edinburgh.

*Vice-Presidents.*—Mr. Jas. Henderson, of Newton-on-Ayr; and Mr. John Wilson, of the Tradeston Gas-Works, Glasgow.

*Hon. Secretary and Treasurer.*—Mr. R. S. Carlow, of Arbroath.

*Committee.*—Mr. D. Vass, of Airdrie; Mr. D. Robertson, of Dunoon; Mr. W. Blair, of Helensburgh; and Mr. T. Carmichael, of Barrhead.

*Auditor.*—Mr. R. B. Main, of Glasgow.

#### NEXT PLACE OF MEETING.

The PRESIDENT intimated that the next place of meeting would be Glasgow, that city having been selected because of the Exhibition which is to be held there.

#### VOTES OF THANKS, &c.

The PRESIDENT said they had had excellent fare, in the way of papers. They had had one of the best programmes the Association had ever had; and he asked the members to accord a hearty vote of thanks to the gentlemen who had come forward that day, and who had taken so much trouble in the preparation of papers.

This was agreed to.

Mr. H. POOLEY presented Mr. Ewing with the President's Medal for the year. He himself should, he said, take away with him from Scotland his Presidential Medal, which he prized very much; and he was quite sure that Mr. Ewing would prize his equally. He knew he only expressed the wishes of every member of the Association, when he said he hoped that Mr. Ewing might be long spared to wear his medal.

The PRESIDENT thanked the Association with all sincerity for their kindness in presenting him with the medal, which he would certainly greatly prize. His term of office had been nothing but pleasure.

Mr. A. MACPHERSON proposed a vote of thanks to the Secretary. They all knew, he said, the extraordinary energy and enthusiasm Mr. Carlow threw into his duties.

Mr. CARLOW returned thanks, and said that the position of the Association was improving every year. He certainly should do his very utmost to make it this year a practical and a financial success.

This concluded the meeting.

In the evening, a large company of members and their friends—ladies and gentlemen—sat down to dinner in the Balmoral Hotel. Mr. Ewing presided. A brief toast-list was gone through, and a number of songs and recitations were given, which greatly contributed to the enjoyment of a very pleasant evening.

On Friday, a party of about 120 journeyed to Lanark, from whence they drove to the far-famed Falls of Clyde. The walk through the wood was a little oppressive, on account of the heat of the day. Apart from this slight drawback, it was most enjoyable. The Falls were seen to advantage. There was abundance of water; and the spectacle—the grim and rugged rocks standing out amidst the luxuriant greenery of bush and tree, the effect heightened by the glistening white of the roaring cascades—was viewed with delight by the thronging visitors. On returning to Lanark, luncheon was served in the Clydesdale Hotel. Several hours were thereafter at the disposal of the excursionists, in which to view the objects of interest in the ancient Royal Burgh and its neighbourhood. Tea was partaken of about 6 o'clock; and this was the closing proceeding of a meeting in which there had been nothing but happiness and good feeling from beginning to end. The excursionists travelled to and from either Edinburgh or Glasgow, as suited them. The weather during the day was bright and pleasant.

**The North of England Gas Managers' Association and Workmen's Compensation, &c., Insurance.**—Our readers may remember that just before the Workmen's Compensation Act came into force, about two years ago, the Committee of the above-named Association took steps to obtain a minimum rate of insurance for the North of England, and succeeded in securing a 9s. 6d. rate from a non-tariff office—the Ocean Accident and Guarantee Corporation, Limited—when tariff offices quoted twice this amount. In June last year the Committee succeeded in obtaining a reduced rate of 5s. from the office in question. They have again been recently approached by the Committee with the view to a further reduction; but they state that, judging from the extent of the claims they have had to meet, they are quite unable to make any abatement on the 5s. rate. In a circular on this subject issued by the Hon. Secretary of the Association (Mr. J. H. Penney, of South Shields), he remarks that many gas companies are now renewing their policies with the above-named Corporation at the 5s. rate, feeling that some consideration is due to them for meeting the Association so liberally at the outset, when other offices were charging very high rates. But as lower rates have now become somewhat general, the Committee are of opinion that the time has arrived when gas companies and local authorities in the district of the Association may very properly consider themselves free to make their own arrangements with any of the good offices now quoting; there being no longer any reason for the Association to intervene—the purpose for which they previously stepped in having been served.

## PRINCIPLES INVOLVED IN THE PRODUCTION OF GAS BY DIFFERENT PROCESSES, AND THEIR RELATIVE VALUES.

By W. YOUNG.

[A Paper Presented to the North British Association of Gas Managers; Edinburgh Meeting, 1900.]

It is just twenty years ago that I had the pleasure of reading before you a paper on the principles involved in gas manufacture. I prefaced that paper by saying that the success of any manufacture depends very much upon the principles on which it is conducted; or, in other words, upon the correctness of the application of the physical, chemical, and mechanical laws which affect such manufacture. From time to time I had, I said, made jottings of matters which had occurred to me relating to the principles involved in gas manufacture; and believing that these jottings might be of some little value to the members of the Association—more particularly as pointing in the direction in which we were likely still further to improve our manufacture by the proper application of those principles to which I referred—I have, with the view of submitting them for your consideration, arranged and strung them together into something like consecutive order. The remarks I then made very closely describe my position before you to-day.

### I.—USE OF COKE IN GAS MANUFACTURE.

At the date of my former paper, the sole purpose for which coke was used in the manufacture of gas was the heating of the retorts to effect the carbonization of the coal; and the first points then considered were the principles involved in the leading methods of utilizing the heat energy in the coke in order to heat the retorts. First, we had the method known as direct firing, which consisted in passing through the coke on the fire-grate the whole of the air necessary to oxidize the carbon of the coke completely and directly into carbon dioxide, and in utilizing the hot products of complete combustion as perfectly as possible in heating the retorts. Secondly, we had the generator and regenerative methods—deepening the bed of coke on the fire-grate, only admitting sufficient air to oxidize the carbon in the coke to the state of carbon monoxide, and completing the combustion of the carbon monoxide in the flue space around the retorts by means of a secondary supply of air preheated by the waste products of combustion on their way to the chimney.

Since that date, the use of coke in the manufacture of gas has been greatly extended by the introduction of the carburetted water-gas process. In this process, the heat energy of the coke is utilized in decomposing steam and hydrocarbon oil. A still later development in this direction has been brought under the notice of the gas industry by Mr. Carl Dellwik and by Professor Vivian B. Lewes; and in this the heat energy of the coke is still more effectively utilized for the manufacture of gas.

The principles of these respective processes are closely analogous to those of using the coke in heating the retorts; and although the purpose for which the heat energy of the coke is utilized, and the manner in which it is applied, are different, yet, as you are all conversant with both systems of heating retorts, these may, with advantage, be used to illustrate to you the newer processes for the utilization of coke in the manufacture of gas.

#### *Use of Coke in Retort Firing.*

The result of passing the whole of the air through the coke in the furnace during direct firing of the retorts, so as completely to burn the carbon necessary to heat the retorts into carbon dioxide, was, as you all know, to produce intense local heating in the furnace and adjacent brickwork. This caused both the brickwork and the ashes to clinker; making stoking difficult, and shortening the life of the retorts. Besides, there was great trouble in regulating the draught of air through the coke. At first, when the furnace was newly charged with coke and the fuel bed was deep, there was invariably less air than was necessary to burn the carbon of the coke to carbon dioxide. A part of the products remained as carbon monoxide, and a corresponding amount of energy was lost. On the other hand, on the layer of coke burning away, an excess of air passed through the fuel bed, and the excess nitrogen and oxygen of the air had to be heated up to the temperature of the furnace, and carried energy away with them which was entirely lost. It will thus be seen that, for the purpose of heating the retorts, both the principle and the practical application of direct firing were bad.

To overcome these defects, and more perfectly to utilize the heat energy of the coke, what are known as the generative and regenerative systems were introduced. Here we have the bed of coke on the fire-grate made much deeper, and kept at such a depth that the regulated current of air which is passed up through the coke is only sufficient to oxidize the carbon to the state of carbon monoxide; and to prevent local heating and fluxing where the air comes first into contact with the coke, a quantity of steam is mixed with the air, and the carbon monoxide and hydrogen thus produced are, as is well known, subsequently burned to carbonic acid and water vapour. This is done in the flues surrounding the retorts, by means of a secondary supply of air preheated to a high temperature. As there is no difficulty in keeping the bed of coke sufficiently deep to ensure that the regulated supply of air and steam shall combine with sufficient carbon to form carbon monoxide at all times, and as the volume of both the primary and secondary



air can be easily regulated so as to produce the exact quantity of carbon monoxide and subsequently to oxidize it completely to carbon dioxide, in order to supply the necessary heat to carbonize the coal, both the principles and the practical applicability of this method of utilizing the heat energy of the coke for the heating of the retorts are ideally perfect.

#### *Retort Firing and Gas Making Compared.*

The heating of retorts to carbonize coal by the combustion of the coke is, in a sense, a continuous process—that is to say, the heat is being continuously passed into the walls of the retorts. The manufacture of water gas or of carburetted water gas is an intermittent or alternating process. In this process, the heat from the combustion of the coke during the blow-up period is stored up in the contents of the apparatus, and is subsequently utilized in doing the useful work of decomposing water or oil. When the process is confined to the production of water gas alone, then the sole object aimed at during the blow-up period is to get as much as possible of the heat energy from the combustion of the coke localized and stored up in the coke which remains in the apparatus after the blow-up period. When, on the other hand, carburetted water gas is produced, the main object is still to get the heat of the combustion of the coke stored up in what remains; but a small part of the heat is required in order to decompose or crack-up the oil.

#### *The Dellwik Process.*

In the case of heating the retort by what is known as direct firing, we know that the result of passing the whole of the air through the coke bed, so as to burn the carbon into carbonic acid, was to produce intense local heating. Now, while that was a most objectionable condition of matters in the heating of gas-retorts, it is, as explained, the very condition desirable in the intermittent water-gas process, and is the very condition which Mr. Carl Dellwik has so successfully applied in his apparatus. He, as nearly as is practically possible, adjusts the thickness of the layer of carbon in his producer in accordance with the force of his air-blast, so that the carbon will be completely burned to carbon dioxide; and thus he concentrates the maximum possible quantity of heat in the remaining coke. The remaining coke is thus made available for the decomposition into water gas of the steam subsequently passed through it.

The principle of this process is sound; for whether the carbon is directly oxidized into carbon dioxide, or is first oxidized into carbon monoxide and subsequently further oxidized into carbon dioxide, the total number of heat units will be the same per pound of carbon consumed. The whole possible heat will be developed in the presence of the coke, and will be absorbed by it; and it will only be that remaining in the products of complete combustion which will pass away, either to be utilized for other purposes, such as raising steam or preheating steam prior to its being brought into contact with the hot coke, or simply to be blown into the air as is done in the Dellwik process.

In carrying such a principle into practical operation, there are, however, a number of difficulties which must be attended to, or otherwise there will be considerable loss. These difficulties are substantially identical with those experienced in the direct firing of retorts. Unless the quantity of air passed through the layer of coke in the producer is exactly adjusted to the thickness of the layer, so as to carry out the principle of completely oxidizing the carbon to carbon dioxide, there will be loss. If the air is in excess, there will be loss of heat, on account of that excess of air carrying away heat. If, on the other hand, the air is not in sufficient quantity, it does not matter whether the oxygen of the air unites with the carbon to form carbon dioxide or carbon monoxide first; a definite quantity of carbon monoxide will leave the surface of the coke in the producer exactly proportionate to the deficiency in the supply of air.

Now, in no published illustration of the apparatus for carrying out the Dellwik process is there any provision made for maintaining a uniform layer of coke. Coke, when charged into a producer by gravitation, tends to form a heap. The apex of this heap is at the point of delivery, and the heap falls away at the angle of rest; but as the angle of rest for large pieces is less than that for small, the large pieces of coke tend to roll to the tail of the heap in the producer. The tail of the heap of coke in the producer would therefore not only be the thinnest part of the layer, but would also be more open, on account of the larger pieces of coke. The strong air-blast would naturally pass at a greater rate through this thinner and more open part of the layer in the producer than through the deeper and denser part; and if the air-blast were just such as to pass through the open portions of the layer, neither carrying forward free oxygen nor carbon monoxide, then it is evident that the air passing through the deeper and closer part of the fuel bed would not be enough. The result would be the same whether we take it that carbon monoxide is first produced and subsequently oxidized to carbon dioxide, or that carbon dioxide is directly produced. In either event, the carbon dioxide would be reduced to carbon monoxide before it reached the surface of the coke towards the apex of the heap.

If the blast of air were increased, a portion would pass through the thinner and open part of the coke layer; carrying forward some free oxygen which might complete the oxidation of the carbon monoxide at the surface of the deeper part of the layer, and might still be, in part at least, used to heat the surface of

the coke. If, however, the blast were still further increased, the corresponding portion of air would be in excess of that necessary to burn the carbon monoxide, and the peripheral excess of air would lead to waste. These practical difficulties would be accentuated by the intermittent method of charging up the producer.

We thus see that, however beautiful and perfect in principle the Dellwik process may be, it will be necessary, before that principle can be fully utilized, that some arrangement be provided for regulating the thickness and equalizing the openness of the bed of coke to suit the pressure of the air-blast.

Even allowing that a perfectly even bed of coke could be maintained, that during the blow-up period the combustion continued through the entire depth of coke, that the products leaving the surface of the coke are carbon dioxide and nitrogen, and that the whole bed of coke is thus raised to an even high temperature, still it is evident that the products of complete combustion must leave the surface of the bed of coke at a much higher temperature, and consequently carry away with them a larger amount of heat than would have been the case if the bed of coke had been deeper and the carbon dioxide had undergone the heat-absorbing process of being reduced to carbon monoxide. In the same way, in the heating of retorts by direct firing, the products left the surface of the coke at a much higher temperature than do the products from the surface of the coke contained in the generator in the generative and regenerative settings.

Then, again, the thickness of the bed of coke in the producer and the pressure of the blast of air being necessarily correlated with one another, it is evident that there is a limit to the thickness of the bed of coke. Beyond a certain point, the coke would not stand the blast, but would be lifted and carried away in the air-current. Evidence of this restriction in the thickness of the bed of coke is provided in the Dellwik process by the relative durations of the period of blowing up with air and that of gas producing from steam. The thinner the layer of coke that it is necessary to use in the Dellwik process in order to get the blast of air during the blow period to continue the combustion throughout the entire depth of fuel, so as to make it produce only carbon dioxide, the more inevitable it is that the products of combustion should leave the surface of the coke at an extremely high temperature, and the more necessary it becomes that the steam should be passed proportionately more slowly through the thinner bed of fuel, in order to ensure that the oxygen of the steam will, as far as possible, be combined with carbon to form carbon monoxide, and not carbon dioxide. There is no doubt that the relatively longer steaming period in the Dellwik process is due, in part at least, to these conditions.

#### *Carburetted Water Gas.*

In the carburetted water-gas process, the object is still to get the heat energy of the combustion of the carbon of the coke mainly concentrated in the coke remaining in the producer. The principle of the process is to use the energy of the heat of the coke chiefly in the production of water gas; using only a small part of the heat energy subsequently in order to crack up oils to carburetted gas. The relative proportion of the heat energy of the coke so utilized for each of these purposes, and the proportion which is lost, mainly depend upon the constitution of the products of combustion coming from the producer in which the coke is blown up by the blast of air. These products are subsequently used to heat up the brick checker work in the oil decomposing vessels. The proportions respectively utilized and lost also depend upon the constitution of the oils used as the carburetting agents. If the producer products contain much carbon monoxide, it cannot be all burned among the checker work, as it would overheat it, and a part is wasted. The quantity of carbon deposited upon the surface of the checker work is, with some oils, so great that its combustion alone would supply sufficient heat to decompose the carburetting oils.

To carry the principle of the carburetted water-gas process successfully into practical operation, it is essential that there be a due proportion between the combustion of the carbon into carbon dioxide in the producer and in the vessels containing the checker work respectively. It is also essential that the mass of coke in the producer, and that of the checker work in the decomposing vessels, should be able to store up the heat energy resulting from the combustion of the carbon in the respective vessels during the blow period, so as to enable these to do the work of decomposing the necessary quantities of water and of oil during the gas-making period.

Although the great mass of checker work affords considerable elasticity for variations in the relative amount of combustion of the carbon in the different vessels, since it has an equalizing action analogous to that of the fly-wheel in a heat-engine, yet, in practice, the principle of the process has hitherto been rarely attained. This is mainly due to the relative depth of coke in the producer and the pressure and volume of the blast not being adjusted, so as to bring about the due distribution of combustion of the carbon into carbon dioxide among the coke in the producer and amid the checker work in the decomposing chambers.

These defects in working are not, however, inherent in the principles of the process; and the erectors of the plant were quite aware of the advantages of consuming a proper proportion of the carbon into carbon dioxide in each compartment,



and were also aware that the proportions could be practically altered. In a paper read before the Incorporated Institution of Gas Engineers, in 1893, Mr. A. G. Glasgow said: "It is essential, therefore, that the apparatus be so designed that a perfect working balance is maintained between the demand for energy in the fixing chambers and that supplied by the generator when on blast, in spite of wide variations in the quality of fuel. This equilibrium involves, broadly speaking, a correct relation between the area and depth of generator fire and the blast pressures throughout the apparatus; and gradual development upon these lines has finally resulted in overcoming completely the waste due to the presence of carbonic oxide in the blast products."

In a table which accompanied that paper, Mr. Glasgow showed that upwards of 50 per cent. of the heat energy of the carbon is utilized in the production of the water gas. It would thus appear that the principle of the Dellwik process was largely applied in the carburetted water-gas process, and that Mr. Glasgow was aware that, by thinning the layer of coke and increasing the force of the blast, he could increase the amount of water gas produced per pound of carbon, and could thus improve the working of the process.

## II.—DESTRUCTIVE DISTILLATION.

The next jotting in my former paper had reference to the manner in which the heat energy of the coke acted in breaking up and re-arranging the elements of the coal during the process of carbonization. Reference was made to my having, at the previous year's meeting, brought before you samples of gases, all containing exactly the same weights of carbon and hydrogen, yet all having different volumes and illuminating powers. This revealed the strange fact that small volume and low illuminating power may go together. It was explained that these differences in the character of the gases were to a large extent due to the differences of potential energy stored up in the different gases; that the object aimed at in carbonizing our coal was so to transmit the heat energy of the combustion of the coke to the volatile hydrocarbon constituents of the coal that as large a yield of gas of as high an illuminating power as possible might be produced; that these results were largely dependent upon the way in which the heat energy of the coke was made to act upon the coal; and that there were three methods by which the heat can be transmitted to the coal—namely, (1) by direct conduction through the mass of coal contained in the retort, (2) by the convection of the volatile constituents from the coal, bringing them into contact with the walls of the retorts, and (3) by radiation from the walls of the retorts through the volatile constituents of the coal in the empty space above the charge in the retort.

The manner in which the heat acted when applied in these three ways had, on a former occasion, been technically dealt with in detail before a kindred Association; and to that paper you were referred. But it was briefly stated that when the heat energy of the coke is transmitted to the volatile products from the coal by contact between them and the hot surfaces, either of the coked portion of the coal, or by contact with the heated walls of the retorts, or by means of convection, there is an indiscriminate transference of the heat to the various volatile constituents of the coal; that they are in consequence shattered, broken up, and re-arranged in a manner not consistent with our wants; that, on the other hand, when radiant heat acts upon the volatile products from the coal it has a selective action, breaking up and re-arranging the constituents of the coal more in the manner we desire; and that to allow the heat to act as radiant heat, it is absolutely essential that there should be a free space in the retort, and that this free space should be of certain dimensions in relation to the charge of coal.

### *Recent Developments.*

Our knowledge, or at any rate our experience, of the process of carbonization has undergone a large development since the date of that paper. We have had the introduction of various oil-gas processes, inclined retorts, and, latterly, the carbonization of coal in coke-ovens, in all of which the process of carbonizing has been more or less modified.

On several occasions where these different processes have been under consideration, observed conditions and results have been described, and statements have been made regarding them, most of which, while substantially confirming the soundness of the views which were formerly expressed regarding the action of heat during the process of carbonizing, yet indicate a misconception of the fundamental principles underlying the process of carbonization or destructive distillation, and of the observed results obtained.

The object of destructive distillation, as the name implies, is, in the case of gas manufacture, to destroy the existing constitution of the molecules present in the coal or oil, and to re-arrange the constituents into new forms, so as to produce the largest volume of such gas as shall have the greatest heating and illuminating power. As all modes of destructive distillation are progressive—that is, are invariably effected in stages—it follows that in the case of coal, the volatile hydrocarbonaceous constituents must be evolved from the coal mainly as crude oil vapours, accompanied by a small volume of simultaneously evolved gas; and that these crude oil vapours are further decomposed, stage by stage, as heat is poured into them at higher and higher temperatures. If such be the case—and of this there can be little doubt—then the process, and more

particularly the final stages of destructive distillation, can be most readily and conveniently studied by first considering the analogous phenomena observed in the destructive distillation of coal and shale for the production of oil, in the simple distillation of the oils in the process of refining, and in the cracking-up of the oils into gas.

### *Oil Distilling and Refining.*

The object of the oil-distiller is to produce from the hydrocarbonaceous part of the coal or shale as large a yield as possible of liquid paraffins; and he finds that the lower the temperature at which he carbonizes or destructively distils the coal or shale the more perfectly does he attain his object. But even at the very lowest temperature that will decompose the volatile constituents of the shale, a portion is unavoidably converted into permanent gases; and a further portion is also cracked-up into liquid hydrocarbons other than paraffins (mainly olefines). It is further observed that the volume of gas and the decomposition of the higher paraffins into simpler paraffins and olefines not only increase as the temperature of distillation rises, but that they are also still further increased when there is a vacant space in the retort above the surface of the contained shale. It is found, however, on passing through the shale and the vacant space in the retort an inert gas, or else steam, which, at the low temperatures employed, acts as an inert gas would do, that the effect of the high temperature and the vacant space is much reduced; and the oil distiller has been enabled by this means to distil his shale at a slightly higher temperature and in a shorter time than he could have otherwise done.

In the subsequent distillation of the crude oils during the process of refining it was found that, even at the temperatures necessary simply to distil the oils, there was a certain amount of cracking-up. Not only were the higher paraffins broken down, but even permanent gas was produced; and, as in the case of the distillation of the shale, it was observed that decomposition of the oils increased as the vacuous space over the surface of the oils increased. The oil distiller got over the difficulty through keeping the vacuous space at a minimum, and through making the process of distillation continuous—feeding in the oils at the same rate as they distilled; and he employed a current of steam in the still as an equivalent for an inert gas in the retort.

When the respective market values of the heavy and light oils were such as to make it desirable to increase the quantity of light oils, the heavy oils were partially cracked-up, by purposely charging large stills with a small quantity of the heavy oil; leaving a large vacuous space above. The temperature employed was necessarily that at which the oils slowly distilled into the vacuous space, where they were subjected to the radiant heat from the surface of the oils and from the walls of the still. Even at that low temperature the heat slowly cracked-up the heavy oil vapours; large volumes of permanent gas were produced; and light oils distilled over into the condenser.

In conducting such a process, it was observed that the cracking-up got gradually slower; that the residual oils in the still became of a more and more stable character; and that by-and-bye there was a balance between the decomposing power of the radiant heat over the molecules of the oil vapours and the power of the molecules to resist the cracking-up action. The process was never very successful, on account of the light oils produced having a disagreeable smell, which was difficult to remove by chemical treatment; and besides, there was considerable loss by reason of the quantity of gas produced. I merely mention the process as a step leading forward to the further development of decomposition or cracking-up of hydrocarbon vapours, by what has come to be known as the Peebles process.

### *The Peebles Process.*

The principles of this process are, in some respects, substantially identical with those of the process of cracking-up the oil which we have just been considering. The only essential difference in this sense consists in the higher temperature employed, which hastens the process and enables the vapours of the oil to be completely cracked-up into gas and fixed carbon. The oils are similarly run into large cylindrical retorts, and are volatilized into the vacuous spaces over the oils, where they are cracked-up by the radiant heat in an atmosphere of their own vapours. The partially cracked-up vapours are subjected to condensation; the portion cracked-up into permanent gas passing away for use, while the imperfectly decomposed portion is returned to the retort to undergo further decomposition. Ultimately, the whole original hydrocarbon constituents of the oil or tar are fractionally cracked-up stage by stage, and mainly by the action of radiant heat, into permanent gas of high illuminating and enriching power and solid carbon in the form of hard coke.

### *Difficulties Encountered.*

Although, however, the results obtained from the cracking-up of oils and tars prove that the principles of the process are sound, yet, as many of you are aware who have either worked the process or made yourselves conversant with the working of it, the carrying of those principles into practical operation is not unaccompanied by difficulties, both of a mechanical and physical nature.

A study of the causes of those difficulties, more particularly the physical ones, is highly instructive as giving us an insight into the principles involved in the process of destructive distillation.



Experience in the working of the process shows that, owing to the chilling action consequent upon the evaporation of the stratum of liquid oil or tar on the bottom of the retort, the lower parts of the retort contract while the upper parts remain expanded, causing fractures at the lower parts; and when the retorts are made of fire-clay to stand the higher temperature required for the cracking-up of the tar, the retorts get disintegrated and lengthened through the tars being absorbed by the porous clay, more particularly at the cooler parts where they pass through the front walls and join the iron mouthpieces. The oils or tars thus absorbed swell up in the final coking process with enormous force, and push out the front walls.

The physical difficulties arise from the fact already referred to, in the kindred process of cracking-up the heavy oils into lighter ones, that as the cracking-up process progresses, the portion of the vapours left undecomposed becomes more and more stable in character. Those of you who have worked the process will have observed that on starting it with fresh oil each retort would produce (say) 500 cubic feet per hour, that although the heat upon the retort was kept as nearly as possible at the same temperature, and although the stream of oil and condensed residues flowing back into the retort was also kept the same in quantity, the make of gas would day by day fall away, till it became less than half of what it had been at the time of starting with fresh oil. That observed fact made it perfectly evident that under the conditions obtaining there was a relation between the constitution of the hydrocarbon vapours in the retort and the proportion of those vapours that could be cracked-up by heat of a given temperature; and that as the vapours got changed in character by the action of heat of a given temperature, what remained became more stable and more able to resist the cracking-up influence of that temperature.

There were three ways in which the make of gas could be increased: (a) By increasing the flow of mixed oil and residues returning to the retort, while keeping up the heats upon the retort to the same temperature; (b) by raising the temperature of the retort and retaining the original rate of flow of oil and residues into the retort; or (c) by increasing the flow of oil and residues into the retort and, at the same time, increasing the temperature of the retort.

When the flow of oils and residues into the retort is made so large that the quantity of fresh oil present in the flow is equal to the original stream of oil, and the temperature of the retort is kept the same, the make of gas is increased; but not in proportion to the increased flow. It is not even equivalent to what the oil present in the flow would have produced had it been isolated from the residues. This shows that the vapours from the residues are not only left uncracked, but that they have a preservative action. They prevent the oil vapours from being cracked-up; and thus they act as steam or an inert gas did in the process of destructively distilling shale in order to obtain oil, and in the subsequent distillation of the oils. The conditions which were highly beneficial when the object was to obtain liquid products, are thus objectionable and detrimental when the object is to convert the oils into permanent gas.

When it is attempted to increase the yield of gas per retort by either (b) or (c) methods, the volume of gas increases; but the illuminating power, and more particularly the enriching effect per unit of oil, fall away. The increased temperature necessary to overcome the preservative action of the more stable residual vapours thus has not a beneficial but an injurious effect; besides which, it involves waste of the energy of the fuel employed to heat the retort.

The better method was found to be to continue the process of cracking-up the oils and residues up to a certain stage—that is, so long as the vapours of the residues did not interfere to any injurious extent with the cracking-up of the oil vapours. Then, on the cracking-up process reaching that stage, the residues are cracked-up by themselves; the temperature of the retort being raised till all are reduced to gas and coke.

#### *The Causes of These Difficulties.*

An analysis of successive portions of the residues and of the gases, as the process of cracking-up progresses, reveals the reason for these observed results. One would naturally suppose that it would be the vapours of the most volatile hydrocarbons that would be first cracked-up, and that the more stable compounds present in the residues would be those having a high boiling-point. Such, however, is not the case; for as the cracking-up process progresses, it is found that the higher paraffins—the olefines, and, if present, the oxy-hydrocarbons—are the first to yield to the action of the heat. During the early stages of the cracking-up of coal tar, the gas sometimes contains from 15 to 20 per cent. of carbon monoxide, derived from the cracking-up of the creosols, carbolic acid, &c. As these compounds disappear, the vapours of the homologues of the benzol series appear in increasing quantities, and as, in turn, they disappear, pure benzol and naphthalene make their appearance in increasing quantities. Ultimately, in the case of the cracking-up of coal tar, the sole distillate from the residues, during the last stages, forms a solid cake of naphthalene.

It is thus seen that for the major part the stable compounds left in the residues are highly volatile. On being returned to the retorts, they simply volatilize at the low temperature; and, being highly stable, they act after the manner of an inert gas,

preventing the oil vapours from being cracked-up by the radiant heat. It would thus mainly be the portions of the vapours which come into direct contact with the hot walls of the retort that are cracked-up into gaseous compounds. On stopping the oil supply and cracking-up the residues, by returning them again and again to the retort by themselves, one portion of the residues is cracked-up into permanent gas; and that gas serves as the vehicle or medium for taking up the remaining uncracked but volatile benzol, &c., in diffusion.

#### *Remedies.*

These observed results naturally suggested the use of a supplementary supply of gas, obtained from sources outside the oil, to take up the benzol and other volatile hydrocarbons as these were produced by the decomposition of the oil. Both water gas and ordinary low-quality coal gas, unsaturated with hydrocarbons, were used, and both with success. These gases were introduced into the hydraulic main of the oil-gas plant, among the warm products from the oil. The gas was thus enabled to take up, and hold in diffusion, these volatile vapours that would have otherwise been condensed and returned to the retort, and interfered with the cracking-up of the oil. Not only was the make of gas per retort per hour thus considerably increased, but there was a large increase in the illuminating value per unit of oil used. When the oils were cracked-up by themselves, and the resulting gas was used to enrich the coal gas, a gallon of oil yielded from 1600 to 1700 candles of enrichment; but when the coal gas was brought into contact with the hot products from the decomposition of the oil, the enrichment went up to 1800 to 2000 candles per gallon of oil. The reason for this great increase was that, while a gallon of volatile hydrocarbons as distilled from the residues, when diffused through coal gas, gives an enrichment value of from 4000 to 5000 candles, the same gallon of liquid hydrocarbons, if cracked-up so as to produce gas from one portion to take up the remaining part in diffusion, only produces from 500 to 600 candles illuminating power.

#### *Effect of Inert Gas.*

From what has already been said as to the principles underlying the decomposition of hydrocarbons, it will be evident that to have admitted water vapour or other unsaturated gas into the retort among the vapours of the oils and residues would have increased the difficulty in effecting the decomposition of those vapours. When, as in the case of the carburetted water-gas process, the oil vapours have to be cracked-up in the presence of the inert water gas, it has been found necessary to make the vacuous spaces through which the combined gas and vapour passes extremely narrow or thin, so that the radiant heat never has more than a short distance to penetrate in order to reach the vapours; and, besides this, the surface of the brick checker work is made enormously great in proportion to the quantity of oil vapours to be decomposed.

#### *With or Without Inert Gases in Cracking-Up?*

As already stated, it has been frequently asserted that when oils are cracked-up by having their vapours diffused through an inert gas and subjected to the decomposing influence of heat, they are cracked-up in a manner which yields a higher illuminating or enriching value than that which could be obtained from the same oil when the vapours were cracked-up by themselves. The way the statement is sometimes made is very misleading. It is quite true that if we crack-up oil vapours by themselves into permanent gas and condensable residues, and thereafter mix the permanent oil gas so obtained with water gas or coal gas, less illuminating value is obtained than would have been the case had the oil been cracked-up in the presence of water gas or coal gas; but the lower yield in the one case, and the higher yield in the other, is no conclusive evidence that the difference was due to the nature of the cracking-up process. If the residues from the cracking-up of the oil by itself (which will vary in quantity from 25 to 35 per cent. of the original oil, according to its constitution and the temperature at which it is cracked-up) are examined, they will be found to contain a high percentage of very volatile hydrocarbons, which the saturated oil gas could not hold in diffusion. If, however, the oil residues be warmed up, and if the water gas or coal gas be passed through the residues, these volatile constituents of the residues will pass in diffusion into those permanent unsaturated gases, and will remain permanently in diffusion; and if a volume of water gas or coal gas, thus carburetted with the volatile vapours from the residues, be now commingled with the oil gas, the resulting illuminating or enriching value of the combined oil gas and vapours from the residues will be found to equal, and possibly to exceed, that obtained from the same oil carbonized or cracked-up in the presence of the inert gas. Any difference that would exist would be entirely dependent upon the relative temperature at which the oils had been cracked-up under the two conditions.

The fact that our esteemed member, Mr. Foulis, who has had great experience in the cracking-up of mineral oils, and who uses oil for enriching power alone, has abandoned the method of cracking the oil vapours in the presence of water gas, and adopted in place of the checker brickwork large cylindrical retorts, in which the oils to be used for enriching the coal gas are cracked-up in an atmosphere of their own vapours, mainly by the action of radiant heat of comparatively low temperature,



is strong evidence as to the soundness of the principle of the latter method of cracking-up oils.

#### *Early Experiences.*

As directly bearing upon the principle of those two methods of cracking-up hydrocarbons, I may be allowed to refer back to some personal experiences of my own, in connection with a modification of what was known as the "hydrocarbon" process. The object of the modification of that process, which was patented by Mr. Henry Aitken, of Falkirk, and the writer in 1875, was more fully to utilize the volatile hydrocarbons produced during the carbonizing of coal, but not capable of being permanently held in diffusion by the permanent gas simultaneously produced from the cannel coal used in Scottish gas-works. The modification to which I refer consisted in providing a supplementary supply of water gas, or other poor unsaturated gas, for the purpose of enabling the volatile hydrocarbons to be permanently held in diffusion.

There were two distinct methods of using this supplementary supply of poor gas. The first method was substantially identical in principle with that recently suggested by Professor Vivian B. Lewes, in his lecture at the meeting of the Institution of Gas Engineers, in connection with the Dellwik process. The only essential difference lay in the method of obtaining the supply of water gas. In the process, as described in the patent, the supply of water gas was produced in a separate set of retorts, any excess of steam was condensed out, and, if necessary, the gas was also purified. The water gas was thereafter passed into and through the vacuous space above the surface of the coal, while this coal was undergoing the carbonizing process in the retort (as stated in the patent specification). This was done because it appeared that the water gas served to shield from over-decomposition the hydrocarbons present in the crude bituminous gases suitable for carburetting the poor gas. The combined gases and products were thereafter subjected to a system of fractional condensation, in which the condensed tars were made to flow back against the current of gases, through a Coffey still arrangement, and in which also the tars were heated; being thus prevented from absorbing the volatile hydrocarbons from the mixed gases, and made to give them up to the water gas.

In the other method—the water gas—or other poor gas, was not passed into the retort, but was only subsequently brought into intimate contact, and mixed with, the gas and other products from the carbonizing of the coal in the Coffey still arrangement. The tar and other products being kept hot, the water gas or other poor gas was thus made to take up in diffusion the volatile hydrocarbons present in the products from the coal.

Now, it is evident that, if the presence of the water gas or other poor gas in the retort had had the effect of advantageously influencing the nature of the decomposition of the volatile constituents of the coal, so as to yield a larger product of illuminants, the results from the two methods would have been very different. The results of a large number of experiments made at the time showed, however, that the gain in the illuminating power which had been obtained by the hydrocarbon process was not necessarily due to the presence of the water gas in the retort. On the contrary, it appeared that, just as in the case of cracking-up the oil, to which reference has already been made, equally good results—nay, even better results—could be obtained by mixing the water gas, or other poor gas, with the products resulting from the carbonizing of the coal after these had left the retort. It was observed that it was very much the temperature and the conditions obtaining during the carbonizing process that influenced the value of the results obtained. Both when passing the water gas through the retort during the carbonizing of the coal, and when only mixing the water gas with the coal gas and products after these had left the retort, the best results were obtained when the temperature of carbonization was slightly reduced.

Professor Frankland, in making his original experiments on the hydrocarbon process, must have made a like observation; for he stated that he used a lower heat upon the cannel retorts when testing the hydrocarbon process than when testing for the results that could be got from carbonizing the coal by itself. It was further observed that, as a rule, the richer cannels gained most by lowering the temperature, while ordinary coal gained least.

These observed results are to a large extent explained by what we have been already discussing as to the process of cracking-up the vapours of liquid hydrocarbons. We have seen that, when a solid or liquid hydrocarbon is carbonized or cracked-up by itself for the production of illuminating gas, the decomposing process is necessarily carried to that stage where the permanent gas produced from one portion of the hydrocarbon is just able to take up, on diffusion, the vapour of sufficient volatility produced from the other portion. If the decomposition is carried beyond that stage, then there is produced more permanent gas than is necessary in order to take up in diffusion the remaining volatile hydrocarbons; and a corresponding part of the hydrocarbon illuminants is decomposed and converted into permanent gas. The illuminating power is thus reduced, both by the destruction of volatile hydrocarbons and by the diluting effect of the larger volume of non-luminous gas. On the other hand, we have seen that, before the decomposing or cracking-up process is carried so far as to effect a balance between the volume of permanent gas and the volatile vapours present

in the products and capable of diffusing through the permanent gas, there is a stage where the volatile illuminants are present in large excess, and that some portion of these illuminants has to be partially cracked-up in order to supply the permanent gas necessary to take the remainder into diffusion. Now it is evident that if, instead of cracking-up the one portion of the volatile vapours so as to supply permanent gas in order to take up the remainder in diffusion, there were some independent supply of permanent water gas, it would be unnecessary to carry on the cracking-up process farther than the stage necessary to produce the greatest possible quantity of carburetting and illuminating hydrocarbons. These carburetting hydrocarbons would in that case be taken up in diffusion by the supplementary supply of permanent water gas.

If those deductions from results be sound, then it logically follows that the gain in illuminating power obtained by what was known as the hydrocarbon process was not due to any difference in the nature of the products arising from the better cracking-up of the hydrocarbon vapours in the presence of an inert gas, but was solely due to the power of an inert gas to take up in diffusion the products from the cracking-up of the hydrocarbon vapours; this cracking-up having been effected at a reduced temperature.

In further evidence of that view, it may be mentioned that the hydrocarbon process—that is, the use of a supply of water gas in conjunction with the carbonizing of a hydrocarbonaceous substance—only gave advantageous results when the constitution of the hydrocarbonaceous substance was such as to produce by its decomposition an excess of volatile carburetting vapours over that which the permanent gas, simultaneously produced, could take up in diffusion. Such is the case with oils, cannels, and shales; but with many of the ordinary gas coals, their constitution is such that the permanent gases are produced in excess over the volatile carburetting illuminants. Under those circumstances, the addition of water gas, whether into the retort or into the products coming from the retort, acts mainly as a diluent; and any benzol or other hydrocarbon absorbed by the water gas from the tar is, in most cases, not sufficient to counteract the loss in illuminating power due to dilution by the added water gas.

#### *Analogous Results in Ordinary Retorting.*

In fact, with such coal something equivalent to the hydrocarbon process is carried out to its fullest extent by our ordinary method of carbonizing and manufacture. From the very nature of our ordinary carbonizing process, it is practically impossible to subject the coals to the best carbonizing conditions. For some time after the coal has been charged into the retort the volatile products are under-decomposed, and the volatile hydrocarbons are present among the products in excess of what can be taken up by the permanent gaseous portion then being formed. After a time, the proportions of permanent gas and volatile hydrocarbons respectively become adapted to one another. Thereafter the decomposition of the volatile constituents of the coal is excessive; and far more permanent gas is produced than there is hydrocarbon vapour present to saturate it. These successive stages in the destructive distillation of the coal are not, however, arrived at in equal times, nor even at all parts of the length of the retort at the same time. The different stages are passed through in periods which depend upon the distance of the coal from the products outlet. Those products which have to travel a proportionately greater distance, are subjected to the cracking-up influence of the radiant heat from the roof and walls of the retort for proportionately longer periods of time. Thus, the products coming from the coal in the back portions of the retort may reach the over-gasified stage; while the portions in front are under-decomposed. When this is the case, the excess of permanent gas from the back portions of the coal is brought into contact with the excess of volatile hydrocarbon vapours from the front; and this may enable the hydrocarbon coming in excess from the front to pass into and remain in diffusion throughout the gas, instead of being condensed, as would have been the result had it not been for the presence of the permanent gas from the back part of the retort. We thus see that an ordinary retorting process is found, when studied, to embody all the principles of the hydrocarbon process. By-and-bye, however, a stage in the carbonizing is reached when the gasified portion of the volatile constituents of the coal is far in excess of that necessary to take up the hydrocarbon vapours simultaneously produced. From that stage onward there is unavoidable over-decomposition and destruction of the hydrocarbonaceous constituents of the coal.

#### *Intermittent and Continuous Carbonization.*

We are thus brought to observe that there are essential differences in principle between what may be described as the intermittent and the continuous carbonizing systems. With a liquid hydrocarbon, the liquid can be conveniently fed into the retort at such a rate that the vapours are cracked-up by the heat to the desired degree; the temperature of the heat on the retort and the rate of feed being adjusted to suit each other. Many attempts have been made to adapt the same continuous principle to the carbonization of coal, by passing the coal through the retort, either by gravitation or by mechanical means, at the same rate as the carbonization progressed. The object has been to have the carbonizing process regulated at all stages, as in the case of oil; but hitherto no practical method



has been discovered by which that desirable end can be attained—failure being mainly due to the caking of the coal into masses.

#### *A New Method.*

There is, however, another principle of carbonizing. This is, to make the amount and the temperature of the heat supplied suitable for the carbonizing of an intermittent charge of solid material, or to make them suitable for cracking-up vapours such as may require different temperatures for their decomposition; and it is to that principle that my next jotting refers.

The new process resembles the carburetted water-gas process, or that of Dellwik, inasmuch as the heat required to do the work of gasification is obtained intermittently. The difference is that the heat produced during a period of combustion is applied to, and stored up in, a mass of moving matter, instead of the mass being at rest; and the heat is given out by this moving mass during the gasifying period. The advantage of the moving over the stationary surface consists in this—that the heat of combustion is more equally absorbed and diffused, and that the heated surfaces can by the motion be brought into contact with the substances to be carbonized; and the stored-up heat can thus be transferred, as required, at the desired rate.

I have no doubt many of you will, in passing through an alkali works, have observed what are known as the revolving black ash furnaces. These are large cylinders, built of iron or steel plates, and lined with brickwork. They are carried on circular rails resting in grooved rollers, and are made to revolve by means of a spur-wheel and pinion, driven by an engine. The revolving cylinder has an opening at each end. Through the one end are introduced the producer gases and air to heat up the charge; the products being drawn away by the opening at the other end. A door, or a number of doors, are provided in the side of the cylinder, through which the materials are charged and discharged. These cylinders are sometimes made very large; some being capable of taking a charge of from 18 to 20 tons of material.

Such an arrangement of apparatus suggested itself as being, with slight modifications, highly suitable for carrying out the principle of the modified system of carbonizing to which reference has just been made. The only alterations necessary would be to provide the inlet and outlet openings at the end of the revolving cylinder with gas-tight arrangements. Of these, the one would consist of a pipe passing through a stuffing chest and provided with the necessary valves for the admission of air, &c., during the heating-up period, and for the exit of the products of decomposition during the gas-producing period; the other opening, through which the products of combustion escape, being provided with a door or valve which can be closed during the period of gas making.

The apparatus may be operated in a variety of ways, according to the substance to be carbonized; but the time at our disposal will not enable these to be considered in detail. The principle in all, however, is the same—namely, to raise a mass of moving material, either in the form of brick linings and ribs, or a charge of coke, or both, to a high temperature. The heat may be derived from fuel in the form of producer gas or liquid hydrocarbons, or by the combustion of a part of the coke in the revolver. On the moving mass of material acquiring the desired temperature, the heating-up process is stopped, and the substance to be carbonized is charged into the revolver. If the substance be a solid, such as coal, then it is all charged in at once. The speed of the revolver is then adjusted, so as to bring the coal and the heated mass into contact, at such a rate as to bring about the desired amount of decomposition. The high temperature in the mass of material within the apparatus at the beginning of the carbonizing process enables the large volume of volatile matters liberated from the coal at first to be effectively cracked-up; and as the carbonizing progresses, and the volatile matters fall away, the temperature in the mass also falls, and thus prevents over-decomposition during the final stages. Besides, by varying the rate at which the apparatus revolves, the conditions can be still further adjusted, so as to bring about the desired amount of cracking or decomposition.

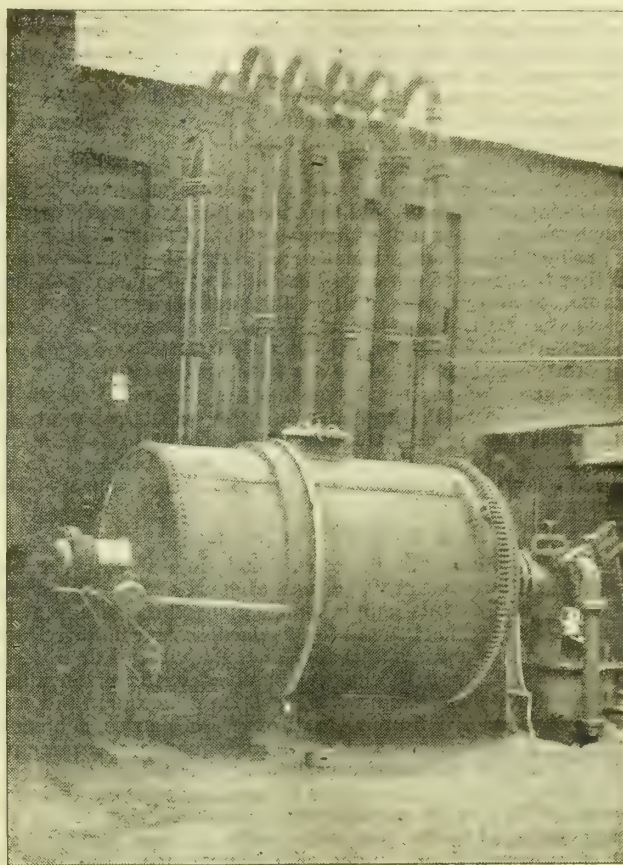
When the arrangement is applied to the cracking-up of a liquid hydrocarbon, the process is modified to suit the altered nature of the substance. The liquid residues from a previous run or charge, which require a high heat for decomposition, are first injected into the apparatus, after the blow-up period; and as the temperature of the apparatus falls, fresh oil is added to the residues in increasing quantities till, at the end of the run, pure oil alone is used—the residues from the one run forming the material to begin the gas-making period of the next.

Neither the time nor the opportunity has yet occurred for testing the merits of the principles of the system as applied to the carbonizing of intermittent charges of a solid, such as coal or shale, in such an apparatus. But some twelve months ago an opportunity occurred at the Addiewell works of Young's Paraffin Light Company for testing the system as applied to the cracking-up of liquid hydrocarbons. The apparatus was what may be termed a scratch one, consisting of the gathering together of a number of parts of plant that had been used for other purposes. The revolving cylinder had been used for the carbonating of the soda tars from the refining of the oil. It measured 9 feet long and 6 feet diameter; and the manner in which it is adapted to the new purpose is fairly well explained in the photographic views thrown upon the lantern screen. It

will be observed that the axial opening at the end is provided with a 9-inch pipe passing through a stuffing-gland, which allows air and liquid hydrocarbons to be introduced, and the gasified products to pass away through the hydraulic seal-box to the condensers; suitable vessels being provided for receiving the residues or tars. The other axial opening is provided with a gas-tight door hung upon a lever by a central pin, which allows it to rotate along with the revolver.

When operating the apparatus, it is kept charged with coke as high as possible without interfering with the escape of gases through the axial openings; and it has been found in practice to be an advantage, during the blow-up period, to spray in along with the air-blast a portion of residues, as this hastens the heating-up process and utilizes the comparatively valueless residues. The rate of revolution during the heating-up period requires to be very slow, just sufficient to turn over and present fresh surfaces of the lining and of the coke. At the beginning of the gas-making period, when the temperature is high, the revolver may for a time be left at rest; but as the temperature falls, the revolver must be set in motion, and the rate of revolution should be increased as the temperature falls, but should at no time exceed one revolution per minute.

There is produced at each run of this apparatus from 1500 to 1800 cubic feet of gas, in a period of about twenty minutes; and since it has been erected, it has produced about 4 million cubic feet of gas. As far as can be seen, the fire-brick lining is still in good condition.



My object in bringing this principle of carbonizing before you as well as my jottings upon other principles involved in gas manufacture, is, as I have already stated, to guide us in the further development and improvement of our manufacture. With gas oils at their present market prices, there is no inducement to adopt such an apparatus; but from my experience of its working, and from my experiences in carbonizing tar in retorts, and in the stationary form of producer which I had the pleasure of bringing under your notice at our meeting in Glasgow in 1894, I feel warranted in bringing the arrangement before you. It overcomes many of the difficulties previously experienced; more particularly the fracturing and rupturing of the retorts when the tar was cracked up in them, and the clinkering together of the mass of carbon in the producer when the stationary form of producer was employed.

#### III.—HOW SHOULD GAS BE TESTED, AND THE BEST GAS TO SUPPLY.

History repeats itself in connection with the gas industry as with nations. It is just a quarter-of-a-century since our worthy member, Mr. MacPherson, brought before you the subject of the relation between the chemical constitution of a gas and its illuminating power, and made remarks regarding the manner in which the value of a gas should be determined. At that date, the illuminating power of gas was the all-important factor, only a comparatively small quantity of gas being used for heating and motive power purposes; and the only known practical method of obtaining light from gas was by the incandescence of the carbon contained in it. The quantity of carbon in the



gas, and the manner in which it was combined, were therefore of vital importance.

Since then, however, the methods by which illumination is obtained from gas have vastly developed, and a far greater amount of light can now be obtained from a given volume of gas by its combustion in a non-luminous flame; substituting a mantle of the rare earths for the carbon as the incandescing and light-emitting body, or else by using the gas to produce light through the agency of mechanical and electrical energy. Besides, gas is now much more extensively used for domestic and industrial purposes, in which the calorific value is all important.

#### Calorific Value.

These changed methods and uses of gas, in which its calorific value is the main factor, are rapidly extending; and so far as illumination is concerned, the percentage of carbon present in a gas, and the particular method in which it is combined, are losing their importance in respect of the production of light, and the calorific value is rapidly becoming equally important, if not more important, than the illuminating power.

At the recent meeting of the Institution of Gas Engineers, Dr. Harold G. Colman read a most interesting paper on the calorific value of gases. The object of his researches was to ascertain whether it was possible to establish a ratio between the calorific value of a gas and its illuminating power, much as Mr. MacPherson tried long ago to ascertain whether there was a relation between the other characteristics of a gas and its illuminating power. As might have been expected, having in view, for example, the samples of gases which I brought under your notice at the date of Mr. MacPherson's paper, and which all contained the same weight of carbon and hydrogen, but all had different volumes, illuminating powers, and heating values, Dr. Colman found that there was no definite ratio between the calorific value and the illuminating power of a gas.

Seeing that the calorific value of a gas is becoming its main factor, that the carbon is rapidly losing its importance as an illuminating constituent, and that water gas can be produced at a much less cost, per unit of heating power, than a hydrocarbon gas produced from coal, cannel, or oil, and taking into consideration that the heat of water gas is just as suitable, if not more suitable, for all purposes to which the heat of gas is applied, the question naturally suggests itself, Why should we not discard the production of hydrocarbon gas, which is costly to produce, and adopt the cheaply produced water gas in preference?

That question leads us to consider the question, What is the best quality of gas to supply, or, in other words, what are the factors that have to be taken into consideration in deciding the value of a gas to the user? This, in its turn, brings us to the link connecting the technical and the commercial aspects of the question.

#### What Price per Unit of Energy?

The main commercial factor is, What does it cost the consumer, or rather what price per unit of energy has he to pay for his supply of gas, this supply being, upon the average of his wants, of the kind best suited for his purpose? The price must cover the cost of manufacture and distribution and the interest and other taxes upon the capital invested in the undertaking. The conditions which determine these main factors in the commercial problem are, from a great variety of causes, subject to considerable differences, and, as a consequence, the price per unit of energy is necessarily variable. Further, as these conditions are subject to changes due to the advance of our technical knowledge of how to manufacture, distribute, and utilize the energy conveyed by the gas, there can be no one quality of gas that is, universally and under all circumstances, the best to supply.

While that is the case, however, we may with advantage consider some of those technical-commercial conditions which have a dominating influence on the cost of energy to the gas consumer; and in considering these factors, the calorific power of the gas will be the only characteristic taken into account, as that is the one which can be more reliably determined by experiment, and which is rapidly becoming the most generally useful factor in respect of transmission of energy.

As already stated, the commercial consideration which mainly decides the quality of gas best suited to the consumer is that the quality should be such that it can be supplied through the consumers' meters at the least charge per unit of energy. Energy in the concrete form of coal is sold by weight of coal; and the price includes the cost of mining, the cost of storing, if necessary, and carriage to the point of consumption. Gas is sold by volume, and the price includes the cost of production, of storage, and of distribution; and just as coal costs sometimes more per ton for binging it until it is required and carrying it to the point of consumption than it does to mine it, so does gas sometimes cost more for its storage and distribution than it does for its production. A coal with a comparatively low calorific value might possibly be so easily mined as to cost much less per ton than another coal with a comparatively high calorific value, and, in consequence, it might supply heat at a lower cost per unit at the mine or in the immediate vicinity than the better coal; but gradually, as the distance from the mine to the point of consumption increased, and as the cost for carriage also increased, the coal with the higher calorific value, although much more costly at the mine, might, with the added carriage, become

the cheaper coal to the consumer, as it would supply the heat at a less cost per unit at the point of consumption.

To illustrate the point under consideration, we may, by way of example, compare the cost of water gas with a calorific value of 300,000 heat units per 1000 cubic feet, that of coal gas of 600,000, and that of cannel gas of 900,000 heat units. These three gases have, respectively, no illuminating power, and, approximately, 15 and 28 candle power. The cost of producing these three gases will vary according to the position of the works, upon which will depend the cost of gas-producing materials and the value of residuals; and, therefore, on making the comparison, it is necessary to arrive, as nearly as possible, at the average costs, and then to compare the results which would be obtained under the altered relative costs of each gas, due to difference of conditions affecting the works producing and distributing it.

#### Different Results under Different Conditions.

I have assumed the average costs of production to be, water gas 4d., coal gas 12d., and cannel gas 24d. per 1000 cubic feet. I still further assume that the average capital and other on-cost fixed charges, irrespective of quality of gas, will be about 20d. per 1000 cubic feet; and these, added together, will be the cost per 1000 cubic feet to the consumer. The figures are embodied in the following table:—

TABLE OF COSTS.

Description of Gas.	At Point of Production.			At Point of Distribution.		
	Calorific Power B.T.U. per 1000 Cub. ft.	Cost to Produce 1000 Cub. ft.	Cost of 100,000 B.T.U. in Pence	On-Cost Charges per 1000 Cub. ft.	Total Cost at Point of Distribution.	Cost Price to consumer of 100,000 B.T.U.
		d.	d.	d.	d.	d.
Water gas. . . . .	300,000	4	1'333	20	24	8'000
Coal " " " " " . . . .	600,000	12	2'000	20	32	5'333
Cannel " " " " " . . .	900,000	24	2'666	20	44	4'888

It will be found, on consulting available statistics, that these assumed costs and values, as given in the above table, are fairly near the averages that have obtained for many years past. As already stated, they are subject, from various causes, to great differences; but by changing the costs given in the columns of the table so as to suit the altered conditions, it will be easy to calculate what would be the best quality of gas to supply under those altered conditions.

As regards the higher quality of gas, there is no doubt that the figures given in the above table apply to the greater part of Scotland, as gas with the higher calorific values represented has been supplied to the consumers in a number of towns at even correspondingly lower prices; and under such conditions, cannel or higher, quality gas is the best to supply.

If the distance from the source of the supply, or if the cost of materials for the production of the higher grades of gas were to increase, and if the cost of the lower grades of gas decreased, the conditions would change, and the balance of advantage might be otherwise; and, in the same way, the present extraordinary rise in cost of materials generally might possibly change the relative values of the different grades of gas. But in the discussion which followed the reading of Mr. Livesey's paper (at the recent Institution meeting), advocating a reduction in the grade of gas in London, Mr. Herring made it plain that here, in Scotland, the recent change in prices had been in favour of the higher grades of gas.

I am quite aware that there are a number of other minor factors which should have been taken into consideration in estimating the relative values of the different grades of gas, and that these factors are both technical and commercial—such as the unit of on-cost per 1000 cubic feet required to pay capital and other charges, and the relative values of the unit of heat for different calorific purposes.

#### What is Our Duty?

There is also another side of the question as to what is the best grade of gas supply—namely, What grades of gas supply will yield the most profit to the manufacturer and the supplier of gas? The consumer looks to the price per 1000 cubic feet. He does not consider its calorific value, any more than the user of a penny-in-the-slot meter considers the extra price he has to pay for the check thereby put upon his improvidence. As it is put by Mr. Livesey: "The public were asking a cheaper gas; they knew nothing about a lower power." We can form our own opinion as to the attitude we ought to take up in regard to this aspect of the matter. Besides, these and other points will be best brought out by the general discussion of the whole subject which I hope will follow the reading of this paper.

#### Gas Under High Pressure.

There is, however, one other point to which I might be allowed to draw your attention before concluding, in reference to the supply of the different grades of gas. That is, the supply of gas under high pressure, just as electricity is supplied under high pressure, and with a very similar object—namely, that of lowering the cost of distribution or carriage to the point of consumption.



The calorific value *per unit of volume* of high-grade gas may be looked upon as being due to the power which the carbon possesses of combining with hydrogen and condensing much hydrogen into small volume. The equivalent of that chemical condensation, in enabling gas to be economically distributed or carried to long distances, is mechanical compression. The natural gas in the United States is locked up in the earth's crust under enormous pressure; and when tapped, it can be economically conveyed for long distances. Its high calorific value and high pressure enable a pipe of small diameter to convey to a distance a large amount of heat energy through the medium of gas; and recently in the United States a similar system has been adopted for the transmission of coal gas to long distances, the gas being compressed mechanically at the point of production, and reducing governors being used at the point of distribution.

We have seen that water gas is far and away the cheapest gas per unit of heat energy at the point of production, but that, owing to its low calorific value per unit of volume, it becomes the most expensive to carry long distances. By using up a small part of the low-priced water gas at the point of production, it would be possible, by means of a gas-engine and compressing pumps, to confer upon the bulk of the remaining water gas a high pressure that would enable it to be more economically distributed in a variety of ways, which will at once suggest themselves to your practical minds.

BRICKS AND BRICKWORK IN ENGINEERING CONSTRUCTION.

The lecture which Dr. A. C. Elliott delivered to the British Association of Water-Works Engineers, at their annual meeting at Cardiff, on the "Strength of Bricks and Brickwork," possesses an interest for all branches of the engineering profession; for it is safe to say that there is no section of an important work of construction more fraught with anxiety to the engineer during design and calculation than the masonry and the foundations whereon and whereby it is supported. In this regard, as between masonry and steel and iron work, for instance, there is a distinct difference. The engineer may, and in general does, exact very definite standards of quality in iron or steel work, both with respect to material and workmanship. The science of applied mechanics and the engineering experimental data accumulated during the last fifty years furnish almost unerring machinery for the analysis of stresses and the determination of scantlings; and the designer, free from doubt about the trustworthiness of his calculations, is in a position to apply the whole of his professional power and experience to the realization of the ideal structure—viz., that which mechanically and economically best meets the ends in view. On the other hand, masonry materials are of very variable quality, even in stuff of identical name and origin. The stresses are usually complex in some degree; and often crushing, tension, bending, and shearing coexist from point to point, vieing with each other for the mastery. To the engineer himself inspection is possible only on the face and the top of the last course. Bad weather, be it ever so carefully watched and provided for, always effects a certain, or rather, uncertain, amount of evil; and, inasmuch as there is nothing so weak as green masonry, the forces operating for, and the varying resistances acting to prevent, damage or failure during erection have to be painfully anticipated, considered, and, as far as possible, controlled.

Very properly Dr. Elliott had, at the outset, something to say in regard to mortar; but it may all be summed up in the one

sentence that the joint accumulated knowledge on the subject is so great and precise that practically mortar is a solved problem. Passing on, he referred to the early experiments on the crushing strength of building stones and bricks, the cohesive strength of certain cements and brickwork in cement, and the strength of samples of various sandstones and limestones. This brought the Doctor to the heart of his subject. Although, as he says, a knowledge of the crushing strength of stones as derived by operating on sample cubes, and in the case of brick by operating on individual bricks, is valuable, not to say essential, there remains to be determined the strength of the masonry itself. In fact, we should like to solve, if possible, the problem: Given the strength of the stones or bricks, the necessary relative dimensions, age, and mechanical properties of the mortar, to assign with a reasonable factor of safety the proper working loads for the structure during and after erection. This problem can be attacked with any chance of success in one way alone—viz., experimentally; and it must be confessed that we are still far from its complete solution. Nevertheless, something has been done. There is strong evidence that for equal loads the strength of otherwise similar piers and walls diminishes with increase of height; and Dr. Elliott's experiments have often exhibited bulging near the middle of piers considerably before the attainment of the maximum ultimate stress. Though this bulging looks more like bursting than lateral bending, the column formula of Gordon with suitable constants seems to pretty well express the relationship subsisting between tests of very short piers and those of considerable length; and so Dr. Elliott would not hesitate to apply this method of calculation in practice. High brick piers and walls are usually in some degree laterally supported at intervals. But to what extent even rigid support of this nature affects strength as a whole is doubtful, and is an extremely important practical point needing investigation.

An allusion to experiments on brick piers, carried out by the American Society of Civil Engineers about 1888, led Dr. Elliott to give an account of three series of experiments in the same direction recently conducted by the Royal Institute of British Architects. In these, the length of the brick piers was uniform, but considerable—viz., 6 feet; and the cross-section was 18 in. by 18 in., except in the case of Staffordshire blue-brick piers, which were 13½ in. by 13½ in. In the last series, the lime mortar was of the proportion 1 lime to 2 sand, and the cement mortar 1 cement to 4 sand, and the age at testing was uniformly five months.

Name of Brick.	Average Strength of Brick. Tons per sq. ft.	Maximum Stress on Pier. Tons per sq. ft.	Ratio	Strength of Pier Strength of Brick
Lime Mortar—				
London stocks . . . . .	84	18.6		0.22
Gault . . . . .	189	31.1		0.16
Fletton . . . . .	221	30.7		0.14
Leicester red . . . . .	362	45.4		0.12
Staffordshire blue . . . . .	780	114.3		0.15
Cement Mortar—				
London stocks . . . . .	84	39.3		0.47
Gault . . . . .	189	51.3		0.27
Fletton . . . . .	221	56.3		0.25
Leicester red . . . . .	362	83.0		0.23
Staffordshire blue . . . . .	780	135.4		0.17

In regard to Dr. Elliott's own experiments, so far as they have gone, they were designed mainly and originally to apply in the

COMPRESSION TESTS OF BRICKWORK PILLARS AT UNIVERSITY COLLEGE, CARDIFF.

Number of Experiment.		RED WIRE-CUT BRIDGWATER THIRDS.				RED WIRE CUT MAINDY THIRDS.	
		1	2	3	4	5	6
a	Size of cross-section of pillar (inches)	9×9	9×9	9×9	9×9	9×9	9×9
b	Length of pillar (feet)	3'00	2'00	2'00	2'00	2'15	2'31
c	Mortar	Neat P.C.	1 P.C. to 2 S.	1 P.C. to 2 S.	1 P.C. to 2 S.	Common black lime mortar.	1 P.C. to 2 S.
d	Age (weeks)	1	1	2	17	2	2
e	Maximum load on pillar (tons)	44.90	29.70	39.13	41.15	33.23	54.07
f	Maximum stress on pillar { tons per square inch	0.55	0.37	0.48	0.51	0.41	0.67
	{ tons per square foot	79.80	52.8	69.5	73.1	59.0	96.1
g	Average compressive strength { tons per square inch	1.84	1.74	2.04	1.84	1.00	1.35
	{ tons per square foot	265	250	294	265	144	191
h	Ratio $\frac{\text{line } f}{\text{line } g}$	0.30	0.21	0.24	0.28	0.41	0.50

Number of Experiment.		RED PRESSED DENNIS RUABON (TWO FROGS).			RED PRESSED "J.C.E." RUABON (TWO FROGS).		
		7	8	9	—	—	—
a	Size of cross-section of pillar (inches)	9×9	9×9	9×9	9×9	9×9	9×9
b	Length of pillar (feet)	2.25	1.40	0.83	2.25	2.25	1.00
c	Mortar	1 P.C. to 1 S.	Neat P.C.	Neat P.C.	1 P.C. to 2 S.	1 P.C. to 1 S.	None.
d	Age (weeks)	1	1	1	17	5	—
e	Maximum load on pillar (tons)	72.42	98.65	91.60	78.90	66.05	18.66
f	Maximum stress on pillar { tons per square inch	0.89	1.22	1.13	0.97	0.81	0.23
	{ tons per square foot	128.7	167.5	155.5	140.2	117.4	33.2
g	Average compressive strength { tons per square inch	1.45	1.45	1.45	2.14	2.14	2.14
	{ tons per square foot	209	209	209	308	308	308
h	Ratio $\frac{\text{line } f}{\text{line } g}$	0.62	0.80	0.74	0.45	0.38	0.11







It is claimed that the economy of this construction lies in the fact that a large portion of the heat may be utilized which is set free by the explosion: "(1) By reducing more or less the richness of the explosive mixture, by the addition of air, and by increasing in proportion the compression of the mixture in order to obtain a good combustion. (2) By producing and superheating steam in a suitable quantity, the action of which unites and combines with that of the gases, while at the same time reducing the temperature of the walls, and of the apparatus generally, to a degree compatible with the proper working of the constituent parts."

**Regenerator Settings.**—Broadhead, J. W., of Elland. No. 17,361; Aug. 28, 1899.

This invention (in reference to the division-walls of flues in regenerator furnaces or settings) consists in placing between the secondary-air and the waste-heat flues—instead of the ordinary flat tiles or bricks usually employed—corrugated or fluted tiles, whereby "the efficiency of the recuperation of heat and the working of the setting are greatly improved."



Fig. 1.

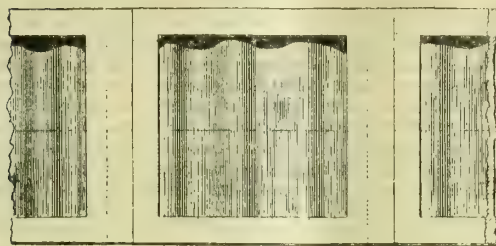


Fig. 2.

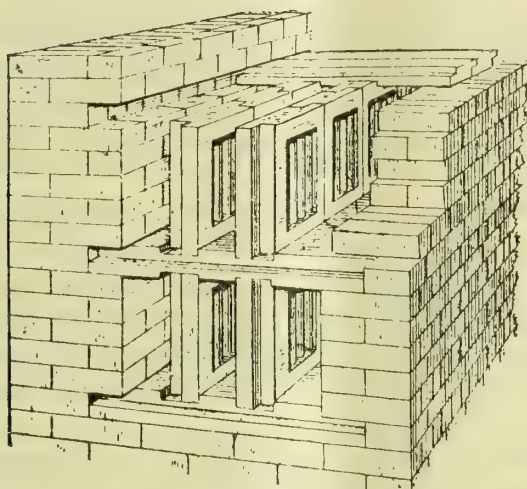


Fig. 1 is a sectional plan and elevation of a fragment of a division-wall formed of these special tiles or bricks. Fig. 2 is a perspective view of part of a regenerator furnace, showing one way of applying the corrugated tiles to divide the waste-heat flues and air-passages.

The tile is made flat or plain for a short distance from each outer edge towards the middle on both sides, so as to form wide margins, mouldings, or frame portions on the two faces of the tile; and the part of the tile within, or surrounded by, the mouldings or frame portions is corrugated or fluted on both faces. The increased strength gained by the corrugations enables the middle portion of the tile to be made much thinner than the tiles or bricks hitherto employed for the same purpose, "whereby heat is more rapidly conducted from side to side of the tile or brick, while the corrugations largely increase the surface areas for the absorption or collection and radiation of heat." The plain or flat surrounding also enables good, firm joints to be made.

At the edges or sides, where the tiles are to join each other, rebates may be formed to make joints between each tile, as shown, or the edges may be straight so as to form flush joints, or else tongued or grooved, as desired.

When there are two waste-heat flues with a secondary-air flue sandwiched between them, the corrugated tiles will form the division-walls on each side of the secondary-air flue, as illustrated at fig. 2. Used in this way, "the corrugated tiles enable a very efficient shallow regenerator to be constructed."

**Fractional Scrubbing and Washing of Gases (also Applicable to the Fractional Distillation of Liquids and Condensation of Vapours).**—Young, W., of Peebles, Glover, S., of St. Helens, and Glover, T., of West Bromwich. No. 17,620; Aug. 31, 1899.

This invention relates to apparatus of the type described in patent No. 1587 of 1881—apparatus "employed for washing, scrubbing, or similarly treating a gas (such as illuminating gas) obtained from coal, oil, or the like."

The apparatus there referred to consists of a number of superimposed compartments divided by horizontal partitions, or of a number of vessels formed with horizontal bottoms, provided with a large number of upwardly projecting tubular extensions which permit the passage of gas from the under side of a partition to the upper side. Each of these tubular extensions is surmounted by a flanged cap, the flange of which surrounds

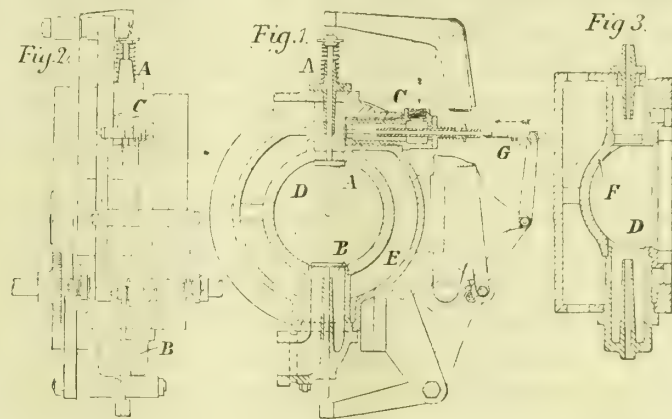
the extension and projects downwards to a certain extent into the liquid contained upon the partition or horizontal bottom. The edges of the flanges of the caps are corrugated, serrated, or perforated. Gas passing upwards through any tubular extension displaces the cap vertically to a slight extent; passes downwards; and bubbles through the liquid—being broken into fine streams by the serrations upon the flanges. The caps are, to some extent, held in place in the tubular extensions by downwardly projecting pins which fit loosely into the gas passages. The apparatus as thus constructed (the patentees point out) possessed some disadvantages, the chief of which was that a sudden rush of gas was liable to blow some of the caps out of position, or cause them to rise irregularly and tilt to one side—the gas thus escaping or passing through without being properly treated. Another defect was that any matters which were in mechanical suspension in the gas and were carried forward by it, were liable to become deposited on the tops of the caps, and thus load them to such an extent that they became too heavy to rise and permit the free passage of the gas. The suggested improvement is for the purpose of obviating these disadvantages.

The specification of the present invention is not illustrated; but the patentees fully describe their proposals, as follows: In carrying these improvements into effect, and to prevent the caps having any considerable independent or individual motion, each of them is formed with a wire stem which projects loosely downwards through its tubular extension, and is of a length to almost come in contact with the cap immediately below it on the next lower horizontal partition or bottom. Each cap is also provided with an eye fixed centrally upon the top of it, which eye may be an extension of the stem. By means of these eyes and suitable connecting wires, the caps are flexibly connected in a single group in each bottom or layer, or in two or more groups in each layer. By these means, the upward movement of any individual cap is communicated to its neighbours, and is resisted by their weight. Moreover, should the upward movement of any cap become excessive, it encounters the bottom of the spindle of the cap vertically above it, and is thereby prevented from rising further, or has its upward movement resisted by the united weight of the group of caps above it. In a modification, the stems of the caps need not be long enough to nearly reach the caps in the next lower partition. In this event, the caps of each partition or bottom would rise and fall without affecting those in the next higher partition. In order to precipitate the mechanically suspended matters out of the gas without depositing them upon the tops of the caps, the openings through the tubular extensions are formed with a wider diameter at the bottom than at the top. The velocity of the gas is thus increased, so that it impinges with increased force against the undersides of the caps. The suspended matters are thus arrested or precipitated and fall downwards. If desired, the improved interconnected caps may be used in combination with the tubular and parallel projections described in the earlier specification. The apparatus is equally applicable to other and similar treatment of gases and vapours—such as condensation.

**Gas-Motors.**—Bellamy, A. R., of Stockport. No. 17,726; Sept. 2, 1899.

This invention has for its object to so arrange the various valves as to dispense with the usual ports leading from such valves to the cylinder.

Fig. 1 is a vertical section of the cylinder-end of such an engine casting. Fig. 2 is a side elevation, looking in the direction of arrow in fig. 1. Fig. 3 represents a vertical cross section of the cylinder-end, taken at right angles to fig. 1.



The cylinder-end casting is arranged to carry the air-valve A, exhaust-valve B, and gas-valve C—the air-valve and exhaust-valve being vertically disposed, one opposite the other, as shown. The spindle of the air-valve is carried in a plug secured to the cylinder-end casting; the valve itself finding its seat against the interior of the combustion-chamber D of the cylinder, and being held thereto by means of a spring, as usual. The pendent exhaust-valve B, which is of any suitable description, is inserted in the cylinder-end casting, and lies opposite to the air-valve A; the outer wall of the valve being kept cool by passing through the water-jacket E to the interior of the combustion chamber. The gas inlet-valve C, which is preferably self contained, as shown, is arranged horizontally in the cylinder-end, and leads into the air-valve chamber at right angles to a line drawn through the centre of the air-valve spindle.

With this horizontal arrangement of gas-valve, a hit-and-miss tappet G may be used, or a sliding wedge may be employed to act on the gas-valve spindle—the wedge being operated by the usual hit-and-miss tappet.

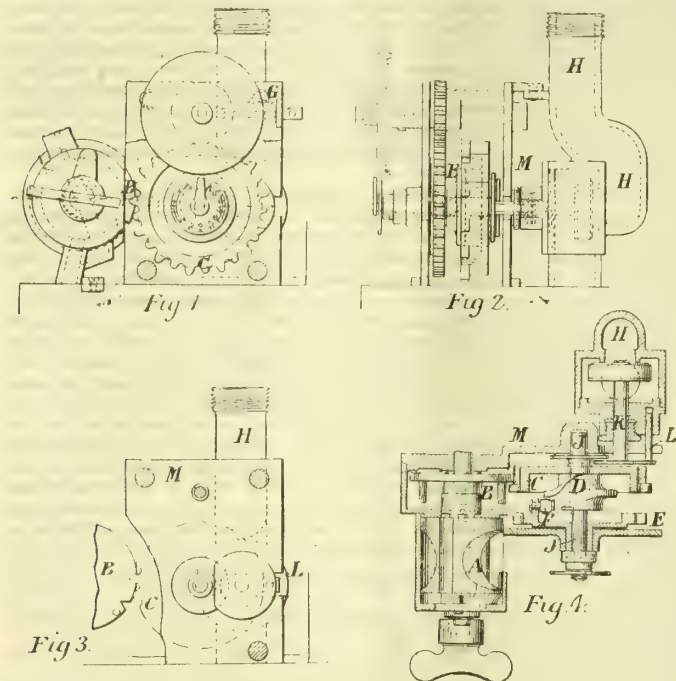
In order to obtain greater water-space on the outside of the combustion chamber, and at the same time reduce the surface of the combustion chamber in contact with the water, the interior face F of the cylinder-end, which constitutes one wall of the combustion chamber, may be of a curved or concave form, as in fig. 3.

**Coin-Freed Apparatus for Gas-Meters.**—Stansfield, A., of Oldham, and Meters Limited, of Manchester. No. 9026; May 16, 1900.

This invention relates to improvements upon the apparatus for which a patent was granted to Daniel Orme in 1893—No. 15,740; and in



carrying the invention into effect, a cam was fixed on a spindle in juxtaposition to a wheel driven from the meter mechanism (the wheel being loose on the spindle, and having an arm carrying a bowl which engages with the cam), the purpose of the mechanism being to give an endwise movement to the spindle when either the cam or the meter-wheel was revolved. The present invention relates to an improved method of actuating the cam by means of the rotation of the coin-receiver, and also to an improved method of forming the connection between the cam and the valve.



As described in the earlier specification, a connection is formed between the coin-receiver A and the parts operating the delivery mechanism by means of the coin; the coin-receiver being free to rotate without producing any effect on the measuring or delivery mechanism when a coin is not in the receiver. A portion of the coin, when held in the receiver, falls into a claw formed on one end of the spindle on which the disc B is fixed. The spindle is sustained by the framing, in which it is free to revolve. The disc (constructed as shown) is fitted with two pins diametrically opposite to each other, which are respectively followed by gaps cut in the periphery of the disc. The wheel C—the “measuring wheel”—has two sets of teeth formed on its periphery; one set extending across the whole width of the wheel, and the other set being narrower but longer than the other teeth. The teeth are of the same pitch, but occur alternately on the periphery of the measuring wheel. The edge of the disc enters the path of the measuring wheel in the spaces between the wide teeth, as shown; and the pins project from the face of the disc so that, as it is rotated, they come alternately into contact with the long narrow teeth. When the disc is rotated, one of the pins engages with one of the long teeth, and rotates the wheel C through a definite angular distance; the gap passing over the succeeding wide tooth. When the movement of the disc is completed, and the coin discharged, the edge of the disc lies between two of the teeth, so that the disc B is locked, and the wheel C cannot be again rotated until a fresh coin is inserted.

The cam D is formed on the inner face of, and as part of, the measuring wheel which is fixed on the spindle J; the teeth of the wheel being wide enough to permit of the necessary endwise movement of the spindle. The meter-wheel E carries an arm; a pin and bowl F engaging with the cam course. The spindle J is borne by the framing of the machine, as is also the wheel E, the boss of which enters the framing and forms a bearing for the spindle. The wheel is prevented from moving endwise by means of a collar fixed on it, and having a small pin driven into it, and also into the boss of the wheel E. The latter is driven by a pinion fixed on a short spindle, on the other end of which a readily changeable crown-wheel is also fixed, so as to gear with a long pinion G, which has a protruding spindle by means of which it can be coupled to the meter-gearing in any suitable manner.

The valve fixed on the spindle K is borne as shown, and passes through a suitable stuffing-box. On the measuring-wheel spindle J is fixed a washer, and on the valve-spindle K a similar washer; the two washers (when the mechanism is in a working position, as in fig. 4) overlapping and closely adjoining each other. The inlet-pipe and valve-chamber H is fixed to the meter; and the back-frame M of the apparatus is provided with a slot, to permit the measuring mechanism to be slid inwards over the spindle K, so as to cause the washers to overlap each other, as in figs. 3 and 4. The result is that the coin-receiving and measuring mechanism can be removed and replaced while the inlet-pipe and valve-chamber H are left in working position. The first-named washer is provided with a small pin L, which slides in a hole in the valve-chamber, thus permitting the valve to slide, but not to rotate.

**The Heckmondwike District Council and the Gas-Works.**—The Heckmondwike District Council held a statutory meeting last Tuesday, to consider the advisability of jointly with the Liversedge District Council applying to Parliament for powers to constitute an authority for the acquisition of the Heckmondwike Gas-Works. A resolution identical with the one passed by the Liversedge Council on the previous evening, in favour of purchase, was carried unanimously. Mr. T. H. Gaunt, who said he was personally interested in the gas-works, strongly advocated the municipalization of such undertakings. The question will be submitted to the ratepayers of the respective townships.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Electric Lighting at Hastings.

SIR,—In the “JOURNAL” for the 17th inst., I note a reference to the above matter in your “Electric Lighting Memoranda,” and, in view of the interest therein shown in the matter, I would offer the following remarks from a local point of view.

Although the Local Government Board did not refuse the loan for the purchase of the electric light works at an exorbitant figure, as we had hoped, they were no doubt impressed by Professor Robinson’s valuation of £40,000, and consequently granted £58,000 for the purchase for twenty years, and declined to allow the cost of transfer from the Company to the Corporation to be included as a capital charge. The balance of £253 odd at the credit of the net revenue account includes as one item “Unexpired insurance premiums, £153 16s. 2d.” While, of course, this, from a financial point of view, is quite in order, it shows how desperate is the position of the department. Then, too, income includes £2377 8s. for current supplied to the Front-Line lamps; and, in addition, there is the current supplied to the public buildings, which our local people are artful enough to include under the heading of “Current sold per meter.” The income from public lighting is particularly aggravating, since the amount above mentioned does not include repairs or renewals, which the ratepayers have to pay, bringing the cost per annum up to £2650, or exactly £50 per annum for the 53 lamps, half burning till midnight, and half all night. This, from your experience, you will know to be a most outrageous figure; and seeing that the electric light on the Front was originally adopted on a contract price of £1300 per annum; it is not a pleasant story to contemplate. Moreover, for lamps of practically the same description, except that two incandescents will be used after midnight instead of burning alternate arcs, the recent scheme puts the price at £13 to £14 each per annum; and the scheme has been adopted on these false pretences—depriving the Gas Company of legitimate custom. Then, too, last year the balance expended in excess of loss amounted to £14,045; and obviously interest and sinking fund on some, if not on all, of this was not made provision for.

Hastings, July 24, 1900.

CHAS. F. BOTLEY.

SIR,—When I wrote you on the 24th inst., with reference to your notes of the 17th inst., regarding the above subject, it had escaped my notice that one of the local papers had taken the matter of your article up; and I yesterday, therefore, corrected the omission by forwarding you a marked paper. You will observe the article is said to be “inspired,” and that the Press representative no doubt referred to the Borough Electrical Engineer or Chairman of Committee. I can leave it to you to prove what you say; and I now give you the following additional information.

From the analysis of the accounts for 1899, it appears evident that, unless the Company had received the same amount as the Corporation charge the ratepayers for the lighting of the public buildings and street-lamps, there would have been a loss on the year’s trading. But, of course, it is well known locally that the Company when they sold were in the position that they could not raise money, and they were over-capitalized. This naturally meant (as Professor Robinson pointed out) that to bring the concern, with its plant, up to date, it would be necessary to write off, or reduce the capital, with naturally great loss to the shareholders—the share capital, indeed, only being about one-half the total “capital” of the Company.

At the purchase inquiry, the plant and mains were represented to be equal to work for some time to come; but this was altogether beside the mark. I cannot say absolutely that any plant has actually been “scrapped”; but the engines were extravagant in steam consumption, the station buildings were altogether unsuitable and indeed dangerous, and the system of mains involved a leakage account of about 35 per cent. These things, which the Company could not put in order, under the circumstances I have explained above, the Corporation have undertaken, with the result that the capital by the end of this year will have reached at least £100,000.

The Department must have been in desperate straits to show a profit on last year, as per my last letter; for further investigation shows that the capital expenditure in 1899 is charged with £450 12s. 3d., for Engineer’s salary and sundry expenses. It appears that our Borough Electrical Engineer is fairly well paid as things go—receiving £450 per annum. I honestly believe the £450 of the above sum represents his whole salary for the year charged to capital; the 12s. 3d. being for “sundry expenses.” This may be, as you will agree, defended as strict finance; but it shows a deplorable state of commercial success.

There is another point in regard to our local electric light scheming, which to those “in the know” is exasperating. It happens as follows: The local Company, after three years, had enough of the Front Line arc lamp contract, and were able to place the Corporation in the position that they could demand their own price for a renewal of the contract, or force the Corporation to do this lighting themselves. The latter was decided upon; the Company’s plant being then represented as the reverse of what it should be. As soon as the public lighting scheme was sanctioned, negotiations for the purchase of the whole undertaking were instituted, and finally brought to completion, as you know. But the Corporation did not drop their public lighting scheme; and thus they defended the policy of having two separate stations, as being recommended to them by a competent Electrical Engineer, and as economical. It is really astonishing what town councillors will swallow when they have the electric light mania badly. On taking over the lighting of the Front Line with the separate station, the Corporation had to pay the Company practically as much for the old lamps and cables as they could have erected new ones for; and besides they renewed, at the ratepayers’ expense, nearly the whole of the lamps and the cables, which it was suggested at the time had only been put in to last three years. This pretty little scheme cost the town practically £9000; and as was inevitable to those acquainted with the subject from the first, the station has now been abandoned on the score of economy. The only return that the ratepayers of Hastings have at the present time for the £9000 of expenditure



is that one of the small engines is to be moved to the large central station, and Messrs. Babcock and Wilcox have taken back the two water-tube boilers in exchange for another one. Thus it would be fair to assume that the town has dropped £7000 or £8000 over this scheme, which I, as an individual with others, protested against from the first. Do you think there will ever be a remedy for such muddling?

Hastings, July 27, 1900.

CHARLES F. BOTLEY.

#### The "Transactions" of the British Association of Water-Works Engineers.

SIR,—In the notice in the current issue of the "JOURNAL" of the recently published volume of "Transactions" of the above-named Association, you very properly call attention to the delay which has taken place in issuing it. I think it is only fair to the members, as well as to others interested in the Association, to state that the delay was due in the first place to the postponement of the winter meeting until February of this year. The most serious cause, however, was the receipt, at a very recent date, of some valuable notes from Dr. Kemna, of Antwerp, supplementing his paper on "The Biology of Sand Filtration." It was thought that to give these additional notes in the volume in which the paper itself appeared was sufficient justification for the delay in publication.

54, Parliament Street, S.W.,  
July 25, 1900.

PERCY GRIFFITH, Secretary.

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bill read a second time and committed: Paisley Water-Works Provisional Order Confirmation Bill.

Bill reported: Paisley Water-Works Provisional Order Confirmation Bill.

Bills reported, with amendments: Gaslight and Coke, Commercial Gas, and South Metropolitan Gas Companies Bill [New title, "Metropolis Gas (Prepayment Meter) Act, 1900"], Mid-Kent Water Bill, Rickmansworth and Uxbridge Valley Water Bill.

Bills read the third time and passed: Bradford Corporation Bill, East London Water Bill, Rickmansworth and Uxbridge Valley Water Bill, South Metropolitan Gas Bill, Wandsworth and Putney Gas Bill.

### HOUSE OF COMMONS.

Thursday, July 26.

#### THE EXPORT OF COAL.

MR. HARWOOD asked the First Lord of the Treasury if his attention had been called to the fact that the exports of coal from this country to France had increased during the last two years from 2,670,000 tons to 4,230,000 tons for a period of six months.

MR. FIRBANK also asked whether the right hon. gentleman's attention had been called to the supplies of coal which were daily being shipped to foreign countries for storage for naval purposes; and whether, as the Government were bringing in a Bill to check the exportation of arms, ammunition, and military and naval stores from Great Britain, he would consider the desirability of extending the provisions of the Bill to include so important a munition of war as steam coal for foreign navies.

MR. BALFOUR: I believe the facts as regards the export of coal are as stated. The Bill which awaits third reading in the House of Lords does apply to coal as well as to other naval and military stores.

Friday, July 27.

#### THE EXPORT OF COAL.

SIR H. VINCENT asked the President of the Board of Trade if his attention had been called to the rise in the price of coal; whether he had any official information to show that this result had been brought about by the increase in the purchases of coal, by foreign competition, or by the laying in of stocks by foreign navies; and whether he proposed to take any steps in the matter in the interests of the home population and of the defensive requirements of the United Kingdom.

MR. RITCHIE: The price of coal exported in the first half of 1900 is considerably higher than in the year 1899, but not so high as in 1873; the figures being 15-87s. in 1900, 10-71s. in 1899, and 20-90s. in 1873. It is not practicable to apportion the recent rise in price among the various causes which have contributed thereto. With regard to the last question, the Government, while alive to the considerations referred to by my honourable friend, are not prepared at present to make any proposals to Parliament in the direction indicated by my honourable and gallant friend.

SIR H. VINCENT: Will the right honourable gentleman state to what countries the coal exported mainly goes?

MR. RITCHIE said he would be glad to do so if a question were put down on the subject.

The following further progress was made with Private Bills last week:—

Lords Bills reported, with amendments: Morley Corporation Bill, Salford Corporation Bill.

Lords Bills read the third time and passed: Barnsley Corporation Bill, Bury and District Water (Transfer) Bill, Rotherham Corporation Bill, Walsall Corporation Bill.

The notice placed upon the paper by Sir Albert Rollit, in reference to the increase in the price of gas by the Gaslight and Coke Company, now stands under the heading of those given for next session, as well as among the notices for which no dates have been fixed.

On the order for the consideration of the Borough Funds Bill, as amended by the Standing Committee being read, the Bill was withdrawn.

## THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons on Municipal Trading (see *ante*, p. 226) met again last Tuesday, under the presidency of the Earl of Crewe; the other members present being Lord Windsor, Sir W. Foster, Sir W. Dunn, Mr. Grant Lawson, and Mr. Lewis Fry.

The Earl of Morley, Chairman of Committees in the House of Lords, gave evidence as to the procedure of the House of Lords so far as it touched the sphere of the inquiry. When the session began, he said, he went through every Bill with the promoters, and argued any point that arose. These interviews with promoters were entirely private; the object being to facilitate the progress of Bills in both Houses, and to save cost and trouble to promoters by getting the amendments he thought necessary introduced in the First House. If any important question of principle arose, he consulted the Chairman of Ways and Means in the House of Commons; and if the matter was very important indeed, the head of the Government Department concerned sometimes came to see him. He was, of course, merely the agent of the House of Lords; and his decisions he considered to be the decisions of the House of Lords. The question whether corporations should be allowed to work tramways was very much discussed in 1892. The decision in favour of giving the corporations the power could only be arrived at by an alteration of the Standing Orders; so that both Houses had ample notice of what was being done. When smaller matters arose—such as the manufacture of fittings for electric or gas work—he dealt with them himself. The vote on the manufacture of fittings had been inserted in Private Bills for the last two years. He consulted several experienced gentlemen who came before him in regard to the promotion of Bills; and they all said that they did not want power to manufacture at all. He did not quite agree with a former witness, who said that it would be easy when a corporation bought up a company to cut out any power to manufacture which the company might possess. The undertaking would be purchased as a whole; and the power to manufacture would affect the terms of purchase. The Chairman said the Committee had had complaints that local authorities—particularly small ones—had obtained Electric Lighting Orders, and had not used them. Witness replied that he had heard the same thing casually. He thought that the Clauses Bill of 1899 embodied exactly the practice enforced by the Board of Trade up to that time. This measure gave the Board of Trade power to revoke a Provisional Order after a certain time; but he fancied the power had been very sparingly used. It would be far better that there should be a limit of time put on the completion of the works; and that if at the end of this time the local authority sought power to extend the period, it should be extended. Witness did not think that it should go on indefinitely. The effect of this would be that at the end of the stated period, the local authority requiring an extension would have to give distinct reasons for it. They would have to review the circumstances of the case; and if they gave good reasons for the extension or modification, it would be granted. If not, they must make way for someone who would. At present, it depended on the Department saying: "Why have you not so far utilized your Provisional Order?"

Sir Robert Hunter, Solicitor to the Post Office, explained the legal position of the Post Office with regard to the National Telephone Company, in the matter of the opening of streets in Glasgow; and Mr. J. W. Benn gave evidence respecting the working of the tramway system under the London County Council.

At the meeting of the Committee on Friday, Mr. G. Briggs, Managing-Director of the Shap Granite Company, of Westmorland, representing a number of manufacturers of concrete slabs, protested against the way in which certain corporations are competing with such manufacturers by means of paving material made out of the refuse from destructors. Mr. Maxwell, the President of the Scottish Co-operative Wholesale Society, Limited, having its head-quarters in Glasgow, expressed his satisfaction with the manner in which the Corporation of the city had conducted their various undertakings. Mr. E. L. Gaine, General Manager and Solicitor of the National Telephone Company, replied to some of the evidence given by the Lord Provost of Glasgow with reference to the Glasgow telephone service, and the sitting closed.

It is understood that no further evidence will be taken.

**Gas Explosion in Manchester.**—Last Wednesday morning, about two o'clock, an alarming explosion occurred in Tib Street, Manchester. Near the hour named, the pavement flags outside the hat and cap manufactory of Mr. Peter Johnson were lifted into the air by an explosion. In a few minutes the Fire Brigade were on the spot, and it was found that the flames had travelled underneath the warehouse, melting the gas-pipes and causing a large quantity of gas to escape. A series of minor explosions followed; and fearing more serious consequences, four firemen were sent to the basement of the premises to cut off the gas at the meter. The basement was full of gas, and the firemen were overpowered—some difficulty being experienced by their comrades in rescuing them. Meanwhile the flames threatened to set the building on fire; but by turning off the gas at the main, this was fortunately averted.

**Fatal Fire at an Oil-Gas Works.**—Last Tuesday afternoon, a fire occurred in the oil-gas works belonging to the Great Central Railway Company, near the Victoria Station, Sheffield. Operations were going on as usual when there was a loud report in the neighbourhood of the five storage-tanks, and the works were quickly on fire. One of the workmen, apparently heedless of the risk he ran, made an attempt to shut off the steam. He succeeded, but at the cost of his life, as he was overpowered by the escaping gas, and his charred remains were found after the fire had been extinguished. The cause of the outbreak can only be surmised; but it is thought that an explosion occurred in the engine-house, perhaps through the melting of some lead piping, and the gas which leaked made its way to the retort-house, and was there ignited. The works have been in existence for something like thirteen years, and are built on similar lines to those at other large centres along the line.



## LEGAL INTELLIGENCE.

## THE MANUFACTURE OF WATER GAS AT HORSHAM.

## Alleged Nuisance.

At the Horsham Town Hall last Saturday, the hearing of a summons taken out by the Horsham Urban District Council, under section 114 of the Public Health Act, 1875, charging the Horsham Gas Company with permitting noxious smells to escape from their works, came before the Magistrates (Mr. R. H. Hurst, Chairman, and Colonel St. John).

Mr. C. J. B. HURST represented the Council; Mr. G. F. HOHLER appeared for the Company.

Mr. HURST, in opening the case, said in the summer of last year the Gas Company, for the purpose of improving the quality of their gas, started making carburetted water gas; and almost immediately the residents in the parts of the town near the works began to complain of a nuisance caused by the horrible effluvia escaping therefrom. On Sept. 15 a memorial signed by 46 of the inhabitants was sent in to the Council, who went into the affair, and on the 22nd of September brought the matter before the Gas Company. The Company replied that they were sorry to hear of the complaints with regard to their new works, at the same time saying that the carburetted water-gas plant was guaranteed by the makers to be entirely free from any offensive smell, and that, by introducing the new process, it was anticipated that the smell which necessarily arose from the old process of manufacture would be abolished. Their object was to give their consumers an improved quality of gas; and they were pleased to state that the improvement had been acknowledged throughout the district. For a short time the smell caused by the works entirely ceased; but it began again in October, when the matter was again brought before the Council. All through the early months of this year, there was no appreciable abatement in the intensity of the smell created by the new works; but a verbal assurance was received by the Council from the Chairman of the Company that they had the matter under consideration, and were conferring with their Engineers as to the best steps that could be taken to abate the nuisance. Thus matters went on until June. The Company had raised their iron smoke-stack some 6 or 10 feet; but this had had no effect. Nothing had been done to purify the noxious fumes, or to reduce the amount. It was a significant fact that the Company had been manufacturing gas in the district for some forty years; and it was not until the erection of the new plant that any cause for complaint had arisen.

Dr. Kinnear, a surgeon, residing within 80 yards of the works, deposed that he had suffered inconvenience from the new works owing to the smell that was emitted, a humming noise caused by the machinery, loud explosions, and fires in the chimney shaft. The smells were as bad as ever after the raising of the chimney. Besides the fumes from the chimney, he had also observed smoke coming through the roof of the building. They were penetrating, suffocating fumes, which filled the house and caused headache and a feeling of sickness.

Cross-examined: He had attended patients for sickness caused by the fumes. He had never seen the Gas Company's people on the matter. What he had seen of the gas-works was enough for him. The fumes were darker than one would expect from a coke-fire. He had got used to the smell from the old works, which was entirely different to the present effluvia. He purchased his house last spring. If the nuisance had existed then, it would have made a great difference in the price that he should have paid.

Several other residents of Horsham, living more or less adjacent to the works, gave their experience of the fumes coming from the gas-works since the new works had been erected.

Mr. HOHLER then opened the case on behalf of the respondents, and submitted that the evidence which had been given on behalf of the applicants as to the alleged nuisance had been greatly exaggerated. He then described at length the process of making carburetted water gas, which, he said, had been carried on throughout the country in large towns without complaint. The Company had complied with the provisions of the Act in carrying on their works in the best possible manner, and, in fact, no nuisance had been caused.

Mr. Corbet Woodall deposed that he had been consulted with regard to the erection of plant for the manufacture of carburetted water gas since its first introduction into this country. The gas was made by the decomposition of water; and it was enriched so as to have an illuminating value by means of petroleum oil. Coke was put into the first chamber, the generator, which took the place of the ordinary retort in a gas-works, and was lighted; the depth of the fuel being about 4 feet. When it was lighted, a stream of air was blown through it, and the effluent gases from the decomposition of the coke were carried forward into the carburettor and the superheater. These were filled with checkered brick-work, which was raised to a bright heat; then the supply of air was turned off, the effluent valve from the last of the chambers was shut, and the steam turned on into the generator. Then there was a close communication from the generator right through into the gasholder. Steam was put into the base of the generator, and coming in contact with the coke the steam was broken up, the oxygen set free, and the hydrogen coming in contact with the coke made carbon monoxide. These two together went into the carburettor, and then oil which had been raised to a high temperature was driven in to mix with them. The water gas with the oil vapour went down through the hot carburettor, and afterwards rose through the superheater. In this process, the oil became fixed as a permanent gas, so that it would not deposit again in the pipes when it was subjected to a low temperature. This completed the system of manufacture. While the process was going on, white steam was being driven into the hot coke. At the end of 5 or 6 minutes, the temperature of the coke was too low to allow of the proper generating of the gas, and then the steam was shut off, and the valve on the chimney stack opened. Then the valve was opened again, air driven in so as to raise the coke to the necessary temperature, and the process repeated. Before the change took place, it was necessary to drive out of the chambers the whole of the oil that had been used for the purpose of enriching. If this were not done, it was possible that there might be a smell from the chimney. The opening and shutting of the valve had to be operated by a man in

attendance; it was not self-operating. The man had a clock in front of him by which he regulated the opening and shutting of the valves at stated intervals. Witness visited the works, and was able to say that the apparatus was thoroughly good; it was well designed and well built; it was kept in proper order; and, so far as he could see, the operator was an intelligent man, and understood the apparatus. He had seen the apparatus at work, and was unable to detect any smell, either inside or outside the works. The only practical means he could suggest for abating the nuisance, if there were any, would be to carry the chimney up higher. If the same quantity of gas were to be made under the old system, it would cause a greater nuisance. The gas coming from the flue would be largely nitrogen, some carbonic acid, and possibly a little carbonic oxide. There would also be a little sulphurous acid, due to the sulphur in the coke used in the generator. These were simply the ordinary products of the combustion of coke. The nuisance caused by clearing out the purifiers was considerably modified by this process, because the quantity of sulphur carried forward by the gas was much less than in the manufacture of coal gas. The necessity of pouring water on the coke when drawn from the retort was also done away with.

Cross-examined: The carburetted water gas was not made exclusively for the purpose of enriching coal gas, because, at the present price of coal, it could now be made cheaper than ordinary coal gas, besides being less objectionable. The amount of sulphur fumes would depend upon the amount of sulphur in the coke. The use of a pure carbon in the generator would render the product entirely free from all sulphur fumes. Oven coke contained less sulphur, but was altogether unsuited for this process, because it would not retain its temperature in the same way that gas coke did. The smoke that was seen coming through the roof was no doubt caused by water being poured on the chink drawn from the retorts to quench it. Knowing the apparatus as he did, and having seen it in operation, he could say that there was nothing to cause the smells which had been complained of; but, of course, if there were neglect, a smell might be made, as with every other apparatus. No nuisance could arise from the steam that came through the roof from quenching the coke.

Mr. E. D. Sapey, the Manager of the Horsham Gas-Works, was next examined. He said he had been Manager at Horsham for sixteen years—having previously been at Littlehampton and Hong Kong. He had never perceived anything offensive from the working of the new plant, and considered it a great improvement on the old process. The men who worked the plant under his direction were all thoroughly competent to do the work. In consequence of the first complaints, the smoke stack was raised 21 feet; making the total height 51 ft. 6 in. He denied that any smoke could have been seen coming through the roof; it could only be vapour or steam caused by quenching the coke.

Cross-examined: No complaints had been made to him personally. The winter before the new plant was put down, the consumption of gas was fully up to the capacity of the old plant; and if they had not put down the new plant, they would have been in a difficulty in the future. He agreed that, with the present price of coal, the new method of making the gas was cheaper than the old; but that did not influence the Directors in causing the new method to be adopted. The coal used at Horsham was one of the best coals that could be got; the price was never taken into consideration, only the quality. He knew of no coke that had no sulphur in it. The best coal was not always used for the purpose of making oven coke. The advantages claimed for the new system were better illuminating power, and less room required to manufacture the same quantity of gas, besides which, the Gas Company were rendered independent of coal strikes. His comment on the evidence called by the applicants was that it was greatly exaggerated, and the result of imagination.

Mr. W. J. A. Butterfield, M.A., F.I.C., agreed with Mr. Corbet Woodall that the carburetted water-gas plant at Horsham was the best that could be obtained. The process of manufacture, as he had seen it carried out, was such as to cause the minimum of nuisance. The products discharged into the atmosphere from the shaft in question were the same as from any furnace or fire. He had analyzed the gases coming from the chimney, and found them to be ordinary chimney gases.

Cross-examined: He did not think the use of oven coke was at all practicable in the South of England. No doubt if the shaft were still further heightened, it would diminish the risk of nuisance being caused; but, in his opinion, the Company had already raised their shaft higher than was necessary considering the size of the works.

Re-examined: His analysis of the effluent gases showed 13.5 per cent. of carbonic acid, 5.5 per cent. of carbonic oxide, and 0.2 per cent. hydrocarbons. The remaining gases were not estimated, but would be nitrogen and hydrogen, and sulphur dioxide 1 volume in 4025. This latter figure was very small. He should expect to find in most chimney gases as much as 1 volume in 2500.

Several residents were then called, and said that they had not noticed anything offensive coming from the Gas Company's new apparatus.

Mr. Samuel Culler, junr., a member of the firm of contractors who had erected the new plant, was then called. He said the chimney erected at Horsham was higher than at any works he had contracted for relatively to the size of the works. He had been at Horsham on several occasions, and denied that there were any smells emitted from the works. If there were, it would not be consistent with proper working of the plant. The capacity of the plant at Horsham was a make of from 125,000 to 150,000 cubic feet.

At the conclusion of the case, which had lasted five hours, the Chairman announced that they found there was evidence of a nuisance arising from the new works, but that they suspended the final determination of the matter for the period of three months, on the condition that the Gas Company undertook to raise the shaft to such a degree as would be sufficient to abate the nuisance.

## The Welsbach and Sunlight Settlement.

In the Chancery Division of the High Court of Justice yesterday, before Mr. Justice Buckley, the case of the Kern patent No. 294 of 1897 was down for judgment. Mr. Bousfield, however, said that since the matter was last before the Court, the Sunlight Company had held their meeting, and the arrangement provisionally come to between the parties



had been confirmed. Under these circumstances, he asked his Lordship not to deliver judgment. He thought the better plan would be to withdraw the petition for the revocation of the patent. Mr. Moulton suggested that the action should be discontinued, without costs. He also mentioned that the mantle action had been settled. Mr. Bousfield said the better plan would be to withdraw the petition, without costs. Mr. Moulton added: "And, by consent, discontinue the action, without costs." His Lordship assented to this course being adopted.

#### Compensation for Injuries Caused by the Explosion of a Gas-Meter.

At the Belfast Assizes on the 21st inst., Daniel Gracey and his wife, Sarah Gracey, of 33, Palestine Street, Belfast, sought to recover from the Belfast Corporation £650 damages for injury to person and property, alleged to have been the result of negligence on the part of defendants and their servants. It appeared from the evidence that on returning home one Saturday evening Mrs. Gracey detected a strong smell of gas, and spoke about it to her husband. He struck a match, and a violent explosion occurred. The plaintiffs were both seriously injured, and considerable damage was done to the furniture in the house. The explosion resulted from an escape of gas through the overflow chamber of the meter, the cap having been left off by the Corporation inspector who put the water into the meter. The escape, it was stated, was more immediately caused by the high pressure of gas necessary on Saturday evenings for the lighting of shops. The defence was that the meter was not under the control of the defendants or their servants, and that the explosion was caused through the negligence of the plaintiffs. After hearing evidence, the Jury found for the plaintiffs, with £68 10s. damages.

#### The Alleged Theft of Water from the East London Company.

At the Central Criminal Court last Thursday, Joseph Holland, on bail, was indicted before the Recorder for stealing 900,000 gallons of water belonging to the East London Water Company. Mr. C. F. Gill, Q.C., and Mr. Arthur Gill prosecuted; Mr. Purcell defended. The accused, who was a builder, was engaged in erecting houses at Leytonstone, and for some of these houses he had arranged with the Company for a supply of the water required. It was alleged that after some of the houses had been erected the accused surreptitiously obtained the water he needed for erecting another block of houses. The hearing of the charge extended to Friday morning, when it was stated that one of the jurors had informed the Court that he had a case of diphtheria in his house. The Recorder upon learning this adjourned the further hearing until next sessions; the defendant being allowed bail.

#### The Oystermouth Water-Company Fined.

At the Swansea Police Court last Wednesday, the Oystermouth and District Water-Works Company were summoned on the information of Mr. Villiers Meager, barrister, for neglecting to furnish him with a supply of water for domestic purposes at his residence, West Cross, after information of the need of it had been duly tendered. The proceedings were taken under section 43 of the Water-Works Clauses Act, 1847. The complainant deposed that he paid his water-rates regularly, and was consequently entitled to a supply of water. He had lived at Coehir for 18 months, and during his occupation of the house there had been practically no water supply. He had lodged written complaints at least a dozen times. For the defence, Mr. Clason Dahne contended that the Company were not bound to supply the highest house in the neighbourhood, which Mr. Meager's certainly was. The Bench found that there had been no supply on the 19th of July; and a penalty of £10 was imposed—defendants to pay also £2 for every day since upon which water was not supplied.

#### Another Water Waster Fined.

At the Ipswich Police Court, on Monday last week, Mr. George L. L. Warren, of 61, Victoria Street, was charged with suffering the fittings, &c., of a water-closet cistern to be out of repair at 21, White Elm Street, and a tap to be defective at No. 25 in the same street. Defendant pleaded guilty, and said he meant to do the repairs, but they had slipped his memory, as he had so much to do. Mr. W. Bantoft said notices to repair were served on defendant a number of times, but he had taken no notice of them. Mr. Hamlet Roberts, Manager of the water-works, said the waste of water at No. 21 was 300 gallons per hour—an amount which would have supplied 360 persons for a day. At No. 25, the waste was 300 gallons per day. Defendant had been previously convicted for similar cases, and he was now fined 30s., and 8s. 6d. costs, in each case.

**New Buildings for the Manchester Gas Department.**—On Monday last week, the foundation stone of the new buildings which are being erected in Poland Street, Manchester, by the Street Mains Subcommittee of the Corporation Gas Committee, was laid by Alderman Gibson, the Chairman of the Committee. The scheme is in two sections. On the right-hand side of the entrance are a general office, store-room, workshop, and shed for testing mains by hydraulic pressure; and on the left the storekeeper's house, mess-room for fifty men, and stables. The cost is estimated at £13,000. Alderman Griffin, the Chairman of the Subcommittee, presided. On behalf of the Architect (Mr. Joseph Swarbrick), he presented Alderman Gibson with a trowel and mallet with which to perform the ceremony. In doing so, he said it was apparent to even a casual observer that the extension was one of necessity. The outlay needed, though large, would, he believed, adequately repay the ratepayers. An important feature was the accommodation to be provided for the horses. Alderman Gibson then declared the stone well and truly laid. The ground they were standing on, he said, had been the property of the Corporation for the last forty years, and he believed that in the first instance the purchase-money was £1400. An important part of the scheme was the provision to be made for testing mains. When they knew that a leakage of 1 per cent. of gas meant a loss to the ratepayers of £5000 a year, they would understand the value of this department. He was glad also a mess-room for the workmen was to be provided.

## MISCELLANEOUS NEWS.

### THE GASLIGHT AND COKE COMPANY.

#### Half-Yearly Report and Accounts.

The following is the report on the working of the Company in the six months ending June 30, which, with the accounts for this period, will be submitted to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance available for distribution of £626,602 13s. 11d., out of which the Directors recommend a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, carrying forward the sum of £296,755 0s. 11d. to the credit of the current half year.

The sales of gas have increased during the half year at the rate of 3.3 per cent. This represents an addition to the quantity of gas sold in the June half year of 1899, of 359,524,000 cubic feet.

The increase in the price of coal, to which the Directors have adverted in their last two half-yearly reports, has been fully maintained, and there is, unfortunately, no evidence of any immediate reduction in market quotations. The Directors have completed contracts for the purchase of the Company's requirements up to June 30, 1901, at the very serious advance in price of 8s. per ton, which will entail an additional charge against revenue, for the year, of £800,000.

The Directors have reason to believe that the present prices of coke and other residual products will be maintained for some time longer; but the additional revenue from this source represents only one-fourth of the extra cost of coal.

Under these circumstances, the Directors have, with great regret, and in common with the other Metropolitan Gas Companies, been obliged to give notice of an increase in the price of gas per 1000 cubic feet, such increase in the case of this Company being, to private consumers north of the Thames, as from June, at the rate of 6d., or a net increase of 5d. having regard to the reduction of 1d. made to them in January last; and (following upon increases made by the South Metropolitan Gas Company), to Local Authorities for street-lamps and to private consumers south of the Thames, an increase of 3d. as from March and a further increase of 4d. as from June.

The proprietors are fully acquainted with the provisions of the sliding-scale clauses of the Company's Acts, and will have therefore been prepared for the reduction in the rate of dividend of 10s. per cent., or 2s. per cent. for every 1d. of the net increase of 5d. per 1000 cubic feet in the price of gas since last year to private consumers north of the Thames.

The action of the Directors in raising the price of gas has been criticized by Local Authorities and others, who have evidently failed to appreciate the fact that, under present legislation, the consumers of gas cannot be subjected to an increase in the price they have to pay without the proprietors of ordinary stock being at the same time subjected to a corresponding reduction in the rate of their dividend.

It is with regret that the Directors have to announce that the Company's Bill for further capital powers, to which reference was made in their report of January last, and which had been drawn up with a view to secure, in the interests of the consumers, the raising of the necessary capital at the lowest possible rate, was, on the 18th of May last, rejected by the Committee of the House of Commons.

The Bill promoted by the London County Council for legalizing the use of portable photometers, and for regulating the supply of prepayment meters and fittings, was opposed by the three Metropolitan Gas Companies. That portion thereof relating to portable photometers was rejected; while clauses were agreed to between the Companies and the Local Authorities which fixed the price to be charged for the use of prepayment meters and fittings. The Bill embodying these clauses now awaits consideration by a Committee of the House of Lords.

In the report presented to the proprietors in January last, reference was made to the negotiations which had been carried on with the South Metropolitan Gas Company for the sale to them of the Company's district of supply south of the Thames, together with the works at Nine Elms and Battersea. The Directors have now to report that these negotiations resulted, on the 29th of June, in a provisional arrangement between the two Companies for such sale, and the South Metropolitan Company had then before Parliament a Bill, which had passed the House of Commons, containing provisions for giving effect to such sale. The Committee of the House of Lords, however, when considering this measure, declined to sanction that part of it which had reference to the sale, and thus the endeavours of the two Companies to give effect to one of the principal recommendations of Sir James Rankin's Committee of 1899 have been rendered fruitless.

The Court of Directors has been furnished by the several Engineers of the manufacturing and distribution departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

Accompanying the report are the usual statements of account, from which we take the following particulars:—

The statement of capital (stock) on June 30 stands as follows: Total paid up, £9,216,500; added on conversion, £12,176,490; unissued, £250,000—total amount authorized, £21,642,990. The statement of loan capital stands thus: Total paid up, £2,644,000; added on conversion, £1,479,975; unissued, £200,000—total amount authorized, £4,323,975. The total stock and loan capital is therefore £25,966,965, of which £25,516,965 has been paid up.

The capital account shows receipts (with premiums, £1,603,050) to the



amount of £27,120,015. The expenditure is shown in the following items :—

Expenditure to Dec. 31, 1899 . . . . .	£12,824,855	3	9	
Expenditure during the half year to June 30, 1900, viz. :—				
Buildings and machinery in extension of works . . . . .	£14,706	13	0	
New and additional mains and service-pipes . . . . .	22,972	19	4	
Do. do. meters . . . . .	18,580	14	1	
Do. do. stoves . . . . .	20,633	8	0	
	£76,893	14	5	
Cr. by sale of surplus land . . . . .	8,203	2	4	
		68,690	12	1
Total expenditure . . . . .	£12,893,545	15	10	
Nominal amount added on conversion . . . . .	13,656,465	0	0	
Balance of capital account . . . . .	570,004	4	2	
	£27,120,015	0	0	

The revenue and net revenue accounts are given in full below.

The balance available for division is £626,602 13s. 11d.; and the statement showing how the Directors propose to appropriate it is as follows :—

June, 1899.				
£53,759	..	Net balance brought from last account	£193,333	8 4
453,129	..	Net revenue for the half year	433,209	5 7
£506,888			£626,602	13 11
(£4 18s. per cent.)	A dividend on the ordinary stock—			
£367,330	..	£4 8s. per cent. per annum on £14,993,075	329,847	13 0
£139,558	..	Balance carried to next account	£296,755	0 11

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on June 30 were as follows : Reserve fund, £51,902; insurance fund, £84,603; and depreciation fund, £55,204. The insurance fund had to bear in the past half year a sum of £70 2s. 4d., the value of plant destroyed by fires in the Company's district.

Dr.		REVENUE ACCOUNT.				Cr.		
June. Half Year, 1899.		£	s.	d.	June. Half Year, 1899.	£	s.	d.
£682,741	To Manufacture of Gas—				By Sale of Gas—			
14,284	Coals, including oil, dues, carriage, unloading and trimming . . . .	883,451	3	9	Common gas, per meter, at 2s. 11d., 2s. 1d. & 2s. 4d. per 1000 cubic feet	1,554,206	0	2
161,548	Salaries of engineers and other officers at works . . . . .	14,663	5	7	Public lighting and under contracts—			
16,567	Wages, carbonizing £174,194/13/3 sundries . . £16,707/13/5	190,901	17	8	Common gas . . . . .	75,423	8	8
24,677	Purification, including £18,459/15/8 for labour . . . . .	41,636	0	11	Rental of stoves . . . . .	..		23,784 9
	Repair and maintenance of works and plant, materials and labour, less received for old materials, £5481 8s. 7d. . . . .	168,599	13	5	Residual products—			
180,054	Distribution of gas—			1,249,252 1	Coke, less £45,565 4s. 7d. for labour, &c. . . . .	387,332	6	2
33,343	Salaries and wages of Officers (including Rental Clerks) . . .	35,658	8	9	Breeze, less £2,528 12s. 4d. for ditto	13,196	9	11
41,384	Repair and maintenance of mains and service-pipes . . . . .	35,775	9	7	Tar and tar products . . . . .	92,421	6	6
25,117	Repair and renewals of meters . .	24,588	5	5	Ammoniacal liquor and sulphate of ammonia . . . . .	100,021	4	5
27,820	Stove fixing, repairs, and renewals	29,863	1	6				592,971 7
..	Gas fittings (auto. meter supplies).	26,574	16	9	Rents receivable . . . . .			4,662 17
				162,459 17 0	Transfer fees . . . . .			257 5
16,518	Public lamps—Lighting and repairs .	..		18,150 15 4				
6,113	Rents, rates, and taxes—							
112,915	Rents payable . . . . .	6,135	18	0				
	Rates and taxes . . . . .	120,171	18	0				
2,750	Management—			126,307 16 0				
229	Directors' allowance . . . . .	2,750	0	0				
	Company's Auditors and Assistant	235	14	0				
11,714	Salaries of Secretary, Accountant, and Clerks . . . . .	11,131	18	6				
20,326	Collectors' commission . . . . .	20,638	18	9				
6,735	Stationery and printing . . . . .	7,118	2	2				
4,120	General charges . . . . .	3,508	10	3				
				45,383 3 8				
2,963	Parliamentary charges . . . . .	..		5,424 16 8				
1,233	Law charges . . . . .	..		662 0 8				
..	Charges re Quinquennial Re-valuation.	..		2,000 0 0				
5,253	Bad debts . . . . .	..		5,571 4 1				
500	Depreciation fund . . . . .	..		500 0 0				
12,194	Annuities . . . . .	..		14,262 5 5				
2,500	Workmen's Compensation Account .	..		886 19 6				
	Public Officers—							
879	Gas Referees and Official Auditor.	875	16	4				
1,129	Public testing-stations . . . . .	1,354	17	2				
				2,230 13 6				
£1,425,606				1,623,091 13 2				
648,009	Balance carried to net revenue account . . . .			628,018 13 10				
£2,073,615				2,251,110 7 0	£2,073,615			2,251,110 7

Dr.				NET REVENUE ACCOUNT.				Cr.				
June, Half Year, 1899.		£ s. d.		£ s. d.		June, Half Year, 1899.		£ s. d.		£ s. d.		
£65,660	To Interest on debenture stock and bonds, accrued to June 30, 1900 . .	..		66,469	12	6	£416,496	By Balance from last account . . . .	560,663	15	1	
75,995	Dividend on the preference stocks—											
4	4 per cent. consolidated . . . .	75,994	14	0				Less dividend on the ordinary capital for the half year to Dec. 31, 1899 .	367,330	6	9	
	Convertible 5 per cent. . . . .	4	10	0		362,737					193,333	8
45,500	Dividend on the 3½ per cent. maximum stock . . . . .	45,500	0	0								
				121,499	4	0	53,759					
7,721	Interest on temporary loans & sundry funds . . . .			6,840	11	9	648,099	Revenue account . . . . .	..		638,018	13
506,888	Balance applicable to dividend on the ordinary stock.			626,602	13	11						
£701,768				821,352	2	2	£701,768				£831,352	2

The statements furnishing particulars as to working are as follows :—  
STATEMENT OF COALS USED, Etc.

Description of Coal.	In Store, 31st Dec., 1899.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 30th June, 1900.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	143,705	996,851	1,017,346	2,125	121,085
Cannel	17,415	6,317	14,801	..	8,931
Total	161,120	1,003,168	1,032,147	2,125	130,016

\* In addition to this quantity of cannel, 4,709,623 gallons of oil and spirit have been used during the half year.

STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 31st Dec., 1899.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 30th June, 1900.
Coke—tons	35,531	640,378	142,893	506,788	20,228
Breeze—tons	4,233	73,398	16,751	58,775	2,105
Tar—gallons	1,048,202	10,414,684	10,528,241	18,093	916,627
Ammoniacal liquor—batts	27,148	287,056	295,753	..	19,051

STATEMENT OF GAS MADE, SOLD, Etc.

QUANTITY SOLD.			Total Quantity accounted for.	Number of Public Lamps.
Quantity Made.	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*12,040,775	535,868	10,716,368	11,415,779	51,996
†11,557,809	538,260	10,369,442	11,058,119	52,362

\* Including 1,539,811,000 feet of "oil gas." † June half year, 1899.

The last statement is the general balance-sheet. It shows that the value of the stores on hand on June 30 was as follows : Coals, £96,510; coke, £18,692; tar and ammoniacal liquor products, £99,007; sundries, £277,962—total, £492,171. The figures for the corresponding period of 1899 were : Coals, £94,029; coke, £14,189; tar, &c., £78,402; sundries, £282,570—total, £469,190. The item "automatic meter supplies (balance of fittings account)" amounts to £254,191, as compared with £298,556 at the close of the six months ending June 30, 1899.



### The Half-Yearly Report and Accounts.

The adoption of the sliding-scale in 1876 made shareholders and consumers partners. All increase of profits resulting from improvements in, and from cheapening the manufacture of, gas are shared between them—the consumers having the lion's share. At first the proportions were a trifle over three to one; whereas now, by years of careful expenditure of capital on extensions of business, the share of the consumers in any advantage or saving has grown to seven to one—that is, out of every £8 saved they get £7 in the shape of a reduction of price, and the share-

A word must also be said for the consumers of gas. The price was increased from 2s. 1d. to 2s. 4d. at Lady Day, and again to 2s. 8d. at Midsummer. Circulars announcing and explaining the reason for the increase were sent to every consumer. The reception of the unwelcome

Description of Capital.	Certified to Dec. 31, 1899.		Received since that date.		Total.	
	£	s. d.	£	s. d.	£	s. d.
Ordinary stock . . . . .	2,356,685	0 0	..	..	2,356,685	0 0
Premium thereon. . . . .	431,066	0 0	..	..	431,066	0 0
Debenture stock . . . . .	953,333	6 8	..	..	953,333	6 8
Premium thereon. . . . .	275,160	0 0	..	..	275,160	0 0
Total . . . . .	4,016,464	6 8	..	..	4,016,464	6 8
Nominal amount added by conversion—						
Ordinary stock . . . . .			£3,285,000	0 0		
Debenture stock. . . . .			566,666	13 4		
			£3,851,666	13 4		
Less premium . . . . .			706,246	0 0		
					3,145,420	13 4
Total. . . . .					7,161,885	0 0

By Sale of gas—				
Lady Day, at 2s. 1d. per 1000 feet . . . .	£332,346	12	9	
Midsummer, at 2s. 4d. per 1000 feet . . . .	228,203	18	11	
	£560,550	11	8	
Public Lighting and under contracts, including lighting, repairing, materials, &c., £12,914 17s. 1d. . . . .	29,336	19	5	£589,887 11 1
Meters in use (207,474)—				
Company's Meters at rent: Ordinary, 95,239; automatic, 102,347 . . . . .	£20,550	5	11	
Company's stoves at rent: Ordinary, 48,637; automatic, 81,208; fires, 10,610 . . . . .	16,031	17	8	86,582 3 7
Residual products—				
Coke, less £15,348 18s. 4d. for cartage; £1666 11s. 5d. for labour, &c. . . . .	217,146	2	4	
Breeze, less £2983 3s. 0d. for cartage; £908 8s. 5d. for labour, &c. . . . .	11,030	9	9	
Tar, less £194 4s. 6d. for cartage; £161 5s. 0d. for labour, &c. . . . .	26,182	2	0	
Ammoniacal liquor, less £235 14s. 2d. for labour, &c. . . . .	9,845	9	9	
Sulphate of ammonia, less £6079 18s. 2d. for acid, &c.; £3555 7s. 2d. for labour, &c. . . . .	39,543	13	3	303,747 17 1
Rents receivable . . . . .				1,455 5 4
Transfer fees. . . . .				66 5 6
Total Receipts . . . . .	£931,739	2	1	

Balance from last account . . . . .		£165,876	7	10
Less dividend for the half year ended Dec. 31, 1899	£150,450	5	4	
Divisible profit carried to reserve fund . . . . .	10,343	9	0	
		160,793	14	4
				<u>        </u>
				£1,882
Amount from revenue account . . . . .				176,617
Interest on banker's balances . . . . .				400
				15
				<u>            </u>
				£181,901



news has been such as to prove once more that the British public, when it knows the facts, will act fairly and considerably; for out of the Company's 200,000 consumers, only 28 letters have been received on the subject—the greater part of these objecting to the method of giving the notice rather than to the actual increase of price.

In all other respects the condition and prospects of the Company have never been better. The increase in the consumption of gas over the corresponding half year has been at the high rate of over 12 per cent.; the total increase being 590 million cubic feet. These being the facts, the Directors feel justified in assuring the proprietors that they need have no fear as to the stability of their property, that the cloud will pass, and that when coal returns to a reasonable price—certain to come—their old prosperity will be renewed.

A circumstance that ought not to be omitted from this report is the passing of the Bill which the Company promoted during the present session of Parliament. The Company accepted the recommendations of the Powers of Charge Committee of last session to reduce the initial price and increase the rate of increase of dividend under the sliding-scale. The Directors also took the opportunity of applying for a reduction in the standard illuminating power from 16 to 14 candles, with a corresponding reduction of the initial price, which, after a very careful inquiry, and against very determined opposition by the London County Council, was granted by the Committee. The Bill now only awaits the Royal Assent.

The London County Council also, with no mandate from the consumers, introduced a Bill to alter the method of testing the gas of the Metropolitan Companies, which would have necessitated a large increase of illuminating power, for which the consumers would have had to pay, greatly to their disadvantage. The Council endeavoured to support their case with some very questionable evidence, which the Committee did not accept, and consequently rejected the Bill. The cost of promotion and defence were very heavy, which fall in one case on the ratepayers and in the other on the consumers of gas.

The Directors propose the same rate of dividend per annum as was paid for the previous half year; £5 14s. per cent. was then payable, but only £5 6s. 8d. was paid. The increase in the price of gas from March last limits it on this occasion to £5 8s. per cent.; and that being so, the recommendation is that a dividend of  $5\frac{1}{2}$ , or £5 6s. 8d., per cent. be declared. The further increase in price from Midsummer will necessitate a reduction of dividend to the rate of 5 per cent. per annum for the current half year.

Accompanying the report are the accounts. The first two statements relate to the stock and loan capital. The former sets forth that the standard rate of dividend on the £5,641,885 of stock on which it is payable is 4 per cent. at the standard price of 3s. 6d. per 1000 cubic feet; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,520,000. The third statement is the capital account, which, with the revenue and net revenue accounts, we give on p. 297. Following these are statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £129,634; renewal fund, £19,834; insurance fund, £53,727. The statements dealing with the manufacturing operations of the Company furnish the following particulars:—

#### STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1899.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1900.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	40,046	656,044	572,829	799	123,462
Cannel coal	1,003	—	16*	—	987
	41,049	656,044	572,845	799	123,449

\* 261,964 gallons of petroleum spirit used as a substitute for cannel.

#### STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1899.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store June 30, 1900.
Coke—cwt.	445,854	7,056,656	1,692,911	5,606,522	202,577
Breeze—yards	7,603	129,006	24,588	107,135	4,946
Tar—gallons	474,706	5,390,281	357,942	5,177,397	329,648
Ammoniacal liquor—batts	38,152	181,357	113,026	79,915	26,568

#### STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made.	QUANTITY SOLD.		Total Quantity accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).		
Common	Thousands. 5,618,930	Thousands. 196,152	Thousands. 5,206,729	Thousands. 5,483,048	21,334

The remaining statement is the balance-sheet, which gives the value of the stores in hand as follows: Coal and enriching materials, £114,444; coke and breeze, £6999; tar, sulphate, and liquor, £9038; and sundries, £166,411. The figures this time last year were: Coals, &c., £30,356; coke and breeze, £2709; tar, sulphate, and liquor, £7917; and sundries, £146,792. Among the accounts due to the Company is a balance of £18,338 for gas fittings; and one of £8979 for alteration of street-lamps. A sum of £40,879, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £41,142. Appended to the accounts is the certificate of Sir R. Giffen, the Official Auditor, who points out that a forfeiture amounting to £9, incurred during the half year, must be paid out of the divisible profits, and by way of reduction of dividend.

#### CRYSTAL PALACE DISTRICT GAS COMPANY.

##### Half-Yearly Report and Accounts.

The report which the Directors of the above-named Company will present at the half-yearly meeting next Friday opens with an expression of satisfaction that the general business of the Company is in a thoroughly sound and prosperous condition. The increase in the quantity of gas sold over the corresponding half year has been at the rate of 11 per cent.—a rate which has rarely before been reached. These considerations, however, although proving the stability of the Company's business, temporarily sink into insignificance in the face of the enormous rise in the price of coal. Once in the history of the Company has this rise been exceeded—in 1873; but at that time it was to a considerable extent met by a fortuitous rise in the value of tar, and an advance in the price of coke, which approximated to the advance in coal. On the present occasion, however, the price of coke has not gone up in the same proportion; and no new discovery in the use of tar products has come to the aid of gas companies. The Company's coal contracts—all for Newcastle coal—expired last March. They were made a year previously at the then high price of 8s. per ton free on board in the Tyne. This year the North Country contractors wanted 16s. per ton; and the Directors, finding that they could obtain railway-borne coal from the Midlands at a rather lower cost, have taken their supplies exclusively from that district. To meet the increased cost of coal, after allowing for the extra receipts from coke, an addition of at least 8d. per 1000 cubic feet to the price of gas would be necessary. Under these circumstances, the Directors have raised the charge for gas 4d.—viz., 2d. from March and 2d. from June—to 2s. 10d. per 1000 cubic feet, which will divide the loss nearly equally between the Company and the gas consumers. The Company's share of the burden will be borne partly by a reduction of the dividend payable, partly by a diminution of the profit-sharing bonus of the employees, and the remainder by drawing from the reserves, which fortunately are in a strong position. The Directors believe that the present high price of coal cannot be maintained for any prolonged period. They therefore hold out the hope that the increased charge for gas, the reduced dividend, and the diminished bonus to the employees will only be of temporary duration; and they can give the assurance that at the earliest possible moment the price of gas will be reduced. The dividend recommended for the past half year will be the same as was declared in February last—viz., at the rate of  $5\frac{1}{2}$  per cent. per annum. (Last February  $\frac{1}{2}$  per cent. short of the full dividend under the sliding-scale was paid.) The increase in price will therefore only entail a reduction of  $\frac{1}{2}$  per cent. on the dividend payable in the ensuing half year.

The accounts accompanying the report show that in the six months ending June 30 there was expended a sum of £11,894 for capital purposes; £4653 being for buildings and plant in extension of the works, £2798 for mains and service-pipes, and £4416 for meters and stoves. The total expenditure up to the close of the half year was £732,899, out of £736,226 raised; leaving a balance of £3327. The revenue from the sale of gas was £76,973; the rental of meters and stoves, £3645; residuals produced £29,988; and the total receipts were £110,616, against £97,328 for the six months ending June 30, 1899. On the other side of the revenue account, the items referring to the manufacture of gas are: Coal, £46,649; oil (£4216) and coke (£1944) for oil gas, £6160; purification, £2491; do., oil gas, £445; salaries, £1146; wages (including £433 for oil gas), £6729; maintenance of works and plant, £11,031—total £74,651. Distribution cost, £6611; management, £3516; and the total expenditure in the half year was £89,802, against £77,760. The balance carried to the net revenue account is £20,814, as compared with £19,568. Under the supervision of Mr. S. Y. Shoubridge, the Company's Engineer, 53,877 tons of coal, 12 tons of cannel, 228,282 gallons of gas oil, and 1365 gallons of carburene were dealt with for the manufacture of 548,846,000 cubic feet of coal gas and 88,598,000 cubic feet of 17-candle oil gas—together 637,444,000 cubic feet. Of this quantity, 609,435,000 cubic feet were sold and 616,543,000 cubic feet accounted for. The quantities of residuals produced in the half year were: Coke, 673,612 cwt., of which 215,915 cwt. were used (37,551 cwt. for the manufacture of oil gas); breeze, 15,810 yards, of which 6470 yards were used (531 yards for oil gas); tar, 549,765 gallons; ammoniacal liquor, 11,165 butts; and sulphate of ammonia, 492 tons.

#### BRENTFORD GAS COMPANY.

##### The Half-Yearly Report and Accounts.

In the report to be presented by the Directors of this Company at the half-yearly general meeting on the 10th prox., they state that the sale of gas continues to steadily increase; the percentage for the six months ending June 30 being  $6\frac{1}{2}$  more than in the corresponding period of last year. The number of automatic meters in use is now 19,317, against 17,104 on June 30, 1899. A further extension of gas-manufacturing plant at Southall is in progress, and is expected to be ready for use next winter. The Directors have had under their careful consideration the probable effect of the enhanced cost of coals and other materials on the business of the Company; but, in view of the increased value of products generally, and a favourable contract for coal, they have decided not to give notice at present of any increase in the price of gas. The amount available for distribution is £78,702; and the Directors recommend the declaration of dividends of 5, 12, and 9 per cent. on the preference consolidated, and new stocks of the Company.

The revenue derived from the sale of gas in the past six months was £126,974, as compared with £119,683 in the corresponding period of 1899; meter and stove rentals were £10,498, against £9413; residuals produced £32,063, against £27,410; and the total revenue was £169,578, against £156,553. The expenditure on the manufacture of gas came to £87,941, as compared with £82,353 (coals and oil costing £65,915 against £57,889); on distribution £17,853, against £16,710; and on management, £5003, against £5066. The total expenditure being £123,618, against £115,966. The balance carried to the profit and loss account is £45,959, against £40,587. Under the supervision of Mr. J. Husband, the Company's Engineer and Manager, 65,928 tons of Newcastle coal, and "Solar" oil equal to 20,960 tons, were used in the past



half year for the manufacture of 938,440,000 cubic feet of gas, of which 859,748,000 cubic feet were sold, and 873,748,000 cubic feet accounted for. The estimated quantities of residuals produced were: coke, 44,230 tons; breeze, 5525 tons; tar, 784,424 gallons; and ammoniacal liquor, 18,919 butts. At the meeting, a resolution will be submitted to authorize the raising of £46,875 of 4 per cent. debenture stock.

### THE LONDON COUNTY COUNCIL AND THE TESTING OF GAS.

At the Meeting of the London County Council last Tuesday, the report of the Public Control Committee on the subject of the testing of gas by the portable photometer, some extracts from which were given in the "JOURNAL" last week (p. 230), came up for consideration.

Mr. NATHAN ROBINSON (Chairman of the Committee), having moved the reception of the report,

Mr. E. G. EASTON called the attention of the Council to a chart sent round by the Committee having reference to the great disparity between the quality of the gas as supplied and as it should be sent out. It showed that, as a rule, instead of being of 16-candle power, it had only, on an average, been about 12 or 13 candle power. He should like to ask whether the Committee were going to take any steps to prevent this practice, or obtain for the consumers a proportionate relief. What he meant was that if they were robbed of 25 per cent. of the illuminating power of their gas, it was only right to expect that they might have a 25 per cent. deduction from the bill.

Mr. NATHAN ROBINSON said he fully appreciated the remarks of Mr. Easton, and he should like to ask every member of the Council to carefully read the report of the Committee. Then it would be seen that, so far as the Committee were concerned, they attempted to promote a Bill to make the portable photometer a legal testing apparatus; but the Committee of the House of Commons—probably never known to be altogether antagonistic to monopoly—had, in this particular instance, shown their devotion to monopoly to its fullest extent. The Public Control Committee simply asked Parliament to put them in possession of a power which would compel the Gas Companies of London to supply the article they professed to sell. The Council knew that if a licensed house supplied them with an article which was below the legal standard, the unfortunate publican was taken before a Magistrate and fined. If a milkman put a drop of water into his milk, he likewise was cited to appear before a Magistrate. But the Gas Companies seemed to have absolute power to do just what they pleased. He was quite certain that if the members of the Council would carefully read the report of the Committee they would see that they had attempted to secure the public against the malpractices on the part of the Gas Companies to which reference had been made, and also that Parliament—or rather a Committee of the House of Commons—had prevented them from doing their duty to the public.

Mr. J. ALLEN BAKER asked if some practical step could not be taken by the Committee to secure that at all events the consumers obtained the right quality of gas if they had to pay a higher price for it. He happened to be one of the victims of the recent increased charge, the effect of which he felt rather severely, for he paid for his gas just over £600 a year at the old price, and the rise meant the addition of another £100 per annum. If they had no option but to pay this increased price, it seemed to him that, at all events, they should get good quality and proper pressure of gas. It bore very hardly upon those who used gas not only for lighting, but for driving engines, and so on, and it also pressed very heavily upon the Council, because they were very large users of gas in connection with the gas-engines employed at their pumping-stations and other places; and unless they got good quality and full pressure, they paid a very high price for an article which was not supplied according to contract. He recently had an interview, upon what he felt to be a great grievance in connection with his own firm, with the Secretary and General Manager of the Gaslight and Coke Company; but no satisfaction whatever could be obtained from him. Instead of making a reduction in price where large quantities of gas were used for mechanical power, they increased it. He hoped, at all events, something could be done to secure their having gas of proper quality, if they had to pay the full price for it.

Mr. W. PEARCE asked the Chairman of the Committee if their attention had been directed to the modern practice of gas companies in mixing water gas with ordinary coal gas. Water gas had no illuminating power, and this had to be imparted to it by extraneous methods in the shape of hydrocarbons. After these had been put in, there was danger of their depositing in the pipes, and of the luminosity of the gas being reduced. Mr. Livesey had been asking for a reduction of his standard from 16 to 14 candle power. Water gas could be produced at a very much lower cost than coal gas; and it was quite evident that if any gas company were able to mix 10 or 15 per cent. of water gas with their coal gas, although they might have to artificially make it luminous, they would make a very fine bargain with the public. He thought this subject was well worth the attention of the Committee. The practice to which he had referred was objectionable in another way. Water gas contained carbonic oxide, which was exceedingly poisonous—much more poisonous than coal gas; and there were objections to its use on the score of public health. He was sure it was a growing practice on the part of gas companies to increase the percentage of water gas in their coal gas, and if they were not carefully watched, they would be able to make a magnificent bargain with the public with a reduction of their illuminating power. He thought the attention of the Committee might be directed to the points he had indicated—first, whether the cost of coal gas was not largely reduced by the admixture of water gas; and, secondly, whether it was not deleterious to the public health when mixed above a certain percentage in gas supplied to a house.

Mr. H. CLARKE said there was another point which affected the profits of the Gas Companies and the interests of the ratepayers. In the contracts for the street-lamps, it was stipulated that the flame should be of certain dimensions. Any inhabitant of London who walked about the streets after dark and took notice of the dimensions of the flame of the gas-lamps would frequently discover that it was a little more than half the proper size; so that apparently the Gas Companies had to be brought

to book in many ways. He trusted, as a consumer and a ratepayer, that they would be.

Mr. NATHAN ROBINSON, in answer to Mr. Pearce, said the Committee had had the subject of water gas under consideration on more than one occasion, and the Chemist had made tests for the presence of this gas, and had never found—up to the present time, at any rate—that there had been more than was allowed.

The Committee's recommendation was agreed to.

### LONDON LOCAL AUTHORITIES AND THE GAS QUESTION.

At the Meeting of the Court of Common Council of the City of London last Thursday, some time was devoted to disposing of a number of resolutions and communications which had been placed upon the paper of business, dealing principally with the high charge made for gas by the Gaslight and Coke Company, as compared with the relatively low one of the South Metropolitan Company.

The first matter was a report from the Streets Committee, submitting one by the Remembrancer on the Bill of the last-named Company. It set forth that the Select Committee of the House of Lords, before whom the Bill came on the 11th inst., unanimously rejected the preamble of the part of the Bill relating to the proposed purchase by the Company of the portion of the district of the Gaslight and Coke Company south of the Thames. This report was, on the motion of Mr. A. C. Morton, ordered to be printed and circulated for the information of the members. Following this came a resolution from the Vestry of the parish of St. James and St. John, Clerkenwell, in the following terms: "That the Corporation of the City of London be asked to convene a conference of the Vestries and District Boards north of the Thames (similar to that convened on the telephone question), to consider what steps can be taken to protect the consumers against the continued excessive and exorbitant charges of the Gaslight and Coke Company." The next item was a communication from the London County Council relative to a proposed conference, after the recess, of representatives of the Corporation of London and the Vestries and District Boards of the Metropolis, with regard to the charges made for gas by the London Gas Companies, the quality of the gas, the quantity supplied through slot meters, and the action which should be taken in the interests of the consumers; and asking the Corporation to appoint representatives to attend the conference. The letter further stated that particulars as to the date of the conference would be sent. Finally, there was the following motion by Mr. A. C. Morton: "That a conference of Local Authorities in London be held at the Guildhall, on a date to be fixed by the Right Honourable the Lord Mayor, to consider the increasing charges of the Gas Companies for the supply of gas to the Metropolis; that each authority be invited to send three delegates to such conference; and that it be referred to the Streets Committee to make the necessary arrangements accordingly."

To suit the convenience of the Court, Mr. Morton's motion was taken first of all.

Mr. MORTON, who was complimented by the Chairman of the Streets Committee for the untiring and successful part he had taken in the Committee-rooms of both Houses of Parliament this session, stated that, without in any way being antagonistic to the County Council, he wished his motion to be adopted, as it would not prevent the Corporation sending delegates to the County Council's conference. He would like to see a conference called in the City separate from, and in addition to, that of the County Council. Without being at all offensive to the Council, he believed the Corporation would be more successful in the Committee-rooms of the House of Commons if they were to go united with the Local Authorities than with the Council, who had in hand several matters relating to slot meters and fittings and the quality of gas which had been settled by Parliament this session. What he wished was to keep the one question of price before the Local Authorities, 26 of whom had appeared in the Committee-rooms this year and had succeeded in saving the Municipal Authorities north of the Thames between £30,000 and £50,000 per annum on public lighting alone.

Mr. A. A. WOOD seconded the proposition, stating that the question of the inequalities in the price charged for gas was in all men's minds. He said the question was very much in their minds now. They knew exactly what they wanted, and they would make a stern effort to get it—that was to put an end to the difference of 3s. 5d. against 2s. 8d. per 1000 cubic feet for gas on the north and south sides of the Thames.

The motion was carried and was referred to the Streets Committee, as were also the resolution of the Vestry of St. James and St. John, Clerkenwell, and the communication from the County Council—in the last case for the appointment of delegates.

**Local Authorities and Sources of Water Supply.**—At the monthly meeting of the Executive Council of the County Councils Association, held last Wednesday at the Guildhall, Westminster, under the presidency of Sir J. T. Hibbert, the Committee appointed to consider the question of the sources of water supply which were or might become necessary for local consumption, presented their report. They stated that, though the replies which they had received to a circular issued to local authorities on the subject were not numerous, they were sufficient to show that in most counties in England and Wales there are districts where the supply of water required to meet the wants of the locality is, or is likely to be, imperilled in the immediate future. This is attributed, in the majority of cases, to the action either of water companies or of colliery proprietors. The Committee entered into communication with the Association of Municipal Corporations, and at a meeting held on the 14th of February last, the opinion was generally expressed that the best course would be to introduce a Bill into Parliament dealing with the question, with the object of having it referred to a Royal Commission or a Select Committee of the House of Commons. No formal resolution was proposed; but the Committee of the County Councils Association undertook to draw up a statement, embodying their proposals in outline, in the hope that such proposals might form the basis of a Bill which would command the approval of both Associations. The Executive Council resolved to have a Bill drawn embodying the proposals of the Committee.



## NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held at Winchester House, Old Broad Street, E.C., on Thursday last, to consider the provisional agreement entered into with the Welsbach Incandescent Gas-Light Company, Limited, for the sale to that Company of the business of the Sunlight Company, and to determine what course should be adopted for dealing with the remaining assets and liabilities of the Company. Mr. J. H. DUNCAN, Chairman of the Company, presided.

The SECRETARY (Mr. Laurence Fletcher) having read the notice convening the meeting,

The CHAIRMAN said he wished to make a few introductory remarks before the contract which they had come together to consider was read. First of all, he would take them back to last year, when they met for their statutory meeting. They had just gained a great victory in the Court of Appeal over the Welsbach Company in the matter of the De Mare patent. Following upon this, they got the De Mare patent amended; and then they commenced an action against the Welsbach Company for infringing the patent by the manufacture of the Kern burner. This led to their also beginning another action for the revocation of the Kern patent. This provoked retaliation from the other side, who asked for the revocation of the De Mare patent. At that time, the Sunlight Company had several actions pending against them; and they could do nothing but go on with the litigation. From the commercial point of view, they opened the season, he was glad to say, extremely well; but they were pulled up rather by the want of supplies. They had taken over a factory in Germany for the manufacture of their new white mantle. This factory, however, got to work very slowly, and disappointed the Directors in the quantity of mantles it could turn out. They succeeded in making an excellent arrangement with a large factory in Switzerland; but unfortunately, owing to some difference in the process, the first mantles received from there did not give satisfaction. It was not until March that they got really good mantles; so that during the whole of the winter they had had to rely solely upon their own little factory. This kept down the sales enormously. They could have got rid of four times as many as they were selling. Apart from this discouraging side, the popularity of the mantle and the success achieved with it were very satisfactory. This brought them up to March, when the 1886 patent action came to a head. This action was heard under rather peculiar circumstances. It was tried by a Judge who had only just been appointed. He referred to Mr. Justice Buckley. The Sunlight Company had to go into Court with two of their principal witnesses (Sir William Crookes and Professor Lewes) in a feeble state of health; so that they were not in a very favourable position. The consequence was that their Counsel, thinking he had by cross-examination got sufficient facts from the witnesses for the other side, elected not to put his witnesses in the box at all, with the result that the judgment went against the Sunlight Company. The Directors considered then, and considered still, that on appeal this judgment would have been reversed. This brought them up to the point which affected them that day. The 1893 action then came on. This action was, of course, the *crux* of the whole situation, because if the Welsbach Company were successful in that, they could put a stop to the Sunlight Company's trade. Therefore the Board and their advisers had devoted their energies day and night to this matter. Altogether, this action had caused them a very great deal of anxiety and work to prepare. Having, as they believed, got it into a very good condition, their care was to bring it on at the right time. The Kern patent revocation action had also reached the stage at which it could be heard. He mentioned these two matters in order to lead up to the next step. A few weeks ago, the Welsbach Company called their shareholders together, having just prior to that reduced the prices of their commodities to the extent of 40 per cent. At this meeting there was a good deal of bickering; and in the course of the proceedings, the Managing-Director of the Welsbach Company rather threw out the suggestion that if the Sunlight Company would make proposals to his Company, they would be very favourably considered. Of course, it was impossible for them not to take up such a challenge; but to their astonishment nothing came of their efforts. As therefore there did not appear to be any very great hope in that quarter, the Directors went to work to bring to a head the litigation which had been pending. They decided to put forward the Kern patent revocation case first. In this the Sunlight Company had very little to lose; while the other side could not well afford to experience defeat. This action was to be immediately followed by that dealing with the 1893 patent. The Welsbach Company had evidently been led to believe that they had a very strong case in regard to the Kern patent; and they went into Court in the most confident spirit. They fought the case in Court for eight or nine days. Judgment in it had not yet been given—and very probably never would be given; but the opinion of those present (he thought he might say even of the people on the other side) was that the Sunlight Company had won the case hands down—that they had completely proved their contention. Having scored this success, the Directors were very anxious, if possible, to open up negotiations again; but how to do it they did not know. It was at this moment that a mutual friend (Mr. Tilden Smith) came to the assistance of both Companies. The result was the agreement now before the shareholders; and with that in their hands, they went to the Court and told the Judge what had taken place. He consented to defer his judgment for a time, in order that the shareholders might be consulted. If the amalgamation was carried through, the litigation with their rivals would be at an end; and all the actions (he believed there were eleven) would be dismissed. The commercial history of the Company for the past year was satisfactory on one side, and unsatisfactory on the other. They would remember how he had insisted last year on the question of turnover; and not having been able to manufacture as much as they could have sold, they had not been able to top their expenses. They had had a very fair gross profit, but not a net profit. Taking into account the legal expenses, there would be a loss of several thousand pounds when the accounts came to be made up. He would next ask the Solicitor to read the agreement which had been entered into subject to the approval of the shareholders.

The SOLICITOR to the Company (Mr. Arthur E. Abrahams) then read the agreement.

The CHAIRMAN (continuing) said the contract was fairly clear. It meant that the Company were to retain in their own hands all book debts, cash, and certain other assets, in order to meet their liabilities. They were to receive for the goodwill of the business, patents, stock, &c., £110,000 of 5½ per cent. stock. This was a debenture stock, in the sense that it was a liability payable by the Welsbach Company, but was not charged by any special mortgage. The conditions attaching to this stock would make it a really first-class security; and the only thing he knew of against it was that the Welsbach Company retained power to redeem it. One point he must touch upon was the commission they had had to pay on account of the negotiations. He could easily understand shareholders thinking that £5000 was a good deal to pay on this head. But it must not be forgotten that the two Companies were not friendly; they were rivals, and there was an immense amount of jealousy between them. Many efforts made by the Directors on both sides had come to nothing. The fact that the Welsbach Company were paying Mr. Tilden Smith exactly the same sum as they were proposing to do, showed that the difficulties of the matter were realized in that quarter also. When first announcing the scheme, the Directors had said that the amount payable under the agreement worked out to about 10s. per share. They said "about" in order to give themselves a little time to look into all the liabilities. Having now done so, they did not think the estimate of 10s. was at all a sanguine one—in fact, they believed the amount divisible would more nearly approach 11s. per share. This would mean that 55 per cent. of their capital would be returned to them in a first-class debenture stock. They would take their 5½ per cent. whether the Welsbach Company made a profit or not. He had been a great critic of the Welsbach Company; and he thought they had gone a little too fast in reducing their prices. But allowing for all this, the property must be a very fine one. They would, after this amalgamation, have nothing to fear from other rivals, but would easily beat anyone who came into the field. Some of the shareholders complained of the reorganization last year, when 5s. a share was called up; but since then, it must be remembered, the business had been shorn of 75 per cent. of its profits. A year ago, the incandescent business was a name to conjure with in the raising of money; but now he feared it was quite the opposite. Not being able, therefore, to raise further money, their business must, if the amalgamation fell through, come to a standstill. Dealing with the past year's trading, he said that, had it not been for the supplies falling off, they would have done a very good business; but even if they had had such a result, it would have been affected by the sweeping reduction in prices that had been carried out independently of themselves. Last year it was a splendid business; now they were coming down very near to the bone. If they were going to continue their trading, they must have a large amount of new capital. Having pointed out the evil that would result to the incandescent trade generally if the Welsbach 1893 patent was destroyed, he concluded by moving—"That the provisional agreement submitted to the meeting, and dated the 17th day of July, 1900, which has been entered into with the Welsbach Incandescent Gas-Light Company, Limited, for the sale to that Company of the business, goodwill, and property of this Company (other than cash, bills, book debts, and certain other excepted assets), and for the settlement of all litigation between the two Companies, be and the same is hereby approved, ratified, and confirmed; and that the Directors be, and they are hereby, authorized and requested to carry the same into effect."

Mr. PARKER seconded the motion; and it was carried unanimously.

The CHAIRMAN said there were three alternatives in regard to the method of disposing of the money. One of the conditions was that the Sunlight Company should be got out of the way as quickly as possible; and it was therefore absolutely necessary that the shareholders should at once give directions as to which of the three plans was to be adopted. The proposals were: (1) The voluntary winding up of the Company and the transfer of its remaining assets and liabilities to a new Company to be formed by way of reconstruction of this Company, but with objects restricted to the dealing with, and disposition of, the remaining assets. (2) The voluntary winding up of the Company with a view to the distribution of the assets among the shareholders in specie, and the formation of a small new Company. (3) The continuance of the Company, subject to such alteration of its Memorandum of Association as might be required. The plan recommended by the Directors was the second of the three; and he begged therefore to propose "the voluntary winding up of the Company with a view to the distribution of its surplus assets amongst the members in specie (provided that the Welsbach Company elect to pay their purchase-money in the form of debenture stock, so as to enable such a distribution to be made), thus involving no reconstruction, but only the formation of a new Company with a small nominal capital for the purpose of giving effect to the agreement with the Welsbach Company."

Mr. FREDERICK WALKER seconded the motion.

An amendment to the effect that the meeting be adjourned for three weeks having been put to the meeting and lost, the resolution was carried unanimously.

Mr. OLIVER WETHERED next moved—"That a sum of not exceeding £5000 be paid to the Directors out of the assets of the Company for their extra services, and as compensation for their proposed loss of office or the reduction of their numbers and remuneration (as the case may be), such sum to be divided amongst them in proportions similar to the division of their present remuneration, or in such proportions and manner as the Directors may determine amongst themselves." In doing so, he said it was to be distinctly understood that if anything less than 11s. per share was available for division among the shareholders, the difference was to be made good out of the £5000.

Mr. LOWE seconded the resolution.

Mr. HOLMES proposed, as an amendment, that the motion be suspended until the holding of the next meeting.

Mr. LOVIBOND seconded the amendment, which, on a show of hands, was declared carried.

The proceedings then terminated.

**Water Supply for Littleport.**—The Ely Rural District Council have engaged Mr. E. J. Silcock, of Leeds, to prepare a scheme for an improved water supply for Littleport. The town is situated in the Fens, and is at a considerable distance from any available source of suitable water.



## THE SULPHATE OF AMMONIA COMMITTEE.

## Third Annual Report.

The following report, dealing with the work of the Executive Committee of the above-named Committee in the year ending June 30 last has been issued by the Chairman (Mr. W. G. Blagden), and will be submitted at the annual general meeting of subscribers to-day:—

There has been a very marked increase in the number of competitions carried out by agricultural societies during the past season, compared with the figures for the preceding year; the numbers for the two periods being 69 and 47 respectively. Of the 69 competitions brought to a successful issue this season, 34 were organized by English societies, 34 by Scottish societies, and one by an Irish society. In addition to these, 14 societies—6 Scottish, 5 English, and 3 Irish—who had accepted the Committee's offer of prizes, abandoned their competitions, chiefly on account of the unfavourable character of the season for root crops.

The tabulated results of the 1898 competitions, accompanied by a report drawn up by the Committee's Agricultural Adviser (Mr. John Hunter, of Edinburgh), were issued towards the end of last year. Twenty thousand copies of this report were printed, of which number only 8000 were taken by subscribers. Copies of the report were sent to the principal Agricultural Societies throughout the kingdom, and those societies who had carried out the competitions were invited to apply for as many copies as they might require for distribution among their members. The demand, however, from this source was not large, as rather less than 2000 copies were applied for.

Mr. Muir's essay which gained the 500 guinea prize was published early in September, and 20,000 copies were printed, of which number 5000 were bound in cloth. In all, about 15,000 copies of the work have been distributed. The essay entitled "Sulphate of Ammonia: Its Characteristics and Practical Value as a Manure," which the Committee purchased from Professor Warington, M.A., F.R.S., was published in February. Twenty thousand copies of this work were printed, 2500 being bound in cloth; and about 12,000 in all have been distributed. Upwards of 5500 copies of an illustrated pamphlet entitled "Manuring with Brains," which was published by the Potash Syndicate, have been distributed among the subscribers. During the past year, articles on "Sulphate of Ammonia" have appeared from time to time in the following papers: "Glasgow Herald," "Times," "Field," "Farmer and Stock-breeder," "Farming and Market Gardener," "Nineteenth Century," and "Edinburgh Evening Despatch." These articles amounted in the aggregate to 2400 lines. A similar arrangement has been entered into for the present year; the expenditure being limited to £50.

At the beginning of January, the Committee commenced to advertise in 13 agricultural periodicals and 256 provincial newspapers. The advertisements continued to appear until the middle of May; the total cost of this advertising was £777 14s.; and, as in the previous year, the provincial papers were selected by the subscribers from lists submitted to them by the Committee.

On the expiration of Mr. Hunter's second year of office as Agricultural Adviser to the Committee, he was re-appointed for a further period of twelve months at a salary of £200.

In recognition of the numerous additional services which he has rendered the Committee, Mr. Chris. Middleton, the author of the pamphlet, "A Few Facts about Sulphate of Ammonia," has been paid an additional sum of 20 guineas.

Mr. William Love, of the Broxburn Oil Company, Limited, and Mr. Charles Carpenter, of the South Metropolitan Gas Company, have been elected members of the Executive Committee in the places of the late Mr. W. Kennedy and Mr. Frank Livesey; and Mr. R. O. Paterson, of the Cheltenham Gaslight and Coke Company, Mr. Alex. M. Chance, of Messrs. Chance and Hunt, Limited, of Oldbury, and Mr. Francis T. Cotton, of the Alliance and Dublin Consumers' Gas Company, have been elected members of the Executive Committee.

The Executive Committee regret that the total tonnage represented by the subscriptions received during the past twelve months shows a falling off, compared with the figures for the previous year, of 3267 tons, or about 3 per cent. The tonnage represented by the different districts for the two periods is as follows:—

	July, 1898, to June, 1899.	July, 1899, to June, 1900.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Scotland . . . . .	45,181½	45,810	628½	..
London and Home Counties . . . . .	31,303½	30,350	..	953½
Lancs. and Yorkshire . . . . .	18,190½	16,978	..	1,212½
Midland Counties . . . . .	10,798	9,321½	..	1,476½
Northern Counties . . . . .	4,628	5,955½	427½	..
West of England . . . . .	2,493	1,650½	..	842½
Ireland . . . . .	1,369	1,428	59	..
Wales . . . . .	131	234	103	..
	114,094½	110,827½	1,218	4,485 1,218
			Decrease	3,267

The Executive Committee consider that the very large increase in the number of agricultural competitions carried out during the past season and the extremely good results which were obtained is a most satisfactory feature in the year's work, as it is the best possible indication of the growing interest which farmers and others are now taking in the intelligent use of artificial manures. The present season, however, promises to show a further substantial increase in the number of agricultural competitions, as 69 societies have already entered and agreed to arrange 84 competitions. It is interesting to note that four of these societies are Irish; and it is hoped that, with the assistance of Mr. Hunter, other societies in that country may be induced to follow their example, and organize competitions. The Committee are of opinion that no effort should be spared to extend the area over which these agricultural competitions are carried out, for by means of them the great advantages of

the use of sulphate of ammonia are brought home to the actual consumer in the most impressive manner.

## Report of the Agricultural Adviser.

Accompanying the preceding report is that of the Committee's Agricultural Adviser on the competitive experiments carried out in the season 1899. It is dated the 25th ult., and is accompanied by tabulated particulars of the experiments. Mr. Hunter's report is as follows:—

While the reports of the experiments for the season 1899 show some improvement in the systems of manuring, there is still room for more on the part of many agriculturists, as is evidenced by the mixtures and methods of application recorded in the following notes. For example, it is not good agriculture to mix slag, superphosphate, kainit, and sulphate of ammonia, and to sow this mixture either broadcast or in the drills. Slag contains free lime; and when such a mixture as is here indicated gets on to or into a damp soil, changes are almost certain to take place that will prove detrimental to the sulphate of ammonia, and also probably to the superphosphate, and consequently, of course, to the crops. Neither is it good agriculture to sow sulphate of ammonia in "the back end," nor is it advisable to top-dress with sulphate of ammonia so late as the end of July. In the former case, much loss must be suffered because of the nitrification of the sulphate of ammonia before the crop is there to use the products; and in the latter it is more than probable that much of the derivable benefit will be lost because the alterations in sulphate of ammonia in the soil which are essential to its being serviceable to plants will not be completed in time for the season's growth.

Again, it has been abundantly proved on Lord Rosebery's experimental station at Dalmeny that the annual application of from 3 to 5 cwt. per acre of ground lime, or of lime shells slaked, and more especially if the lime contains notable proportions of magnesia, is of the greatest importance, if the best results are to be obtained from the manures employed, and especially where dung or sulphate of ammonia is used. It is, however, of the first importance to note that the lime, just as in the case of slag, should be sown weeks before the other manures are applied, if the costly artificials are not to be sacrificed, and the best crops are to be raised. This line of action is especially important where sulphate of ammonia is used; and as it is undoubtedly the line to follow where quantity and quality of crops are desired, and where good feeding and good keeping qualities are important, agriculturists ought certainly to give it more attention than they have in the past. This rational use of lime is discussed in the Committee's pamphlet on "The Science of Manuring," and it would be well for proprietors and agriculturists if they would carefully ponder over the facts there narrated.

In these 1899 reports, there are but few references made to results obtained from the use of nitrate of soda as compared with sulphate of ammonia, but where there are any, they again point unmistakably to the increased appreciation of sulphate of ammonia; and there can be no doubt whatever that the more intelligent interest an agriculturist takes in his profession, the less of the alkaline nitrates—nitrate of soda and nitrate of potash—will he use.

Experiments are being carried out this season (1900) in various parts of England and Scotland, where sulphate of ammonia and nitrate of soda are being carefully tested against each other on the oat crop. It is too early to form any opinion of the ultimate results; but if there be anything like confirmation of those obtained at Dalmeny, Woburn, and elsewhere, the bulk, and more especially the weight and the quality of the grain, should in every case be better where sulphate of ammonia is employed.

Your experiments have not included sugar-beet culture, which is perhaps a regrettable omission; but it is a fact that comes within your reporter's knowledge that since the publication of the results of the sugar-beet experiments on Dalmeny in 1897, the demand for sulphate of ammonia in the beet and sugar-cane growing countries has increased enormously, and is certain to become conspicuously greater than in the immediate future. All the results recently obtained show that when sulphate of ammonia is rationally used in sugar-cane and beet culture, there is a very distinct advantage over nitrate of soda, both as regards the total sugar and, what is more important still, the percentage of crystallizable sugar.

Let it be understood that the rational use of sulphate of ammonia implies the conjoint use of all the essential inorganic constituents, of which lime and magnesia as carbonates are as important as, if not more so than, phosphates or potash or anything else; and that inattention to this all-important fact has been the cause in the past of probably every one of the few disappointments that have been experienced in the using of sulphate of ammonia. With this neglect remedied, there is no other purely nitrogenous manure that will not compare unfavourably with sulphate of ammonia.

**Class I. (Yellow Turnips).—**The reports in this class are more than favourable, notwithstanding the fact that 1899 was pretty universally a disastrous year for turnips, we have here a record of many very large crops; numerous cases that are more than the average of a good season; while the few that may be regarded as low are in reality among the very best in their districts.

**Class II. (Swedes).—**The remarks on Class I. are equally applicable in this. There is, however, a new interest here, in so far as we have Ireland taking a part for the first time in these highly-instructive experiments. The manner in which the Coachford Agricultural Society (County Cork) have gone about their work is greatly to be commended, and their results deserve more than passing notice, as the following data as to the crop per acre will show:—

	No. 1. Tons Cwt.	No. 2. Tons Cwt.	No. 3. Tons Cwt.	No. 4. Tons Cwt.
Full manuring—				
With sulphate of ammonia . . . . .	32 10 ..	28 0 ..	26 0 ..	25 5
Without " . . . . .	26 0 ..	21 0 ..	16 0 ..	18 0
Excess produced by sulphate . . . . .	6 10 ..	7 0 ..	10 0 ..	7 5
Sulphate used per acre . . . . .	1½ cwt.	1 cwt.	1 cwt.	1 cwt.
Costing at (say) 12s. per cwt. . . . .	15s.	12s.	12s.	12s.
Which yielded, taking swedes at 25s. per ton . . . . .	£8 2 6	£8 15 0	£12 10	£9 4 3

This just means that, with a break of (say) 40 acres of swedes, these



farmers would have an extra profit of £295, £326, £476, and £338 10s. respectively, in addition to the ordinary profits from their crops; and if this extra yield is converted into beef or mutton, the benefit would, as a matter of course, be increased correspondingly. These figures are simply confirmatory of the declarations of the authors of "The New Soil Science," and they go a long way to show to agriculturists of a sea-girt country like Ireland what improvements can be made, and at what a small cost, where material suited to their country and climate is used.

**Class III. (Mangels).**—Generally it is only the prize-winning crops that are detailed, but in most cases numerous other results are reported to your Committee from each district, and are excluded from the tables simply for want of space. In practically every instance the others in order of merit follow closely on the heels of those tabulated, and there is but one exception to those features which were emphasized in the report for 1898—viz., sound roots, good quality, and excellent keeping properties. The Escrik and District Agricultural Club again distinguish themselves by so elaborating their experiments that the results are extremely advantageous to themselves, valuable to your Committee, and educative to mangel growers everywhere. The experimenters have in each case provided a plot without sulphate of ammonia, but in other respects identical with the competing areas, and the crops per acre are as follows:—

	No. 1.				No. 2.				No. 4.			
	Tons	Cwt.	Qrs.	Lbs.	Tons	Cwt.	Qrs.	Lbs.	Tons	Cwt.	Qrs.	Lbs.
With sulphate . .	57	7	0	0.48	7	3	12	34	11	1	20	
Without sulphate .	41	2	2	12.38	15	3	4	30	6	2	12	
Increased produce	16	4	1	16	9	12	0	8	4	4	3	8
Cost at (say) £12 per ton . . . .				18/-				12/-				12/-

No. 3 is excluded from the above because sulphate of ammonia was used on both breaks, but in different proportion; the larger quantity used proving a highly profitable investment. In two of the three cases detailed, the expenditure of 12s. per acre has yielded an extra 4 tons 4 cwt. and 9 tons 12 cwt. respectively; while 18s. worth of sulphate of ammonia has given an increase of 16 tons 4 cwt., which shows an extra profit over the ordinary manuring that mangel growers and feeders had better calculate out for themselves.

The North Walsham and Aylsham Agricultural Association also have taken the trouble to duplicate their experiments this season, which is very gratifying, if for no other reason, because it is an excellent indication of the increased interest farmers themselves are taking in this highly-educative work. The North Walsham figures are as follows:—

	No. 1.		No. 2.		No. 3.	
	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.
With sulphate . . . .	34	8	33	9	33	5
Without sulphate . . .	30	4	27	7	26	7
Excess produced . . .	4	4	6	2	6	18
Costing at (say) 12/- per cwt.	12/-		12/-		12/-	

The "no sulphate" plots were manured and treated in the same manner in every other respect as the sulphate breaks; and the result in favour of sulphate of ammonia will be a surprise to those who will take the trouble to calculate the extra produce—from the application of 1 cwt. per acre—into mangels, beef, or mutton, and thence into pounds, shillings, and pence!

**Class IV. (Early Potatoes)** has again no entries. This is very unfortunate for the growers, because while it is quite well known that many of the large purchasers of early potatoes, grown on the West of Scotland, absolutely decline to buy those grown by the aid of nitrate of soda, there are no objections whatever to those to which sulphate of ammonia has been given, for these cannot be of that waxy character which always results from the use of alkaline nitrates. It is a fact that early potatoes grown at the Azores which surprised the London market this spring (the seed for which did not leave Scotland until the first week of November, 1899, while the crop was returned to, and sold in, London in the first week of March, 1900), were grown mainly by the aid of sulphate of ammonia. The crop was about double what has ever been known to be raised previously at the Azores; the quality was excellent; and they realized £15 per ton. This is a new source of supply against which home growers of early potatoes will have to compete, and unless those home growers accept the teachings of the new and true science, as has been done abroad, or make experiments for themselves on such lines as your Committee have suggested and have backed by competent advice, they will surely lose their place in the race.

**Class V. (Late Potatoes).**—This is again an interesting class, and when we consider that the average crop of the country in 1899 was not over, but probably considerably under, 6 tons per acre, the results in these trials of from 10 to 16 tons per acre must come as a surprise to many. No doubt there is one case of 8 tons 4 cwt. per acre; but as that is the only one under 10 tons, it is almost justifiable to exclude it in striking an average. It is simply a matter of fact that the potato crop of 1899 went so badly with disease that in very many cases not less than half proved useless and unmarketable. But yet, in the face of this fact, there is only one instance in the whole of those experiments where the potatoes grown by sulphate of ammonia did not keep well; and in this case the tubers of the whole district went bad, no matter what manures had been used. The remarks of the judges and of the growers themselves under the heading "Keeping Properties" in preceding tables must form interesting and instructive reading to those who can appreciate the opinions of some of the best men in the country. They also completely corroborate the results obtained at the leading experimental stations of Britain, where it has been proved up to the hilt that, when rationally used, there is no purely nitrogenous manure known that gives weight and quality of crop and keeping qualities comparable for one moment with sulphate of ammonia. It must be very gratifying to your Committee to find in the 1899 results so much that is in harmony with those of 1898. In truth, there is no contradiction, for every statement made this season is a substantiation of all you have ever claimed for sulphate of ammonia, and of everything that has been said in its favour by those who were competent to judge.

The prizes given by your Committee for yellow turnips and swedes exhibited at the show of the Scottish National Fat Stock Club were gained by

Lord Rosebery and Mr. Hogg. "The quality in each case was "excellent;" and the keeping qualities have proved "exceptionally good." There were several other special competitions in the turnip classes; and it is worthy of being carefully noted by agriculturists that in every case, as far as ascertained, all the crops that gained the leading prizes were grown by sulphate of ammonia. In the cabbage competition at the same show, four out of the five prizes were won by exhibits grown with the aid of sulphate. This result is simply a repetition of those of 1898; and it is a strikingly strong confirmation of the anticipations in your previous reports, and of the unvarying results obtained at the Dalmeny experimental station, where quantity, quality, and unsurpassable keeping and feeding qualities have been invariably associated with the application of sulphate of ammonia.

In your Committee's report of the 1898 experiments, emphasis was laid on the necessity for the universal use of small quantities of the essential ash constituents—lime and magnesia—in addition to dung, phosphates, potash salts, and sulphate of ammonia. Ground lime shells—sold as ground lime—or in its place slaked lime, should be used annually to the extent of from 3 to 5 cwt. per acre, and should be broadcast four to six weeks before other manures are applied. This lime application materially increases the benefit derivable from all the higher class manures, such as bone manures, suppers, potash salts, dung, and sulphate of ammonia. This fact is being realized by sugar-cane growers, who have returned to the use of sulphate of ammonia and discarded nitrate of soda; while at home the benefits have been so conspicuous that producers of ground lime are at present quite unable to meet the requirements, even with increased and improved grinding plant.

This report would surely be incomplete if reference were not made to the competitions for prizes offered by your Committee for barley grown by the aid of sulphate of ammonia and exhibited at the Brewers' Exhibition in the Royal Agricultural Hall, London, in October, 1899. It is worthy of note that the crops which gained your Committee's prizes gained also commendation in the British malting barley competition. They gained also the first, as also a special prize in Class X. "Extra Special London Brewing Prizes." In Class XI., the "Special Shropshire Prizes," they again won the first and a special prize. Again, in Class XIX.—"Mark Lane Express" Diplomas for Seed—the three competitors for the Sulphate of Ammonia Committee's prizes gained four diplomas with the barley grown with sulphate of ammonia. This is "record-breaking" and no mistake; but, after all, it is only what might have been anticipated when we think of the results obtained at Dalmeny, Rothamsted, Woburn, and other experimental stations where, weighed on the scales and their malting qualities judged of by practical experts, the barleys grown by sulphate of ammonia have been declared superior in every respect to those grown by nitrate of soda. Brewers themselves are now beginning to realize, that, for malting for beer production, nitrated grains are objectionable for several reasons that need not be discussed here; but there is little doubt that this top-dressing of barley by a soda salt—i.e., nitrate of soda—has had much to do with brewers looking abroad for grain that would better suit their purpose.

## SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., last Wednesday, Mr. Alfred Richards conducted a sale of gas and water stocks and shares. The first lots consisted of a new issue of 4 per cent. perpetual debenture stock of the Ilford Gas Company. It was put up in £100 lots, the greater number of which were sold at par; a few fetching 10s. and £1 premium. These were followed by a new issue of £10 shares (7 per cent.) in the Chigwell, Loughton, and Woodford Gas Company, which realized £14 each. A new issue of 3 per cent. perpetual debenture stock of the Maidstone Gas Company fetched from £75 to £76 per £100 of stock. A few fully paid ordinary £10 shares in the South-West Suburban Water Company (last dividend 5 per cent. per annum) were sold for £14 12s. 6d. apiece; some 5 per cent. preference shares of like nominal value fetching £13 5s. each. A new issue of 4 per cent. perpetual debenture and 5 per cent. ordinary stock of the Cromer Gas Company was next offered. The former was put up in £50 lots, and was disposed of at £100 per pair. The ordinary stock, the last dividend on which was at the rate of 4 per cent. per annum, fetched £85 and £85 10s. per £100. Some 4 per cent. perpetual debenture stock of the Southend Gas Company was sold at the rates of £100, £100 15s., and £101 per cent.; and £481 of new ordinary 5 per cent. stock (last dividend 5½ per cent. per annum) fetched from £100 to £105 per cent. The last lots offered consisted of £500 of consolidated "B" stock of the Tottenham and Edmonton Gas Company, sold by order of Executors. It ranked for a standard dividend of 3½ per cent. per annum, subject to the sliding-scale—the last dividend having been at the rate of 4½ per cent.; and it was sold for £92 and £94 per £100 of stock. At a sale conducted on the previous day by Messrs. Sparks and Son, at Littlehampton, the following prices were obtained for gas shares: Six original shares in the Littlehampton Gas Company, paying 10 per cent., £11 10s. each; six similar shares, £11 12s. each; seven new ordinary £5 shares in the same Company, paying 7 per cent., £7 18s. apiece; and twenty £5 shares, £7 13s. per share. At the same sale, £25 of consolidated ordinary stock of the Arundel Gas Company, ranking for a standard dividend of 5 per cent., was sold for £37.

**Gas Poisoning in Belfast.**—On Monday last week an inquest was held relative to the death of Ann Thompson, aged about fifty years, who resided alone at 38, Tobergill Street, Belfast. Charles Nicholson, son-in-law of the deceased, identified the body, and stated that he last saw Mrs. Thompson alive on the night of the 14th inst. Since then she had not been heard of until the night of Sunday, the 22nd, when he entered the house in company with the police, and discovered her lying dead in bed, the body being black and swollen. There was a strong smell of gas in the house, and he found subsequently that one of the jets was half turned on. Dr. English said he believed death had occurred more than a week previously, as decomposition had fairly advanced. There were no marks of violence on the body; and, in his opinion, death was due to gas poisoning. The Jury returned a verdict to this effect, and did not attribute blame to anyone in connection with the death.



## MANCHESTER CORPORATION GAS SUPPLY.

## Annual Report and Accounts.

We have received from the Superintendent of the Manchester Corporation Gas Department (Mr. Charles Nickson) a copy of the report of the Gas Committee, briefly noticed last week, with an abstract of the accounts for the year ending March 31 last. The Committee record the progress of the undertaking as follows:—

The number of tons of coal and cannel carbonized, including the equivalents of enriching materials, and quantity of gas and residual products made per ton carbonized, compared with the previous year, is—

	Coal and Cannel Carbonized. Tons.	Gas per Ton. Cub. Ft.	Coke per Ton. Cwt.	Coke For Sale per Ton. Cwt.	Tar per Ton. Gallons.	Am. Liq. per Ton. Galls. (10 oz.)
1900.	458,273	10,312	12'65	8'49	12'21	26'74
1899.	426,831	10,445	12'97	8'79	12'10	27'60

the production of carburetted water gas, 2,122,163 gallons of oil and 11,584 tons of coke have been used.

The illuminating power of the gas sent from the works was equivalent to 19.40 standard sperm candles, against 19.36 candles for the year 1898-9.

The quantity of gas transmitted from the works shows an increase of 268,771,000 cubic feet, or 6.03 per cent., as compared with an increase of 303,553,000 cubic feet, or 7.31 per cent., in the previous year. The total output and quantity unaccounted for, compared with 1898-9, is as follows:—

	Gas Sent Out. Cub. Ft.	Unaccounted for. Cub. Ft.	Percentage of Loss.
1900	4,725,844,000	164,065,000	3.47
1899	4,457,073,000	171,735,000	3.85

The number of gas consumers on March 31, 1899, and 1900, was respectively as follows:—

	Within the City.	Beyond the City.	Total.
1900	102,668	23,523	126,191
1899	97,312	21,646	118,958
Increase in 1900	5,356	1,877	7,233

The percentage of private consumption was as follows:—

	1899. Per Cent.	1900. Per Cent.
Within the city—Ordinary consumers	80.98	79.45
Prepayment	4.00	4.79
Outside the city—Ordinary	14.74	15.39
Prepayment	0.28	0.37
	100.00	100.00

The number of automatic meters in use at the end of the financial year was 31,436, as compared with 26,751 in the previous year—an increase of 4685, of which 4096 were fixed in the city and 589 in the out-townships. The quantity of gas consumed by these meters was 214,097,000 cubic feet—an increase of 46,824,000 cubic feet, or 28 per cent., on the previous year.

The number of gas fires, cookers, and other appliances on hire on the 31st of March was 9560, and the number of gas-engines in use 1488, as compared with 7336 and 1375 respectively for the year ended March 31, 1899. The quantity of gas used by cookers, fires, and engines is estimated at 350 million cubic feet; being an increase of 12.90 per cent. on the previous year's figures.

During the past six years, the increase in the consumption of gas has been as follows:—

Year ended March,	Cubic Feet.	Increase Per Cent.
1895	151,032,000	4.28
1896	79,503,000	2.16
1897	419,769,000	11.16
1898 (decrease).	28,819,000	0.69
1899	303,553,000	7.31
1900	268,771,000	6.03
Average.	198,968,000	5.63

The total amount of revenue was £654,527, as compared with £594,970 in 1898-9; being an increase of £59,557. The revenue was derived as follows:—

	1899.	1900.
Gas-rentals, &c., within the city	£413,942	£433,843
Do. beyond the city	84,215	88,979
Coke	48,362	64,927
Tar	24,568	34,533
Ammonia water	23,357	31,436
Sundry receipts	526	809
	£594,970	£654,527

The amount paid for coal, cannel, and oil, including the cost of unloading, was £253,076. The cost of material per ton carbonized was 11s. 0.54d., against 10s. 9.98d. for the previous year, an increase of 2.56d. per ton, which, on the total carbonization of 458,273 tons, amounts to £4888.

The advance of 5 per cent. recently given to the workmen, and the increase in the price of all materials used in the manufacture and distribution of gas, have affected the profits of the department during the past year, and will do so to a much greater extent during the current year.

The amount paid in compensation to workmen was £498 7s. 8d., in addition to which the sum of £5000 has been granted to the widow and children of the late Mr. G. E. Stevenson, Engineer, who was killed in the explosion at the Rochdale Road Gas-Works on Oct. 30, 1899.

The gross profit on the year's working was £149,051 12s. The sum of

£38,400 16s. 10d. was paid for interest, and £36,686 3s. 8d. has been placed to the sinking fund (as required by the Acts of Parliament under which the money is borrowed). The net profit, therefore, amounted to £73,964 11s. 6d. Of this amount, £52,000 was paid over to the city fund; £1758 8s. 2d. has been placed to the suspense account, on account of the outlay on carburetted water-gas plant; and the balance, £20,206 3s. 4d., has been carried to the contingent fund.

The expenditure on capital and renewals accounts was as follows:—

	Capital.	Renewals.
Gaythorn	£3,634 7 6	£390 0 0
Rochdale Road	6,531 0 5	5,282 11 2
Bradford Road	4,561 16 8	500 0 0
Droylsden	124 2 0	189 17 7
Street-mains stores (Poland Street)	282 10 11	1,212 1 4
Mains	12,649 9 6	2,981 11 6
Services	6,813 2 0	2,676 3 8
Meters	16,242 19 6	9,635 19 11
Stoves	14,300 14 6	323 1 2
Stoves show-room (Deansgate)	5 11 7	—
Street-mains stores (Whitworth Street)	3,570 5 6	—
Oil storage dépôt (Mode Wheel)	493 4 7	—
Land and property	6,543 13 6	—
	£75,752 18 2	£23,191 9 4
Less—Transfer to Rochdale Road explosion account—value of clock tower, &c., destroyed	3,500 0 0	—
Transfer to renewals account, value of buildings demolished	1,384 5 10	—
	£70,868 12 4	£23,191 9 4

With regard to extensions and renewals at the Gaythorn station, the following work has been executed: Erection of exhaustor-house, and fitting exhaustor and engine with connections of a capacity of 160,000 cubic feet per hour, for drawing the gas as required from the Bradford Road works. (This was completed on Sept. 20, 1899, and has continued to work satisfactorily.) The removal of nine old tower scrubbers to make room for a new section of modern washing and scrubbing plant of a capacity of 3,500,000 cubic feet per diem. This plant, consisting of a Livesey washer, a Stevenson scrubber, and a Holmes washer-scrubber, was erected and set to work shortly after the close of the year, and will have an important bearing on the future working results of this station. Other work of importance was done in No. 1 retort-house in the way of more efficiently ventilating the charging-floor and fixing new stone beds for the gearing of the coke conveyors.

During the year, a considerable amount of work was in progress at the Rochdale Road station. The conversion of the "A" retort-house into a meter and governor house, mechanics' shop, and smithy was completed; and the two latter are now ready to receive the new machinery and tools. Two new station meters, each of a capacity of 175,000 cubic feet per hour, and four 24-inch governors, were erected and put into action. The difficult work of removing the old meters and governors, and re-arranging the various connections throughout the works, was partly carried out, and is now approaching completion. The taking down of the clock tower, damaged by the explosion, was effected without accident. A new valve-house, in which all the connections and valves of the several gasholders are concentrated, was erected, and will facilitate the easy and safe working of this section of the works. The purification of the gas with lime was adopted at this station, and commenced in April, 1899; and the results achieved have justified its introduction. Carbonic acid was practically absent from the gas distributed during the year, and the sulphur compounds were reduced to a minimum. Although carbonic acid is not so deleterious an impurity as sulphur, there is no question as to the advisability of its removal; the difference in the brilliancy of a gas-flame with this impurity absent as compared with one in which it is present being very marked.

At the Bradford Road station, the principal work carried out during the year was the erection of a coke-hoisting plant and foundations for the new oil-storage tank. The former work has resulted in a diminution in the production of breeze. The total sales of breeze during the year at all the stations amounted to 20,500 tons. As the difference in value between this product and ordinary coke is considerable, any plant which has for its object the saving of coke from breakage is of great service, and should be extensively adopted.

The work executed at the Droylsden station has been unimportant, with the exception of the improvements to the coal and cannel elevators, including the addition of a 14-cwt. self-indicating weighing-machine.

Attention was paid during the year to the maintenance of the mains and services in good condition. In the cases of a large number of the renewals, advantage was taken of the opportunity to replace with pipes of a larger size, so that a good supply of gas could be delivered to districts in which a great increase in the number of dwelling-houses and other premises had taken place. The 36-inch main which has been laid for the direct transmission of gas between Bradford Road and Gaythorn was completed on Sept. 22, 1899, and was found very useful during the winter. At the Poland Street dépôt, new stables, workrooms, and offices are in course of erection. The total length of mains now laid is 1,411,639 yards, or 802 miles and 119 yards; being an increase of 15½ miles and 108 yards during the year.

The following is a summary of the past year's transactions in the Stove Department compared with the previous year:—

	1899.	1900.
Number of articles sold	1179	941
New stoves purchased for hire	2489	2477
Stoves issued on ordinary hire (including new stoves and re-issues)	3074	4307
Stoves issued on the hire-purchase system	35	22
Stoves cleaned and repaired	962	1350

The whole of the works and plant have been kept in good repair and working condition throughout the year, out of revenue.



Accompanying the report are the accounts and the usual appendices, from which we take the following particulars :—

# PROFIT AND LOSS ACCOUNT.

## INCOME.

Gas-rental—			
Ordinary meters . . . . .	£449,808	3	8
Prepayment meters . . . . .	29,829	15	8
Public lamps . . . . .	38,307	0	11
Stove-hire . . . . .	4,876	14	1
Residual products—			
Coke . . . . .	£64,927	12	8
Tar . . . . .	34,532	13	5
Ammonia water . . . . .	31,436	5	5
Carbon . . . . .	332	17	11
		131,229	9 5
Rents of cottages, &c. . . . .		475	15 11
		£654,526	19 8

## EXPENDITURE.

Cannel and coal (including cost of unloading, &c.) . . . . .	£253,076	9	7
Carbonization (retort men's wages, &c.) . . . . .	56,805	6	8
Retorts, fire-bricks, &c. (including cost of setting) . . . . .	13,125	12	6
Repairs and maintenance of works, mains, &c. . . . .	67,137	11	1
Renewals of plant, &c. . . . .	23,191	9	4
Purifying material and wages . . . . .	9,208	1	9
Salaries and wages of clerks in Superintendent's office, rental and inquiry offices, and meter inspectors . . . . .	25,341	5	2
Collectors', receivers', and cashiers' salaries . . . . .	8,489	7	6
Rents, rates, and taxes . . . . .	33,416	16	8
Compensation under Workmen's Compensation Act, 1897 . . . . .	498	7	8
Bad debts . . . . .	667	8	6
Miscellaneous expenses . . . . .	5,148	16	8
Rochdale Road Gas-Works explosion account . . . . .	9,368	14	7
		£595,475	7 8
Balance . . . . .		149,051	12 0
		£654,526	19 8
Interest . . . . .	£38,400	16	10
Sinking funds . . . . .	36,686	3	8
Balance (net profit on the year's working). . . . .	73,964	11	6
		£149,051	12 0

The balance of net profit is applied as follows :—

Amount paid over to the city fund account . . . . .	£52,000	0	0
Suspense account in connection with expenditure on carburetted water-gas plant . . . . .	1,758	8	2
Balance placed to contingent fund . . . . .	20,206	3	4
	£73,964	11	6

The appendices following the accounts furnish, as usual, statistics as to the progress of the gas undertaking during the year.

The figures in Appendix A—a statement of the lamp and private rental, including meter and stove rents, derived from within and beyond the city—have already been given in the profit and loss account.

Appendix B is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows :—

	Daytime, Cubic Feet.	Twenty-four Hours, Cubic Feet.
Year ended March 31, 1899. . . . .	1,188,340,000	4,457,073,000
Do. do. 1900. . . . .	1,322,308,000	4,725,844,000
Increase . . . . .	133,968,000	268,771,000
Quantity of gas transmitted from works . . . . .	4,725,844,000	
Do. measured and accounted for . . . . .	4,561,779,000	
Loss (by condensation and leakage) . . . . .	164,065,000, or 3' 47 per cent.	

In Appendix C, particulars are given as to the results of the working from June 24, 1881, to March 31, 1900. The table contains statistics as to the number of tons of coal carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., for each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 458,273 tons; gas made, 4,725,743,000 cubic feet; yield per ton of coal carbonized, 10,312 cubic feet; illuminating power, 19.40 candles; make reduced to 20-candle power, 4,583,970,000 cubic feet; make per ton, 20-candle power, 10,003 cubic feet; make of coke, 254,204 tons; do. per ton of coal, 12.65 cwt.; make of tar, 26,719 tons; do. per ton of coal, 12.21 gallons; make of ammoniacal liquor (10-oz. strength), 10,748,451 gallons; do. per ton of coal, 26.74 gallons.

Appendix D shows the number of stoves on hire and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 6375 stoves on hire within, and 3185 beyond the city—together, 9560, as compared with 5057 and 2279 (together 7336) at the corresponding date in 1899; so that there was an increase of 2224. The number of meters in use was 126,191 in 1900 and 118,958 in 1899. There was last year a net increase of 7233 on the number for the preceding year. Of the total number at work on March 31 last, 119,967 were on hire, as compared with 112,076 at the close of the financial year 1898-9. The number of prepayment meters on hire on March 31 last was 31,436—an increase of 4685 on the number at the close of the preceding year.

From Appendix E, we learn that the gas-mains laid last year within the city amounted to 23,708 yards, and beyond the city to 12,674 yards—a total of 36,382 yards, or 20½ miles 302 yards. The mains taken up were 7912 and 642 yards respectively—a total of 8554 yards, or 4½ miles 194 yards. The total net increase during the year, therefore, was 27,828 yards, or 15½ miles 108 yards. The total length of mains laid up to March last was 1,411,639 yards, or 802 miles and 119 yards.

Appendix F consists of a statement showing the amount of gross profit

made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from 1862 to March 31 last. The figures for the past financial year are as follows: Profit, £149,051; paid over for improvement purposes, £52,000; carried to contingent fund, £20,206; borrowed money owing, £1,026,456; and excess of assets, £1,126,834. The profit of £149,051 is appropriated thus: Interest, £38,400; liquidation of mortgage debt, £36,686—leaving a surplus of £73,965.

## BIRMINGHAM CORPORATION GAS SUPPLY.

### Increase in the Price of Gas—The Retirement of Mr. Edwin Smith.

At the Meeting of the Birmingham City Council last Tuesday, the report of the Gas Committee noticed last week (p. 233), containing a recommendation that the price of gas should be increased by 3d. per 1000 cubic feet, with a proportionate increase for public lighting, from the September reading of the meters, was presented.

Mr. J. H. LLOYD, in moving the approval of the recommendation, reminded the Council that, in making the annual statement of the Gas Department last May, he told them that if the reported demands of the coalowners were successful, there must undoubtedly be a serious rise in the price of gas. It was now necessary to decide what that rise should be. According to a carefully-prepared estimate, the increased cost of coal and oil in the current financial year would be £140,000; and to this must be added an increase in the cost of the materials for manufacture—such as stores, iron, fire-clay goods, &c.—and labour, with a further £2000 for rates and taxes; making a total of £162,000 more than last year. On the other hand, they hoped they might get a certain extra amount for residuals. They estimated £25,000 on account of the improved values of tar and coke, or a net increase to be provided for of £137,000. The higher prices for gas could only be applied this year to the six winter months' output; and it would require an increase of nearly 10d. per 1000 cubic feet to provide in the six months for the deficiency of the year. By sundry savings which it was hoped to make, and by suspending for the year the usual provision for depreciation, the deficiency of £137,000 could, it was estimated, be reduced to £79,000. This would require an increase of 5½d. per 1000 feet on the output for the six months; but, as explained in the report, the contribution to the improvement rate for the year 1900 had already been provided—that was the £29,821 voted in May last; and the Committee therefore suggested to the Council that no provision should be made from the current year's income for any contribution to the rates. They proposed, in fact, until they came into more favourable circumstances, to revert to the former practice of providing the contribution to the rate of 1901 from the income of the Gas Department in that year. By this means it would be possible, at any rate for the present, to limit the increase in the price of gas to 3d. per 1000 cubic feet. The Committee made this recommendation to the Council with hesitation, knowing that 3d. was a very small rise indeed in face of the enormous advance in the price of coal, oil, and other materials. They would have preferred to be able to pay the contribution as usual at the close of the current financial year, and to have made the usual allowances for depreciation. They looked at the circumstances, however, as abnormal; and though they regretted the action of the coalowners in raising the price of coal excessively, they did not wish to hinder the progress of the undertaking by checking the extensive use of gas-engines as a substitute for other forms of motive power which was now taking place on a considerable scale. It must, however, be clearly understood that the present position could not remain, and was only a temporary method of meeting an emergency. The future would depend upon the state of the market for gas coal. If the high prices and restrictions on output were maintained next year, it would be necessary to ask for another advance. But the Committee hoped that by then wiser counsels might prevail. The existing state of the gas-coal market was to a great extent artificial. There was undoubtedly at present a large quantity of gas coal yet in the market; and already new collieries were being opened up. The general effect of an advance in price was to check consumption; and as increases in the price of gas—many of them large ones—were taking place all over the country, the effect would probably be felt in another twelve months, and would tend to reduce the price of coal. The Gas Committee hoped the very moderate advance for which they were now asking would not have the effect of materially checking consumption. It was well known to gas suppliers that high prices of fuel tended to a greater use of gas-engines and gas cooking-stoves; and it must be remembered that here there was a permanent substitution of gas for other fuel, which strengthened the department in bad times. In the first three months of the current financial year, the output of gas-stoves had reached 1100, as compared with 860 in the corresponding period of last year.

The motion having been seconded,

Mr. E. PARKES, M.P., expressed the opinion that the Committee were sailing very near the wind. He said the average increase in the price of gas which was taking place throughout the country was about 6d. The Committee were proposing to provide £45,000 against an extra expenditure of £137,000. It was evident that this could not last; and he thought it would have been wiser to have asked for another 1d. or 2d. He feared the result of not doing so might be a larger increase eventually.

Mr. LANCASTER said it seemed to him to be very bad finance to dispense with putting aside £50,000 for depreciation, and to suspend the contribution of £30,000 to the rates. This must mean an increase of 3d. in the rates. They were, in fact, making a present to the consumers, outside as well as inside the city, of 3d. per 1000 feet. He would rather take the bull by the horns, and increase the price of gas by 6d. and pay their way.

The LORD MAYOR (Alderman Beale) said there appeared to be some misunderstanding. The report did not say that the Gas Department would not contribute the usual £30,000 to the rates, but that the sum would be provided out of the profits of the year 1901, and not out of those of the present year.

Mr. LLOYD said the position in relation to the contribution of the Gas Committee to the rates was that the £30,000 profit made in the year that was closed had been paid over in relief of the improvement rate of the present year. The intention of the Committee was that the £30,000 for



next year should be paid at the close of the financial period, as was formerly the case. The price of gas for next year would have to be settled in view of this circumstance. No doubt the Committee were undertaking considerable risk; but they trusted that an extra 3d. would just help them through the present year, and they would then look at the position for the year following.

The motion was carried.

Mr. LLOYD then moved that the Committee be authorized to advertise for, and to appoint, a Secretary of the Gas Department at a salary of £1000 per annum, in the place of Mr. Edwin Smith, who desires to retire early next year. They were about, he said, to lose one who had been a faithful servant to the Corporation and the city. Mr. Edwin Smith was chosen by Mr. Joseph Chamberlain, when he was Chairman of the Gas Committee, soon after he had negotiated the purchases from the old Companies, and he had successfully organized the Corporation department combining the two Gas Companies. Mr. Smith was a man of great ability, and before he went to the Gas Department was widely known as Secretary of the Midland Institute. No one could have been more faithful to the interests of the department, or taken a higher standard in regard to all his work. Justice to every consumer and no favouritism of any kind were characteristics of his labours. Gifted with a clear and logical mind, he had always been ready to grasp the complicated details of the great undertaking; and now, while in the full vigour of life, he desired to avail himself of the superannuation scheme rather than continue to work at the Gas Department when he began to desire rest. None but the Gas Committee knew how much the community had to thank Mr. Smith for his earnest, incessant zeal for the welfare of the undertaking; and their regret at losing his services would be great. He (Mr. Lloyd) was sure he was expressing the wishes of the whole Council when he said he hoped Mr. Smith might be long spared to enjoy his well-earned rest. Their need now was to find a fitting successor. He must be a man of ability, accustomed to the management of men, able to grasp the details of the department, trained to thoroughly understand and master the innumerable problems that would be likely to beset a man in his position. The word "Secretary" in no way described all that was expected. He must either already have a thorough knowledge of the commercial and financial sides of gas-making, or he must have the requisite patience and ability rapidly to grapple with the principles and details, and master them. He must have the accurate knowledge which would enable him to bring matters before a Committee with all the information ready, so that the essential points could be considered and decisions made without delay. He must also have the gift of organization for a large office of clerks would be under his headship; and he must be courteous to every one of the 60,000 consumers, even though one or two were occasionally unreasonable and irritating. The present Secretary had received £1250 per annum for very many years; but the Committee now proposed that £1000 a year should be the amount of salary advertised. No one who had any knowledge of the value of such an office would consider this sum too great; but the Committee hoped it was large enough to induce some really first-rate men to apply.

Mr. BISHOP, in seconding the motion, said he had known Mr. Edwin Smith longer than any other member of the Gas Committee, and he could endorse every word the Chairman had said with respect to the great debt they owed him. They all hoped he would have long and pleasant enjoyment of his retirement.

Alderman COOK inquired, with respect to Mr. Smith's successor, whether the Committee had looked carefully round to see if there was any member of the municipal staff who might be promoted to the position.

Mr. LLOYD said they had looked round the department, and had also taken a wider view; but they had no one in their minds who was likely to supply what they wanted.

The motion was carried.

### DEVONPORT GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday—Mr. A. BENNEE in the chair.

The Directors in their report stated that their contracts for the supply of coal were fortunately made before the great advance in price; but the new contracts had been entered into at much higher figures, and this, with the increased cost of almost every kind of material, had necessitated an increase of 6d. per 1000 cubic feet in the price of gas. This increase would not continue longer than was absolutely necessary. The sum derived from the sale of gas and from meter-rents amounted to £28,422, as compared with £27,255 in the preceding year. Residuals also realized £2873 more. The total income was £39,312, and the total expenditure £36,511; leaving £2801 to be carried to the net revenue account. The Directors reported with great regret the resignation of Mr. R. C. Smith, who had been a member of the Board for 51 years, and had ably occupied the chair for upwards of 41 years; and they also recorded with regret the death of Mr. J. T. Philp, a member of the Board, and of Mr. John Williams, the Secretary. They notified that in place of Mr. Williams, Mr. F. T. Trethewy had been appointed Secretary.

The CHAIRMAN, in moving the adoption of the report and accounts, said there had been an increase of nearly £4000 in the cost of the coal carbonized; but more than £3000 of this was accounted for by the rise of something like 3s. per ton as compared with the preceding year. Wages showed an advance, owing to the larger quantity of coal carbonized, and extra work which had been done in various parts of the town in laying new mains and replacing old ones. Another item of expenditure was due to one of the holders. This holder had given trouble from the start. Owing to the sinking of the foundation, it was not quite perpendicular; and as it became worse with lapse of time and under pressure of storms, it had to be put right. On the credit side of the account, there was an increase of about £1100 in the revenue from the sale of gas, and of about £40 in meter-rents. The sales of coke turned out exceedingly well. They had no contracts running when the price went up, and they made the most of the advance, with the result that there was an increase under this head of nearly £3000. The balance of net revenue was £9295, as compared with £10,925 last year; but, considering what they had done, they might congratulate themselves that it was so good. The electric light was coming; but they had no fear that it would affect the prosperity of the Company. They would probably

lose a customer here and there; but for one lost they would gain two or three. In Devonport, as in other places, the electric light would simply stimulate the demand for gas. They had had one unfortunate experience during the year. At the time when they wanted good coal and plenty of gas, a fire broke out in two of the coal-stores. All they could do was to use the coal as quickly as possible; but they were put to the expense of moving it, in order to prevent the destruction of the whole quantity. The coal difficulty had been very great. Not only did the price go up 3s. per ton, but freights advanced by 2s. or 2s. 6d. a ton. They had fortunately made contracts both for coal and freights before the advance; but in the current year they would feel the effect of the increase in all kinds of material. As to the future, incandescent burners would, no doubt, give a great stimulus to the consumption of gas. They were the first Company west of London to introduce incandescent burners for public lighting. Devonport was one of the worst lighted places in Great Britain. He knew towns of similar area which had four times the number of lamps. People cried out for better gas; but those who cried loudest often had bad burners, and did not get the full value of the gas when they had it. New houses in Devonport were being fitted with  $\frac{3}{8}$ -inch pipes, which was absurd, and led to complaints of want of pressure, when all that was needed was room for the gas to pass. In old houses, there were often worn-out and corroded pipes which no one ever thought of renewing. Gas of high illuminating power was, for these and other reasons, seldom worth what it cost to produce; and it was satisfactory to find that Parliament had come to the conclusion that 14-candle gas was quite good enough. The main reason for the change in the opinion of Parliamentary Committees on this subject was that new light had recently been thrown on the course of events in Germany with reference to the illuminating power of the gas. In Berlin—the best-managed Municipality in the world—incandescent gas-burners were in use everywhere, and had replaced the electric light in the streets. He might mention, too, that in Magdeburg and other places gas of from 7 to 10 candles was made, and everybody used incandescent burners. In this country, the progress of incandescent lighting had been hindered by the dearth of the mantles and burners; but they had a great deal to hope for from the cheapening of them. When they first put incandescent lights into the lamps in Devonport Park, they paid 32s. 6d. each for "D" burners; while the present No. 4 burner, which was better both in its construction and in the results it gave, cost only 5s. 6d. He thought that the Welsbach Company would see that it was advisable to further reduce their prices, and that incandescent burners would be ultimately as generally used in this country as on the Continent. With regard to their relations with the Corporation, their motto was "Peace." They wanted peace and hoped to have it. At the same time, they wanted fair play; and they did not consider that in regard to the supply of gas to the district recently added to the borough they had been treated quite as fairly as they should have been. They were asked by the Corporation to carry the mains to the boundary of the borough as it formerly existed to supply lamps 100 yards apart, as against the usual 25 and 40 yards. They did not object; and, anticipating the demand of the future, they ordered mains, which, after some delay, were now delivered. In December, 1898, they were asked to quote terms for the supply of gas to the added district. They might have declined to send terms; but they did not. Without waiting for them, the Council applied to the Plymouth Gas Company for a quotation; but that Company naturally said they would not do the work at any price. As to their own quotation, they said to the Corporation: "If you will pay the cost of the mains and services, we will supply gas at the same price as in the town, scattered though that district is." The Corporation replied that these terms were by no means acceptable, and that they thought the Company would have been glad to supply the district. To this the Company wrote suggesting an interview; but they heard no more from the Corporation until November, 1899, nearly a year after the former communications. Then the Corporation wrote, not in answer to their suggestion for an interview, but complaining of certain matters. No interview had taken place, and nothing had been done; but it was not fair for the Corporation to say, as they had done before a Local Government Board Inspector, that the Company refused to supply gas on any other terms than those he had named. If the Corporation had met them in a reasonable way, he thought they would have come to terms, and the district would have had a supply of gas. They did not want the work, and were sure there was no profit to be made out of it; but they were willing to undertake it if they could protect their shareholders and present consumers.

Mr. A. W. WHITE seconded the motion.

Mr. MOON said the shareholders had not heard the other side of the story. The Corporation paid for gas they did not consume, through lamps not being alight. As to the outlying districts, many of the people would be consumers of gas if they could get it.

The CHAIRMAN explained that one of the lamplighters called at the Police Office at eleven o'clock each night and obtained a list of the lamps reported to be out; and, if possible, all were relit. The fact was the Corporation got a very great deal more than the Company were under obligation to give them. They supplied 14-candle gas instead of the 12-candle gas provided for by their Act, and they gave at least 5 cubic feet of gas per hour in the public lamps, instead of the 4 cubic feet contracted for. Besides this, they lit the lamps by Greenwich time and extinguished them by local time; so that the town had the advantage of 20 minutes extra lighting. For all this the Corporation paid nothing. Answering a question on the point, the Chairman explained that automatic meters were not a great success in Devonport. They had a rule for the supply of ordinary consumers that 30 yards of service-pipe should be laid free, and that for anything beyond this the consumer should pay. They could not make this charge in the case of automatic meters, and they did not care to put them in where the service-pipe was more than 30 yards long.

The report was adopted, and the usual dividends were declared.

A vote of thanks was passed to Mr. R. C. Smith, the late Chairman, for his long services as a Director; and the Chairman, Directors, and officers were also thanked for their attention to the business of the Company.

The Leeds Gas Committee have decided to borrow about £70,000, chiefly required for new mains. A portion of the money is to be spent on the York Street works.



### THE LEAMINGTON CORPORATION AND THE GAS-WORKS.

A Special Meeting of the Leamington Town Council was held on Monday last week, for the purpose of receiving the report of the Town Clerk (Mr. H. C. Passman) on his interview with the Solicitors to the Gas Company relative to the withdrawal of the offer to purchase their works. At the last meeting of the Council, it may be remembered (*ante*, p. 173), he was instructed to ascertain whether the Company would consent to such withdrawal. He now stated that he had been unable to obtain any definite assurances from the Company; but a meeting of the Directors had been called for the following day, after which the Company would be in a position to carry the matter further. In the meantime, it was understood no steps would be taken by either side in regard to the appointment of arbitrators. It was understood that some definite proposition would be put before the Council at their next monthly meeting; but that if any important developments should occur before that date the Mayor would call a special meeting. The Directors held their meeting on Tuesday, and, after some discussion, decided that they were not in a position to come to a definite conclusion on the matter until they had been more fully advised on the points of law involved. It was decided that Counsel's opinion should be taken on these, and the meeting was then adjourned for a month.

### PURCHASE OF THE SHIPLEY GAS COMPANY'S WORKS BY THE DISTRICT COUNCIL.

An agreement has been come to by the shareholders of the Shipley Gas Company and the Shipley District Council by which the latter acquire the Company's undertaking. The agreement has already been signed on behalf of the Shipley District Council, and will be signed on behalf of the Company after the usual statutory meeting which in such a case has to confirm the resolution of the shareholders passed at the general meeting on Wednesday last. No official information is forthcoming as to the price to be paid; but it is stated by the "Bradford Observer," on unquestionable outside authority, that the terms of purchase are on the basis of 30 years' profits, which means a sum of £228,000. The Company have been paying 10 per cent. on £48,000 worth of ordinary shares, and 7 per cent. on £40,000 worth of preference shares. In round figures, the annual profit has been £7600; and, at 30 years' purchase, this would produce the sum named as the purchase price. The ordinary shares of the Company have generally had a market quotation two-and-a-half times their original value; and the preference shares have been quoted at a proportionately high figure. The price to be paid by the Council is on the lines of many similar transactions; "even had it been higher, municipal experience throughout the country is uniform in showing that the acquisition of gas undertakings at anything like a reasonable cost has proved remunerative to the communities concerned." The Council will go to Parliament next session with a Bill for the purpose of confirming the transaction, and for other purposes of local government; and they will insert clauses in the Bill enabling Bradford to purchase the Heaton portion of the present Company's business as a going concern. Probably, similar facility will be offered to Baildon.

Commenting on the matter, our contemporary remarks: "The Shipley District Council have undoubtedly strengthened their position as a local governing authority by acquiring the undertaking of the Shipley Gas Company. Subject to what are really formalities, the transaction is an accomplished fact. A statutory meeting of the Company's shareholders has yet to be held; but its decision can hardly vary from that of the meeting of shareholders last Wednesday. Parliamentary sanction to the transaction has also to be obtained, especially as the Shipley District Council will insert clauses in their Bill with a view to Bradford (in reference to Heaton) and Baildon acquiring their respective interests in the concern. According to precedent, the Shipley District Council can hardly have done wrong, for local authorities have uniformly profited from taking over gas undertakings. Thirty years' profits is a not uncommon valuation for such a transference—some towns have paid on the basis of a larger period. The point for the Bradford City Council to consider is whether Shipley will not by this stroke have so emphasized its claim to be considered a separate local authority, that the best course for Bradford to pursue is to include in its next Parliamentary Bill a request for the inclusion of Shipley within the Bradford area."

**New Zealand Coal Supplies.**—According to a Reuter telegram, dated the 24th inst., from Wellington (N.Z.), the scarcity of coal in the colony has had the effect of raising the price, and the mines at present working are unable to cope with the demand. The position of affairs has been debated in Parliament, with the result that the Premier indicated that, unless the lessees of certain large and valuable coal-bearing lands are prepared to work them, steps will shortly be taken to determine their leases. The "New Zealand Times" advocates the Government throwing open other coal-bearing lands, and offering every facility for private persons willing to work them.

**The Cowlyd Water Board Negatives their Engineer's Recommendations.**—At the last meeting of the Cowlyd Water Board, the Engineer (Mr. T. B. Farrington) presented a long report, in which he urged the Board to consider the question of increasing the water supply from the trunk main. He suggested that a new 12-inch main be laid from the intake at Dolgarrog down to Conway, and pointed out the absolute necessity of service reservoirs being constructed at Deganwy, Penrhyn, Colwyn Bay, and Llysfaen, to receive an unlimited supply during interference with the transit main. Mr. Hugh Owen called attention to the financial position of the Board. He said they owed the bank £18,326; and, under the circumstances, he did not think they ought to contemplate laying an additional main. He proposed that the recommendation be not carried out. The Engineer remarked that the expenditure of a few hundred pounds at the present juncture would save the Board spending some thousands of pounds later. Eventually the recommendation was not entertained. A resolution was passed advising the constituent authorities to provide themselves with reservoirs of a sufficient capacity for their respective districts.

### THE PROPOSED ROYAL COMMISSION ON COAL SUPPLY.

Our readers may remember that some few months ago Mr. A. D. Provand, the member for the Blackfriars and Hutesontown District of Glasgow, addressed a letter to the First Lord of the Treasury, suggesting the appointment of another Royal Commission to inquire into the question of the coal supply, and calling his attention to some facts which have arisen since the last Commission reported, in 1871, on the output, export, and probable duration of our coal. We gave the letter in the "JOURNAL" for the 3rd of April last (p. 881). Mr. Provand is still of opinion that further inquiry is urgently called for; and last Thursday he sent Mr. Balfour the following letter on the subject:—

On the 20th of March, I wrote to you suggesting the appointment of a Royal Commission on the coal question. Your replies, both in the House and by letter, suggested no doubt as to your belief in the importance of the subject to the country; but you were reluctant to ask a number of competent men to spend time in conducting an investigation which, as advised, you did not see would be likely to be followed by practical results. You, however, added that this did not apply to a more limited inquiry, relating to the best use to which we might put our existing supply of Welsh steam coal. On this point you reserved your judgment.

Since I wrote to you, the question has come forward, and now occupies a leading place among those to which the public pay attention. What is called the "coal famine" has increased, and prices for both domestic and manufacturing purposes threaten to be higher than they are at present.

With respect to your desire that there should be some practical issue to place before a Royal Commission, permit me to say that there are many to which I might refer besides the two I suggested in my letter of the 20th of March. Of the first I then said: "We have in Wales the most valuable steam coal for naval use in Europe, of which the supply is limited. It is an important arm of defence; but it will not remain so permanently unless we reserve it for our own use." Since I drew attention to this, the question has become acute. This is shown by the number of questions asked in the House and the articles and correspondence in the Press. It is no exaggeration to say that there is a growing national concern as to the future of our naval coal supply.

The other point to which I then referred related to coal development in the United States. Down to 1896, an increasing output was accompanied by a declining price, until the average cost of coal in that year at the pit's mouth was 4s. 5d. in the United States, while it was 6s. 4½d. in the United Kingdom—i.e., our coal was about 50 per cent. dearer. I believe the difference will become greater. Since then coal has increased in price in the United States, but not to the same extent as here; and their production is rapidly advancing. In a preliminary statement which I have just received from Washington, I find that the output for 1899 was 231 million tons, against 196 millions in 1898; showing an increase of 35 million tons in the year. For the first time their output has exceeded ours, and the increase, both actual and relative, will probably be maintained. Even if there should remain some advance in price in the United States, it will, I think, not equal the increase in this country, because, on account of the greater accessibility of their coal deposits, the output per miner is quite 50 per cent. more than in the United Kingdom.

The increasing production and increasing relative cheapness of coal in the United States must be fraught with momentous consequences to our manufacturing industries when any slackening of the present activity takes place. This is only one of many points which should receive attention, such as: The future production in the United Kingdom and other countries—Australian and Oriental, as well as European and American; our export of coal, and the possibility of ultimate importation; the relative cost in different countries; and the effect of present prices, and any increase in these, on our industries.

It would make this letter too long to enumerate the matters which might properly be referred to a Royal Commission. The first thing is to ascertain the facts; and even if no recommendations of moment were made by the Commission, it would, generally speaking, still be of enormous advantage for us to know the truth as far as it was ascertainable, so that we might set our house in order, and prepare for what may possibly take place.

In your reply, you said you thought the investigation could be adequately accomplished by private individuals. I feel satisfied that this is not the case. There are differences of opinion among experts, and these are brought before the public in a merely academic way in letters to the Press or in papers read at societies, where they cannot be subjected to adequate examination. No private inquiry could possess the influence or authority of a Royal Commission; and its means of collecting evidence would be totally beyond the power of any body of private inquirers.

Permit me to say, in conclusion, that it is impossible to over-rate the importance of this question to the nation; and I hope the ripening of public opinion which has taken place since I addressed you on the subject will now be considered sufficiently pressing to prompt the Government to appoint a Royal Commission to consider the question in all its bearings.

### FELLING A CHIMNEY AT THE SALTLEY GAS-WORKS, BIRMINGHAM.

The Saltley Gas-Works of the Birmingham Corporation were the scene, last Tuesday, of a somewhat sensational operation, which happily was performed without injury to life or limb, and was only attended by the breaking of a water-pipe. It consisted in felling a large chimney-stack nearly 150 feet high; and this feat was accomplished under exceptionally favourable conditions. The following account of what took place is reproduced from the "Birmingham Daily Post" of Wednesday: "The chimney belongs to one of the retort-houses erected when the works were established in 1856, and which are being removed in con-



nection with the scheme for the reconstruction of the station at a cost of £350,000, sanctioned by the Council eighteen months ago. A considerable portion of the ground had been cleared; and as the adjoining space is largely a coal-yard, the spectators were able to have a clear and safe view of the operations and the catastrophe they were designed to bring about. It is not an uncommon thing to bring down even the whole of a lofty chimney-stack at one fell swoop by the plan adopted yesterday. In this case, however, the chimney, which was originally 147 feet high, had had 40 feet taken from it brick by brick. This was done by steeple-jacks, who reached the top of the chimney in the usual way by means of holdfasts and jointed ladders. This method, however, was found to be very wasteful, as the bricks, after being thrown down from such a height, could not be used again; and Mr. Hack, the Engineer of the works, at last consented to the job being finished by 'felling.' Three or four days last week were occupied in removing from the chimney on one side the courses of brickwork to a height of about 6 feet from the ground; the cut extending diagonally about half-way through the base, which is 14 feet square outside, and 7 feet square inside. The masonry was replaced temporarily by stout wooden props, which had to support nearly half the weight of the truncated chimney and its square base, or supporting tower. The latter rose to a height of 27 feet, while the chimney above, commencing with a diameter of 14 feet, tapered to about 9 ft. 4 in. at the place where the steeple-jacks had left off. Had the chimney been dealt with as a whole, the weight supported by the undercut base would have been 580 tons; and the props had to help to hold up quite 400 tons, made up of 1½ million bricks. Little was left to be done at ten o'clock yesterday morning, when Mr. Hack, with other officers of the gas-works, and the representatives of the Contractors (Messrs. Jeffrey and Sons, of Birmingham), and a few others, assembled to witness the downfall of the chimney of the old No. 1 retort-house. The workmen, creeping under the doomed structure, chipped away as much as they could of the flues and the 9-inch lining of fire-bricks; the side which had been undercut being the blank side of the stack. Then shavings were brought into the opening, and piled up round the wooden supports. Upon the shavings were heaped old bits of planking; and then tar was poured on to give the bonfire a good start. On the signal being given that all was ready, the workmen were cleared out of the roped space round the chimney and out of the neighbouring workshops and retort-houses. Officials, visitors, and workpeople took up positions on the coal stacks and other elevated points, and then a man was seen carrying a shovelful of live coke from the companion retort-house. Thrown into the opening, this soon set everything cracking. The flames lapped the wooden props and the sides of the square base, and sent out a dense black smoke. Some of the smoke ascended the chimney; and thus from the top there fumed a pathetic farewell cloud. The sight was not unpicturesque, but it did not last long. In a few minutes the chimney was seen inclining in a minute degree to the right and then to the left as the props felt the fire. Then it seemed to pull itself together as though resolved to die as a well-built chimney should. Twelve minutes after the fire had been lighted, the props were heard cracking. The chimney bowed stiffly, but with dignity; halted a moment, as though to have its farewell acknowledged by the executioners; then solemnly bent forward. Almost silently the stop increased—first slowly, then more rapidly. When at an angle of about 60° to the ground, a momentum had been gained which made the rest of the fall seem instantaneous. The ground was shaken by a dull thud-like detonation, which must have suggested to the gas-makers the firing which accompanies the opening of a large retort. Where the chimney had stood out against the sky there was nothing but blue ether and sunlit cloud. In the line of its fall, for a few seconds there was nothing to be seen but a long dense yellow and white dust-cloud, rising some 40 to 50 feet above the ground. Almost suddenly, the cloud disappeared, and what had been the chimney appeared as a long white and red bank of disintegrated brickwork, with bits of iron banding wriggling about in places like serpents which had been driven out of their holes by the shock. The chimney-fellers employed by the Sub-Contractors (Messrs. James Rees and Son, of Smethwick) had done their work well. But for a slight twist or two where the masonry had almost given way about half-way up, the stack fell wholly and squarely. The centre line of the mass of bricks was at its farthest point from the base scarcely 3 feet out of the line marked out for it."

### ELECTRIC LIGHTING NOTES.

On Thursday, the 19th inst., the electric light and dust destructor works which have been in progress in Gloucester during the past twelve months were formally opened by the Mayor (Mr. F. Treasure), at the invitation of the Electric Lighting Committee. The generating station has been erected on a site in the south-west portion of the city, and the installation has been carried out by Mr. Robert Hammond. There are at present in use for street lighting 44 arc lamps of the Brockie-Pell single-carbon type, grouped in four series of nine and two series of four. The total extent of cable laid is 23½ miles. The generating plant in operation consists of two combined sets. The larger one is composed of a triple-expansion engine of 500-horse power coupled to two Silvertown dynamos, equal to an output of 300 kilowatts at any pressure between 440 and 500 volts. The smaller set consists of a two-crank compound engine, driving two dynamos having a combined capacity of 150 kilowatts at the above-named pressure. The destructor, having a burning capacity of 50 tons per 24 hours, will consist of two cells side by side; and it will have to deal with 150 tons of refuse per week.

The Rochdale electricity works are rapidly approaching completion, and it is expected that the Corporation will be in a position to supply current by the end of August or the beginning of September. The area of the site is 2838 square yards; but only about half of this ground is at present covered. In the engine-room there are two 275-horse power engines, and space is provided for a third. The boiler-house contains two 30 feet by 8 feet boilers, fitted with mechanical stokers; and there is room for another. The dynamos are designed to furnish a 440-volt supply to the town and a 500-volt supply for tramway traction purposes. The Corporation have put down cables to enable them to furnish current to customers in their compulsory area; but the limits of supply will, of course, be extended as the demand for the current increases. The system

adopted in Rochdale is the low-tension three-wire. The price to be charged for the current is 6d. per unit for lighting purposes and 3d. per unit for power. Meters will be supplied by the Corporation. The erection of the works and the installation of the plant have been carried out under the superintendence of Mr. T. A. Lacey, the Engineer to the Corporation; and the cost will be about £30,000.

Last Wednesday, the President of the Board of Trade received a deputation from London Electric Light Companies, who desired to have the Board of Trade regulation as to the supply of electricity amended so that they could change from 100 volts to 200 volts by agreement with the consumer, or, failing agreement, by arbitration. The regulation at present specifies that no change shall be made in the pressure of the supply to any premises except with the consent of the consumer. Mr. Ritchie was accompanied by Sir Courtenay Boyle, the Hon. T. H. W. Pelham, Mr. Garnham Roper, and Mr. A. P. Trotter. Professor Kennedy said the Westminster Company were the first to change over from 100 to 200 volts; and all the other London Companies present were in various stages of following suit. An infinitesimal number of consumers could prevent the change so long as the Board of Trade regulation remained in its present form. They suggested that, instead of the change from 100 to 200 volts being made with the consent of the consumer, it should be settled by an arbitrator appointed by the Board of Trade. Mr. Ritchie, in reply, said perhaps the difficulty could have been avoided if the Companies had adopted a more conciliatory tone to the consumers when they desired to make the change. The consumers at present had the right to refuse, and they might *bona fide* consider that there was danger in raising the voltage from 100 to 200. Certainly, they ought not to be told that their supply would be cut off if they did not accede to the change. General Webber, on behalf of the Companies, said it was their last wish to use threats. It was in the interest of the public in London that the pressure generally should be raised from 100 to 200 volts. Mr. Ritchie admitted that it was a strong order for a few persons to stand in the way of the application of the new system. But these people were within their rights; and if the Board assented to the proposal of the Companies, they would be over-riding those rights. The Companies could not refuse to supply any consumer with 100 volts if he desired to have it. He would take the matter into consideration; but he hoped the Companies would use more conciliatory methods with their customers. The deputation, having thanked Mr. Ritchie, withdrew.

When the Exeter Corporation acquired the electric light undertaking in 1896, it was with the knowledge that at an early date they would have to remove the works to a larger and more convenient site. All the reports presented on the subject indicated that the existing site was already fully occupied, and that large extensions were impracticable. Since that time, the number of customers has increased from 150 to 400, and the lamppost connections from 7300 to 19,800. Under these circumstances, removal to a larger area has become imperatively necessary. On Wednesday last, the Electric Lighting Committee presented to the Town Council a report by Mr. H. D. Munro, the city Electrical Engineer, recommending the erection of new works on land belonging to the Corporation which has the advantage of railway and water communication. Mr. Munro recommended that the main building should be laid out in blocks of 1000-horse power, and that, as a beginning, 2½ blocks, or half the proposed station, should be erected. The greater part of the equipment of the present station is to be worked into the new scheme. The existing system of supply is the single-phase alternating, with a frequency of 100 alternations per second. He is of opinion that, under the economical conditions of the new works, this system will give results equal to any direct-current system, but that the frequency should be altered to 50 alternations per second. He roughly estimates the cost of the scheme at £41,550, of which £33,500 is for the building and plant, £2000 for the site, £3000 for altering and removing existing plant, and £3050 for main feeders from the new works to the city. The scheme, which was endorsed by Mr. T. P. Wilmshurst, Borough Electrical Engineer of Derby, was adopted. The City Council have in view the erection of a refuse destructor. Mr. Wilmshurst said in his report that a destructor might give 100 to 140 horse power available for the purposes of the electricity station; but if the electric lighting undertaking was to derive any appreciable benefit from it, he advised the Committee not to undertake the obligation of contributing towards its cost of maintenance.

Increases in the price of gas, as our readers are aware, have been pretty general all over the country, and in some cases they have evoked the foolish threat to resort to electric lighting. But the cause which operates to make gas dear—the high price of coal—must, of course, affect the cost of producing electricity. This fact has been brought home to the Electricity Committee of the Lancaster Corporation, who lately, on the reception of reports from the Borough Accountant and the Engineer as to the extent to which the estimate of income and expenditure for the current financial year will be affected by the advance in the price of coal, resolved to raise the charge for electric current from 3d. to 3½d. per unit for motive power, and from 4½d. to 5d. per unit for lighting. When the minutes came before the Town Council last Tuesday for confirmation, Mr. Heald, said the increase proposed was necessitated in consequence of the enormous rise in the price of coal. No doubt it would cause a certain amount of complaint; but he should like to point out to those who used electricity for motive power that the increase the Committee suggested was only about 17½ per cent., whereas if they used coal they would have to pay 50 to 60 per cent. more. The increase in the price of current for lighting purposes was not so great, being about 12 per cent. Unfortunately, at present coal was the only force available for producing electricity. Other forces were being made use of in different localities, though not to any great extent; but he thought if the price of coal continued as at present, or, as some people seemed to think it would, increased considerably, it would encourage people of inventive minds to see if they could not develop some of the forces of Nature for the production of power which could easily be converted into electricity. In Lancaster, they were not unfavourably situated for making use of some of these forces, having water power in their midst. The Committee did not recommend the increase with the view of making a profit, but to enable the Electricity Department to pay its way and lay by a substantial reserve. Alderman Smith moved, as an amendment, that the minutes be passed, with the exception of that relating to the increase in the price of current supplied for motor purposes. Mr. Bowness seconded the amendment; but it was negatived, and the minutes were confirmed.



## CLAY CROSS WATER-WORKS ARBITRATION.

## A Settlement Arrived At.

At the Westminster Palace Hotel last Friday, the Arbitrators in the above matter (Messrs. W. B. Bryan and Charles Hawksley, MM.Inst.C.E.) attended with the Umpire (Mr. G. H. Hill, M.Inst.C.E.) for the purpose of determining the price to be paid by the Clay Cross Urban District Council for the undertaking of the Clay Cross Water Company. The Company were represented by Mr. Freeman, Q.C., and Mr. Honoratus Lloyd; the Council, by Mr. A. J. Ram, Q.C. At the opening of the proceedings, Mr. Freeman stated that before the parties came into the room they had been able to arrive at a satisfactory solution of all figures and questions of that sort, so that they both had a basis on which they were able to discuss the matter privately. The concern was absolutely a local one, and the people who were interested in it, and the authority purchasing it, were neighbours and friends; and it was therefore thought very desirable, if possible, to avoid even the appearance of conflict. He and his learned friend Mr. Ram had therefore both advised their clients to stretch a point and give way a little. As the result of further negotiations, they had been able to come to terms; and he therefore asked the Arbitrators to make an award on the following basis: The price to be paid for the undertaking to be £14,000; the purchasers in addition agreeing to discharge a mortgage of £1000 and pay £100 towards the expense of winding up the Company—the latter sum, of course, having nothing to do with the costs of the arbitration, which would have to be dealt with in the ordinary way. He expressed the hope that the result would be satisfactory to everybody, and that in future the District Council would be very pleased with the undertaking they had bought. Mr. Ram confirmed the statement made by Mr. Freeman, and said he hoped that by the arrangement come to the Council would find that they had got a satisfactory undertaking at a price which the Company would regard as adequate. The Arbitrators then formally agreed to make the award in the terms mentioned.

## NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

This year's meeting of the North British Association of Gas Managers was held in Edinburgh last week. When either Edinburgh or Glasgow is the meeting place, there is sure to be a good attendance. It was particularly good on this occasion; and in addition to gratification at the numbers present, there was the added pleasure of seeing from how wide an area the assemblage was drawn. It was truly the gathering of a national assembly. Not only was every one of the large towns represented—which does not happen every year—but the representatives of the smaller towns who were present were from far as well as near. Of those who most regularly attend the meetings of the Association there was scarcely an abstention of any note. This, probably uncon-

sciously, gave the "happy family" air to the meeting at its start—a characteristic which it bore throughout. In the House of Commons the member who says least of all is he who is designated the Speaker. Few Chairmen of meetings are able to rise to the ideal of the House of Commons. Mr. W. Ewing, of Hamilton, as President of this year's meeting, in this respect came as near to what should be as possible. He left the members to do the speaking—and there was no lack of it. The President's Address was a little disappointing; his explanation being that he had but recently recovered from an attack of the weakening ailment influenza. But apart from this, it is not given to everyone to be both a worker and an orator. Mr. Ewing has the better part of being able to produce good working results, which is certainly, for him, preferable to being able to lecture like a Lewes.

The two papers by Mr. Herring and Mr. Young were sufficient to make the meeting a memorable one. Mr. Herring had the good fortune to be able to deal with a subject which is new to the Association. Till he came to Scotland, there was no thought anywhere of erecting inclined retorts. By his paper, he has given managers in Scotland something to think of in relation to a process which is one of the prime factors in labour saving; and by his example, he is giving an earnest of his faith in the process. The reply which he made to the criticisms offered upon his proposed scheme, was a performance which was the talk of the members during the remainder of the meeting. Not only did the evident grasp of detail shine out in every sentence, but it was impossible to listen to his explanations without feeling that there was no side of the subject, and no possible source of failure, to which he had not applied his thoughts. It may be said that in the works he has devised for the Edinburgh and Leith Gas Commissioners there is not a brick more than is necessary, and that there is not a bolt or rivet in the plant which has not a special purpose, or which could be safely dispensed with. After receiving such a favour from Mr. Herring as this masterly communication was, the Association did what they could to mark their high sense of it in electing him President for the year. There are some who wonder how, in a year when he will be so busy, he should be able to find time to discharge presidential duties; but Mr. Herring, I venture to say, will feel them no burden upon him. Next year's meeting is to be held in Glasgow; and it is a fortunate thing for the Association that they will have a strong President—one who will give distinction to a meeting which is certain to have more than the customary attention paid to it.

Mr. Young, unfortunately, was unable to be present. His health is not so good as it was. It is fortunate, however, for all who are connected with gas supply, that he is able to wield his pen for their enlightenment. His paper was held as read, and will in this way be brought before the class of persons who are interested in it. There was a talk of its being discussed next year. This should be abandoned. Before then some of the conclusions in the paper may be out of date. Mr. Young has, before now, conducted some most interesting discussions through the medium of the "JOURNAL," and this paper might well be dealt with in that way. The paper is entitled "Jottings;" it might almost be called "A Treatise upon Gas Production." I have only been able to glance through it; but, so far as I can perceive, it is an exceedingly broad-minded production,

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 272.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
590,000	10	Apl. 11	10½	<b>GAS COMPANIES.</b>				60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Alliance & Dublin 10 p. c.	18-19	..	5 10 6	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Do. 7 p. c.	13-14	..	5 7 2	851,070	10	Apl. 27	7	River Plate Ord.	10-10½	..	6 13 4
200,000	5	May 16	6	Australian 5 p. c. Deb.	101-103	..	4 17 1	250,000	Stk.	June 23	4	Do. 4 p. c. Deb.	100-102	..	3 13 5
40,000	5	"	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	10	Apl. 11	8	San Paulo, Ltd.	11½-12½	..	6 8 0
880,000	Stk.	Feb. 23	12	Do. New, £4 paid.	4-4½	..	5 6 8	185,000	Stk.	Mar. 14	10	Sheffield A.	246-247	..	4 1 0
270,000	"	"	9	Brentford Consolidated	250-260	..	4 12 4	209,053	"	"	10	Do. B.	244-246	..	4 1 4
60,000	"	"	5	Do. New	182-187	..	4 16 3	447,427	"	"	10	Do. C.	244-246	..	4 1 4
153,375	"	June 14	4	Do. 5 p. c. Pref.	140-145	..	3 9 0	5,600,000	Stk.	Feb. 23	5½	South Metrop. 4 p. c. Ord.	126-129	..	4 2 7
220,000	Stk.	Mar. 14	11½	Do. 4 p. c. Deb.	116-120	..	3 6 8	1,520,000	"	July 12	3	Do. 3 p. c. Deb.	94-97	-1	3 1 10
226,320	"	"	8½	Brighton & Hove Orig.	225-235	..	4 17 10	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
999,500	Stk.	Feb. 23	5	Do. A. Ord. Stk.	160-165	-5	5 3 0	70,825	"	July 12	4	Do. 4 p. c. Deb.	117-122	..	3 5 7
420,000	20	Mar. 29	10	Bristol, 5 p. c. max.	125-130	..	3 16 11	120,000	Stk.	Mar. 14	6	Tottenham A. 5 p. c.	103-108	..	5 11 1
60,000	10	Feb. 23	12	British	39-41	..	4 17 7	250,520	"	June 14	4½	and B. 3½ p. c.	80-85	-5	5 5 11
79,000	10	"	9	Bromley, Ord. 10 p. c.	24-26	..	4 12 4	55,100	"	June 14	4	Edmonton 4 p. c. Deb.	111-115	..	3 9 7
500,000	10	May 16	6	Do. 7 p. c.	19-21	..	4 5 8	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Buenos Ayres (New) Ltd.	83-91	..	6 9 9	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Do. 4 p. c. Deb.	99-101	..	3 19 3								
100,000	10	June 14	8	Cagliari, Ltd.	23-25	..	6 12 0								
60,000	50	May 2	6	Cape Town & Dis., Ltd.	134-14½	..	5 10 4								
550,000	Stk.	Apl. 11	13½	Do. 6 p. c. 1st Mort.	55-57	..	5 5 3								
236,425	"	"	10½	Commercial Old Stock.	270-280	-5	4 16 5								
288,237	"	June 14	4½	Do. New do.	205-215	..	4 17 8								
800,000	Stk.	May 31	9	Do. 4½ p. c. Deb.	133-138	..	3 5 3								
200,000	"	"	7	Continental Union, Ltd.	153-168	-2	5 13 11								
51,600	Stk.	Feb. 23	14	Do. 7 p. c. Pref.	170-175	..	4 0 0								
173,400	"	"	11	Croydon A 10 p. c.	335-340	..	4 2 4	780,404	Stk.	June 28	11	Chelsea, Ord.	285-295	-10½	3 14 7
555,000	Stk.	Feb. 23	5½	Do. B 7 p. c.	265-270	..	4 1 5	150,000	"	"	5	Do. 5 p. c. Pref.	155-160	..	3 2 6
60,000	"	"	5	Crystal Palace Ord. 5 p. c.	110-115	-3	4 11 4	160,000	"	Mar. 29	4½	Do. 4½ p. c. Pref. 75	143-148	..	3 0 10
486,090	10	July 27	11	Do. 5 p. c. Pref.	130-135	..	3 14 1	175,785	"	"	7	Do. 4½ p. c. Deb.	145-150	..	3 0 0
854,060	"	"	11	European, Ltd.	119-120	..	5 10 0	1,720,560	Stk.	Apl. 11	7	East London, Ord.	187-192	..	3 12 11
14,993,075	Stk.	Feb. 9	4½	Do. £7 10s. paid.	14-15*	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p. c. Deb.	142-147	..	3 1 3
2,600,000	"	"	3½	Gas 4 p. c. Ord.	97-99	..	4 8 10	890,000	"	"	3	Do. 3 p. c. Deb.	96-98	..	3 1 3
8,799,735	"	"	4	light 3½ p. c. max.	95-97	..	3 12 2	700,000	50	June 14	7½	Grand 10 p. c. max.	104-107	..	3 10 1
8,993,975	"	June 14	3	and 4 p. c. Con. Pref.	117-119	..	3 7 3	810,000	Stk.	Mar. 29	4	Junction 4 p. c. Deb.	130-135	..	2 19 3
70,000	10	May 31	8	Coke 3 p. c. Con. Deb.	95-98	..	3 1 3	708,000	Stk.	Feb. 23	14	Kent	307-312	..	4 9 9
2,800,000	Stk.	May 16	10	Hongkong & China, Ltd.	134-144	..	5 10 4	160,000	"	"	7	Do. New, 7 p. c. max.	200-210	..	3 6 8
473,600	Stk.	Feb. 9	3½	Imperial Continental	197-203	..	4 19 0	1,043,800	100	June 28	104	Lambeth, 10 p. c. max.	275-285	-7½	3 13 8
75,000	5	June 14	6	Do. 3½ p. c. Deb. Red.	100-103	..	3 8 0	406,200	Stk.	Mar. 29	8	Do. 7½ p. c. max.	203-208	..	3 16 11
560,000	100	Apl. 2	5	Malta & Mead., Ltd.	44-5	..	6 0 0	850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	130-133	..	3 0 2
250,000	100	"	4½	Met. of 5 p. c. Deb.	107-110	..	4 10 11	500,000	100	Feb. 23	134	New River, New Shares	415-420	-5	3 4 3
541,920	20	May 31	9½	Melbourne 4½ p. c. Deb.	106-108	..	4 3 4	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb.	123-128	..	3 0 2
667,946	Stk.	Feb. 23	9½	Monte Video, Ltd.	104-114	..	6 1 8	902,300	Stk.	June 14	7½	South Ord.	193-198	-2	3 15 9
299,855	Stk.	June 28	8½	Newcastle & Gateshead Con.	215-220	..	4 4 1	126,500	100	"	7½	wark 7½ p. c. max.	182-187	..	4 0 3
150,000	5	May 16	8	Do. 3½ p. c. Deb.	104-107	..	3 5 5	489,200	Stk.	"	5	and 5 p. c. Pref.	155-160	..	3 2 6
135,000	5	"	8	Oriental, Ltd.	71-73	..	5 8 3	1,019,585	"	Apl. 11	4	Vauxhall 4 p. c. A Deb.	129-134	..	2 19 9
15,000	5	"	8	Do. New, £4 10s. pd.	62-63	..	5 6 8	1,155,066	Stk.	June 14	10	West Middlesex	270-275	..	3 12 9
				Do. do. 1879, £1 pd.	14-18	..	4 11 5	200,000	"	"	4½	Do. 4½ p. c. Deb.	145-150	..	3 0 0
								200,000	"	Mar. 14	8	Do. 8 p. c. Deb.	99-101	..	2 19 5

\* Next dividend will be at this rate.



and is full of the reasons why certain things have been done in the process of development in gas manufacture, and why certain other things which have been tried have not been successful. The narrative of the use of a revolving retort at Addiewell will make most people open their eyes. It will, there is little doubt, be closely looked at; it may be severely criticized; but whatever its treatment, it will remain a notable contribution to the literature of the industry. The same may be said of the whole paper. If by reason of any other decision than that which the Association came to the paper had not been made public, the world of gas making would have been the poorer by the want of it.

The other two papers—those by Mr. T. Lighbody, of Renfrew, and Mr. Forbes Waddell, of Forfar—were of much minor importance; but both were suggestive. Mr. Waddell's, in particular, is an example of what can be done, at small cost, by a manager who is not pressed for time, in the evolution of theories and the perfecting of processes. By such means, Science in reality creeps on from point to point.

There was a welcome infusion of new blood in the speaking. On all grounds, indeed, the Association may congratulate themselves upon the success of this year's meeting, and upon the good prospects for the future. These were seldom brighter than they are at present.

There will be a disposition generally to congratulate Mr. A. Waddell upon his transfer from Broughty Ferry to Dunfermline. He leaves a 44 for a 77 million cubic feet gas-works. This is his third position as Manager. In the two former places he was successful in greatly reducing the price of the gas. Mr. Waddell is a man of resource, quick to adopt whatever may help him in his work. He may be relied upon to make his individuality felt in Dunfermline. There are two elements he will have to reckon with. He will be much nearer the coalfields, and should get his coal cheaper than at Broughty Ferry. This will be an advantage. There is, on the other side, the consideration that he is going to a works in which, while the output is not twice what it is in Broughty Ferry, the capital is three times as great, and the rate of interest is from 3 to 4 per cent., as compared with 2½ per cent. upon the capital in Broughty Ferry. What the Dunfermline undertaking requires to be done for it, in the first place, is a reduction of its capital liabilities.

Mr. W. McCrae, the Engineer and Manager to the Dundee Corporation Gas Department, has recommended the Police Committee of the Town Council, who have charge of the public lighting of the city, to erect 100 lanterns for incandescent gas lighting, at a cost of £2 3s. 2d. each. He estimates that the annual charge for mantles would be about 5s. per lamp. The lamps would each consume 3 cubic feet of gas per hour, and would replace ones which consume 2 cubic feet per hour. The cost of gas would thus be 1s. 10d. per lamp per annum more than at present; but the illumination would be greatly superior. The Committee agreed to recommend the adoption of the proposal.

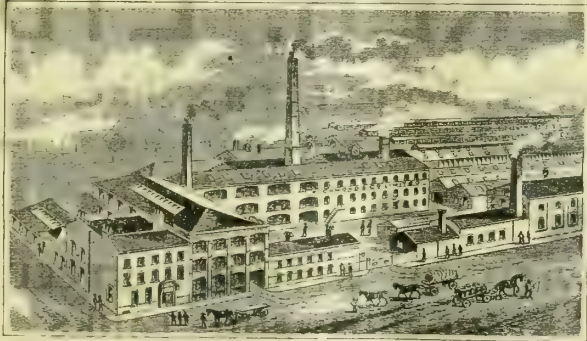
On Wednesday night, an explosion of gas, of some magnitude, occurred at the corner of Balmano Brae and Tarbet Street, Glasgow. The inhabitants of the district had complained of a smell of gas; and workmen from the Gas Department were searching for the leakage upon the surface of the ground, by means of a lighted torch, when the explosion occurred. Part of the pavement was dislodged, and a girl was thrown down, though

fortunately without injury. Several persons complained of suffering from shock; but a medical man who visited them could not discover any one injured. The gas had accumulated in a built drain.

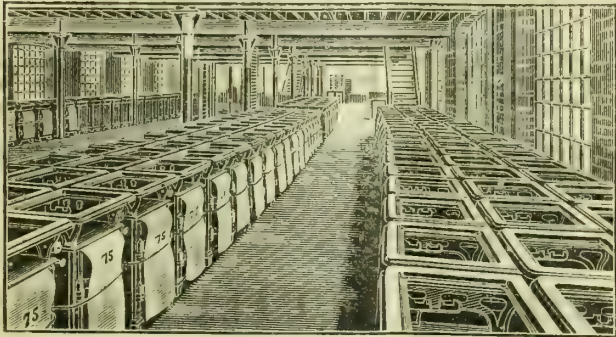
The Kirkcudbright Gas Commission have had an unfortunate year. They estimated for a revenue of £1032, but only realized £970. Their expenditure was estimated at £707, and it amounted to £746. The balance to be carried to profit and loss account was estimated at £328, and it amounted to only £223. There was a charge against the latter sum, for interest, &c., of £301, which left a deficit on the year's working of £78. Bailie Hogg, in submitting the accounts at a recent meeting, said they were sadly deficient in the amount of gas obtained per ton of coal. He suggested that a new retort-bench be put up, which would likely cost from £400 to £500. They would probably by this means save 10d. per 1000 cubic feet of gas. After some discussion, the Commissioners agreed to hear Mr. W. W. McDougall, the Manager, as to what should be done. Mr. McDougall said that they required a new retort-house, with Hislop's patent settings of retorts, new purifiers, and increased gasholder accommodation. At present they had only storage for 15,000 cubic feet of gas; and their maximum consumption per 24 hours was 22,000 cubic feet. It was agreed to consult Mr. G. Malam, of Dumfries, on the subject; and a Committee were appointed to consider his report.

At the annual meeting on Tuesday of the recently incorporated Carluke Gas Company, Limited, it was reported that the quantity of gas sold during the past year was 10,718,300 cubic feet; an increase of 1,613,200 cubic feet over the previous year. The revenue was £2518, or an increase of £645. The profit was £834. A dividend at the rate of 7 per cent. was paid for the year, and a balance of £484 was carried forward. The Directors expect to be able to retain the price of gas at 3s. 9d. per 1000 cubic feet.

The Directors of the Kelso Gas Company met last Tuesday, and finally passed estimates for the building of a new coal-store at a cost of about £350. At the same meeting the arrangements were completed for the purchase of 2½ acres of ground adjoining the works for the purpose of extensions—a new holder and new purifiers being immediately contemplated. The consumption of gas has increased greatly of late years—from 12 million cubic feet in 1892 to 17½ millions now. There are in use 70 slot meters and 280 gas cookers, grills, fires, &c. Upwards of 70 tons of new mains were laid to the town during last summer; and the carbonizing plant (regenerative furnaces) was largely increased. The Company are gradually improving the public lighting, and have now 50 No. 4 Kern 100-candle lamps in the streets, out of a total of 160 lamps in all; and it is hoped soon to have all these fitted with Kern burners. The lighting and upkeep are entirely under the control of the Manager (Mr. A. C. Young); and the Company supply No. 4 Kern burners and mantles, and do the lighting, repairs, &c., for 34s. per lamp per annum. The price of gas has been increased by 5d. per 1000 cubic feet, while the extra cost of coal means an additional expenditure equal to 1s. per 1000 cubic feet. The Directors were confident that but for the higher cost of coal (8s. per ton over all) they would have been able to reduce the price by 5d. rather than increase it. In view of the large number of cookers and incandescent lamps and gas-engines now in use, they are of opinion that



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TOVES.....WARRINGTON  
OGEN.....LONDON

*"Fetch forth the stocks, ho!"—Lear II., 2.*



the time is ripe for a reduction in the illuminating power of the gas, which is 26 candles. Mr. Young has not been quite three years with the Company; and the Directors have shown their appreciation of his services by twice raising his salary—first by £30 and afterwards by £20 per annum.

The Glasgow Gas Committee are looking forward to the time when more gas will be required in Pollokshaws, Shawlands, Langside, Battlefield, Cathcart, and the adjacent districts, as they have recently secured a plot of ground on the banks of the Cart and within the township of the "Shaws," partly in exchange for the site of the old Pollokshaws Gas-Works, which were closed some time ago, after being worked for two or three years in the interest of the Glasgow Corporation. The ground thus acquired will eventually be utilized for the construction of a tank and the erection within it of a big gasholder, having a capacity of some 5 or 6 million cubic feet, which has now become quite the fashion with the Glasgow Gas Committee, or their Engineer (Mr. W. Foulis).

The accounts of the Electricity Department of the Corporation of Glasgow for the past year show a revenue of £59,762, of which £55,471 was derived from the sale of current per meter and £4291 from the Corporation for street lighting. In the preceding year, the respective sums were £41,639 and £2502. For the past year, the expenditure was £38,181, as compared with £31,534. A balance of £21,581 remains to be carried to profit and loss account. The borrowing powers sanctioned by the Secretary for Scotland amount to £700,000; and £628,500 has been raised at 3½ per cent. Of this amount, £11,500 has been repaid, leaving borrowing powers to be executed to the amount of £60,000. The total amount of electricity generated last year was 3,401,731 Board of Trade units, against 2,619,019 units the previous year. The amount supplied to private consumers was 2,566,016 units, as against 1,885,902 units, or an increase of 680,114 units; while for public lamps the quantity supplied last year was 258,334 units, showing an increase of 30,200 units.

**New Reservoir at the Bognor Water-Works.**—The opening of a new reservoir in connection with the Bognor Water-Works took place last Tuesday. It is situated close to the Company's pumping-station, is capable of holding 500,000 gallons of water, and is fed from a source which, while being of the greatest purity, is believed to be practically inexhaustible. The reservoir is lined throughout with portland cement, and the concrete walls are 5 feet thick. The length is 100 feet; the width, 72 feet; and it will hold water to a depth of 12 ft. 3 in. There are four roofs of brick arches, 16½ feet span, supported internally by 33 brick columns, with 30 semicircular arches of 7 feet span. From the pumping-station the water passes through a 12-inch supply pipe, and there is a 12 inch wash-out pipe, with overflow connected. The reservoir is covered with a 15-inch layer of soil, which, with the slopes of the earthen embankment, will be sown with grass. The level of the water in the new reservoir is nearly 30 feet higher than that in the old tank in the town, which has done duty for the Company in the past. The works have been carried out by Messrs. T. Docwra and Sons.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 28.

**Sulphate of Ammonia.**—There has again been a fairly active inquiry, and for prompt or near delivery a good amount of business has been put through at last week's prices; but the buying has not been keen enough to cause a further improvement in values. For prompt delivery, £11 5s. per ton f.o.b. Leith is still quoted; and at Hull and Liverpool, values remain at £11 to £11 2s. 6d. London quotations are £11 to £11 2s. 6d., ordinary terms; but supplies at that port are somewhat limited. For forward delivery, no fresh business is reported; but for delivery up to the end of the year, quotations are steady at £11 to £11 2s. 6d. per ton, Beckton terms, according to position, and at £11 10s. f.o.b. Leith for October-March delivery.

**Nitrate of Soda** is dearer. Spot quotations are 8s. 1½d. per cwt. for ordinary, and 8s. 4½d. for refined quality. For shipment, 8s. 6d. has been paid, and about 1½d. per cwt. advance is now asked.

LONDON, July 28.

**Tar Products.**—The remarkable slackening off in the demand for creosote, and the equally marked drop in prices, has caused great uneasiness among manufacturers, and is reflecting itself decidedly on the value of tar, which is quoted lower. Some of the large tar distillers declare they cannot pay anything like to-day's quotations for tar, if they are to see their own money again. Benzols are moderately steady, with a fair amount of business being done. Carbolic acid is firm. Naphthalene and salts are not quite so strong; while common naphthas are somewhat unsaleable. There is no change in the position of anthracene. The market is fairly firm, as at the present prices makers have little interest in producing it. Pitch is being freely sold for next season's shipment; and the general forecast is that prices will be maintained, though at the moment both prompt and forward quotations are lower.

The average prices of the week are: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 7½d. to 8½d., according to position; special qualities for gas, 9½d.; 50's, 10½d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 45s. to 75s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—This market is a little easier, and dealers are evidently casting round in the hope of covering their requirements at a shade below to-day's values. There has been a decided falling off in buying during the week; but the position is known to be strong, and the material is required. There is, therefore, no occasion for any anxiety, especially as the make is at its minimum and stocks are small. About £11 2s. 6d. per ton, less 3½ per cent., is the average value at all ports.

The Directors of the Gas, Water, and General Investment Trust, Limited, have declared interim dividends at the rate of 4½ per cent. per annum on the preferred stock, and 2 per cent. per annum on the deferred stock for the past half year; carrying forward a balance of about £9000.

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TAR-EXTRACTORS. RETORT MOUTHPIECES OF ANY SHAPE.

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CONDENSERS.

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TAR-BURNERS.

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## SULPHATE OF AMMONIA PLANTS.



## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The anticipations of an upward move in prices with the close of next month, to which reference was made in our last week's report, have brought forward quite a pressure of orders, especially for the better qualities of round coal; and, in fact, so much eagerness is just now being shown by consumers of house-fire coals to get in to a large extent their winter supplies, that there is some danger this may force on an advance in prices earlier than the coalowners had generally intended. During the past week, the business coming forward in the better qualities of round coal has not only been considerably in excess of the output, necessitating in many cases the filling up of small stocks that had previously been accumulated, but coalowners are already getting in arrear with their orders, and probably at no previous similar season of the year has there been so large a trade doing in house-fire qualities. This exceptional pressure for domestic purposes is necessarily withdrawing from the market the large quantities of the lower qualities of round coal which are usually being offered at this time of the year in surplus lots for steam and forge purposes, so that all classes of fuel are more or less affected. For the present, there is no further change in prices beyond perhaps a hardening up on the low quotations for steam and forge coals which have been under the contract rates; and at the pit-mouth the average prices may be quoted from 12s. 6d. to 13s. per ton for the lower qualities of round coal, 13s. to 13s. 6d. for common house coal, 14s. to 14s. 6d. for seconds, such as Pemberton four feet and lower classes of Arley, up to 15s. to 15s. 6d. for the better descriptions of Arley. This exceptional briskness in the round coal trade is causing a correspondingly larger output of slack, and supplies of engine fuel are becoming increasingly plentiful on the market; while the demand for mill purposes shows a tendency to decrease, owing to the unsatisfactory outlook in the cotton trade. Lancashire collieries are at length beginning to feel this altered condition of the market; and in many cases slack is accumulating, while surplus supplies from outside districts are perhaps being pushed more keenly than ever at much below local quotations. The whole tendency is decidedly in the direction of weakness, so far as engine fuel is concerned; and although Lancashire collieries are still holding to late rates, on the basis of 10s. 6d. per ton as the minimum for common up to 11s. and 11s. 6d. for the best qualities of slack at the pit-mouth, they are finding orders difficult to get at these figures, in the face of outside competition, and it is becoming a question how long they may be able to maintain prices on their present basis. For shipment, the demand continues generally active, although not of such a pressing character as to give any hardening tendency to prices, which generally are not more than maintained at the recognized Association basis rates of about 15s. 3d. per ton for ordinary screened steam coal, delivered at Mersey ports. For coke, the demand is being fully maintained, and the position as regards prices is exceedingly strong, the tendency being, if anything, towards a further hardening on current rates on new business coming forward; but quotations generally at the ovens remain at about

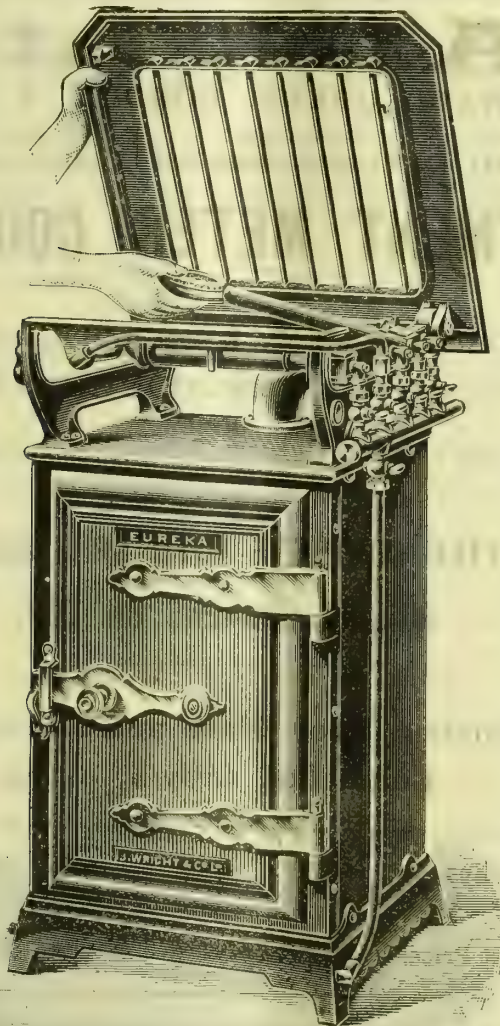
24s. to 24s. 6d. per ton for furnace, to 31s. to 32s. for best foundry classes of coke.

**Northern Coal Trade.**—Now that the strike at Rotterdam has passed away, there is rather more activity in the coal trade; and with a better supply of steamers, the shipment of coal is proceeding more rapidly. In the steam coal trade, there is a steady demand; and with some pressure for early delivery for Russia, the price is firmer at from 18s. to 18s. 3d. per ton f.o.b. Steam smalls are still rather quiet, at from 11s. 6d. to 12s. per ton. In the gas coal trade, the demand is good for the season; and the price is from 15s. 9d. to 16s. 9d. per ton f.o.b. for best Durham gas coals, for occasional sales. The bulk of the deliveries, however, continue to be on contracts, at prices which are now from 15s. 9d. to 16s. per ton. The miners of Durham are pressing for further advances in wages, which will probably in some degree have to be given, and which will to this extent add to the cost of the production of gas coals in that county. There is continued strength in the coke trade; best coke for export being 35s. per ton f.o.b.; while blast-furnace coke is about 29s. per ton at the Teesside blast-furnaces. In gas coke, there are, locally, higher prices for household supplies; about 11d. per cwt. being the quotation in Newcastle. For export, the price of gas coke varies much; and not until the production is fuller will a reliable medium price be obtainable.

**Scotch Coal Trade.**—There is still a small output from the collieries, which keeps prices up; but it has to be borne in mind that steel and iron works have not yet started work, which should have the effect of keeping rates down. The quotations for the little business which has been done are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 159,550 tons—a decrease of 38,079 tons upon the preceding week, but an increase of 7351 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,829,928 tons—an increase of 1,101,345 tons upon the same period of last year.

**The West Cumberland Water Scheme.**—The Egremont Urban District Council last Tuesday rejected the proposals of the Whitehaven Rural District Council for the supply of water to the latter's district, which includes Seascales and parishes in the southern district. It had been intended that the Egremont Council should promote a Bill in Parliament for a supply from Wormghyll, and that the Whitehaven Rural District should become customers.

**Gas Profits at Todmorden.**—At the last monthly meeting of the Todmorden Town Council, Alderman William Jackson, the Chairman of the Gas Committee, reported on the gas undertaking for the year ended March 21. The total income, he said, was £24,939; and the gross expenditure, £15,399—leaving a gross profit of £9539, equal to 6·7 per cent., and, after paying interest, &c., a net profit of £3002, as compared with £1476 last year. The net profit had been considerably reduced by an account of upwards of £600 for work done previous to this year, as well as by an increased cost of about £500 for coal. Since the Local Authority purchased the works, about 6½ years ago, they had made a profit, after meeting all charges against the undertaking, of £14,574.



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**Burry Port Water Supply.**—General Crozier some time ago held an inquiry at Burry Port on the application of the Llanelly Rural District Council for sanction to borrow £22,400 for purposes of water supply. At last Thursday's meeting of the District Council, a communication was read from the Local Government Board stating that the scheme was open to objection on the grounds that in the agreement made with Mr. Mansel Lewis the latter would be able to take more than half the total estimated yield of the gathering area, and even more if necessary. Further, the Council did not propose to purchase the underlying coal; and thus laid themselves open to risk of dangerous subsidences. Special measures would be necessary also to deal with the drainage of farms, so as to prevent pollution. The Board therefore asked the Council to reconsider the scheme with the view of meeting the above objections. It was remarked that the Local Government Board approved of the sewerage scheme; but it would be no good without the water one. It was decided to refer the matter to Messrs. Beasley, the Engineers.

**Seville Water-Works Company, Limited.**—The annual meeting of this Company was held last Friday, under the presidency of Mr. David Evans. The report showed that the income for the year ended March 31 last was £30,989. The net profit was £8195, as compared with £8681 in the previous year. To this sum was added the unappropriated profit at March 31, 1899—namely, £11,844; and after charging the contribution to the sinking fund of £783, and transferring £10,000 to capital account as a provision for expenditure on works in excess of capital raised, the amount standing to the credit of profit and loss account was £9256, which the Directors recommended should be carried forward. The expenditure on capital account so far incurred in excess of capital raised, and the further commitments which the obligations of the concession cast upon the Company, rendered it impossible for the Board to propose the payment of a dividend. The Chairman, in moving the adoption of the report, said that, after having read the Directors' and the Manager's reports, it might be a matter of surprise to the shareholders that, with a net profit of £8195, no dividend was recommended. In order to pay a dividend, however, they would have had to borrow the money; and at the present rate of exchange, this was a very serious matter. The money that the Company ought to have in hand wherewith to pay a dividend was owing to them by the Municipality of Seville. They had no reason to doubt that the Municipality would eventually pay their debts; but in the meantime promissory notes were not cash. The aim of the Board was to keep down the capital account. They could only raise additional capital by offering preferential terms; and the more the preferential shareholders absorbed, the less there was for the holders of ordinary shares. The Company had had a run of ill-luck. They not only had to face a heavy loss on exchange, but there had been a drought which had lasted for three years. The Board had for the last nine months been in negotiation with the town for the settlement of all outstanding differences; and they hoped the result would be satisfactory to both parties. The Company was not a non-dividend earning one; the Directors merely deemed it wise not to distribute the dividend, but to place the amount to capital account. The report was adopted.

**The Falmouth Corporation and the Water-Works.**—It was decided by the Falmouth Corporation last Wednesday to instruct Mr. Phillips to report on the water-works and the advisability of municipal purchase. Mr. J. W. Buckley, who moved the resolution, said they wanted an unbiassed estimate of the value of the undertaking.

**North Warwickshire Water Bill.**—At the meeting of the Solihull Guardians last Tuesday, a letter was read from Mr. A. Bassett Hopkins, of the Temple, stating that now that the North Warwickshire Water Bill had practically passed, he could not deny himself the pleasure of congratulating the Solihull District Council and the Chairman of the Guardians upon the protective provisions in relation to purchase, &c., of which they had procured the insertion. A distinct service had, he said, not only been done to the inhabitants of the district, but to local authorities and the public in general, in relation to water supply. The ten years' purchase clause was the shortest period for optional purchase ever obtained by a public authority in a company's Water Bill. It was a new precedent, and was the more acceptable from the fact that it was obtained in the face of strenuous opposition.

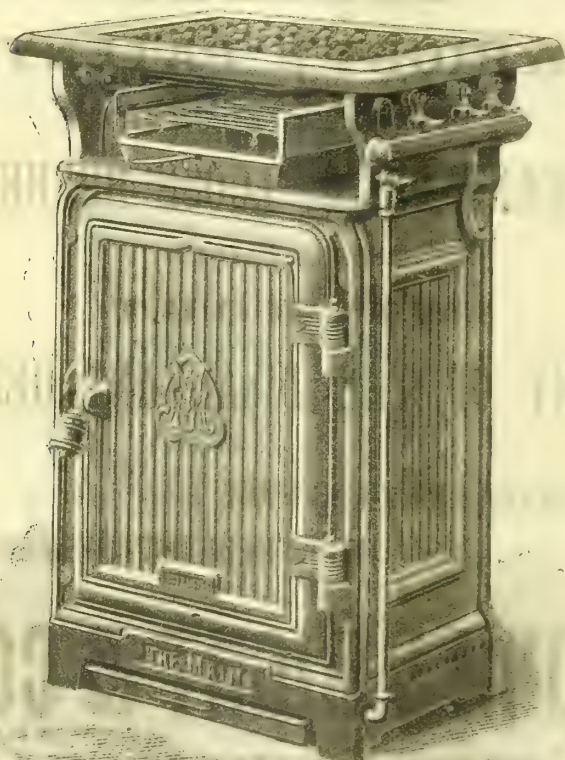
**Otley Water Scheme.**—At a recent special meeting of the Otley District Council, Mr. T. A. Duncan, Chairman of the Water Committee, gave a *résumé* of the agreements which had been entered into by the Council in connection with their new water scheme, the Bill for which has recently received the Royal Assent. The scheme is to impound the waters of March Gill and Bow Beck, two tributaries on the north side of the Wharfe, in the township of Middleton, near Ilkley. After giving a brief outline of the work done by the Council when the scheme was first commenced, and emphasizing the necessity for obtaining an augmented supply, Mr. Duncan said the first agreement he would mention was with the Ilkley Urban District Council, who had met them most fairly in the matter. The Council claimed to have the right to supply three townships within the area—Middleton, Nessfield-with-Langbar, and Denton. The Otley Council had, therefore, agreed not to supply these townships, or any individual or authority in them, with the exception of the Ilkley Council, whom they would supply in bulk at 6d. per 1000 gallons, restricting the supply to 50,000 gallons per day. The next agreement was with Mr. Middleton himself, and was for the protection of the Middleton Estate. They had agreed to serve him upon the same conditions as the Ilkley Council, although it was not likely that they would ever be called upon to supply such a quantity. The price of the land (30 acres) and the easements had been fixed at £6000. No land was required from Mr. M. D. Wyvill, M.P.; but the pipes would be brought through his land a considerable distance, and the question of price was to be settled by arbitration. The Council also agreed to supply Mr. Wyvill with 10,000 gallons per day at 6d. per 1000 gallons. The Leeds Corporation, who had rights in the parish of Denton, had agreed to accept £250 in settlement of their claims; and the Wharfe millowners were to have a guaranteed supply of 140,000 gallons of water daily, and receive £120 compensation. The agreement with Mr. John Waugh, the Engineer for the works, was that he was to receive 6½ per cent. on the contract price; or if the Council carry out the works themselves, 6½ per cent. on the cost.

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List Prices	45s. 0d.	47s. 6d.	52s. 6d.	56s. 6d.

Full Particulars and Special Quotations on Application.



**Some of the Costs of the Derwent Valley Water Scheme.**—A meeting of the Derwent Valley Water Board was held at Derby, last Thursday, Alderman Gainford presiding. The following bills of costs as allowed by the Taxing Master of the House of Commons were presented to the Board and ordered to be paid: Corporation of Derby, £28,120; Corporation of Leicester, £31,274; Corporation of Nottingham, £4729; Few and Co., £3454; and R. W. Cooper and Sons, £83. The Board subsequently resolved to obtain scientific geological advice with regard to the geology of the Derwent Valley. The promotion and passing of the Bill involved an outlay of about £100,000.

**Unreasonable Use of Water by Leeds Publicans.**—We learn from the "Leeds Mercury" that a rather novel discovery has just been made by an official in the service of the Water Committee of the Leeds Corporation. The Committee have had to ask the public to be careful not to waste water, having regard to the effect of the recent dry and hot weather on the quantity in the reservoirs. But, notwithstanding this, the Committee were puzzled to find that there was still an extraordinary leakage, and instructions were given to the inspectors to thoroughly investigate the matter. They did so, but nothing came of it. The Committee were naturally not satisfied with this, and they consequently appointed an inspector specially to make inquiries afresh. The result of his efforts revealed the fact that a number of publicans in the city, in order to keep their cellars cool and the beer in condition, had found it necessary to turn on the water-tap and keep the water running for an exceptionally long period. As the water thus used does not pass through any meter, it was being had on fairly easy terms. So far as the inquiries have gone, it appears that the practice commended itself to one out of every seven publicans whose premises were visited. The quantity of water consumed in this way is estimated at an average of a million gallons daily. A special meeting of the Committee, for the purpose of taking the matter into consideration, was held on Monday last week, at the Town Hall, Alderman Cooke (Chairman) presiding. It was decided to take the necessary steps to render similar misuse of water unlikely in the future; but nothing transpired with regard to what action should be adopted with reference to the offenders.

Messrs. Beesley, Son, and Nichols, of Westminster, have been awarded the first premium in the competition for works for the supply of Honiton with water.

It is proposed to borrow £6000 for the extension of the Kidderminster Water-Works. The Corporation have authorized the engagement of an expert to prepare the plans and to superintend the works.

Messrs. John Wright and Co. recently held, under the auspices of the Ashton Gas Company, in the Oddfellows' Hall, Ashton, an exhibition of their "Eureka" and other gas-stoves; Miss M. B. Terrace giving demonstrations in cookery.

During the past three weeks, Messrs. R. & A. Main, Limited, have held highly successful exhibitions in the New Assembly Rooms and Grand Assembly Rooms in Newcastle-on-Tyne, as well as in the Co-operative Hall, Gateshead.

The excavations taking place in Newcastle-on-Tyne, in connection with the improvement of the tramway system, have resulted in the disclosure of one of the old wooden water-pipes. It appeared to be of Scotch fir, and had a bore of about 8 inches.

The New Conveyor Company, Limited, of Smethwick, are sending out a pamphlet and price list of their detachable chains and sprocket wheels, serviceable for transmitting either power or materials. In addition to the prices, the approximate horse powers which the chains will safely carry are given.

The net result of the trading in the year ending March 31 last by the Coventry Gas-Fitting, Electrical, and Engineering Company was a loss of £948, more than half of which was due to a bad debt contracted in 1898. This loss, together with the adverse balance from the year 1898-9, has been deducted from the reserve, which now stands at £1172.

Extraordinary general meetings of Messrs. John Wright and Co., Limited, and the Eagle Range and Gas-Stove Company, Limited, were held in Birmingham last Thursday, at which the resolutions passed at previous meetings to sanction the amalgamation of the two undertakings (see ante, p. 181) were confirmed. The title of the new Company will be John Wright and Eagle Range, Limited.

The amended tender has been accepted of Mr. H. Roberts, of Ashford, for the construction of a service reservoir, engine-house, mains, &c., for the supply of Faringdon with water, for £3990, in accordance with plans prepared by Mr. G. Winship, Assoc.M.Inst.C.E., of Abingdon. The oil-engines and deep-well pumps in duplicate will be supplied by Messrs. Hornsby and Sons, Limited, of Grantham, for £497.

The London agents for the Metropolitan Gas Company of Melbourne, Messrs. John Terry and Co., have received by cable particulars of the half-yearly meeting of the Company. The profits for the six months to the 30th of June were £51,000. A dividend of 4s. per share was declared; a sum of £15,000 was placed to the reserve fund; and a balance of £8500 carried forward. Dividends will be payable in Melbourne on the 6th prox.; and drafts will be posted to absentee shareholders by the first mail after that date.

On Saturday, the 21st inst., a party of the employees in the Gas and Electricity Fittings Department of the Bolton Corporation, accompanied by Alderman Miles, J.P., the Chairman of the Gas Committee, and other members and officials, had their annual outing; the place selected being Castleton. On reaching their destination, conveyances took the visitors to the celebrated Speedwell and Blue John mines, which were explored with much interest. After luncheon at "Ye Olde Cheshire Cheese" Hotel, the party drove to Hathersage and Surprise View, and then returned to the hotel to tea. An interesting feature of the subsequent proceedings was the presentation to Alderman Miles, on behalf of the fitters, of a handsome epergne, in wrought iron and copper work, in token of their respect, and as a memento of his visit with them to Castleton. Alderman Miles feelingly thanked the men for their beautiful and unexpected present, and assured them that he would treasure it as one of his most valued possessions.

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Merrifield—Westcott—Pearson Patents.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
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BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000

	Cubic Feet Daily.
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDÉ (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETTFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000



**BANK HOLIDAY.**

**NOTICE TO ADVERTISERS.**—In consequence of the **BANK HOLIDAY** (Aug. 6), orders with respect to **ADVERTISEMENTS** should be received at the Office not later than **THE FIRST POST ON SATURDAY NEXT.**

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Old Broad Street,  
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[For Illustrated Advertisement, see July 3, p. 53.]

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**R. WEST**,  
Manager.

Hebdon Bridge,  
July 29, 1900.



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## EDITORIAL NOTES.

## The Affairs of the Gaslight and Coke Company.

THE meeting of the Gaslight and Coke Company on Friday passed off very quietly. The attendance was not large; and there was nothing in the speeches made from either side of the table to indicate that the Company are in any sort of trouble. The Governor, Colonel Makins, was more subdued than usual. Of course, he claimed that the accounts present a "fairly satisfactory" aspect, the chief point of everything being apparently that whatever may be the increased cost of carrying on the business, the consumer pays. Naturally, a coal bill showing an increase of 69 per cent. for the year falls upon both parties to the undertaking in unequal proportions; but most other extra expenses will not touch the proprietors. Has the reassessment put an additional burden upon the property? It must come out of the price of gas. The same with the cost of the wanton parliamentary proceedings of the London County Council. This is all true enough. But the circumstances of the time are not such as to warrant the laying of much stress upon this order of considerations. The most important statement made by the Governor was to the effect that the Directors intend to go to Parliament again next year with a full statement of the past and actual condition and future prospects of the Company, and possibly with a proposal to accept the recommendation of the Powers of Charge Committee in regard to a reduced initial price for any fresh capital. It is much to be regretted that the wisdom of the Board did not run to this a year ago. As it is, it is to be feared that their belated concessions in this and in other matters at issue between the directorate and the public authorities, will only encourage the latter to hit them again in the hope of getting still better terms.

One cannot help thinking that it would have made all the difference in the world to the Company this year, if, in addition to applying for cheap debenture capital, their Bill had asked for a moderate amount of new stock to be raised under the terms suggested by Sir James Rankin's Committee. It might be objected that if Parliament would not give the Company debenture stock, still less would it have been disposed to grant additional share capital to the undertaking. But this is not by any means obvious. At any rate, the subject would have been brought up, and the recommendations of Sir James Rankin's Committee could have been gone into. As it was, the mere repetition of the Bill of the previous year, although a reasonable and proper proceeding from the point of view of Colonel Makins, was a hopeless blunder in the circumstances. It is all very well for Colonel Makins now to protest, when it is too late, that nothing was farther from the Directors' thoughts than anything like flouting the Powers of Charge Committee; but it is impossible to compare his tone on Friday with that of his address last August without noting a vast difference. He still magnifies the circumstance of the Powers of Charge Committee having taken unsworn evidence; but that is a haunting thought of his which nobody outside the Company regards as of any consequence.

Perhaps among other matters concerning the Company of which a clean breast is to be made in Parliament falls the subject of the composition and working of the Court of Directors. While they are about it, the Directors of this great concern had better tell Parliament how much time and attention they give to the affairs of the Company. An impolite London newspaper last week suggested that these gentlemen must be so overworked that it would be an act of kindness on the part of the shareholders to relieve them of their appointments at Horseferry Road. Surely, it is thought, such a Company might look to have a Chairman all to itself—or at least a specialist in gas. Anyone who will take the trouble to consult the usual sources of information in these matters will be inclined to marvel at the vastness and variety of the cares which rest upon the shoulders of the estimable gentlemen now constituting the Chartered Board. Pluralist directors mean amateur or perfunctory administration. At any rate, the Gaslight and Coke Company cannot be cited as proof to the contrary. They also mean an oligarchic chief executive; and this is very finely exemplified at the Horseferry Road. Oligarchies are usually both tyrannous and inefficient; and if the capital account and the course of gas prices of the Gaslight and Coke Company since the last amalgamation do not favour the latter view of the administration, then all the expert criticism that has

## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.



been applied to the working of the Company during the last fifteen years is wide of the mark. Colonel Makins has complained of this criticism as being vague and general in character; but his defence is conspicuously of this description. He has never taken the report of the Powers of Charge Committee line by line, and given the facts a different turn. Perhaps this is another of the things which are to be done next session.

Otherwise, one is reluctantly driven to fear that the next Bill of the Company will fare as the others. The general body of the shareholders are plainly incapable of initiating or controlling any policy. In all the circumstances, the singular lack of interest in their own corporate affairs displayed by the proprietors last Friday is a very bad sign. It will encourage the opposition to the Board. Apart from all questions of policy, the interest of the meeting centred in the problem of coal. Several contradictory views of the future of coal were expressed in the room; and mention was freely made of the folly of householders in largely stocking coal at the present time, which is merely playing into the hands of the dealers.

#### The Coal Question.

THE Government have not, as yet, yielded to the request for the appointment of a Royal Commission on our coal resources; and, judging by the reply made by Mr. Balfour last Thursday to a question on the subject put to him by Mr. D. A. Thomas, no such Commission is likely to be nominated this session. Mr. Thomas prefaced his question—as to whether the Government could now see their way to cause such an inquiry to be made as would remove the prevailing uncertainty in regard to the quantity of coal remaining unworked and available for naval, domestic, manufacturing, and commercial purposes—by the phrase, “having regard to the growing scarcity and dearness of coal.” Mr. Balfour, in his reply, hit the right nail very truly on the head when he said that he did not think the present scarcity and dearness of coal had “any relation to the larger issue dealt with in the main part of the question.” As we have time and again pointed out, the prevailing “scarcity” and high price of coal are no more due to an actual shortage of the mineral in the pits, than the present dearness of diamonds is due to the exhaustion of the Kimberley mines. In each case the enhancement of value is due to a temporary failure of the output to equal the demand.

It is, then, a confusion of unconnected questions to put the need of further inquiry into our coal resources on the ground of the present condition of the market. The latter has merely served to call public attention once more to a subject that is always of equal importance, but is not always given an equal measure of consideration. We know, as certainly as is humanly possible, that we have ample supplies of coal in this country to provide the requirements of the nation's home and foreign trade for many years to come, and that the prevailing dearness of coal is simply due to the fact that we cannot get at these supplies as quickly as we need them. The public, however, require to be reassured on the point—for they are being needlessly scared by the “headline” Press—and those who feel no anxiety as to the immediate future have thought, as we have thought, that the present is a good opportunity to obtain further knowledge as to the probabilities regarding the duration of the best and cheapest coal. For the question of the most practical importance is, of course, not when our coal supply will be exhausted, but when the cost of production, from physical causes, will be permanently increased, and the level of average coal prices permanently raised in consequence. This and the question of our coal resources considered as a munition of war constitute the real basis for an expert inquiry. The existing condition of the market is merely due to temporary and passing circumstances.

The question of most and pressing importance for the gas industry is, of course, how soon the present tense will be changed for the past, and it will be possible to speak of those temporary circumstances as matters of history rather than of living concern. Mr. Livesey, speaking at the Horseferry Road last Friday, was refreshingly optimistic; and, while Colonel Makins had in his preceding references painted the future somewhat darkly, he afterwards fell in with the more hopeful view that the tide had turned in favour of the buyer. As Mr. Livesey pointed out, the public—alarmed by the sensational forecasts of some of the newspapers (and oh, the dreary nonsense that some of them print daily!) as to the possibilities of the coming winter—have been playing

straight into the hands of the coalowners and merchants, who neither, by their own account, are reaping any profit, by frantically scrambling for their winter stock of coal. A very few weeks will see that scramble ended, and it will then not be long before the inevitable reaction in the house coal market follows, for it is certain that the householder will not be extravagant with his coal this winter, and a mild season will upset the calculations of not a few coal gamblers [not, as the printer made us say last week, of the coal “grumblers”]. The most uncertain factor of the situation—one to which we think Mr. Livesey did not, perhaps, give adequate importance—is the export trade; and that is, admittedly, the most difficult to forecast. In our opinion, the continued heavy shipments to other countries will prove sufficient to keep the market stiff for some time to come; so that we do not expect to see it break much this side of Christmas, and it will then be a “weather market.” But be it a month sooner or later, the break is coming.

Upon this question of the export trade, we would again repeat our regret at the mischievous shriekings of a section of the newspapers—some who might be excused on the ground of irresponsible youth did they not exercise such an influence on the even more ignorant public; others who ought to be above such work—as to the meaning of the expanded condition of the export coal trade. From every trustworthy source it is only possible to find refutation instead of confirmation of the sinister rumours as to the use to which foreign countries are putting, or mean to put, the coal they are buying from us. An American official report on the European coal difficulty (from which we give elsewhere some extracts) bears witness to the great need in France of coal for industrial purposes—leading her, indeed, to buy large quantities from America; while Mr. Charles Fenwick, M.P., points out, in a contemporary, that steam coal rapidly deteriorates when stored in the open, and that, in his opinion, this fact alone is sufficient to prove the falsity of the alarm-cry raised. A final exposure of the falsehood of the story that the coalfields of Wales are being drawn upon to an abnormal extent for the supply of foreign navies is, moreover, provided by the fact, communicated to the House of Commons by Mr. Ritchie on Friday last, that the exports of coal from Wales during the first six months of this year show a decrease of 400,000 tons compared with the corresponding period of 1899.

#### A Call for Enterprising Gas Companies.

A SUGGESTIVE paper entitled “Means of Stimulating the Demand for Electricity” was read by Mr. H. Collings Bishop, the Borough Electrical and Tramways Engineer of Wigan, at the last meeting of the Municipal Electrical Association. Mr. Collings enumerates and also comments sagaciously upon the ordinary aids to good electrical business, beginning with “low price”—which, as he observes, requires no commendation—and running through “free wiring” and the rest. Of some of these expedients, particularly the last named, it is remarked that they are “not as satisfactory as at first sight they appear.” Of course, the electric lighting engineer is greatly handicapped by the costliness of the service, and also of everything the user of electricity needs—wiring, meters, motors, and the rest. Yet he does his best to get trade into his hands; and if even he is slightly optimistic on the point of the comparative cost of electric and gas light, he is less blameworthy than the gas manager who is only too often heedless of the whole subject. We desire now to engage the attention, not only of managers of gas-works, but even more especially of directors and corporation gas committees, to the imperative necessity for their showing more commercial enterprise in the cultivation of their business.

Gas managers, particularly this year, have as much work on hand as they can possibly get through to make ready for the coming winter's work. On all sides we hear woful tales of the impossibility of having new additions, and even ordinary repairs, done to time. Dearer gas is not making the slightest difference in the demand, simply because the people know that coal and oil are dearer likewise; and they stick to gas in the hope that the price will fall again some day. It is not to be expected, therefore, that the works manager, or the engineer of the whole undertaking, can himself take up the propaganda of incandescent lighting, and push gas-fires for the winter, in the style recently reported upon by Mr. Webber as now prevailing in Germany, and as repeatedly advocated in the “JOURNAL.” The manager, in



short, has his hands full, and is probably otherwise unsuited for carrying on an active outdoor campaign on modern lines. Wide-awake directors, however, can easily determine to appoint a new assistant, under the manager, to organize a new department. Now is their opportunity, when advanced prices, although not checking the popularity of gas, will naturally dispose the consumers to look more favourably than ever upon the incandescent system. All business men know well, moreover, that when trade is brisk is the right time to push it. Amateurs and mere officials might think to wait until trade flags before making an effort to revive it; but that is because they are amateurs and officials. In this way, dearer gas might positively be made the excuse for driving a smart trade in economical burners. Besides, when the corner is turned, and it becomes possible to take a penny off the price, this money had better be spent in the enterprise of pushing gas into the houses and shops of the people on the most approved modern lines.

Not, of course, that it will always, or even often, be necessary for gas companies themselves to do the work of fixing and maintaining incandescent burners after the German fashion, which pays so well. It will often be possible to make arrangements for this accessory work to be undertaken at a tariff by respectable local tradesmen; and this should always be arranged if it can be done. The shopkeeper can always, if he has a spark of enterprise, keep a better class stock of gas-fittings than the gas company or corporation department. It is his business to do so. This is precisely how it is managed in Berlin, Magdeburg, and many other Continental towns. Unfortunately, however, good gas-fitters, and even ironmongers worthy of the name of craftsmen, are not to be found in every gas consuming district. In London, reliable work of the kind is confined to amazingly few hands; and in the suburbs, sound specialists in gas-fitting on modern principles can hardly be said to exist. The "cash stores" has destroyed the old working tradesman who kept a shop of his own; and if there is one "department" of the "stores" which is mismanaged, it is usually the plumbing and gas-fitting. Some builders keep decent "three-branch hands;" but to call one of them in is like going into a lottery. We should like every board of gas directors throughout the land to appoint a small committee out of their number to investigate this matter, and ascertain how a new and more aggressive style of developing their ordinary staple trade can best be fashioned and carried into effect.

By dint of a vast upheaval of intelligence and enterprise, some gas directors have actually risen to the giddy height of sending out circulars, to meet threatened competition by corporation electric lighting, showing how much cheaper gas is than the rival illuminant. This is not enough. If the competition were between two gas companies in the same town, they would soon sharpen one another up; and one would be giving away incandescent mantles and gas-fires to spite the other. Is there no middle line between cut-throat competition and utter slothfulness in business? Let us hope there is, and that the "shake-up" which has been administered to the British gas industry this year by a handful of men who live in their epoch, will not pass away without leaving any permanent effect. Gas companies must do more for their public than they ever did before. Eternal vigilance is the price of prosperity, as well as of liberty. If gas companies go to sleep, the electricians will steal a march upon them; and serve them right. Only, it will not be fair to put all this additional work upon gas managers. Give them technical secretaries or outdoor assistants, and the business will go. The existing staff will rarely be found suitable for the task. Lastly, it is unnecessary to wait for the further throwing open of the mantle trade in this country. There is no longer any serious ground of complaint with the home facilities in this regard. The better and more careful class of prepayment-meter consumers might be encouraged to take to incandescent lighting forthwith. If these things are done promptly, the demand for electricity will require more "stimulating" than ever.

#### The Labours of the Sulphate of Ammonia Committee.

At the third annual meeting of the Sulphate of Ammonia Committee last Tuesday, the Chairman (Mr. W. G. Blagden) was able to give a very good account of the useful work performed by the Committee during the twelve months to June 30. A great deal had been done

in the matter of printing and distributing essays on the value of sulphate of ammonia as a manure, and there was an increase in the number of Agricultural Societies who had undertaken to carry out the Committee's prize competitions. Special arrangements had been made, too, for articles on the use of sulphate of ammonia to appear from time to time in various newspapers; and a large number of advertisements were inserted. In addition to all this, the Committee are setting aside a considerable sum in the accounts for the purpose of carrying out a new series of grain competitions, in which, alongside the plots to be manured with sulphate of ammonia, were to be other plots manured with nitrate of soda. Such a liberal programme as this, of course, requires much money to carry out; and it is disappointing to learn that during the past year there has been some falling off in the income of the Committee. Seeing that the sole object of the Committee is to encourage the greater use of sulphate of ammonia for purposes for which it is eminently fitted to be employed, it is surely the duty of all manufacturers of the article to assist in the good work by every means in their power. Although, as was pointed out by Alderman Miles at the meeting, the Committee was not formed for the purpose of artificially maintaining the price of sulphate, the result of persistently bringing its good qualities as a manure before farmers must be to much increase its value. From this all sulphate of ammonia manufacturers will derive benefit; and therefore it does not seem too much to ask that they should all assist, monetarily and otherwise, in the attainment of the object in view. Sulphate is at a considerably higher price now than was the case at the time when the Committee commenced operations; and it is fair to argue that this increase has been caused, to a large extent at least, by the work that has since been accomplished. Accompanying the Committee's report was that of their Agricultural Adviser (Mr. John Hunter), dealing with the experiments carried out in 1899. These experiments constitute a strong argument in favour of the use of sulphate of ammonia as a manure. Mr. Hunter, referring to the competitions in which sulphate of ammonia and nitrate of soda are being carefully tested against each other on oat crops, says: "It is too early to form any opinion of the ultimate results; but if there be anything like confirmation of those obtained at Dalmeny, Woburn, and elsewhere, the bulk, and more especially the weight and the quality of the grain, should in every case be better where sulphate of ammonia is employed." We shall look forward with interest—and doubtless our readers will also—to the conclusion of these experiments. The question is not whether sulphate of ammonia will come in first, but as to how far ahead of its rival it will be. As we have already said, it is the Sulphate of Ammonia Committee who are doing the work; but it will be the general body of sulphate manufacturers who will reap the benefit.

#### A Question for Belfast.

THE Belfast Corporation has hitherto ranked with the Corporation of Glasgow in the "first flight" of those municipalities which serve their public with gas and other necessities at the lowest possible cost. If one may safely judge from the newspaper report of the last meeting of the Town Council, however, there is some danger of the financial purity of the various trading Committees of the Corporation being soiled by the adoption of the "spoils" system. It has been the practice of the Gas Committee to apply their profits to the purposes of their own undertaking, with an occasional exception in favour of a special grant in aid of some particular and pressing municipal cause. Quite recently, the Finance Committee of the Corporation cast envious glances at the profit balance of the Gas Committee, and suggested that they might have some of it for the general purposes of the Corporation. The Gas Committee resisted the suggestion, on the ground that as coals and oil are going up they could not bind themselves to do more than try to avoid an increase in the price of gas, certainly not countenance any talk about an outside subsidy just at present. This snub was not taken in a humble spirit by the Finance Committee, who retaliated by moving a resolution at the Council meeting that £10,000 out of the gas profits should be handed over to them for the credit of the general purposes rate. This brought up the question of policy; and accordingly the whole matter was talked up and down at the meeting in a very interesting way.

It is unnecessary to repeat our own views on the question



of the proper allocation of municipal gas profits, which are quite familiar to readers of the "JOURNAL." It is curious to mark the clearness and completeness with which the issue was presented before the Belfast Corporation. The Town Council were informed that if they directed the Gas Committee to pay over £10,000 or any other sum out of their so-called profits in aid of the rates, the Committee would simply at their next meeting put up the price of gas to a corresponding figure. There are no profits on the gas undertaking, properly speaking, and nobody knows whether the price of gas in Belfast may not have to be raised in order to make both ends meet. Consequently, the question which had to be decided was whether the gas consumers should be directly taxed another £10,000 in aid of the ratepayers, or whether the ratepayers should be left to pay their own scot and lot as before. It is satisfactory to learn that the latter course was decided upon. It is one thing to set aside a lump sum in aid of rates out of gas profits already made, and quite another thing to deliberately put up the price of gas in order to make the profits. That is how it looks to the ordinary town councillor. Essentially, of course, there is no sort of difference; but, human nature being what it is, a difference appears between the two proceedings, which in this case proved too much for the Belfast Corporation.

This body should take warning by Manchester, where the Corporation have actually done, in defiance of the Chairman of the Gas Committee, what Belfast would not do. The truth is that in this, as in other downward courses, it is only the first step that costs any pain and doubt. Once let the subsidizing of rates out of a trading committee of a corporation become a regular practice, and it will be persisted in, even at the risk of doing such an injustice as that which the Belfast Corporation are not yet prepared to inflict upon the poor gas consumer. They have long become hardened to this at Blackpool, even, where they make the prepayment meter consumer pay more for his gas rather than let his landlord suffer a little extra rating. The Lord Mayor of Belfast, during the recent debate, made a weighty observation upon the rate at which the gas consumers of the city have been taxed to extinguish the capital of the undertaking. He is quite right in holding that this process can be overdone. There is no good reason why the next generation should be presented with gas-works free of capital; but, on the other hand, there is no just cause for reducing the general rates at the expense of the consumers. The best interests of a city, more especially a manufacturing city like Belfast, are served by cheapening the gas supply to the utmost; for cheap light and power are the first inducements to industrial expansion within the limits. Subsidies are usually taken out of the wrong pockets and paid to the wrong recipients. Besides which, they generally cover up something which had better stand out in the light. For these and other reasons, it is to be hoped that Belfast will keep its municipal finances pure, and will not fall into the way of the indirect taxation of the gas consumers after the Manchester pattern.

#### More Newspaper Ineptitudes.

THE sage who bade his son observe with how little wisdom the world is governed, is never likely to pass beyond the range of sympathetic quotation. His immortal remark might be expanded nowadays to embrace the wonderful lack of knowledge of common things which writers in our newspapers occasionally betray. How is it, one is inclined to inquire, that individuals capable of writing such vapid stuff contrive to obtain the opportunity for directing "public opinion"? We are well accustomed by this time to the perfervid gentleman—or is it a lady?—who pours editorial scorn on the suggestion that an advance of 8s. per ton on the price of coals, to say nothing of other advances, should suffice to explain why it is that gas companies in general have raised the price of gas. He was beaten lately by another journalist who told the readers of a leading London newspaper that the wicked Master Bakers' Association had forced up the price of bread, and concluded his tirade with the remark, "and flour is dearer, too." Next day the newspaper very properly published a letter from a representative of the baking trade, asking courteously whether the journalist was aware that bread is made of flour; and, if so, whether there might not be supposed to be a natural connection between the selling prices of the two commodities? This is the sort of thing

that makes common-sense people pitch their newspapers into the waste-paper basket. It is only too true that the civilized world is struggling through an era of high prices. How long this will last, or what will be the end of it, nobody can say. The economists seem unable to make up their minds about a "theory of value;" but the practice of marketing is painful enough at present for those who are constrained to make a fixed income meet at both ends, whatever the cost of necessities and luxuries. They must do without some things; and among the superfluities likely to be dispensed with first are, one would fain believe, the mushroom crop of trashy newspapers and periodicals which have appeared so thickly during the past year or two, and rarely contain anything either more entertaining or informing than the chatter of one street loafer with another. Time was when the conductors of periodicals were supposed to be able to inform or amuse their patrons in a rather superior manner. They were experts, in short, in their various lines. But nowadays, apart from circulating news, the journalist seems to be chosen because he knows no more of any subject than the man who is expected to read him. So when some retired tradesman on the London County Council calls dearer gas a "monstrous imposition," the journalistic sycophant of this distinguished body adds that it is shameful to charge the ratepayers more for their gas, at the very time, too, when the County Council's own coal bill will be £40,000 heavier than that of last year. Thus democracy repeats the folly of ancient rulers.

### WATER AND SANITARY AFFAIRS.

WHEN commenting last week upon the short supply of water in Paris, we alluded to the prevalent rumour that it had been brought about by the use of the filtered water for street sprinkling and industrial purposes; and the fact that the Municipal Engineers were making efforts to bring the contents of the reservoirs up to their normal condition seemed to indicate that they had been rather too heavily drawn upon. But that there should have been any necessity for curtailment is somewhat surprising, in view of the fact that quite recently the aqueduct to convey to Paris the water from the new sources of supply—the Loing and the Lunain—has been completed. It was understood that by its aid an additional 11 million gallons of limpid water of fine colour, containing little organic matter and few bacteria, would be available for the use of the citizens. But it looks as though this new supply is not yet ready; and as rather alarming statements are being made as to the quality of the water now being distributed, it is possible that that derived from some of the other sources has been sent out imperfectly filtered. What these waters are like in their raw condition is shown in the Municipal Pavilion at the Paris Exhibition; and it was well for the authorities to clearly indicate that the consumption of Seine water for private purposes is prohibited, and also to show the effect of filtration. Such a display is reassuring, because warnings are being issued to intending visitors to Paris not to drink the water unless it has been filtered and boiled. It appears that the mortality from typhoid fever in Paris last year was very much higher than it had been since 1892—about 4300 cases being notified; while in the first ten weeks of the present year some 800 cases came under the notice of the authorities. It would, perhaps, be going too far to attribute this condition of things to contaminated water, seeing that a very large number of the houses, bright-fronted as they are, are still without proper sanitary appliances; while the upper rooms, usually occupied by servants, are described as "kennels hardly fit for a dog." We have been hearing lately something about the effect of the contiguity of a sewage farm upon the water supply; and possibly the great establishment at Achères, upon the land of which, close upon 2500 acres in extent, something like 13,000 million gallons of sewage was spread last year, may be responsible to some extent for the typhoid. At all events, there is the fact.

Reference to the sanitary condition of the Paris houses leads to a consideration of the housing problem, especially in connection with the working classes. A conference convened by the Sanitary Institute discussed this matter for two days at the beginning of last week, and visits were paid to the artisans' dwellings erected by the London County



Council on the Millbank Estate, Westminster, and on the Boundary Street area, Bethnal Green, as well as to those put up by the Richmond Town Council. The proceedings on the first day were presided over by Mr. R. Melville Beachcroft, of the London County Council, who opened a discussion on the subject of "Unhealthy Areas and the Displacement of Town Populations." Comparing the work of clearance effected by the Council with that done by their predecessors, the Metropolitan Board of Works, he showed that the cost per head was £50 with the former and £59 with the latter—the difference being attributable to the special compensation provisions of the Housing Act of 1890. He pointed out that, in carrying out these schemes, every large clearance effected by the Council must involve the buying out not only of the "slum" owners, but also of trade interests; and it was this which caused the loss to the ratepayer. It would seem, however, that the loss must be borne, on sanitary grounds. The disappointing feature in these schemes is, as Mr. Beachcroft acknowledged, that so few—a mere fraction—of the displaced residents in the slums find their way back into the new dwellings erected for them; and consequently Lord Rosebery's question as to what is to be done with the displaced residuum has still to be answered. Mr. Beachcroft thinks that the crux of the question lies in providing accommodation on the spot for the residents displaced, before the actual displacement; and, in his opinion, no clearance scheme should be allowed to pass in which no provision is made for this. It is all very well to turn out the poor people, but where are they to go to? In the new buildings hitherto provided for them the rents are too high and the restrictions too great; and they consequently get into the suburbs.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 367.)

AFTER so quiet a week as that which preceded it, no wonder can be felt that last week showed no acceleration in point of activity. With one day short (Saturday was a closed day), and with the holidays impending, the natural tendency in the markets was to slow down till they barely moved. But quiet as things were, they were not so much depressed as they might have been; and in some departments the tendency was pretty firm. In the Money Market, there was a fair demand for the end of the month, which prevented a lapse towards easiness, and discount rates were disposed to be firm. In the Gas Market, there was almost an approach to total stagnation. Hardly any dealings were marked, and changes in quotation are almost *nil*. It would really seem that holders of stock are learning wisdom, and are declining to sell at present prices. We made some remarks last week as to the indications that gas companies had been doing good business during the half year just completed. What has transpired since then fully confirms this view. The published accounts show that the demand for gas is constantly increasing—indeed, some companies find that it is in greater demand than ever. This is the true test. Gas companies may have to pay sometimes more and sometimes less for the commodities they buy; but the ever increasing demand for the commodity they themselves purvey is the sure indication of prosperity. Therefore let shareholders take heart, sit tight on their stock, and await with confidence the inevitable swing of the coal market pendulum back again.

As to market movements in gas on the Stock Exchange, they were: A few transactions of hardly any importance took place at figures practically unchanged from those which were marked at the close of the preceding week. The changes in quotation were of the slightest. Gaslight debenture stock was lowered a point on Tuesday, and the preference stock was put down half a point. On the following day, Imperial Continental debenture stock was also lowered half a point. The Water Companies, for once in a way, offered more features of interest than the Gas Companies, and were the subject of some irregular ups and downs. East London fell 2; but ditto debenture rose 3. Grand Junction rose 2; but Southwark ordinary fell 6.

### ELECTRIC LIGHTING MEMORANDA.

Professor W. E. Ayrton on the Electric Power Bills—The Shame of Bumbledom—Wanted, Cheap Energy—A Fair Field and No Favour.

THE Electrical Power Bills form the subject of an interesting article by Professor W. E. Ayrton in a recent number of "Nature." The writer is in the proud position of being able to turn up the report of an old lecture of his own, delivered in Sheffield so long ago as 1879, in which the question was asked to which these statutory schemes have at last responded. The question was: "Why should not division of labour be carried to its end, and power be brought to you instead of you to the power?"

Let us hope then that in the next century electricity may undo whatever harm steam may have done during the present, and that the future workman of Sheffield, instead of breathing the necessarily impure air of crowded factories, may find himself again on the hill-side, but with electric energy laid on at his command." That is the point of the whole of this modern electric power distribution business—the bringing of the power and the tool to the work, instead of requiring the workman to attend upon the concentrated power. It is worth while to let one's imagination dwell for awhile upon this aspect of the subject. Here the idea is to be found, if at all; and all experience teaches that the idea, with the point of view which it gives to the man who is able to take it in, is by far the most important thing about a new social or industrial development. It is to the abiding shame also of the blatant representatives of modern Bumbledom—now called Municipalism—that they have been blind, deaf, and selfishly obstructive to all that Professor Ayrton has to advance in respect of the new idea in electric power supply.

Hitherto, in England, as we showed some time ago, the scheme of electric power generation and supply for all purposes, of which lighting was the chief, has rested on a parochial basis. The Electric Lighting Acts embodied this idea; and consequently the minds of that large and influential order of the British public which habitually adjusts itself to statutory standards in affairs, insensibly accepted this limited basis as all-sufficient and final for the electrical industry. Town clerks are the brains of this order in the community. Over and over again it has been made manifest that the idea of electricity supply as a parochial—that is to say, a municipal—perquisite has overpowered the perceptive faculty of otherwise broad-minded gentlemen of this class. It was a great shock to them when first the Joint Committee, and next the House of Commons, refused to put electricity supply in bondage to local authorities. They could not get rid of their point of view in this regard; and when we last wrote on the subject, we had to register the probability that the Association of Municipal Corporations would make use of all the forms of parliamentary obstruction in order to destroy the fruit of the labours of Sir James Kitson's Committee. Wiser counsels have, however, prevailed. Though probably as convinced as ever of the divine right of local authorities to play dog-in-the-manger to any form of enterprise which does not happen to pay tribute to themselves, the Associated Municipalizers have ceased lobbying for the present.

This spell of breathing-time may well be utilized in taking stock of the situation from Professor Ayrton's standpoint. Let us smother the craving for municipal profits for awhile, and listen to the idealist who may prove in the long run to be more practical than the official who cannot see an inch beyond his nose. Professor Ayrton asks his readers to consider with him the fundamental problems of civilized industry. What is it that does the mechanical work of the world? He answers—energy. Hitherto, when people needed this kind of energy, it has been customary for them to generate it, as and where they wanted it, from coal carried to the spot. "So accustomed are we to all this—so little does it strike us as incongruous that scuttles full of black lumps should be regularly brought into a dining room, no matter how valuable the pictures or rich the curtains and carpets—that we forget that our successors will look with more scorn on our customs than we do on those of our ancestors, seeing that, at least, their floor-coverings of rushes, intermingled with old bones and other refuse, could not be much injured by smoke or by dust." Electricity is capable of serving the same purpose as the coal-scuttle, with a difference. But the question of "means" is inseparable from that of "ways." How does the matter stand financially? Is it cheaper to concentrate electricity production on a favourable spot for the purpose, and distribute energy in this form over a wide area, or to carry the coal about as before?

Professor Ayrton understands that it is idle to talk of electric energy as some electrical witlings do, as carrying its own recommendation in its "scientific" character. That is the language of Laputa, wherever it is heard. That commercial service is the most scientific which is the cheapest. There may be, and generally are, other things to be considered; but it is essentially unscientific to spend 6d. for a necessary of life when the same can be had for less money. The question of "bulked" electric power is therefore one of comparative expense, and is admittedly a highly conditional or circumstantial problem. Much of Professor Ayrton's article is devoted to the investigation and valuation of these conditions; and we regret that the limited space at our disposal for the purpose of discussing electrical topics does not permit of the reproduction in full of his able analysis of the case for and against the various Bills. It should be read in "Nature" for the 26th ult. His conclusion on the whole matter is that the decision of Sir James Kitson's Committee was good and acceptable in the circumstances. It tends to encourage the realization of the dream of those who would fain see power brought to the workman, as the cure for the incidental evils of the factory system, which originated in the necessity for taking the workman to the power. At least, it gives electricity a chance of showing what it can do in this way. Professor Ayrton speaks of the obstacles put in the way of this new agency by "England's spirit of masterly inactivity, and by its not unnatural, nor wholly unwise, veneration of vested interests." Well, this is now altered. Those municipalities which do their duty by the public will not be raided, and those who are really nothing more than preservers of Bumbledom will not be respected. We shall see what happens,



## FURTHER QUESTIONS FOR THE DEPARTMENTAL COMMITTEE ON PATENTS.

In connection with the appointment of the Committee to inquire into certain aspects of the Patent system of this country, the Manchester Chamber of Commerce has addressed to the Board of Trade an important letter criticizing the terms of the reference—which have already been discussed in these columns—and setting forth the views of the Chamber on other points of English patent law and practice which it is thought should be included in the inquiry. This is the only expression of opinion we have heard of from a Chamber of Commerce respecting the questions put before the Committee; and we are very glad to consider it in the light of an independent contribution to the controversial literature of a matter fraught with such important possibilities for the national enterprise and industry. Generally speaking, the subject of patents for inventions is only discussed in the technical journals, and some of these are in the habit of procuring their patent intelligence from professional agents—able gentlemen, and well-informed, but not necessarily competent to speak from the independent standpoint of the inventor, the engineer, or the manufacturer. It is the opinion of the Manchester Chamber of Commerce, to begin with, that the composition of the Departmental Committee leaves something to be desired. It is pointed out that, apart from the official element, the Committee is mainly composed of gentlemen eminent in the legal profession or engaged as patent agents; while only two are connected with industry, and these are not known for inventors or for experience of patent law in relation to industry. The point is well taken; but the composition of the Committee will scarcely be altered now.

There are, of course, many men of business who go through life without having anything to do with patents; as there are others whose whole work is among patented inventions. Many of the latter order of business men are still more fully qualified to speak of the relations between patents and industry by having fought heavy patent actions. These experienced persons should make capital witnesses before the Committee; but it does not follow that they ought themselves to sit on the Committee. The judicial spirit might be lacking, or obscured by a ravenous memory of certain "costs in the action." For example, the hand of Mr. Levenstein is plainly to be traced in this protest from Manchester; and Mr. Levenstein has a painful memory of some proceedings under Section 22 of the Act. While applauding the inclusion of this section in the reference, the Chamber reminds the President of the Board of Trade of the vexatious and costly transactions connected with the first action taken under the section. It is remarked that the "test case" submitted on this occasion proved the provision for compulsory licensing to be of little practical use "because of the onerous conditions imposed on the petitioner." We venture to think that this is not an impartial judgment. There are test cases and test cases. The specimen referred to in this passage was artificially prepared, with more than one object; and it is not wonderful that the consequences were not wholly satisfactory.

The Manchester Chamber of Commerce occupies firmer ground when calling attention to certain distinct abuses of the privilege of patent which are not specifically referred to the Committee. One of these is "the taking out of patents for speculative ideas or inventions, not defined, but serving the purpose of appropriating unexplored fields of discovery, and of blocking the way of subsequent inventors who may have worked out original and useful discoveries within the unexplored domain appropriated by the blocking patent." One has heard a good deal about this sort of abuse of the privilege of patents, usually in connection with complaints of the consequential process of disclaiming. It is sometimes argued that the liberty of disclaiming cannot be harmful to anybody, because there is provision in the Act against disclaiming with the object of enlarging the scope of the patent. But this safeguard scarcely meets the case. What is complained of is that, by simply disclaiming certain parts, in the light of later knowledge, a person interested in a patent is enabled to set up a monopoly over something which was only constructively covered by the patentee. Not to speak of matters too nearly connected with the gas industry, it is said there was a good deal of this kind of thing done in regard to the pneumatic tyre patents. There may not be many of these blocking patents in existence; but where they do exist, they are a great nuisance.

Secondly, there is the point of patentees with a foreign domicile, who can patent inventions in England which are not patented abroad, and accordingly make Her Majesty's lieges pay through the nose at home for things cheap enough elsewhere. Processes and products are alike subject to this imposition, which is obviously a restraint upon British trade. It is difficult to see how this particular grievance is to be remedied, consistently with the maintenance of a national patent system at all. Something might be done, perhaps, in the way of modifying the system of patenting "communications from abroad;" but the question is a very difficult and delicate one, raising as it does all sorts of problems of reciprocal action on the part of foreigners. A patent system is a luxury which has to be paid for. When the patent is not commercially successful, as in nineteen cases out of twenty, the patentee pays the expenses;

when the patent is a success, the public pay. Much might be said for the abolition of patent right in one country or everywhere; but this is not a question of practical politics at the present time.

"A further question which the Chamber would gladly have seen in the terms of reference is that of providing for 'patents of addition,' by which the life of a supplementary patent should be limited to that of the original grant. In the absence of such provision, it is possible for a patentee to secure a new lease of life for an old patent in this country, whilst both the original patent and the addition taken out abroad expire together, leaving the invention open there, whilst here it remains a continuing monopoly." Here we have in general language the aspect of an important order of patents.

No example is given to show the enormous practical importance of the question raised by the Manchester Chamber of Commerce. It does not appear, all the same, that this particular Committee will be able to deal with it. The communication to the President of the Board of Trade will have the effect of drawing attention to the point; and this is as much as can be usefully done for the time being by those who have views respecting patent law reform. Another matter mentioned by the Chamber, but not referred to the Committee, is the liability to improper use of the provision of Section 18 of the Act, permitting the amendment of a specification "in the case of one not defined by drawings." This qualification is obscure. It probably has reference chiefly to chemical specifications, in which an apparently innocent form of words might cover a fresh invention. Lastly, the Chamber is of opinion that the contemplated inquiry might with great advantage be extended to embrace all such important differences between British patent law and that of foreign countries as are distinctly hurtful to British industries and trade. So it might, doubtless, if there were no particular hurry for the report, and the life of every member of the Committee were warrantable for another ten years. The direction, in short, is too vague; and the implied criticism founded upon the suggestion accordingly falls to the ground. On the whole, the Manchester Chamber of Commerce has done well to send this frankly expressed and pointed communication to the President of the Board of Trade. By so doing, it has justified itself as a working body. It is very desirable that criticism and suggestion in regard to departmental action in such matters should not be left entirely to the technical journals; but public or semi-public bodies are slow and difficult to move, and somebody must do the chorus part.

## THE EUROPEAN COAL MARKET AND AMERICAN IMPORTS.

In a summary of the commerce and finance of the United States, recently published by the Washington Government, there appeared an article on "The Present Coal Crisis in Europe," which, as a careful study of the peculiar conditions prevailing in the coal markets of the Continent during the past twelve months, affords interesting reading to those concerned in the present and future of the coal trade of this country. From an abstract of the article published in the "Iron and Coal Trades Review" for the 20th ult., we have selected such points as bear most closely upon the state and prospects of our own coal market.

The year 1899, it is remarked, in spite of a large increase in coal production all the world over, witnessed an enormous increase in coal prices, causing serious inconvenience and difficulties to the entire industrial community, and particularly to the iron and allied trades, which depend upon coal, not only as a source of their motive power, but also as part of their raw material. This rise of price began in 1898, and was at that time ascribed to the diminished output of the British mines caused by the strike of the Welsh miners. But when, after the Welsh mines had resumed their output, the rise in price continued, it was seen that other factors were at work beside the temporary reduction—or rather, it should be said, the maintenance at the previous year's tonnage—of the British output. Chief among these factors, some at least of which still subsist, was the extraordinary activity of European trade (the iron and machine building industries especially); old works being extended, and new enterprises undertaken. The scarcity of coal was further aggravated by an extremely rigorous winter, coupled with serious lack of transport facilities in Russia; while the same difficulty in regard to transport was experienced to a lesser degree in France and Germany, and, we may add, in this country also. Then came the Boer war, with its consequent greater activity in the shipping trade, and enhanced demand for fuel for the arsenals, gun factories, and other establishments engaged in the manufacture of war materials, steel rails, bridges, &c. Other factors contributing to the dearth of coal were labour troubles in the St. Etienne district of France, and the protracted strikes in Moravia, Silesia, and Bohemia.

This dearth of coal, it is pointed out, is all the more remarkable in view of the fact that the world's supply has never been increasing at so rapid a rate as during the decade now closing. Since the year 1890, the production of coal has increased almost 30 per cent. In Great Britain, practically the only coal exporting country in Europe, the annual output has risen about 17 per cent. in the past ten years; about half of the increase being witnessed in 1899. In spite, however, of the heavier production, prices last year rose enormously—inferior coal being retailed in the poorer districts of London at as much as 2s. 4d. per cwt.; while in



Germany, 1899 prices showed increases of from 15 to 30 per cent. over those of the previous year. In Belgium, the difference between 1898 and 1899 prices amounts to about 50 per cent., and the same remark holds true in the case of France. In Russia, the increase in price has been even more marked than in other countries, owing to the provisions of the restrictive tariff, which enhance the cost of both domestic and imported coal.

This universal shortage of coal has led to alterations in economic policy in some countries, and agitations in favour of such alterations elsewhere. The Russian Government decided to permit, temporarily, the free importation of coal, both for the use of railways and of some of the principal manufacturing centres. In France, where the scarcity has been most marked in the Lyons district, the high railway tariff—established chiefly to enable the coal of the district to compete with English coal coming by way of the Mediterranean—had to be lowered in order to induce the importation of supplies from Great Britain. The effects of this measure, however, were (says the report from which we are quoting) quite unsatisfactory, since the British mines were unable to meet the new demand on the part of the French manufacturers. The straits to which our neighbours have been put is indicated by the fact that the Paris and Lyons Railway have placed an order for about 75,000 tons with an American Coal Company, notwithstanding the high rates of freight between Newport News and Marseilles, the place of delivery.

Reference is next made to the fact that in this country the condition of the coal market has led to a serious agitation urging that the exportation of coal be prohibited, or at least taxed; the agitators pointing out that the exports of Great Britain have increased much more rapidly than the production. It is, the report continues, more than doubtful whether the agitation will have any practical results, as coal forms the chief heavy article of cargo that can serve as ballast for vessels freighted with lighter merchandise. Furthermore, coal forms one of the main articles of export to those European and South American countries from which England imports her foodstuffs and iron ore; and a prohibition of exports of coal, total or partial, would naturally result in increased cost of importing those foodstuffs and iron ore, due to the fact that higher freight rates would have to be charged by vessels which are now carrying coal from England to the respective countries.

In Germany, general dissatisfaction exists among the manufacturing classes on account of the high prices of coal, and the partial inability to procure coal at any cost. The Government have been urged to buy out the private coalowners—the Prussian Government already owns and works some of the Westphalian and Rhenish collieries—while many Chambers of Commerce have petitioned for the revision of the railway tariffs, especially those which encourage the exportation of coal. For, as the petitioners have pointed out, German coal is actually selling at lower prices in Austria and Italy than in Germany itself, notwithstanding the greater distance of the former from the mines. This state of things is due to the lower prices charged by the Coal Syndicate and to the differentiated railway rates, designed to encourage the export trade. This policy, defensible when the mining industry needed encouragement, is, it is urged, disastrous to German industries under the existing circumstances.

The agitation has grown, and has resulted in the question being brought before the Reichstag, where the methods of the Coal Syndicate were severely attacked. The Government declined, however, to grant the request for an immediate revision of the railway tariffs, on the ground that such a revision, if brought at once into force, would bear hardly upon the shippers, who were bound under existing contracts to deliver coal at fixed prices. The Syndicate, for their part, declared that the deficiency of coal was caused mainly by the larger requirements of the iron and steel mills, which have, in fact, bought up for their own use mines of an annual output of over a million and a-half tons; and, further, that the increase in exports was largely due to the strike of miners in Austria—the dealers being able to get much better prices in that country than in their own.

In Russia, as has been said, the Government were obliged to temporarily forego the import duty on coal. The import tariff had been avowedly imposed in order to protect the producers of coal in the Donetz Basin; the result being a shrinkage of output, and, consequently, a great rise in price, with serious detriment to Russian manufacturing interests. Moreover, it was argued that, Russia being an agricultural country, exporting wheat and other breadstuffs, she was losing heavily on those exports, because, since foreign vessels had to arrive in ballast instead of with coal, freights from Russian to other ports had risen very considerably, in some cases 100 per cent. A comparison of rates from Odessa to England with those from the Argentine ports to that country shows a difference of over a halfpenny per pound (36·7 lbs.) in favour of the latter; the reason being that English imports and exports from and to Argentina are more evenly balanced than those from and to Russia. As a matter of fact, the report states, the number of vessels entering Odessa in ballast during 1897 was 54 per cent. of the total ships entered; whereas, in the case of Argentina, 70 per cent. arrived with cargo. It remains to be seen whether the suspension or relaxation of the import duties on coal will be temporary or permanent; but it is most likely to be only the former.

Under the circumstances of the European coal markets as described, the American official report remarks, it is not surprising that the question of exports of American coal to Europe

is being seriously discussed. Given the enormous distance of not less than 3000 miles between the ports of shipment and discharge, it is manifest that the cost of carriage becomes the main element in the price of coal shipped from the United States to European shores. The real question at issue is not merely that of comparative cost of production, but the combined cost of producing and shipping the coal to the foreign port. In this respect, Great Britain possesses a great advantage over the United States in that, whereas the weight and bulk of articles exported from the latter country are much larger than the weight and bulk of the imports thereto, exactly the opposite is true in the case of Great Britain. As it is, numerous vessels arrive in ballast at American ports; the addition of coal to the exports of the States would obviously but increase the number. Considerable exports of coal are, however, more likely to be made from the Southern ports, as such exports might form additional or complementary cargo for vessels engaged in the cotton trade. It is, moreover, probable that the South American market will be increasingly supplied by coal from the States, as in the trade between the northern and southern continents, the balance of trade, so far as weight and volume are concerned, is in favour of South America; and coal might therefore be used to supplement the cargoes of vessels bound for ports in the Southern Republics.

#### PERSONAL.

Mr. F. W. SELBY, of Witney, has been appointed Manager of the Lavenham (Suffolk) Gas-Works.

On the occasion of his wedding, Mr. GEORGE H. CRYER, who has been for the last ten years engaged in the Engineer's Department of the Rochdale Corporation Gas-Works, was presented yesterday week with a handsome marble timepiece. Mr. T. Banbury Ball, acting on behalf of the employees, made the presentation; and the recipient briefly thanked Mr. Ball and the men for their good wishes, and for their useful gift.

#### OBITUARY.

Mr. JAMES HANDLEY, J.P., of Runcorn, died last Thursday after a brief illness, aged 58. The deceased gentleman was connected with many trading concerns about the country; and, among other appointments, he was a Director of the Runcorn and Frodsham Gas Companies and of the Aldershot Gas and Water Company.

The death is announced of Mr. JAMES BROAD, a Director of the Lewes Gas Company since its incorporation, who was elected Chairman in September, 1891, in succession to Alderman C. R. Kemp, and has held the position ever since. He was also a Director of the Lewes Water Company. Mr. Broad died yesterday week, aged 76.

**Professor Lewes on "Acetylene."**—Reference has already been made in the "JOURNAL" to the work which Professor Lewes has for some time had in hand on the subject of "Acetylene." The book, as will be seen from an announcement which appears elsewhere, is now ready, and we have received a copy from the publishers, Messrs. Archibald Constable and Co., Limited, of Westminster. It is a goodly volume of nearly a thousand pages, with 228 illustrations; and, pending the fuller notice which we purpose giving in an early number, we may say that it appears to fully justify its title as "A Handbook for the Student and Manufacturer." The author has dealt with the matter with his customary thoroughness. At the end of the text (reference to which is assisted by side notes in red) is an appendix of useful data; and there is a good index. The book is well printed and bound.

**The Wastefulness of Present Means of Illumination.**—Writing on this subject in "Cassier's Magazine," Dr. John Henderson remarks that when the great increase in efficiency of the steam-engine and dynamo of the present day, as compared with twenty years ago, is contrasted with that of our sources of artificial light, it must be acknowledged that very small advance has been made. He attributes this unsatisfactory state of things largely to the fact that the true nature of the phenomenon of light itself has been demonstrated by physical science only within very recent years; and a thorough knowledge of the nature of any phenomena to be reproduced must in all cases precede any satisfactory and efficient production of them. Dr. Henderson tells us that, under the best conditions obtaining at present, out of every 100 tons of coal delivered at gas-works or electric light stations, something like 98 tons are, as far as the production of light is concerned, absolutely wasted, and go to produce useless heat. When one considers the enormous quantity of coal used annually for the production of artificial illumination, the absolute waste of 98 per cent. of it seems to him little short of criminal. As to the solution of the problem, to his mind the prospects are at present far from being bright. He thinks some means must be found of exciting other vibrations between the visible limits only, and of eliminating the slow radiant heat waves. He acknowledges that the problem has already been solved on a small scale by the firefly—the most delicate measurements having failed to detect any radiant heat in the light emitted by this little creature.



## COMMUNICATED ARTICLE.

## THE QUESTION OF AN EXPORT DUTY ON COAL.

By A CORRESPONDENT.

Some two months or more ago, I was given space in which to shape a few arguments designed to show the inadvisability, from a commercial point of view, of imposing a duty upon the exports of coal from this country. Since then, the quantity sent abroad has continued to increase; and proposals to tax such exports, or even to entirely prohibit them, continue to be made by increasing numbers of more or less intelligent individuals—many of them speaking with the authority of reputation, others with the irresponsibility of hitherto unheard-of persons. A proposal for the prohibition of all coal exports "till the price within the United Kingdom has fallen to a figure which will make it possible for every British hearth, whether in mansion or cottage, to have a good fire in it next Christmas Day," put forward by a Mr. George Griffiths in a contemporary, was quoted in the editorial columns of the "JOURNAL" recently, with the comment that it would be interesting to hear it criticized by an expert or two. I am very far from laying any claim to be an expert in economics; but perhaps I may be allowed to note some points that have occurred to me in considering this suggestion and one or two other pronouncements that have been recently made upon the same question of coal exports.

Now the autocratic yet benevolent sounding proposal of Mr. George Griffiths can, I think, be made to appear in its true light pretty easily. If it be intended merely as a temporary measure by which Parliament should decree that the whole of a trade of a present annual value of £30,000,000 to £40,000,000 sterling, employing a vast amount of shipping and labour, and the stoppage of which would dislocate the business not only of this, but of every other country, should be arbitrarily suspended until, but not after, the time when the price of coal had fallen to some undetermined level of cheapness (how it adds attractiveness to clap-trap to bring in the cottager's Christmas dinner!), then it can be dismissed as so absurdly unpracticable and unreasonable as to stand condemned by its own exposition. If, on the other hand, it be put forward as a proposal for a permanent measure designed to keep the price of coal always upon the said undetermined level of cheapness, it may be pointed out that, while it might temporarily achieve the desired object, it would entirely fail of permanent effect.

For, if the coalowners knew that all foreign markets were finally closed to them, they would, as surely as night follows day, reduce the output of coal correspondingly. At present, the object of the collieries is, put broadly, to supply home *plus* foreign demands. Special circumstances have rendered the existing arrangements for output inadequate to meeting these demands, and the result is dear coal until equilibrium shall again be established. Supposing that, as is now suggested, the only market to be supplied were the home; then the output arrangements would be certainly made upon the basis of the probable requirements of that market. Let there come then a sudden and unforeseen expansion of the iron and steel trades; the supply of coal would be found inadequate; up would go the price to perhaps higher figures than the present; and where would the British cottager's hearth fire on Christmas Day be then? If Mr. George Griffiths had known anything at all about the history of previous coal "famines," he would have been aware that the shortage of coal in 1872-4 was due entirely to the sudden increase in home consumption, and that even if coal exports had never been known, the price of coal in 1873 would just as surely have reached the level at which in that year it stood, when "Punch" depicted the millionaire inviting his friends to come and share his fireside.

From considering such big-sounding, problem-off-hand-solving suggestions, it is a pleasure to turn to the arguments of a man of the informed and independent judgment and opinions of Mr. Frederick Greenwood. While it is often, as now, possible to disagree with Mr. Greenwood's views, it is never possible to consider them without profit; and in these days when the public demands to be told, no matter how incorrectly, all about everything, how comparatively seldom it is that one meets with a journalist who only writes that which he himself thinks upon subjects which he understands! Mr. Greenwood first contends for the theory—so beloved of the man who is a "Free Trader, but"—that free trade is not to be considered a fixed policy but a "variable expedient." Certain articles of common consumption, he says, "are excepted from the system, for revenue purposes; the choice of them for those purposes being determined, not by economic considerations alone, but by others—political, social, and moral." Why, then, should not the export of coal be numbered among our free trade exceptions? Surely this is a fallacious argument. The revenue duties on the certain articles of common consumption referred to are not in any way an exception from our system of free trade; for our customs and excise duties are only imposed upon those articles of common consumption—tea, cocoa, tobacco, wines, &c.—which cannot be produced in this country. There is, therefore, no "protection" involved in their imposition. The great principle of free trade as regards imports is that the price of home-produced articles of consumption should not be enhanced by the "protecting" of home trade against foreign competition. The revenue duties quoted by Mr. Greenwood are no exception to this principle.

We may therefore consider that the question of coal exports stands for judgment by itself, and cannot be prejudiced by imaginary infringements of our free trade system.

It is, of course, obvious that an export duty on coal would not have a direct protective effect; for its first, though, as I have contended, not its permanent, effect would be to reduce the price in this country. But, as the "Spectator," in a very able and cool-headed article on the subject, remarks, "the ultimate effect would be a limitation of imports in whose production the exported coal was used, which is virtually a form of protection." That is to say, if an export duty were imposed upon coal, the cost of those goods requiring coal for their production which we at present import from the countries buying our coal would be increased; and the result would be to enable home producers of similar goods to charge the consumer a higher price. That is indirect protection.

In these days, however, when there has arisen a generation that knows not the real why and wherefore of free trade as a complete and defensible system—the generation of "free traders, but," as I have called them—it is necessary to do more than show that a proposal is protectionist in its tendencies; one has to show in what way those tendencies would injure the nation's prosperity. When it is the question of an export duty on coal that is to be debated, it is necessary to consider it on two different hypotheses; for the advocates of such a duty fundamentally differ as to its result. Mr. Greenwood throughout his article assumes the imposition of a duty sufficient to prevent the drain on our coal resources involved in the demands of foreign countries. On the other hand, Professor Hull, in his recent address to the Victoria Institute, argued in favour of a 5s. per ton duty, estimated to bring in £10,000,000 a year, "which might go to the relief of our increasing taxation, or form a sinking fund with the same object in view." Such an argument, of course, excludes the possibility of the duty reducing or stopping the export; and, indeed, Professor Hull makes his position quite clear: "Nor do I believe," he says, "that such a duty would have an appreciable effect in diminishing the output from the mines." My point is not as to which view is the correct one—though as against Professor Hull's opinion one might put the fact that, according to a Foreign Office estimate communicated to the Cardiff Chamber of Commerce, American coal can now be delivered at Naples for \$6.50 as against \$7 for Cardiff coal—but rather that it is necessary to consider the effect upon the trade of this country on both hypotheses.

To take the more probable and more popular view first, What would be the effect of prohibiting the exportation of coal? Here, again, two quite different possibilities must be considered. Mr. Greenwood, and most writers, assume that, by prohibiting the export of coal, we should thereby husband our stock. But is that so? It is clearly arguable that the only result might be the possible saving of so much coal as is bought by foreign countries for the use of their navies; while the resulting influence on the prosperity of the bulk of the population of this country would be disastrous, whether any such saving were effected or no. I will try and make that clear.

With the coal we export, we pay for goods we import; those goods comprising (1) food supplies, (2) raw material for manufacture, and (3) manufactured goods. The first we must import, or starve, or employ our coal miners to farm land which cannot produce corn as cheaply as we can buy it from abroad. The second we must import, or correspondingly reduce our business. The third we must import, or make the goods for ourselves—more dearly than we can now purchase them from other countries—using in their manufacture the coal which we now export to those other countries. Choose which alternative you like, is it obvious that prohibition of coal exports would benefit the nation? But more follows. Cease these exports and the shipping trade will no longer earn the freight thereon; and, as a result—vessels having to go in ballast where they now go with coal—higher freight will be charged on goods brought thence, the higher cost coming out of the consumers' pockets. Moreover, if the result of prohibiting the export of coal simply meant the use of more coal at home to make goods formerly imported, where would the economizing of our stock of coal come in? Yet that is Mr. Greenwood's ground for recommending prohibition. The fact is that, if you cease exporting 50 million tons of coal, you must either use that coal yourself less profitably than you could sell it, or cease to raise it, and, thereby, throw out of employment 150,000 men and all those who earn their living by feeding and clothing them, at the same time reducing the national income by the value of that 50 million tons of coal.

To turn now to the second alternative result of imposing an export duty of 5s. on every ton of coal, Professor Hull thinks the trade would not in consequence be reduced, but that the Exchequer would reap £10,000,000 a year from foreign sources; the foreigner being absolutely the only one the worse for the transaction. But, granting Professor Hull's very doubtful hypothesis as to the maintenance of the rate of export, is coal the only commodity in which we have dealings with the said foreigner? Do we not buy with that coal his goods? And if the cost of living and of manufacture be increased to the foreigner by £10,000,000 per annum, shall we not get ten million pounds' worth less of his goods for our 40 million tons of coal? And how then shall we benefit?

It is absolutely impossible, I submit, to lessen or tax our export coal trade without correspondingly diminishing our own



prosperity. The whole question is, shall we deliberately determine to be less prosperous now in order that our descendants a century or two hence shall not find the mines exhausted; and who can tell but what, by that time, water-transit may be so cheap that we can import coal from (say) China, at next to no higher cost than we can now mine it? We are told, on credible authority, that China possesses enough coal to supply the whole world at its present rate of consumption for 3000 years. That coal lies near the surface; and labour in China is absurdly cheap. Need we fear to be prosperous now, for fear of what may happen a century hence?

Mr. Greenwood cries out for a Commission on the question of our coal supplies; and it will certainly be needed to remove public apprehensions if it be continuously asserted, as it is by Mr. Greenwood, that the present high prices are in some measure due to the depletion of our coal resources. He says: "They who should know tell us that little of the better sorts will be left before long; and many a householder has become aware that there is such rubbish in the market now as was never seen till lately, which may be safely taken for a sign." It may; but not for the sign Mr. Greenwood thinks. It is a sign that good coal is scarce *in the market*; not that it is scarce *in the coalfields*. That is my answer when Mr. Greenwood asks what "knowledgeable and trustworthy soul" will assure us that a diminished store of such coal as is most serviceable to a nation of seafarers and manufacturers has nothing to do with the present high price. I rely for my certainty on the point upon those "knowledgeable and trustworthy" souls, the Royal Commissioners who reported on our coal resources in 1871. It is obvious, however, that another Coal Commission is wanted, partly to soothe public nerves, and partly to supplement the information contained in the report of 1871. For, although one can, on the strength of that report, and of knowledge that can be gleaned from any coal mining expert, confidently declare that scarcity of good coal in the mines has nothing whatever to do with present prices, it would be well for the public to have more definite information as to how long (a) our cheap, and (b) our steam, coal will probably last.

The second of these points brings me to that aspect of the coal resources question which is just now being widely canvassed, and with a few comments upon which I must end my lengthy contribution. That aspect, I mean, of the question which is presented by our coal stock considered as a munition of war. That is the consideration to which Mr. Greenwood gives prominence. Coal, he says truly, is, "for England, with a scattered Empire and a vast Navy to maintain, as necessary for defence as shot and shell." Ought we then to sell to other countries who may, in the possible event, use it for the purpose of fighting us, that steam coal which we possess in greater abundance than any of our Continental neighbours, and which is so much more efficient for naval purposes than any other?

The only possible ground on which a decision to forbid such a sale could be based would be that our keeping our steam coal strictly to ourselves would give us a positive fighting advantage over possible enemies. It might, then, be a matter for reference to a Commission to determine whether Welsh coal has an absolutely higher speed-value than any other known coal. If not (and there is every reason to anticipate that the answer would be a negative one—Russia, for one, we believe, possesses first-class steam coal in Sakhalin), then those countries which at present buy Welsh coal for naval purposes, would obtain supplies from other sources cost what it might; and we should be the losers by the diverted trade. The question then, again, merely resolves itself into one of the duration of our coal stock, and takes the form of whether we should lose trade to-day for fear lest in a century or two of time, when conditions everywhere may have changed, we might not have sufficient coal in these islands to fuel the Navy. In considering this aspect of the question, too, it must not be forgotten that our Colonies—New Zealand, Australia, and Canada particularly—have enormous unexhausted stocks of coal, always available for naval purposes.

Mr. Greenwood urges that we are foolish to sell coal to possible foes; and this is an argument at present resounding through the ha'penny Press. But Mr. Greenwood has himself supplied the answer to his own contention in an illustration intended to point the other way. "In the present high demand for arms and the general equipment of war, exportation to the foreigner of half the contents of our arsenals and dockyards would also [referring to the commercial aspect of coal exports] profit the nation in a certain way. . . . But the sale would be intolerably stupid." Why, whatever are we doing day by day but selling battleships, torpedo boat destroyers, rifles, and every other form of munition of war to might-be enemies? Had Birmingham and Sheffield no share in the making of the weapons now in the hands of the Boxers? Let the sensation-mongers talk all they will about the alleged storing of Welsh coal by France and other countries—in the case of France, a tale to a large extent, I think, of "cock and bull"—it is impossible to speak of stopping the export of coal from the political point of view unless we are prepared to deal with all munitions of war in the same way. And who but the maddest of "Jingoes" would propose such a line of policy?

We shall hear repeated demands during the next few months for measures of restriction or prohibition; so the sooner the Government appoint a Commission of men of ability, knowledge, and sense to inquire into the subject, and to, as I feel sure they would, veto all such proposals, the better for the public nerves.

## NOTES.

### The Solution of Naphthalene in Coal Gas.

One would scarcely expect to find mention of the suspension of naphthalene in coal gas in the middle of a description of the behaviour of perfumes in liquid air. Yet this appears in the course of some observations of H. Erdmann. He says that liquid oxygen and nitrogen appear to be miscible in all proportions. A separation into two layers does not occur when liquefied air, as it evaporates slowly in a vacuum vessel, becomes continually richer in oxygen. Liquid air has little if any solvent action on ether, alcohol, and other organic solvents. Various perfumes are appreciably soluble in liquid air; and in spite of the low temperature of about  $-190^{\circ}\text{C}.$ , the escaping gases are strongly scented. The vapour tension of high-boiling perfumes must be quite imperceptible at this extremely low temperature; and their evaporation is accordingly regarded by Erdmann as due rather to solubility in the air than to vaporization. Hannay and Hogarth have shown that the vapour of solvents above the critical temperature dissolves non-volatile substances, or those volatile with difficulty, which are soluble in the liquid solvent. Thus, he remarks, naphthalene is retained by coal gas in quantity far surpassing that due simply to its vapour tension. In consequence of the solubility of perfumes in liquid air, it is concluded that they are also retained in an analogous condition in gaseous air. The difference here marked between vaporization and solution in a gaseous medium is noteworthy.

### The Effects of Unsteady Voltage in Electric Lighting Currents.

In a Franklin Institute paper on Electrical Measuring Instruments, Mr. J. F. Stevens emphasizes both the difficulty and the necessity of the attainment of a high degree of accuracy. This exactitude is particularly important in the case of voltmeters, which should be correct within 1 per cent., since a variation of 1 per cent. in voltage means a corresponding variation in candle power for every incandescent lamp which may be in circuit. It is quite well known that the candle power of any incandescent lamp varies directly with the voltage; the variation being approximately one candle power for every volt increase or decrease from the normal voltage of the system. Further than this, a variation of 1 per cent. from normal voltage on a system carrying incandescent lamps, means a variation of about 16 per cent. in the life factor of the lamp, and about 3 per cent. in the watt consumption per candle power. Errors in the indications of ammeters do not produce such serious results; yet it is desirable that they should be accurate in order to obviate the danger of overload on circuit, translating device, or generator. In view of this declaration of the importance of steadiness of voltage in public electric lighting currents, it would be interesting to learn how many local authorities systematically test the circuits by standardized voltmeters, portable or otherwise. The importance to the gas consumer of accurate registration in the case of his gas-meter is evidently less than that of uniform voltage to the user of electric lights.

### The Illuminating Duty of Enclosed Arc Lamps.

The latest photometric measurement of electric arc lamps has been reported upon by a Committee of the American National Electric Light Association. It is reproduced by the "Electrical Review." The lamps tested were all of the enclosed arc variety, this being one of the best approved forms of arc light in general use at the present day. All the old ratings of the illuminating power of arc lights relate to the open, naked arc, which is obsolete. The tests now in question appear to have been well and fairly made under the supervision of the Committee, by an ingenious method devised by Professor C. P. Mathews, which neutralized the differences of power and colour existing between the arc lamp light and the Hefner unit of light used as the standard. The results are as follows, in watts per Hefner (0.875 English standard candle): Continuous current, 110 volts, (a) opalescent inner globe, no outer, 2.10 watts; (b) opalescent inner, clear glass outer, 2.66 watts; and opalescent inner and outer, 3.04 watts. Alternating current, 110 volts, (a) with clear outer globe, 2.62 watts; (b) with opalescent outer globe, 3.20 watts. A suitable shade was found to increase the mean spherical tendency of a lamp with a clear outer globe by 50 per cent. The conclusion finally arrived at by the Committee is that, with a suitable shade such as is recommended for invariable use with street lamps, the direct current enclosed arc lamp gives 39 per cent. more useful light than the alternating current enclosed arc, and at slightly greater economy. It will be observed, however, that with opalescent glasses these arc lamps do not yield a higher duty in light from the current taken than the ordinary run of incandescent electric lamps with which we are familiar.

### Dr. Joly on the Geological Age of the Earth.

Dr. Joly, of Dublin, has joined the honourable band of those who have essayed to ascertain the geological age of the earth. This interesting problem has been attacked by a variety of scientific methods, yielding very various results. The enormous lapse of time presumably required to mould the earth's surface into its existing state, on the hypothesis of uniformitarian geology, has been scouted by the followers of physical science, who have demanded, in the name of the doctrine of the conservation of



energy, that the geologists should hurry up their phenomena. Professor G. H. Darwin tried to oblige in this direction, by framing his hypothesis of magnified primeval tidal action; but the suggestion has been questioned. Now Dr. Joly has tackled the problem in a new way. Starting with the assumption which underlies all modern theories of cosmic action—that the denudation by solution of the land surface, since the formation of a solid earth crust, has been on the whole a uniform process—it is further assumed that the cause of the saltiness of the ocean is the sodium for the most part carried into it by rivers since the land surface first became exposed to the action of solvent denudation. The whole of the water on the earth's surface must clearly have originally been pure condensed moisture. If, now, we can obtain a correct estimate of the amount of sodium at present contained in the waters of the ocean, and also of the amount annually supplied to the sea by rivers, we have the requisite data whereby the earth's geological age may be computed. On the best available estimates, Dr. Joly finds that the mass of sodium contained in the ocean amounts to  $15,627 \times 10^{12}$  tons. In estimating the amount of sodium carried annually by rivers into the sea, Sir John Murray's analyses of nineteen rivers are accepted, and a result of 24,106 tons of sodium per cubic mile of river water is arrived at. The same authority is followed for the annual river discharge into the ocean, amounting to 6524 cubic miles. These figures give the mass of sodium annually carried to the sea; and this, divided into the total mass of sodium contained in the ocean, gives a grand result of 94,800,000 years, representing the duration of geological denudation. Of course, such a determination is open to all sorts of corrections; but it is an interesting attempt to solve the problem of the age of the solid crust of the earth from what appears an altogether novel standpoint.

#### The Noise of Working Machinery.

A suggestive article recently appeared in the "Engineer," drawing attention to a generally overlooked consideration in regard to the noises produced by the working of machines. It was observed that, if it were possible to calibrate it, sound might be found a not very indifferent method of measuring power. Mechanics are so accustomed to regard sound as the natural accompaniment of mechanical motion, that the fact of its being a monitorial voice, ever telling of energy wasted, usually escapes attention. "The noise of running wheels, of moving water, the crackling of a belt, the hum of a dynamo, the rattle of a motor-car or a railway train, are as sure indications of energy resolved into a useless form, as the crash of broken crockery and the lamentations of a careless servant." The truth of this observation only needs to be stated to be admitted. Indeed, it might be said with much justice that the path of mechanical improvement, as of material civilization, lies along the way of silence. All barbaric doings are noisy; and the attainment of a quiet manner of working is a hall-mark of efficiency. The human ear is of little value as a measuring instrument; but as a detector, even in mechanical matters, its value is scarcely appreciated sufficiently. Yet knowledge of the meaning and gravity of the indications afforded by both ordinary and extraordinary noises in mechanical working is of the first importance to an engineer. There is nothing in the nature of motion to necessitate an accompanying noise; but movement is generally noisy. The nuisance of knocking in stationary steam or gas engines is the commonest illustration of this. As the "Engineer" remarks upon this kind of noise, a play of a brass on a crank-pin, so small that the expansion of the pin caused by a slight elevation of temperature is sufficient to give rise to seizing, will produce quite an alarming knock when running at a high speed. In these circumstances, it becomes a choice of evils between the tolerance of a knock and working with an easy bearing. The gas engineer has learnt the significance of hissing gas-burners, once tolerated as unavoidable. The silent bicycle has, perhaps, been the greatest teacher of the connection between mechanical efficiency and the absence of noise. The conclusion of the "Engineer" is that noise, like heat, is a form of energy; and we can almost as readily waste power in producing one as the other.

**North of Ireland Association of Gas Managers.**—The annual meeting of this Association will be held at the Town Hall, Sligo, next Tuesday, under the presidency of Mr. C. B. Tully. We learn from the programme issued by the Hon. Secretary (Mr. J. Whimster, of Armagh) that the business will consist mainly of the delivery of the President's Address and the consideration of the motion to be proposed by Mr. S. B. Langlands, of Coleraine, and seconded by Mr. F. Eustace, of Tullamore, in accordance with the notice given at the meeting last year, to change the name of the Association to some such one as "The Association of Gas Managers for Ireland." No papers are down for reading and discussion. Technical matters, however, will not be absent; for the members will be afforded an opportunity of inspecting at work Professor Lewes's methane hydrogen water-gas plant, apparatus for enriching gas with benzol or other light hydrocarbons, and Messrs. Biggs, Wall, and Co.'s "Rapid" charging machine, which will be fully described by the President. The proceedings will be opened at the early hour of nine; and the afternoon will be left free for a drive round Lough Gill, with dinner at Dromahair.

#### NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Edinburgh.

Last week (pp. 280-82) we reported the general business transacted at this meeting, held the previous Thursday in Edinburgh. To-day, we give the paper read by Mr. W. R. Herring, also that of Mr. Lighbody.

#### THE CONSTRUCTION AND WORKING OF INCLINED RETORTS

By W. R. HERRING, of Edinburgh.

The construction and working of inclined retorts is a subject which has been prominently before gas engineers for fully ten years. I cannot therefore claim to have anything novel to lay before the members of this Association; but at the request of the Council, I have undertaken to contribute a paper upon the subject, seeing that it has not hitherto formed a part of the transactions of the Association.

The method of constructing an inclined-retort bench is of necessity closely allied to the working of the same; and I therefore propose, in the first instance, to deal with some of the principles underlying the application of the natural law of gravity to the charging of coal-gas retorts.

It is a well-known law that all solid bodies in either an irregular, lumpy, granular, or powdery state have the properties of lying at an angle with the horizontal line when tipped or piled into a heap, and will continue to so lie indefinitely without further alteration of angle, this property being known as the "angle of repose" of the particular substance in question; the angle of repose depending primarily upon the physical characteristics of the substances dealt with.

There are, however, important points which, in a practical way, affect this, as it is possible for substances of varying characteristics to be thrown into a heap, the surfaces of which will assume an angle different from the angle of repose in either a greater or lesser degree, but which, in time, when in a greater degree, will assume the natural angle peculiar to the physical characteristics of the substances dealt with; this apparent change from the natural angle of repose being brought about either by the material being tipped or piled gently, inducing it to assume an angle steeper than the natural angle of repose, or by the material being violently tipped, giving it an impetus which induces it to assume an angle lesser than the natural angle of repose.

These conditions affecting the angle at which any substance will lie under different treatment of tipping or discharge have a very important bearing upon the working of inclined retorts, as in this system the force of gravity and the natural angle of repose of the coal are the two factors which we endeavour to employ to supplant the heavy physical exertion accompanying the ordinary process of carbonization in horizontal retorts.

The first factor to be determined, therefore, is the angle at which the retorts are to be placed in the settings. In determining this, we must take into account the differing classes of coal that have to be dealt with, and their physical properties; bearing in mind that the proportion of the various classes may vary from hour to hour during the day. The physical characteristics of different coal when under the process of carbonization must also be carefully noted. Some coals have the property of assuming almost a liquid mass during the process of carbonization. Such a coal is about the worst one could have to deal with in the inclined-retort system, for the simple reason that anything assuming in the slightest degree a liquid or plastic state will of necessity have a tendency to flow down the slope of the retort and bring about what is commonly defined as "creeping." There are fortunately very few classes which assume this character when under the process of carbonizing; and even those that do can be easily checked in this tendency by an admixture of about 25 to 30 per cent. of a coal which does not possess this plastic property when under heat.

Some confusion has arisen in the discussion upon the question of the movement of the charge within the retort, which is somewhat involved in the preceding remarks with regard to coal of a plastic property. It is alleged that, although the charge is perfectly level in the first instance, upon opening the retort some while after carbonization has proceeded, it has been found that the charge has slipped down the retort and banked at the lower end—and this when it has not been a caking coal—and moreover the same coal will frequently charge perfectly uniformly and remain so, but that occasionally it slips forward with undesirable consequences.

It appears to me that this arises from an acceleration in the speed of charging. In other words, that the charge, although in the first instance level, has been run into the retort at such a rate that the same is to a certain extent under pressure; and in consequence of the slight vibration brought about by the evolutions of the gas from the coal, the charge slips forward. The great variations in the disposition of coal when charged into sloping retorts may be better illustrated by considering two extreme cases. For instance, "nut" or "chirl" coal is the most lively that one could have to deal with in connection with an inclined retort. On the other hand, the Durham or fine Newcastle coal, which is practically all dust, is the slowest coal, particularly if the latter is a little damp. Between these extremes there are numerous varieties; and it is not practical to put up an installation which can provide for many differing



classes of coal, or many different characteristics of the same coal, simply by adjusting the angle of the retort.

Under the circumstances, therefore, in determining such a construction, the prime factor is to be sure that the angle is no greater than that at which any possible class of material that is likely to be used will lie during the process of carbonization; and while this angle can be determined approximately by experimenting with cold retorts, it must be borne in mind that the tendency in a hot retort is to accelerate or assist the coal in its travel down the retort during the charging operations.

Experience has proved that an angle of  $32^{\circ}$  is the most suitable for all descriptions of common or splint coal. I find, however, that this angle is too steep for the shales and cannels when worked alone; but when mixed in proportions to produce a 25-candle gas—namely, about one-third of cannel to two-thirds of first-class splint coal—the angle of  $32^{\circ}$  is equally suitable.

Several attempts have been made to increase the angle of the retort to such an extent as to facilitate the discharge of the coke; but as the angle of repose of coke is much greater than the angle of repose of the coal, it is impossible to reconcile the two conditions. It is absolutely necessary that the angle of the retort should be such as to permit of the coal lying evenly on the bed of the same without moving. Such an angle, in the majority of cases, is insufficient to induce the coke to run without some exterior force being applied. At the outset, however, the mere pricking of the charge with a poker from the lower mouthpiece is usually sufficient to induce the coke to run from the retort, particularly if the cross section of the retort has been such as to permit of the free expansion of coke without wedging in the crown of the same. In other cases, the man attending to the charging appliances, by means of a T-headed rake, gives the charge a push from the upper mouthpiece, which generally results in the free discharge of the retort.

Personally, I have never given in to the claim that the system is automatic or self-discharging; but I do maintain that the slight labour involved in using the pricking rods or tickling bars, particularly with the men working at the back of a screen, as at Huddersfield, considerably lessens the physical labour and exertion on the part of the attendants—the coke hitting against the screen and falling beneath into the waggons, where it is quenched and removed from the retort-house by any of the well-known mechanical means. It would undoubtedly be an advantage if the labour involved in the discharging of the retort could be entirely done away with; and in order to attempt this, the author has designed an appliance which is intended to give the coke a start from the upper mouthpiece by means of a plunger projecting into the retort and travelling 6 or 8 feet down the same—the motion being such as to give the coke a swinging start, as once set in motion the coke will clear itself from the retort quite easily.

Having determined the angle at which the retorts are to be constructed, the next most important point is the charging appliances, which conduct the coal from the overhead storage hoppers to the charging mouth of the sloping retort.

It will be readily appreciated that the speed or the rate of travel of the coal at the point of issue into the retort mouth must have a considerable influence upon the charge laid within the retort. The speed should be no more than sufficient to allow the coal to gently flow down the retort, coming in contact with the stop at the bottom, and building itself up to a depth in proportion to the height of the stop, and continuing this depth throughout the length of the retort. Given such a condition, the height of the stop regulates the thickness of the charge in the retort. Any unnecessary impetus given to the coal causes it to bank in the lower end of the retort, and results in an imperfect charge throughout its length. On the other hand, a slow feed may result in the coal trickling down the retort and having insufficient force to layer itself to the proper thickness, with the consequence that the retort is undercharged and the coal chokes at the upper mouthpiece. Here, again, it will be seen that it is by no means a simple matter to always depend upon the ideal being accomplished, in consequence of the greatly changing conditions of the material to be dealt with from hour to hour.

The impetus attained by the coal at its point of issue into the retort is derived from its fall from the overhead measuring chamber, or whatever other appliance may be used for gauging the charge for each individual retort. The system of setting retorts in three or more tiers each varying in level, of necessity gives a varying drop for the coal, and, if unchecked, a resulting accelerated rate of travel at the point of issue into the retort. The charging appliances therefore play a very important part in the successful working of the system; and various devices have been introduced to overcome the difficulties consequent upon the varying conditions which prevail.

At the outset, one might almost despair of ever reconciling these diverse conditions; and, in practice, it is not possible to arrive at that state of efficiency which too many of us anticipate in the introduction of any new methods to supplant existing processes. The defects and drawbacks of older methods are lost sight of or forgotten; but the slightest defect in the new process is enlarged and magnified in consequence of it being a human failing in the higher species to anticipate and strive for perfection until we are convinced by hard facts of the impossibility of attaining it. From a practical point of view, however, something very

near perfection has been attained when due regard has been given to all the conditions necessary for the successful working of the system.

As is well known, the innovation was first introduced at the works of the Brentford Gas Company in 1889. In 1891 and 1893, the author constructed installations at the Huddersfield Gas-Works equal to carbonizing 400 tons of coal per day. Since this plant was put to work in 1894, the whole of the coal gas manufactured in Huddersfield has been produced from inclined retorts. Prior to the introduction of the newer system, the wages for carbonizing cost 3s. 4'19d. per ton manipulated; whereas during 1899 exactly similar costs were only 1s. 9d. per ton, this system working on retorts 15 feet long.

The Brentford Gas Company's works, as far as the author knows, are the only other works of any considerable size where the whole of the gas has been produced from inclined retorts for some years past; and upon reference to "Field's Analysis," I find that, prior to the introduction of inclined retorts, the Brentford carbonizing wages were 3s. 5'35d. per ton of coal, whereas for the last completed financial year they were 1s. 11'8d. Thus, in the case of Huddersfield, showing a saving of 1s. 7'19d. per ton of coal, and Brentford 1s. 5'55d. per ton of coal. These figures are sufficient to satisfy any commercial man that the system possesses advantages which have not hitherto been accomplished by any other improvements in carbonizing plant, and are sufficient to warrant the most serious attention being given to the system by any gas engineer contemplating an extension of his carbonizing plant.

At the present time, there are about forty or more installations working in various parts of England. Many in the first instance cannot be said to have been an unqualified success; but by far the greater number of them were deficient in consequence of the inefficient heating of the sloping setting of retorts. The altered conditions and difficulties of heating a retort setting placed at an angle of about  $32^{\circ}$  not being sufficiently appreciated in the first instance, rendered many of the settings deficient in heat at the lower fronts, where, owing to the tendency of the coal under certain conditions to bank, the greatest heat is required.

The form of the cross section of the retort has a very important influence upon the easy discharge of the coke after the process of carbonization is completed. The usual form of retort adopted for the newer system has been the  $\Delta$ , with the radius line of the crown springing from a point 2 or 3 inches above the floor of the retort, as shown on diagram No. 1. Diagram No. 2 shows the cross section applied by the author to the second

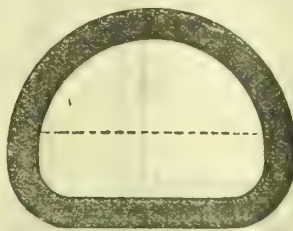


FIG. 1.—SECTION OF ORDINARY  
□ RETORT.

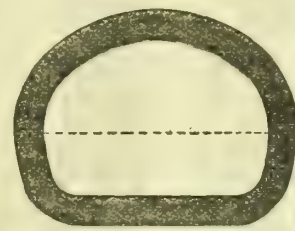


FIG. 2.—IMPROVED SECTION  
OF INCLINED RETORTS.

installation at Huddersfield; but owing to an error on the part of the makers, this was not strictly carried out. The same diagram also illustrates the cross section of the installations which have been put up in Edinburgh, and which are to be put up at Granton. It will be seen on reference to diagram No. 1, that the breadth of the retort is gradually reducing from a line about 2 inches above the base. The thickness of the charge in the retort is approximately 6 inches; and, as a consequence, if the coal has the slightest tendency to expand or "cake" during the process of carbonizing, the coke becomes jammed in the retort, and requires considerable labour to induce it to run down the slope.

On reference to diagram No. 2, it will be seen that the sides of the retorts are opening outwards to a point 7 inches above the base. Any expansion in the coal therefore rises into a larger space than formerly occupied, and absolutely avoids the jamming of the coke, not only permitting of the easy discharge, but saving the wear and tear of the retort to an extent greater than might at first sight appear, as the bursting pressure of the expanding charge in the retort must go a long way towards pulling a setting to pieces, when we remember that this pressure is applied from four to six times every 24 hours. Care must be taken in the making of the cast-iron mouthpieces that the section is continued throughout, otherwise the advantages are neutralized by the jamming of the charge in the mouthpiece.

While on this subject of the discharge of the coke, I might with advantage point out the necessity of the careful jointing of the retorts in the settings; the slightest imperfection in the joints having considerable influence upon the uniformity of the charge, and also the discharging of the retort.

Another small point, but of equal importance, is the means used to support the stop in the mouthpiece. In many cases, an ordinary square bolt-head is inserted through the base of the iron mouthpiece, against which the raking bracket at the back of the stop is made to rest. Whatever tendency the coke may have to run down the retort is completely stopped by this projection, about  $\frac{1}{2}$  inch high. A slight pocket should be cast in



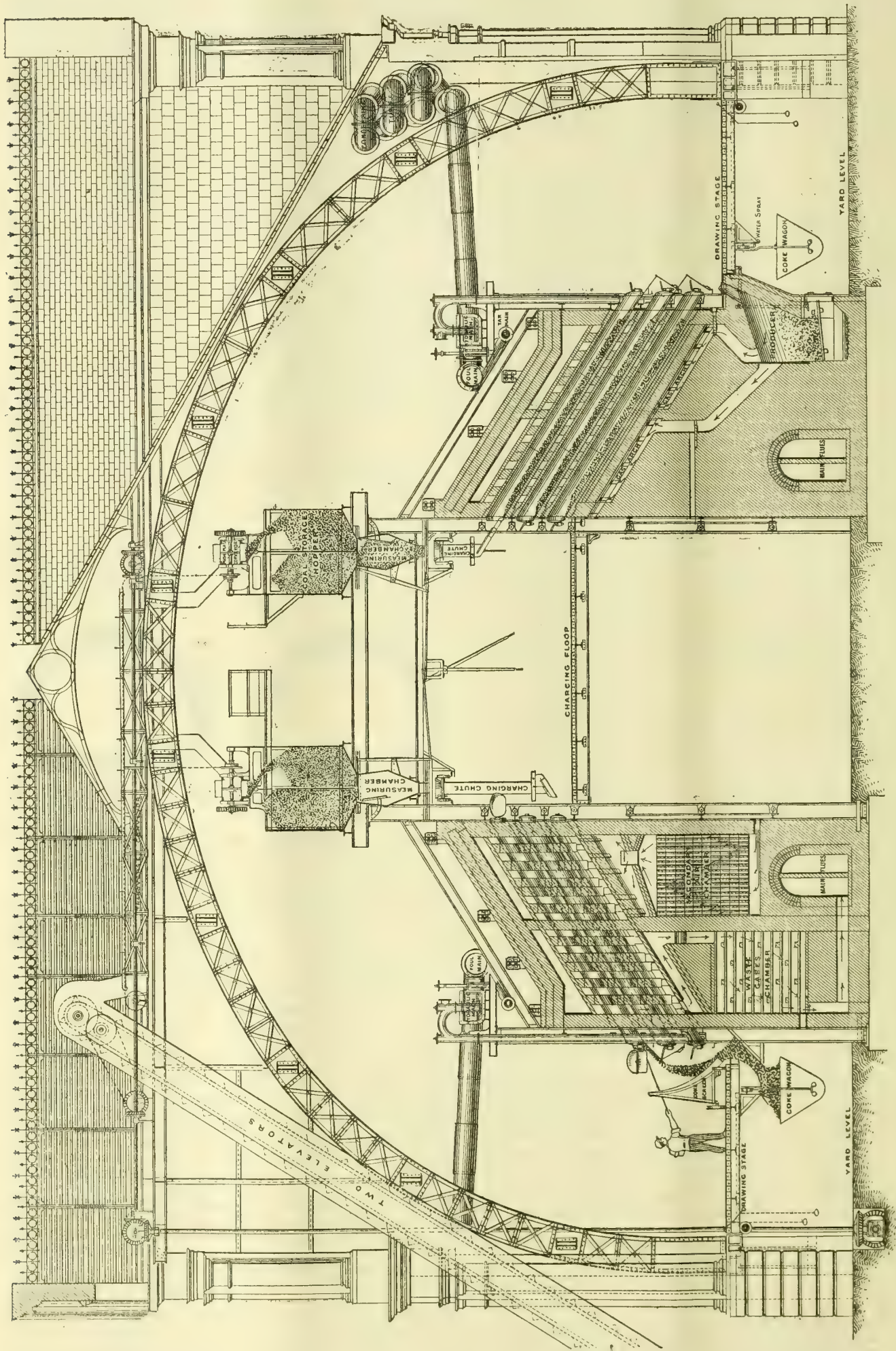


FIG. 4.—EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS—INCLINED RETORT BENCHES.



the mouthpiece for the iron bar to rest therein, as shown upon the general drawing.

All the general principles underlying the construction of a horizontal retort-bench, furnace, and settings are applicable to the construction of an inclined retort installation. The brickwork of the bench should be built entirely on the horizontal line, the top of the division-walls being stepped back—about half brick steps being sufficient to bring about the angle for the construction of a sloping arch. These should be coped with fire-clay blocks, the bottoms serrated to fit in the horizontal steps left in the upper parts of the side walls, and the tops sloped to the required angle (about  $32^\circ$ ), and also sloped on either side to form a skewback for the arch. It makes a stronger construction to build the front portion of the arch on the horizontal line for a length of about 2 or 3 feet inwards, and then to form the sloping arch, keying the same into it—the radius of the front portion being somewhat less than the radius of the sloping portion, in order to get them to key and form a satisfactory line. The arch of the setting is best formed of special bricks 9 inches square, moulded to the radius to suit the particular form of arch adopted. The construction of the furnaces and the regenerative chambers should be entirely upon the horizontal line, as also the brickwork in the setting between the retorts; the beds for the retorts being formed by inserting splay bricks where necessary.

The old system of constructing retort-settings with specially formed fire-clay blocks is, I think, well worthy of being again revived, particularly with regard to the settings of inclined retorts. The difficulty of getting the bricks in the vertical division-walls of the setting cut to the slope of the retort entails a large amount of labour, and but imperfect work at the finish.

In connection with the settings which I have recently constructed, and also for the new works at Granton, I have arranged for their being entirely built with specially formed fire-clay blocks and shields; the one setting that has been constructed with these has proved to be eminently satisfactory and most easily constructed—in fact, it almost ceases to be anything more than a handy man's work to construct the setting. The original models for these blocks, however, must be made from an actual setting of retorts—that is to say, the retorts must be placed in position and proper models made in (say) plaster of Paris, and these duly fitted and registered. I have found that twelve different patterns are sufficient in one setting, and that 700 different pieces are sufficient to complete the setting. Where a greater degree of heat is encountered in the vicinity of the gas-ports, these blocks can be of a material to withstand the greater heat.

To facilitate the equal heating of a setting of inclined retorts, it has been found advantageous to divide the setting into practically four quarters; the central division-wall completely dividing the upper from the lower half, as is usual in horizontal settings, and each half being likewise divided from front to back and under the control of its dampers on either side, there being therefore four waste-heat outlets from the one setting. The circuit of the heat around the retorts can be varied; but it is better to finally draw the heat from the setting in the case of the lower half to the front walls, and in the case of the upper half to the middle division-wall—that is to say, downwards. This tends to produce a more equal pressure throughout the setting. It, however, applies more particularly to the lower half. Provision should be made for considerably increasing the heat in the lower portion of the front half of the setting by means of a couple of spare ports from the producer, each covered with a damper; the damper covering both the gas-port and the secondary air-port. The object of this is, in the event of getting a series of bad charges (from accidental causes which do arise from time to time; the coal lying in the lower end of the retorts), to draw these dampers to whatever extent may be necessary, and give an extra supply of heat to work off the extra thickness of coal which has accidentally accumulated.

The producer charging door should be so arranged as to permit of the coke being discharged from the retort direct into the producer by means of a portable shoot. Without this provision, the labour of charging the producers is unnecessarily excessive; and I know of one case where it formed the most expensive part, and cost more than the drawing and charging of the retorts.

The general arrangement of the retort-bench is best when it starts from the yard level. The old idea of sinking the furnace basements into cellars below ground, rendered light and ventilation and comfortable working an impossibility. It is far better to start from the yard level, building the stage as high as may be necessary above it, but providing an abundance of air-openings in the side walls beneath the stage level for the purposes of light, ventilation, and easy supervision.

We all know the importance of securely bracing a retort-bench to prevent the expansion and contraction destroying the structure in a short period of time. The necessity of efficiently bracing is doubly important in the construction of an inclined retort bench. In the first place, it is of necessity a larger structure; in the second place, there is the tendency for the structure to move downwards as a result of expansion, and never recede to its former position.

From a glance at the diagram, it will be seen that the steel structure seems part and parcel of the building itself. As a matter of fact, the brickwork of the bench, although supported and restricted by the structural ironwork, is entirely independent of it, and could be completely pulled down and renewed at any

time without disturbing the ironwork. The buckstays, hydraulic mains, foul mains, and all other parts remaining exactly as shown during such an operation—the ascension-pipes and mouth-piece only being removed—the advantage of such a construction is apparent on the face of it. In fact, there is no reason why the structural ironwork of the retort-bench should not also be utilized for the supporting of the roofs over the installation. The diagram attached to the larger plan (fig. 3) shows a method

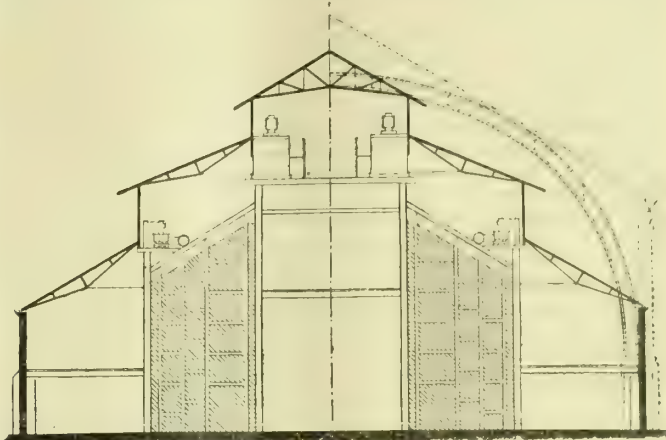


FIG. 3.—PROPOSED CONSTRUCTION OF ROOFS SUPPORTED UPON STRUCTURAL IRONWORK FOR INCLINED RETORT BENCH.

of doing this. Instead of covering with a circular girder roof as shown, the same might be accomplished by covering with short span roofs as indicated. This would not only considerably reduce the height of the side walls of the building, but would appear to make a very much cheaper construction, and is worthy of being closely looked into. The arrangement fig. 4 shows the one about to be erected at Edinburgh at the new works.

The coal is received in railway waggons on sidings running at the general yard level. A pit is formed beneath a double line of rails on the transverse centre line of the retort-house, in which is placed the coal breaking and elevating appliances. The waggon is discharged by means of a hydraulic lift placed between the rails. This, ascending, catches the hind axle, lifting one end of the waggon as a consequence, and emptying its contents upon a traversing plate or picking belt. The speed at which this is made to travel depends upon the class of coal received at the moment, thus regulating the feed to the coal-breaker, where the coal is broken to a uniform size, falling immediately from the breaker into the boot of the elevator. The elevator transports the coal from the base of the pit to the highest point in the retort-house, at which point it discharges on to a pair of conveyors, each of which feeds one of two lines of conveyors at will, running longitudinally with the building. Immediately beneath these longitudinal conveyors, there is a continuous trough or hopper formed, sufficient in capacity to carry about 14 hours' stock of coal. Immediately below the storage hopper, measuring chambers are fixed to gauge the weight of the charge for each individual retort. This chamber is actuated on the old powder-flask principle, by means of a sliding door at the top and at the bottom actuated by one lever, so that when the upper door is open the bottom door is shut. In order to prevent the bye-passing of the coal when the levers are at half stroke, a counterbalance flap is introduced at the bottom of the measuring chamber, which cannot fall and open the bottom port until the bottom slide is fully drawn, and consequently the top slide fully closed. With this arrangement, it is possible to regulate the weight of the charge over a lengthened period of time without its varying more than a few pounds every time the chamber is discharged. The coal is conducted to the upper mouthpieces by means of a traversing shoot (one shoot being provided for each tier of mouthpiece), within which provision is made for baffling the fall of the coal so as to permit of a steady flow into the retort. The settings at present constructed at New Street are working four charges of 7 cwt. each charge, and, as before explained, are constructed with fire-clay blocks and Glenboig retorts.

I find that when carbonizing shale and cannels alone we have some difficulty in maintaining the full heat necessary for any lengthened period of time. This is perhaps accounted for by the depreciation in the quality of coke going to the producers, and also by the greater heat required in obtaining the gas from the cannels and shales. When mixed, however, in the proportions of 33 per cent. of cannel to 67 per cent. of splint coal, there is no difficulty whatever in maintaining a sufficient heat throughout the setting.

The coke in being drawn from the retorts comes in contact with a traversing screen at the back of which the men work; one screen covering a whole setting of retorts, with three vertical slots in it sufficient to enable the pricking rods to pass through. The men by this means are completely protected from the heat necessarily arising from the fronts of the settings, and the discharging coke. The screen directs the coke, through openings on the stage floor, into waggons suspended on an overhead single line. By means of the water-quenching arrangements shown, the men on the stage floor can open the valve and allow the



coke to be quenched in the waggon without going to the ground floor; the steam arising passing up the fronts of the settings clear of the operators. These waggons are drawn from the retort-house by means of a continuous wire-rope; and it is intended that they should pass up an inclined plane to the overhead arrangements which are to be put down for the stacking of the coke in the yard, or the discharge of the same over screens into railway waggons.

The greater part of the condensing appliances are contained within the retort-house; the lines of pipes being nestled within the triangular space above the haunches of the main girders of the roof. It should be noted that the gas-main passing from the foul main at the back of the hydraulic mains has a gentle rise, and continues to rise throughout the seven lengths of 20-inch piping running the full length of the retort-bench. This same system is carried out at Huddersfield, and was found to yield considerable advantage from an absorption of some of the lighter hydrocarbons by the gas—the lighter oils depositing from the gas as they cool flowing in the reverse direction to the stream of gas, the hot gases taking up some of the lighter vapours—not only producing a somewhat higher illuminating power, but tending greatly to bring about uniformity in the quality produced from hour to hour. From this point, the gas passes through the exhausters, and finally through water-tube condensers and through the other general routine, which my present paper will not permit of my dealing with.

I may perhaps mention, however, that it is my intention to construct within the inclined retort bench at present working at New Street—when the same requires re-setting—a setting of retorts similar to that shown on diagram No. 5. The size of

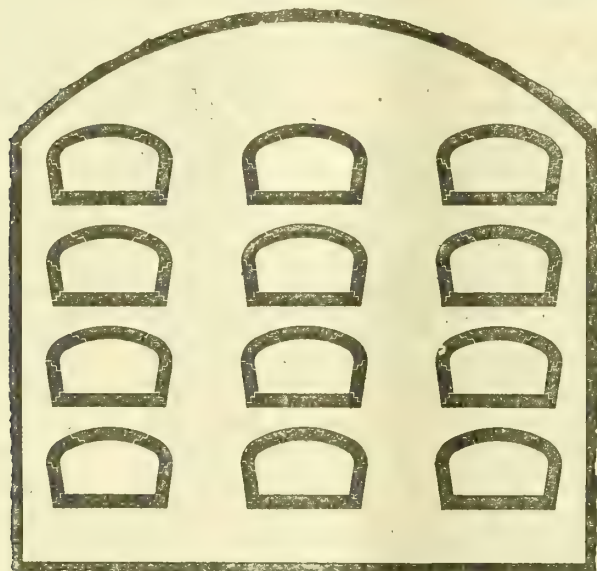


FIG. 5.—DIAGRAM SHOWING PROPOSED SETTING OF TWELVE 22 IN. BY 12 IN. RETORTS, TO BE CONSTRUCTED WITHIN AN EXISTING SETTING OF NINE 22 IN. BY 15 IN. RETORTS.

the archway is, of course, the same as is at present occupied by nine retorts; but it is my intention to try the form of retort shown, and put in a setting of twelve. Whether this will be a success or not, it would be premature to predict. From a practical point of view, however, there does not appear to be any reason why it should not be a success so far as construction and wear and tear are concerned. My only fear is that the heating of a setting working such heavy charges at the rate of six charges per retort per day—in all 25 tons per setting—may be somewhat difficult to maintain.

#### Discussion.

The PRESIDENT said they would all agree with him that Mr. Herring had given them an intellectual treat. He had gone over a field that was new to them. For many years he himself had been making inquiries regarding installations of inclined retort-settings; but there was always something wanting in the information he obtained. They had now before them a complete treatise on the construction and working of inclined retorts. Mr. Herring was the first to introduce inclined retorts in Scotland, by way of experiment; and he was so confident of the results that he was now putting up one of the largest installations in the world. He was sure, from the drawings that were before them, that it would be one of the finest. Mr. Herring, he had no doubt, would be very pleased to answer any question in regard to the different points he had dealt with.

Mr. H. POOLEY (Dunfermline) said that, in the month of March, he reported to his Commissioners on the subject of sloping retorts, along with others; and his opinion in regard to such retorts was that the capital cost of them was very high. He should like to ask Mr. Herring to give them some approximation of the capital cost per mouthpiece, and also to ask him whether he was right in saying that it came to about £120 or £130. This figure was at least 60 per cent. more than the cost of regenerative settings. Then he found that for a works of the size of those at Dunfermline, where the difference in the manufacture

in the summer time was so great—their minimum being 70,000 cubic feet, and their maximum over 500,000 cubic feet—there really was nothing in sloping retorts as against retorts set on the regenerative principle.

Mr. A. MACPHERSON (Kirkcaldy) said that, like Mr. Pooley, he certainly thought the cost per mouthpiece was one that they ought to consider. At the same time, the saving to be effected by the working of inclined retorts must be placed against any extra expenditure of capital; and it was quite possible Mr. Herring might be able to show that the original expenditure of capital would be more than recouped in the saving effected. The thing which struck him more was the angle of repose. Mr. Herring owned that shales and cannel required a different slope from splint coal.

Mr. HERRING: When by themselves.

Mr. MACPHERSON (continuing) said that he was going to ask whether it was necessary to put up a bench suitable for carbonizing shales and cannel, and separate retorts for carbonizing splints and nuts, because they all knew that if they mixed shales of a certain class (and cannel coals) with nuts and splint, they destroyed the coke. In fact, he did not think it would be at all fit to be used in a producer; and consequently they would destroy the value of the coke, both as an article of sale and as a fuel. He certainly agreed with the President in saying that they had had a most masterly communication upon the construction and working of sloping retorts—a subject that was entirely new to them. Like Mr. Pooley, however, he very much doubted whether the system would be suitable for a moderate-sized works yet; and possibly for a long time to come they would have to be content with their regenerative settings. Mr. Herring said he mixed coal in the proportion of 33 per cent. of cannel to 66 per cent. of splint. He supposed Mr. Herring meant by that a cannel having a good coke.

Mr. A. WILSON (Dawsholm) said he thought it was their duty to give Mr. Herring their thanks for the splendid paper he had put before them. It was one of the best they had had for a considerable time. Mr. Herring had gone into the matter most thoroughly, and had made the inclined retort system very clear to them all. In the North, they had not had much opportunity of going into the matter practically. Mr. Herring was about to do that; and he hoped he would give them an opportunity soon of seeing the system in practical operation. The charging, which Mr. MacPherson spoke about, seemed to be the point they all had difficulties about. In the South, where they could get coal of fairly good quality and size, he should think that the inclined retort system would suit very well. When he was in London, at the beginning of the year, he had an opportunity of calling at several of the works where the inclined retort system was in use; and he was certainly disappointed with the charging. It was not at all what they would like to see. In every case it was: "Oh, yes, we have not got the coal that we have been using," and excuses of that sort. They would perhaps go over half-a-dozen of the retorts, and they would find the charges splendid; and then they would come upon three or four retorts where the charge was either at the top or the bottom of the retort. Perhaps 6 or 7 feet at the top of the retort would be bare of coal, which he did not think would occur with other forms of charging. The charging arrangements all through, he should say, looked perfect. Certainly their machine charging appeared clumsy, compared with charging in a setting of inclined retorts. It looked an ideal system for charging coal; but unless they could get exactly what they wanted on the floor of the retort, the ideal might not be altogether the best thing. It seemed to him that in charging inclined retorts a man needed to use his judgment, and to be very skilled in watching the coal he was using, because, while in the South, the coal did not vary very much, they all knew that in the North a large quantity of the coal they dealt with was very variable. In the works he was connected with, they had such a number of coals to deal with that there must be a difference in charging. He certainly hoped that Mr. Herring would have the success he deserved; but he (Mr. Wilson) expected he would have difficulties, especially from what he saw of the charging in London, where it was not a new work. The system had been at work there for several years; and they were still making improvements, as they said, with a view to getting good charging. All the arrangements about the settings seemed to be very good; but they had great difficulty sometimes in getting out the charges. Perhaps Mr. Herring's style of retort (it certainly looked a practical thing) might help them very much; but in a good many of the retorts, where the carbon had begun to grow, there was considerable difficulty in getting out the coke—quite as much, he should say, as there was in drawing from an ordinary horizontal retort. This was not the case with all of them, but it was with quite a number. The difficulty might be got over, of course, by mixing the coal; but, as they all knew, they could not get in coal exactly as they wanted it. They had to use the coal as it came in day by day, and make the best of it. He thought they must all thank Mr. Herring very much for the splendid paper he had put before them. The difference, in his opinion, between inclined retort charging and charging horizontal retorts, with machinery or by hand, was much the same thing as a professional golfer trying to put his ball in on the "putting" green. If he had a fine green, and he was in good form, and his nerves in order, he could get his ball in from a considerable distance, and put it in pretty often; but if the green were lumpy, and he had



been out the night before, he would experience great difficulty. A thing like that took considerable skill. This seemed to him to be about the difference there was between charging inclined retorts and charging with machinery, because with machinery, or by hand, they put the coal exactly where they wanted it, with very little judgment, which was what they needed where large numbers of men were employed.

Mr. D. VASS (Airdrie) expressed a doubt as to the air-space between the benches. It seemed to him that the men had to face a very hot up-current from the retorts, as compared with what there was with horizontal retorts.

Mr. A. YUILL (Alloa) said he felt that the subject of inclined retorts was, perhaps, foreign to most of them, because the amount of work that was necessary to accommodate them properly meant that they must be in houses of a much larger size than most of them were accustomed to. All the same, he thought Mr. Herring had done the Association an honour in giving them the communication. In fact, it appeared to him to be more what they would expect from a text-book dealing with a particular subject, than a paper read before the Association. One matter struck him. Mr. Pooley had asked regarding the cost per mouthpiece. Perhaps Mr. Herring would give them an idea as to the fuel required for heating the retorts—the percentage of fuel necessary, either in relation to the amount of coke produced or the amount of coal carbonized. This would assist them in considering the subject.

Mr. J. WHIMSTER (Armagh) said he also would like to be allowed to ask Mr. Herring a question. In inclined retorts, the gas seemed always taken off at the lower end. It occurred to him it would be more natural to take it off at the upper end, because this would have the effect of keeping the retorts more free of carbon. What he wished to ask was why the gas was taken off from the lower end.

Mr. S. MILNE (Aberdeen) said the subject of inclined retorts was of very great interest to him, because in Aberdeen they had put down a small installation, by way of experiment. So far as the angle was concerned, they had one arch of  $31\frac{1}{2}^\circ$ , and another of  $30^\circ$ ; and they had none of the difficulties mentioned in charging and discharging. The only trouble they had had was in the heating. They could not realize the results they would like. Their setting was intended to put through something like  $7\frac{1}{2}$  cwt. per charge. They tried this for some time, and found they were only getting about 8000 cubic feet per ton. They then reduced the charge to 7 cwt., and obtained better results. A few weeks ago they reduced the charge to  $4\frac{1}{2}$  cwt., in six-hour charges; and this was very satisfactory. They had now reduced the charge to five hours; and they were having very fair heats. The whole difficulty appeared to him to be in the producer. The producer seemed to get choked up with clinker, which was very difficult to remove. He would like to ask Mr. Herring the dimensions of the producers he proposed to put in at Granton. In Aberdeen, their present arrangement was a setting of eight retorts, 9 feet long. He knew settings in England which gave remarkably good results; but they were settings of sixes. They were inclined to think that in their settings of nines they were trying to take too much out of the one producer. He would like Mr. Herring to state, briefly, the advantages of the inclined retort over the horizontal system with stoking machinery. Some speakers seemed to think there was greater first cost. From observation, he held it was practically the same. They could get a greater quantity of gas out of the same ground-space; but with the plant at their command, they could make out that the quantity carbonized in the one case was practically the same as in the other. Therefore he thought there was nothing to be said in favour of inclined over horizontal retorts, so far as ground space was concerned. Inclined retorts were certainly easier and simpler to work; and there was not the same possibility of a breakdown in the machinery. They would be pleased in Aberdeen to show their settings of inclined retorts to any of the members.

Mr. HERRING, in replying to the discussion, said that Mr. Pooley had raised a very important question as regarded constructional cost. They, besides being technical and practical men, were also commercial men; and unless they got some advantage to the balance-sheet, they usually did not favour any system brought before them. They must see some advantage before they could do much in the way of alteration. He mentioned in the paper that, under similar conditions of working, they were able to save 1s. 7<sup>19</sup>d. per ton at Huddersfield. If anything, the cost of labour was rather greater at the end of the period than in 1894, when it was first started. This, of course, was a basis for anybody to start from—as to how much they could afford to spend; but then, at Brentford, they knew they had machinery prior to the introduction of inclined retorts, and there it was shown that they practically saved 18d. per ton also. This was their statement for a period of years; therefore no experimental errors could be assumed. He took the figures from the balance-sheet, so that there could be no errors; and so they might say that 18d. per ton was what they could save on the carbonizing wages. That was to say, a man could, under the new conditions, manipulate practically double the quantity of coal he could formerly. As to increased constructional cost, this, of course, depended a good deal on the man who erected the work. They knew that there were not two gasholders of the same capacity constructed for the same money; neither was it so with inclined retorts, or anything else. Some would put up a stronger bench than others; and one would maintain that a bench

was sufficient which another would not have. The actual cost of the Huddersfield installation which was represented on the diagram was £105 per ton of coal. This, he thought, if compared with the structural cost of a retort-bench to be erected with horizontal machinery, was practically the same. But, in addition to that, there was the advantage that they got a much greater carbonizing area on the same space. The retort-house shown on the Huddersfield diagram was 87 or 89 feet wide, and contained two 15-foot retorts in the breadth. Therefore to compare this with horizontals represented a setting 30 feet long. He ventured to say that there were a great many retort-houses in which horizontal machinery was used which were not much narrower than this, and yet only contained 20-foot retorts. His experience was that an installation of this sort could be constructed, on the basis of a ton of carbonizing power, at the same outlay as the first cost of the construction of a horizontal bench for machinery. Mr. MacPherson raised a very important point—one that, in fact, induced him originally to put up the experimental station at the Edinburgh works. He was well acquainted with South Country coal. He had had a large experience of Yorkshire cannels and coal, where he had a great variety; and he knew what to anticipate when he came there, among another different class of coal. He therefore advised his Commissioners to allow him to put up two settings in the Edinburgh works. They put them up on the foundation of the old chimney—the only place available; and they had been working now for some eighteen months. It was a question whether the carbonizing of shale would long continue in Scotland; but, of course, in using it, they did so in separate settings of retorts now, and they must continue to do so, if they were to adopt the inclined retort system. They might possibly take the angle best suited to the shale. In the arrangement shown on the Edinburgh diagram, it would be seen that there was a division-plate in the coal-hoppers, so that they might have coking coal in one-half and shale in the other; the upper conveyor feeding at will either chamber. By a special arrangement in the measuring chambers, they could draw a charge from either of the divisions of the storage-hopper, and thus charge the retorts with either coking or non-coking coal. In this case, they could not depend upon the angle of the retort; and he favoured the splitting of the difference between the proper angle for the various classes, and depending for the charging upon the regulating arrangements of the charging appliances. Practically, in his experience this had more to do with the matter than the angle of retort. By means of the arrangements shown in the hoppers, they could charge the settings with either class of coal, or, in the case of settings of nines, the three middle retorts with coking coal and the outside retorts with shale; using the same angle for both, and governing this angle by the charging arrangements. He thought this remark answered Mr. Wilson's inquiry as to the various classes of coal; but, of course, they knew that things had not gone smoothly with everybody who had put up inclined retorts. It was so with himself when he first started. Mr. Wilson referred to London; but he thought it was generally admitted among engineers who had had any experience of the system, that in London they had not the best method by a long way. With regard to the varying class of coal coming forward, in his own case, in Huddersfield, the coal was carted to the works from the railway station; and the installation was sufficiently large to have a man in charge on the upper stage. This man could see the coal as it was being shot down to the breakers; and by that he could regulate the checks in the charging-shoots, in accordance with the coal he was receiving. He might be getting 50, 60, or 100 tons of any coal; and he would know that in a given time this would be worked away and into the measuring chambers. He could then adjust his checks. There would thus be one man on the shift who was responsible for the charging; and if the charging were not right, he would have to explain why. He quite agreed that, if it were left with the men, they would not get the charging looked after. Before they knew of it, the man on the shift would have gone off duty; and they could not get at him till next day, when a complaint would have lost a good deal of its effect. One of Mr. Pooley's inquiries was as to the size of the works. Of course, there was a limit to the size of works to which any mechanical appliance could be introduced. So far as inclined settings of retorts were concerned, if it were not for the fact of having to break and elevate the coal to the top of the house, there would be no limit. Inclined retorts were applicable, as a unit, to any works. If there was a works which already got their coal in at a high level, they could introduce inclined retorts; but if they had to keep an engine going to handle 5 or 6 tons of coal per day, it would not pay to introduce them. Mr. Wilson raised the question of machine stoking. He answered that by saying that he knew of two instances where a system of inclined retorts had been working for many years; and they had resulted in a saving of 18d. per ton in carbonizing wages. He had machinery in the Edinburgh works; but he had no machinery in the Leith works. The conditions of labour and wages were the same at both; and he found that there was really very little advantage with the machinery. The carbonizing wages in the Edinburgh works were very little lower than in the Leith works, where it was all hand work. It was from this basis he started, so far as the installation for Edinburgh was concerned. At Huddersfield, they went from purely hand labour to inclined retorts; in Edinburgh he was starting from hand labour and machinery. Mr. Vass asked a question as to the air-space; but this was not very important. There was a



wide air-space shown, in order to make matters as comfortable as possible. In Huddersfield, they started with a 17-foot stage, and then they went to 23 feet. Here they had 22 ft. 6 in. The Huddersfield house proved to be as comfortable as it was possible a retort-house could be; and he had no doubt that the one at Granton would be found to be so too. Mr. Yuill inquired as to the fuel account. At Huddersfield, it was 15 lbs. per 100 lbs. of coal. This was a matter which depended more on the construction of the regenerative setting than upon the particular retort to be used. The conditions were the same; it took no more heat for the one than for the other if it was properly applied. Mr. Whimster asked a question as to why the pipes were placed at the lower end instead of at the upper end of the retort, or probably at both. He thought it was an admitted fact that when there were two pipes in any retort, it did not necessarily follow that the two pipes would work at once. The gas would go the easier way. Therefore the disadvantage of having one pipe was not great. The reason the stand-pipes were placed at the lower end was that there was a great mass of ironwork on the upper, the charging-floor, level; and there was also the radiated heat, which had a great tendency to rise. It was found, where these settings were put up with the stand-pipes on the top side, that there was a greater difficulty in regard to stopped pipes. Another thing was that the length of the pipe was much shorter when on the upper side. There was a great advantage in a long ascension-pipe. It acted to a certain extent, of course, as a condenser; and invariably they were enabled to keep a slightly moist mouthpiece, on account of the condensation in the long pipe. They all knew that this was very desirable, and prevented to a great extent choked ascension-pipes. With the long ascension-pipes in the front, they would generally find that there was at the lip of the mouthpiece sufficient air and moisture to keep it clear, unless they had an extraordinary amount of heat in the fronts. As a matter of fact, it had been found to be more advantageous to have the pipes at the lower end Mr. Milne, who had already gone through that stage which many had gone through before him, was suffering from some of the earlier defects. The heating appeared to be his chief trouble, as it had been in most settings. On this point, he might say there was the proved fact that it was possible to make a sound regenerative furnace to heat any setting of retorts; and he did not think he would advise him to give up his settings of nines. He himself had never put up anything else but settings of nines. He was not always successful with them at first; but he had been since, both at Huddersfield and in Edinburgh. He also worked settings of nines 20 feet long, with full charges of four hours' duration; so that it could be done. There was no doubt that Mr. Milne's regenerative setting had become leaky or cracked; the secondary air not feeding the combustion of the gas in the settings. He was afraid he could not very accurately give the dimensions of the producer; it was about 4 feet deep from front to back, and at least 2 ft. 9 in. wide. The retorts were 22 by 15 in. by 20 ft. As regards the labour cost, of course, it was impossible to judge this where they had only got a small installation. Generally speaking, they could save half the cost as compared with their present system, the conditions of labour remaining the same.

The PRESIDENT said that Mr. Herring had laid before them a very practical paper indeed. It would be the more interesting as time went on—in fact, it would be to them a treatise on the newer method of carbonizing coal. There were unfortunately very few large works in Scotland which would be suitable for such installations. But as the output grew, they were obliged to change from the older to the newer methods; and this might become common in their works by-and-bye. He would ask them to give Mr. Herring a cordial vote of thanks for his courtesy and kindness in coming forward with his paper.

Mr. HERRING thanked the members for the manner in which they had received his paper. He was very pleased if they had been interested in it.

#### AUTOMATIC METERS: WITH A COMPARISON OF THE PRICE CHARGED FOR GAS CONSUMED BY SLOT AND ORDINARY CONSUMERS.

By T. LIGHBODY, of Renfrew.

The automatic or coin-in-the-slot arrangement is by no means a modern invention, as it can be traced back to a period anterior to the Christian era; and we are again forcibly reminded of the words of King Solomon, that there is nothing new under the sun. Originally, the slot arrangement was used for supplying liquid; but we have no definite information that it was exclusively used for supplying water, or if liquid of a more potent nature was also in demand at that period. However, we can rest assured that at that period it was not applied to supplying light; and we have to come down to the year 1887, when the first recorded application for the purpose was made by a Mr. John Stewart Wallace. This was followed by Mr. Brownhill, of Walsall, about a year later. The arrangement of the former was of as simple a nature as the latter was complicated; and in all the arrangements that have followed it has never been surpassed, and I am sure will never be equalled for intricate mechanism, or stupefying detail. A license for the manufacture of these meters was taken out, and a considerable number were put upon the market; but owing to their intricate nature they did not prove

very successful. This patent is, however, still in force, but in a very much modified form; and the only regret that we can have is that the inventor did not live to see the important developments that have taken place with this class of meters.

An effort was made to meet the requirement of the small consumer by the introduction of a stop-meter about 1871 by Mr. Lacey, of the Chartered Gas Company, London. At that period, the principal objection of the small consumer was the deposit they were called upon to pay. This was followed by a well-known firm in this city (Edinburgh), who introduced to the notice of the Midland Association of Gas Managers at their meeting, held at Bath, in 1888, a stop-meter, and by Mr. Valon, of Ramsgate, a year later. These being prepayment meters, and having to depend on the visit of the gas official and his key, they have been successful in meeting the demands of the middle-class shilling; but they do not cater for the more humble penny of the democrat.

These meters were an incentive to other inventors; and within a few years we find almost all meter-makers in a position to supply automatic meters to suit the requirements of their customers, and to such a state of perfection have they attained, that they have been supplied to give from 3 up to 38 feet for 1d. I may say that the first was furnished to a gas company in Ireland to supply a billiard-room; and the latter I need only mention in connection with Widnes.

Treating the slot-meter and the position it has attained in the gas supply of the present day, we find that there are in use in

England and Wales . . . . .	604,600 meters.
Scotland . . . . .	18,200 "
Ireland . . . . .	5,400 "

A grand total of . . . . . 628,200 meters.

This shows an increase of something like 180,000 meters during the year. In England and Wales, the percentage of slot consumers to the total is over 20 per cent.; Scotland, 3½ per cent.; and Ireland, nearly 6 per cent. From the number of meters in use, they have a considerable effect on the returns of many corporations and gas companies. Estimating an average consumption of 10,000 cubic feet per consumer, gives a total of 6282 millions; and at 3s. per 1000 cubic feet, this means a revenue of £942,300.

That Scotland, which we like to see to the front in all things, should be so far behind as the above figures show, may be due to various causes. There may be a greater proportion of our householders ordinary consumers than in England or Ireland, thereby leaving us without the same field to work up; or it may be the cautious nature so characteristic of Scotland that the use of a slot-meter casts a reflection on their honesty. These and other reasons, which might be better left unconsidered, may be responsible for our small proportion of slot-meters.

Have we given our slot consumers the same consideration as our ordinary consumers? I am afraid not. Through the kindness of many of the members of the Association, I am enabled to place before you the average consumption and price charged to slot consumers and the price charged to ordinary consumers for twenty corporations and twenty gas companies—

	Consumption per Slot Consumer.	Price per 1000 cubic feet to Slot Consumers.	Price per 1000 cubic feet to Ordinary Consumers.
Corporations. . . . .	6398	3/9'25d.	3/2'40d.
Companies . . . . .	6207	4/0'05d.	3/7'20d.

These returns give an average extra charge of 6'85d. per 1000 cubic feet for the corporations, and 4'87d. for the companies. The difference in the price charged is from an equality to 1s. 3d. per 1000 cubic feet for the corporations, and to 11½d. for the companies. Five corporations and nine companies charge meter-hire to their ordinary consumers.

Why this difference in price should exist is a difficult question to deal with. We have all manner of opinions; but it is generally put down to extra capital and extra cost of collection. But to compare our slot with our ordinary consumers always appears to me a mistake; as in every town at least 25 per cent. of the gas is used by large consumers, and the capital cost for meters for this class of consumers is no comparison for the slot consumer. The same argument applies to cost of collection.

One illustration may be sufficient to make this clear. Take a consumer who, using a 250-light meter, costing £35 12s., consumes 1,250,000 cubic feet of gas per annum, is only incurring a capital expenditure of 0'341d. per 1000 cubic feet at 6 per cent. on the cost of his meter; while the small consumer who lives in a two-roomed house, and using a 2-light meter, at a cost of £1, who consumes 7000 cubic feet of gas per annum, is incurring a capital expenditure of 2d. per 1000 cubic feet, at 6 per cent. on the cost of his meter. The same argument applies to the cost of collection. In the first instance you have only one meter to survey and one account to render and collect quarterly, and in the second instance you have 178 each quarter.

It is, therefore, this class of small consumers that we must take into consideration in making a comparison between our slot and ordinary consumers, both as regards capital expenditure, cost of collection, and the price which should be charged. That this class of consumers swell the pages of the survey books of every corporation and gas company will be admitted; and I am also quite satisfied that if their average consumption be compared to the slot consumers, they will be found to be nearly equal to each other. But, for the purpose of comparison, take



the small consumer, who consumes 6500 cubic feet per annum, and has his meter supplied free, and take the average price as returned (less 2d. as capital charges), the net revenue derived from his consumption is 19s. 6d.; while the slot consumer who consumes the same quantity—viz., 6500 cubic feet at 3s. 9d.—yields a revenue of 24s. 4½d. This is an extra charge to the slot consumer of 22½ per cent. on the cost of the gas consumed, over the net price charged to the small ordinary consumer, or nearly 12½ per cent. on the cost of his meter. Now, place them on equal terms as to price (3s. 2d.), and again, taking the net revenue at 19s. 6d. from the ordinary, and 20s. 7d., this works out at 5½ per cent. extra to the slot consumer for his gas, or 2½ per cent. on the cost of his meter. These comparisons are made on meters supplied to ordinary consumers free; but where meter-rents are charged, the price must be greater to the slot consumer to cover rent of meter than to the ordinary consumer. Therefore, so far as capital expenditure goes, if we can secure a consumer by fixing a slot-meter where we could not fix an ordinary one, we would be quite justified in doing so, and thereby increasing our gas consumption.

The extra cost of collection requires very little consideration, as I regard the interest on cash *versus* credit accounts and the saving in bad debts will go a long way in recouping this expenditure. In fixing the price, if we are to supply our small consumers with free meters, then equality of price is the only way we can treat this important branch of our industry; as I fail to see how we can go on charging an average of something like 22½ per cent. of an increase to our slot consumers and call it commercial dealing. As an illustration of how this business can be worked on an equal footing, I may be allowed to say that the company who charge their slot consumers 11½d. over their ordinary consumers, fix a cooker, or other appliance to suit their customer, and at the end of each financial year balance each consumer's account and charge 10 per cent. on the cost of the meter, cooker, &c., and return the balance. That this system pays is borne out by the fact that they have the remarkably large consumption of 18,900 cubic feet per annum for each installation.

I have prepared the following table, showing the return per cent. for each rd. per 1000 cubic feet charged the slot consumer over the ordinary, at a consumption of 6500 cubic feet, with a 2-light slot-meter, costing £2, and the extra cost of a slot over a 2-light ordinary meter:—

Extra charge per 1000 cubic feet over Ordinary Consumers.	Per cent. of total cost of Slot Meter.	Per cent. of extra cost of Slot over Ordinary Meter.
1d. ..	1½d. ..	2½d. ..
2 ..	2½ ..	5½ ..
3 ..	4 ..	8 ..
4 ..	5½ ..	11 ..
5 ..	6½ ..	13½ ..
6 ..	8 ..	17 ..
7 ..	9½ ..	19½ ..
8 ..	10½ ..	21½ ..
9 ..	12½ ..	24½ ..
10 ..	13½ ..	27 ..
11 ..	14½ ..	29½ ..
12 ..	16 ..	32 ..

From the foregoing, we can see at a glance how we are treating our slot consumers compared with our ordinary consumers, to whom we fix meters free and allow three months' credit.

That the question of price is of some importance is borne out by the action of the London County Council, who have promoted a Bill for standardizing slot meters and fittings, and to regulate the charges made for their use. This Bill has been before a Committee of the House of Commons; but while they did not obtain the powers sought, the South Metropolitan Gas Company, in their Bill for 14-candle gas, had a clause for regulating the charge for slot meters which was agreed to. The Commercial Gas Company and the Gaslight and Coke Company have agreed to give effect to the decision of the Committee, either by a Bill or Provisional Order next session.

My personal experience with slot meters dates back two years. I then ascertained that within our area of supply there were 2100 inhabited houses and only 1600 consumers. With the view of increasing the number of the latter, I asked my Council to be allowed to introduce slot meters, and I received instructions to fix 24 meters, and give them three months' trial, and report. This being a satisfactory experiment, I had over 200 fixed within 18 months. These meters are set to give 22 feet for 1d., or 3s. 9d. per 1000 cubic feet; and in balancing the accounts at the end of the year I have no reason to complain of any discrepancy between the gas consumed and the money collected. So far as tampering is concerned, I have only had two such cases. One could be clearly traced to a spirit of mischief, and was done with a view of ascertaining the effect of inserting other than a penny into the meter. The result was no gas; but the meter being fitted in a club-house, it caused a flutter among the members. The other was due to an insecure padlock. This, in my opinion, is a very important detail which is very often overlooked.

In introducing these meters (to allow of their being easily changed, if any defect was found, or coins becoming jammed) I specified one union; and although I have had meters supplied by five different makers, they are all interchangeable. This, I may say, was carried out by the different makers without question or extra cost, and is a step in the direction of standardizing meter unions.

The great drawback to a very much greater number of these meters being in use is the extra price charged to slot consumers. Fortunately, or perhaps unfortunately, nearly all our slot consumers are in buildings recently erected. They are therefore living next door to small ordinary consumers; and they do not consider that they ought to be charged a higher rate than their neighbours.

I have kept a careful record of the cost of working this slot-meter system; and I find the total cost for collection, attending complaints, and removing meters to suit consumers to have been 1'028d. per 1000 cubic feet, while our ordinary cost of collection is 0'924d. per 1000, or 0'104d. extra. This, I may add, is almost made up by the absence of bad debts. In a fluctuating population such as we have, the comparison already given applies very strongly to Renfrew, where a few large public works consume large quantities of gas, and the population is almost entirely composed of working classes. I find the slot and the ordinary consumers are in point of consumption equal, and they are therefore being charged a very much higher rate than they ought to be; and I am quite sure, if my Commissioners were to give the slot consumers better terms, a very much greater quantity of gas would be consumed. I am very pleased to observe from the inquiries I have made that at least four corporations and three companies sell at equal rates. This is a step in the right direction. This means that I am not the sole advocate for equality; and I fail to see why we should wait till Parliament or the Board of Trade step in and fix a minimum. I consider that, from an outside observer's point of view, the manner in which the slot consumer is treated would not reflect on the gas profession as an ideal of sound commercial enterprise. If we are to make the most of the appliances which have been placed in our hands, let us sell the same to every consumer; and if by using a slot-meter we are enabled to sell 2000 cubic feet of gas where we previously sold only 1000, then by all means let us do so in the firm conviction that we are not only conferring a benefit on our corporation or company, but also to some home circle, by making life more pleasant and healthy, and at the same time removing the source of so many painful fatalities, which occur through the use of faulty oil-lamps.

#### Discussion.

The PRESIDENT said they were indebted to Mr. Lighbody for bringing the very important question he had before them. He thought they might call it a burning question. His own opinion was that the slot consumer was badly treated. There was, for instance, the extra charge of from, perhaps, 15 to 18 per cent. for the use of the meter. He did not see why this should be. Prepayment meters were a piece of their ordinary plant; and he thought they should be supplied in the ordinary way.

Mr. D. ROBERTSON (Dunoon) said that his experience of slot meters was not by any means extensive. He had only about a dozen in his district; and they happened to be fixed upon cookers simply, as a check upon servant girls, he understood, so that, if they consumed more gas than their mistresses gave them permission to do, it came back upon themselves. It was a question with him whether he should introduce slot meters or not. A great deal of his gas, as many of them were aware, was consumed by visitors, as was the case in all their coast towns; and there would be a difficulty in having so many strange people coming into the same house in a season. He thought it had been found, in other coast towns, that the meters went wrong very often. If anyone present was able to speak to this point, he should be personally obliged to him for information; but this was the difficulty which came to his mind: They might, perhaps, have half-a-dozen people in the same house, one after the other, and some of them might not know anything about a slot meter; and therefore, ten to one, the first time they interfered with it, they would put it wrong. He had a town in his mind where they had instituted a charge of 9d. extra, because people were so often putting meters out of order. Every time the meter was put wrong, they had to put it right again; and really he thought it was quite justifiable to charge for this. He questioned if corporations should be at the expense. With regard to Mr. Lighbody's contention that the rates should be equalized, or made more equal than at present, he thought he was quite right. It was altogether wrong that a consumer who paid cash should be made to pay more than his proportion of the charge for gas, simply for the reason that he paid cash. Suppose they charged a little more to cover the extra cost, 5d. per 1000 cubic feet should be quite a sufficient margin—possibly rather too much. There was no reason why they should be charged more than 5d. extra. When they considered the trouble and annoyance there was in the collecting of gas accounts (of which he had some experience), the slot meter must be a very great convenience—to the collector at any rate—because, as a rule, he found as much money in the box as the meter had passed, and this, in itself, was a great relief. He thought an effort should be made to introduce slot meters, and also to so regulate the price charged for gas consumed through them that there would not be the slightest cause for complaint.

Mr. J. W. CARMICHAEL (Barrhead) said that slot meters had been made to pay well. Some of them, he thought, had paid too well. Mr. Lighbody advocated uniformity in price; and there was a great deal to be said in favour of his contention. They could reduce bad debts by introducing slot meters, and they could keep on as consumers those who had been a trouble



to them; but it was a question whether it was just to ordinary consumers that they should charge an equal rate. He rather thought not. For instance, the price of the meter was about £1 more. If they took 5 per cent. on this extra price, it meant a shilling. He took it that the collection from slot meters cost per 1000 cubic feet double what it did by ordinary meters. On an average consumption of 6000 cubic feet, this would be another 3d., making 1s. 3d. Then if they allowed perhaps a further 3d. for repairs, this would make 1s. 6d. Divide this by six, and the result would be 3d. He held that 3d. or 4d. was quite sufficient to charge above the price paid by ordinary consumers; and he would only then say that the two systems were on an equality with one another.

Mr. H. POOLEY (Dunfermline) said he had had a somewhat long experience with prepayment meters—having introduced them in 1893. They began with an additional charge of 9d., which had been gradually reduced. It was now 3d.; but he might say that he thought this was far too small an amount, and that it should be from 5d. to 9d., according to circumstances. They lent a stove free of hire, if the consumer cared to take one; and they pressed him to take it. The average consumption of gas with a stove was about 9900 cubic feet per annum; and, with the additional 5d. which he advocated, this gave something like 4s. 2d. of additional rate, over the ordinary meter return, which allowed 3s. as the rent of the stove, and 1s. 2d. as the rent of the meter. Of course, they charged no meter rents. They had other contingencies to take into account with prepayment meters, which should raise the charge for them. About 4 per cent. required to be expended upon them annually for repairs; and they occasionally had cases of tampering with money-boxes. He had only had four since 1893; but they were exceedingly annoying. In all the other instances he had been able to settle with the thief. He must congratulate Mr. Lighbody on his collection. Possibly Mr. Lighbody had a collector who was employed in other matters; but in his own case the cost of collection was about 2½d. per 1000 cubic feet.

Mr. J. WHYTE (Seaham Harbour) said he had about 180 of these meters in use. His experience of them was what the author of the paper seemed to have had. Theirs was a mining population; and this accounted for a good deal of the trouble and expense to which they had been put. He ventured to say that they had had to send no less than 250 meters back to the makers—some of them twice or three times—for repairs; and he knew that in their case even 9d. per 1000 cubic feet was not sufficient as an extra charge. When they counted the first cost of the meter, and the cost of keeping it in repair, it was not sufficient. All sorts of dodges had been tried. Pennies had been hammered on the edge, and slightly doubled up, so as to get the gas for nothing—and sometimes they did get it for nothing. His experience of slot meters was not so favourable as to warrant him, at all events, in making the charge equal to that for ordinary consumers.

Mr. J. KINCAID (Falkirk) said that in a town where they had about 1300 slot consumers, what troubled them most was bent pennies being put in, and stopping the mechanism. This meant the sending of a man to put the thing right. Another evil they found was that the valves did not close properly. Slot meters, of course, had not been very long in use; and up till now they had always sent them back, under the five years' limit. His opinion was that they should charge slot consumers a good deal more—at least 4d. or 5d.—than ordinary consumers, because it took that in extra expense in collecting the pennies, and extra cost of up-keep. At times, the registration did not agree with the money; but in Falkirk they set the meters to give a little less gas than they charged the consumers, and then, at the end of the quarter, they gave them back the difference. This pleased consumers very much. But in a town where it took them all their time to supply gas for the requirements of the place, he certainly preferred to furnish it to ordinary consumers.

Mr. A. YUILL (Alloa) said they had to thank Mr. Lighbody for bringing this matter up again. They had something of the same kind before them at their meeting in Ayr in 1897; and, so far, the opinions he had listened to were somewhat the same as were then expressed. At that meeting he also spoke on this question, and argued that a higher rate ought to be charged for gas consumed through prepayment meters than through ordinary meters. He had not changed his mind. The cost of fixing the two meters was practically the same; but they were, to begin with, brought face to face with the difference in the price of the meters. There might be a difference of 20s.; and suppose they had to meet interest and sinking fund, a difference of (say) 2s. on the cost of the meter was brought out. This 2s. ought to make a difference in the cost of the gas. Some had spoken about the difficulties they had with these automatic meters. He thought all who had experience of them would agree with Mr. Carmichael when he mentioned the difficulties caused by twisted pennies, and one thing or another. They ought to charge extra for this trouble. In his own case, they made a difference of 4d. per 1000 cubic feet. If they had an average consumption of 6000 cubic feet, this only came to 2s. a year, which left nothing to pay for the repair of the meter, if it went out of order. They had often to take these meters off, and send them away for repair. They were now beginning to be charged for the repair of the meters which had passed through the period of guarantee. Mr. Lighbody mentioned the relative difference in the consumption through

prepayment meters, in England, Scotland, and Ireland. In the paper he read before the Association last year, he gave the total consumption in England, Scotland, and Ireland; and if he remembered aright, the total consumption in Scotland was 8·32 per cent. of the total in the United Kingdom. In Ireland, the percentage was 3·53. Mr. Lighbody gave the number of prepayment meters in use in England, Scotland, and Ireland. In point of comparison, England certainly had the advantage over Scotland and Ireland; but England was, as they were aware, differently situated from the other two countries, because in London there were whole streets in which there was not a single gas consumer. Now, he understood, some of the London Gas Companies had gone into the business of hiring-out the full gas-fittings of the houses, and charging an annual rental upon them. They had, to begin with, a much larger field to operate upon than there was in Scotland, because in Scotland, when a building was under construction, the whole gas-fittings were laid on in the house. So that in Scotland there must have been a much larger proportion of ordinary consumers than in England. This, in itself, might explain the difference between the 8·32 per cent. of the total consumption in Scotland, and the 2·89 per cent. that was consumed through automatic meters. •

Mr. LIGHBODY, in reply to Mr. Robertson's question, said he had no doubt but that if prepayment meters stood idle four months in the year, as Mr. Robertson's ordinary meters did, they would go out of order; but he still objected to the 9d., which, in his opinion, was too high. Did Mr. Robertson charge anything for repairs?

Mr. ROBERTSON: Not unless it is excessive.

Mr. LIGHBODY (resuming) said he had had bent pennies, but not to any great extent; and their population, as was well known, was composed almost entirely of shipbuilders and ironworkers. He had never had any foreign substances put into the meters, except those which he had mentioned. He thought Mr. Robertson would find that he would help his consumption by keeping the charge for gas as low as possible. He was very pleased that Mr. Carmichael thought the average charge was excessive, but still, he thought, he might take something off the 5d. With regard to Mr. Pooley's question, he was rather surprised that he should give a stove free and should charge the consumer by slot meter the extra price on the gas. It seemed to him to be a case of giving a stove as an inducement to consume the gas, and charging the rent of the stove on the gas which was consumed through the slot meter. Mr. Pooley also charged the cost of collection. He might say that he himself did not employ a collector who did nothing else. They collected six times in the year; but certainly the collector's whole time was not taken up collecting from the slot meters.

Mr. POOLEY said that was what he meant. Mr. Lighbody employed a collector who did other work; but where there were 1000 or 1200 prepayment meters, they required to employ a man for collecting from them alone.

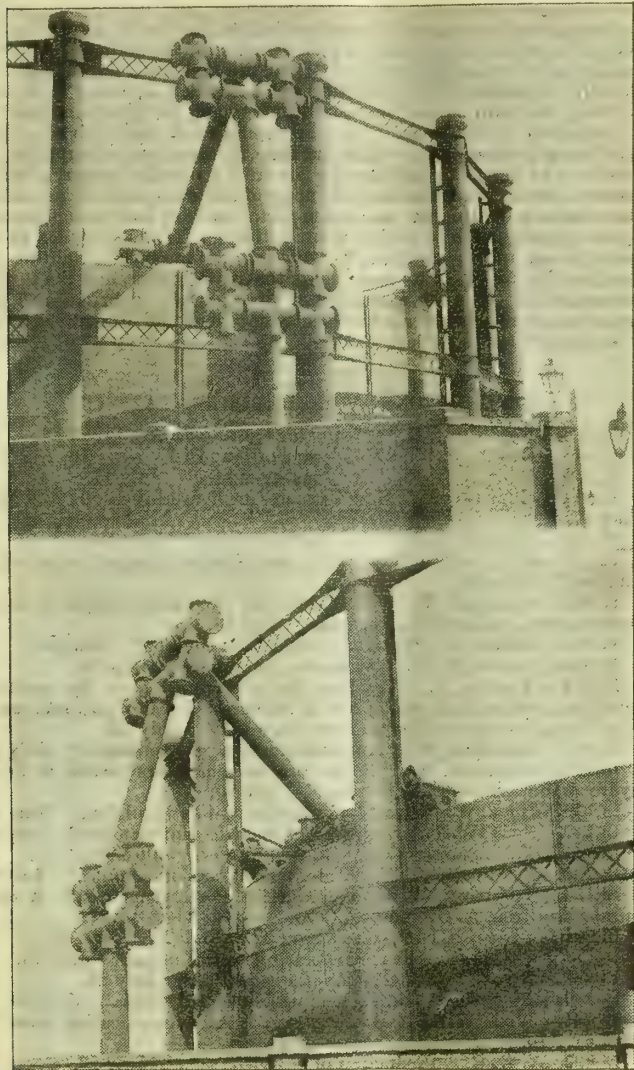
Mr. LIGHBODY (continuing) said, in reply to Mr. Whyte, that they supplied no fittings in new properties; they did not fix meters even. The proprietors did that. They never fixed a meter in any house, unless one had been there previously. Of course, the trouble from meters being tampered with depended on the class of consumer they had to deal with; and he thought that shipbuilders and ironworkers were quite equal to miners in the matter of mischief. Mr. Kincaid's chief troubles were bent pennies and the valves not closing properly. The latter was certainly a trouble; but there were meters in the market whose valves did close. The only drawback to this particular meter was that the people objected to the gas going out without warning. If a consumer burned his gas penny by penny, he might get more than the meter showed; and so it might be set 2 feet less. He thought they ought to use a meter in which the valves closed quickly; he objected entirely to the tailing out of the gas. Mr. Yuill, he considered, occupied a very favourable position. So far as charging the 4d. extra was concerned, he was among the lesser of those who charged consumers extra for gas. He said that where meters were charged for, the price must be extra; but what he objected to was the supplying of an ordinary consumer with a meter rent free, and charging the slot consumer such an advance as even 6d. He did not think this was treating the slot consumer fairly. Regarding the consumption of gas in Scotland through slot meters, in proportion to that in England, they all knew that they had an immense number of slot meters in London; and the average consumption per consumer was 18,000 cubic feet, as compared with 6000 cubic feet in Scotland.

The destructive action on iron of free carbonic acid in water has recently been considered by Herr O. Kröhnke, whose report appeared in a German paper. The author analyzed the town's water of St. Johann, and found it to be pure and soft. The free carbonic acid amounted to 38 milligrammes per litre, and three months earlier it had been as high as 240 milligrammes. This water reduced the diameter of an iron pipe from 26 to 7 mm. in a short time, owing to the formation of a brown crust; while the pipe itself was corroded to a depth of from 1 to 3·5 mm. When tested in a closed vessel, the water was found to dissolve wrought iron very rapidly, with formation of ferrous bicarbonate. On exposure to the air, ferric hydrate was precipitated and carbonic acid regenerated.



## A FRENCH DESIGNED SOUTH AMERICAN GASHOLDER.

A correspondent has kindly sent two photographs which he thinks worth reproducing in the "JOURNAL." He has just received them from South America, and considers that they are typical of how things are done in some foreign gas-works in which British capitalists are interested. The arrangement of inlet and outlet pipes is one often depicted in French treatises on gas lighting for small types of holders; and the gasholder now illustrated is of French nationality. Our correspondent considers that there is nothing in the nature of the ground or



foundations that would make this method of filling and emptying the holder at all essential. As he remarks: "The castings alone are a curiosity—metal is cheap one would think. In hot weather the packed joints have a knack of jamming; and as the result, a nice little hole has been torn in the top of the holder more than once." He points out as an amusing anachronism the use of a triangular pivoted oil-lamp to light the walls of the gas-works, as shown by the upper photograph. Referring to the expensive construction necessitated by such an arrangement as this, our correspondent concludes: "Dividends need be large to provide for fads of this nature, or the price of gas very high—and it is. There must be ample scope for young engineers with brains and ability to make cheaper gas at a profit in South America."

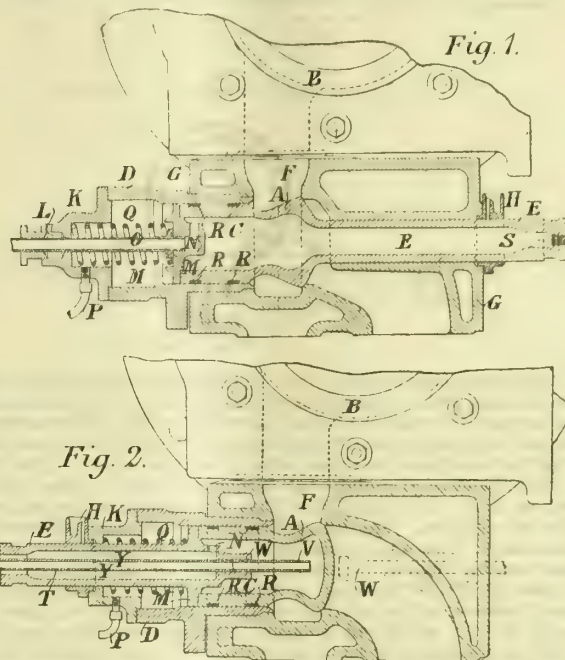
**Improved Street Refuge Lighting in Westminster.**—Those who are interested in improved high-power gas lighting for street crossings, &c., may be recommended to inspect two new refuge lamps, each of fully 1000-candle power, recently erected by Messrs. W. Sugg and Co., in Whitehall (just opposite Downing Street), for the Westminster Vestry. The pressure-increasing plant is installed underneath the stairs of a subterranean lavatory, and in the circumstances the water used should not be charged to the cost of the lighting, as it can afterwards be employed for flushing. Taken at 9d. per 1000 gallons, however, the cost of the water is to that of the gas consumed, at the price of 3s. 5d. per 1000 cubic feet, as 7 to 17. Both lamps together cost in all 2s. 1d. per night, or 1s. 0½d. per night for 1000-candle power actual, full on all night. There are three mantles to each lantern; and the mantles last about six weeks in this extremely exposed situation, where the vibration due to the traffic is excessive. The lamps are now arranged to burn 30 cubic feet per hour up to mid-night, and 10 feet per hour after. It is the most brilliant light of the kind in London. The gas pressure is intensified automatically from about 2½ to 9½ inches.

## REGISTER OF PATENTS.

**Exhaust-Valves for Gas-Engines.**—Crossley, W. J., and Atkinson, J., of Manchester. No. 14,578; July 15, 1899.

The object of this invention is to reduce the load on the exhaust-valve of a gas-engine, so as to relieve the opening gear. The exhaust-valve of an "Otto" type motor—the patentees point out—frequently has to be opened against a pressure of upwards of 40 lbs. per square inch; and in a large engine requiring a large valve, this becomes a heavy load to be overcome by the opening gear. They therefore provide an equalizing piston on the head of the valve, which puts the valve more or less into equilibrium.

Figs. 1 and 2 are longitudinal sections through an exhaust-valve constructed according to two modifications of the invention.



In fig. 1, A is the exhaust-valve, and F the exhaust-port leading from the cylinder B. The valve works horizontally, and has attached to it, at one side, the piston C working in the cylinder D; and at the other sides the hollow stem E, which projects through the valve-casing G, and the oil-gland H—the valve, piston, and stem being all hollow. The valve is slightly greater in diameter than the piston; and the cylinder is telescoped inside the casing (or otherwise removably attached to it), so that the withdrawal of the cylinder allows the valve to be removed. The cylinder is provided with a cover K and a stuffing-box L; and the piston has fixed to it a cap M, in which is bored an angular hole N, opening towards the top of the inside of the piston. Into the hole is screwed a pipe O, which passes through the stuffing-box. The piston is provided with rings R, rendering it nearly gas-tight; but what gas leaks through into the cylinder is led away by the pipe P to any suitable outlet. The spring Q for closing the valve is placed as shown in the cylinder. The cooling-water enters the hollow stem E at its end S, and escapes by the hole N and the pipe O; the position of the outlet preventing the accumulation of air or steam inside the piston and valve. The valve may be operated by means of its stem E, by any usual valve-lifting mechanism.

In the modification fig. 2, the valve-stem E is in one piece with, or attached to, the piston-cap M; and the stem is passed through the cylinder-cover K and the oil-gland H. The valve is closed at the end where the stem was attached in fig. 1; and the cooling-water enters by a pipe T passing through the hollow stem E, and screwed into the internal projecting boss U of the piston-cap M. Another pipe V, forming a continuation of the pipe T, and also screwed into the boss U, conveys the water to the valve A—the water returning by the hole N and the annular space Y in the stem E. The valve-spring Q is contained in the cylinder D, as in fig. 1; and a pipe P is provided as before to draw off the gases leaking past the piston C. The valve may be actuated either by means of the hollow stem E or by means of a pusher-rod W (shown in dotted lines) at the other end of the casing—the pusher-rod pressing against, but not being attached to, the valve.

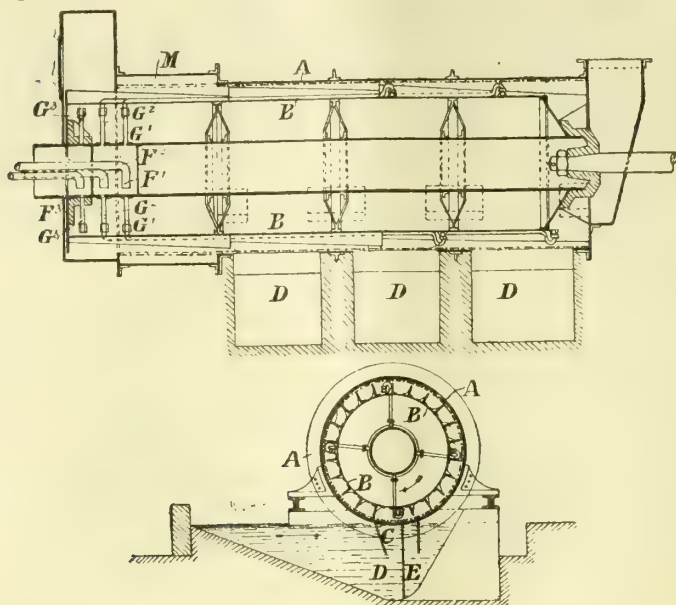
**Gas-Washers.**—Theisen, E., of Baden-Baden. No. 16,735; Aug. 17, 1899.

In constructing his apparatus as referred to in patent No. 27,389 of 1898, the patentee says he has found that, arranging the rotating cylinder of a gas-washer horizontally, a more advantageous supply of the washing water can be effected than when it is placed vertically; the horizontal position has also great inherent advantages in large installations of the apparatus. At the same time, the horizontal form favours the pulverization and evaporation of the liquid in the whole of the space through which the gas passes; and security against the danger of explosion is attained.

By the present invention, the cylinder of a horizontal gas-washer is immersed to a small depth in water contained in a trough which extends along the whole length of the lower surface of the cylinder, or along a considerable part of it. At the immersed part, the cylinder is provided with openings so that the water may pass into the interior of the drum. The water or other liquid admitted into the apparatus is immediately whipped up by the rotating blades, and is carried round and thrown upon the inner surface of the drum, which is covered with wire or the like. Near the inlet opening, and separated from it by a partition, which does not extend to the bottom of the water-trough, there are exit-openings in



the drum, through which the washing water, after it has been scattered over the whole periphery of the drum, can pass away (after depositing the particles it carries with it), to flow under the partition to the inlet-openings.



A is the stationary cylinder, into which the gas to be purified enters at the right-hand end. In the fixed cylinder rotates the cylinder B, to the outer surface of which blades are attached. The inside surface of A is covered with wire gauze, "the purpose of which is to spread out and scatter the liquid so as to expose a large surface of it." This cylinder has openings which dip under the surface of water on one side of the partition E in the trough D, so that the surface of the water is just within the cylinder. The different troughs D may hold different liquids if necessary. The water which enters at C is whipped up by the blades on the rotating cylinder B, and is pulverized and evaporated. Through the tubes F<sup>1</sup> F<sup>2</sup> F<sup>3</sup> washing or absorbing liquids are supplied to the several chambers of the rotating cylinder. From these chambers spring pipes G<sup>1</sup> G<sup>2</sup> G<sup>3</sup>, which end at various parts of the cylinder periphery in sprinklers, preferably closed by ball-valves, the balls of which are pressed on their seats by centrifugal force somewhat less than the pressure of the liquid flowing through the pipe. The liquid is ejected radially into the space between the cylinders A and B from these sprinklers, which rotate with the inner cylinder B. The flow of liquid through the sprinklers can be so arranged that it is smaller through some than others. In this way, the supply from the two first may be evaporated by the heat of the entering gas; while that from the third is sufficient to condense the vapour together with impurities. "By this means, the aqueous vapour or steam produced at the part of the apparatus where the gases to be purified or washed enter, in being caused by the centrifugal action of the blades to be brought into very intimate contact with even the finest particles of dust in the gases, will effectually envelop and lay hold of these, so that on being then subject to the action of the water spray in the other part of the apparatus, the condensation of such vapours will also cause such fine dust particles to be completely separated from the gases."

At the outlet for the gas, the cylinder A is enlarged to form a chamber M, across which the wire gauze extends. This constitutes a drying chamber—for the liquid collects behind the wire gauze, and the gas cannot take it up again.

#### Preparation of Carbide of Calcium ("Acetyloid").—Worsnop, C. H., of Halifax. No. 16,763; Aug. 18, 1899.

This invention relates to a method of preparing calcium carbide so that it "can be transported from place to place without danger, and may even be left in the open air without danger." It consists in impregnating the carbide with a composition of wax, cocoa butter, and sugar, produced as follows: The wax (preferably paraffin wax), cocoa butter, and sugar in equal parts are mixed and heated—sufficiently to melt the mixture. At this point, a comparatively weak organic acid is added, such as tartaric acid, until the sugar becomes of the same consistency as the wax and the cocoa butter. The carbide is then immersed in the hot liquid mixture, and allowed to remain for a sufficient period of time to become thoroughly impregnated. The carbide may then be withdrawn and placed on trays in a cooling chamber, and when cold the new composition is complete. When used for the generation of gas (which is done by subjecting it to the action of water under pressure) the bye-product does not cling to the good material, as moist lime does to calcium carbide, but falls entirely away, leaving the unused clean material to continue its work of generation.

#### Manufacture of Carbide of Calcium.—Rathenau, W., of Berlin. No. 6038; March 31, 1900.

This invention consists of a process for the refining of carbide of calcium and the simultaneous production of silicon iron.

In the manufacture of carbide of calcium by the process hitherto known, the patentee remarks, it has been proved that a pure product is only obtainable if the raw materials employed be free from objectionable admixtures—more particularly from combinations of magnesium and silicon; and since pure materials are not easily obtainable everywhere, it has become necessary to produce pure carbide of calcium from lime containing silicon, or from carbon (coke or the like) containing silicon. Experiments made in this direction have shown that certain metals—especially iron—have the property of taking up the whole of the silicon contained in the mixture of the raw materials when mixed therewith in

proper proportions. It has also been found that, if the flux be allowed to deposit, the resulting silicon alloys will collect in a separate layer underneath the calcium carbide flux which is produced, and can be removed therefrom by being cut off. For a special anthracite containing silicon, a mixture of the following proportions has been found suitable: 56 parts of lime, 60 parts of anthracite (containing about 25 per cent. of silicic acid), and 28 parts of metallic iron. From this, there results a high percentage carbide of calcium, together with a compound of silicon and iron containing 20 to 25 per cent. of silicon, and "eminently suitable for industrial purposes."

#### Lighting Street-Lamps.—Simmanee, J. F., and Abady, J., of Westminster. No. 19,477; Sept. 28, 1899.

The claims for this invention include the combination with an incandescent gas-burner lamp of a fixed auxiliary pipe, terminating within the lamp, for the purpose of supplying an auxiliary jet of gas for lighting the gas from the main burner, a cock or valve for the main burner, and a cock or valve for the supply of gas to the auxiliary lighting jet, and operated directly or indirectly by the lighting torch, in such a manner that, after lighting the main burner, the auxiliary lighting jet is extinguished by a movement of the torch. Also the combination therewith of a fixed auxiliary pipe terminating within the lamp, for the purpose of supplying an auxiliary jet of gas for lighting the gas from the main burner, a treble-ported valve or cock controlling the supply of gas to the main burner, and to the auxiliary lighting jet—the treble-ported valve or cock being operated by the lighting torch in such a manner that gas is first supplied to the main burner and the auxiliary lighting jet; the torch then lighting the auxiliary jet, which, in its turn, lights the main burner, and the further movement of the torch extinguishes the auxiliary lighting jet. The arrangement referred to was sufficiently described and illustrated in the "JOURNAL" for May 1 last, p. 1127.

#### APPLICATIONS FOR LETTERS PATENT.

- 12,786.—BORCHARDT, H., "Means for lighting gas." July 16.
- 12,818.—COWAN, T. W., "Gas lamps or lanterns." July 16.
- 12,851.—BUCHAN, H. F., "Gas cooking-stoves." July 17.
- 12,914.—GREENWOOD, A. S., "Burners for hydrocarbon oils and gas." July 17.
- 12,920.—WILKINSON, J., "Manufacture of gas." July 18.
- 12,927.—BELLAMY, A. R., "Gas and similar internal combustion engines." July 18.
- 12,963.—CLARKSON, T., "Regulators for generators heated by liquid hydrocarbon, gas, and like burners." July 18.
- 12,975.—HOMER, E., "Internal combustion engines." July 18.
- 12,993.—SPROTT, E. W., "Acetylene generators." July 18.
- 12,994.—THUMAN, F., "Treating liquor obtained from the washing, scrubbing, or cooling appliances of carburetted water gas and other plant, so as to separate the tar from the water." July 18.
- 13,007.—ANDERSON, H., "Anti-vibrators for gas-pendants." July 19.
- 13,127.—CLARKSON, T., "Regulators for generators heated by liquid hydrocarbon, gas, and like burners." July 20.
- 13,139.—HOOK, H., "Street-lamp lighter and extinguisher." July 20.
- 13,147.—SUGG, W. T., "Supports for incandescent mantles." July 20.
- 13,162.—TRESSENREUTER, G., "Bunsen burner." July 20.
- 13,191.—PENNINGTON, E. J., "Internal combustion engines." July 21.
- 13,194.—THOMPSON, W. P., "Production of acetylene gas." A communication from A. Giraud. July 21.
- 13,204-5.—GERDES, H., "Gas-generators." July 21.
- 13,234.—CUSSAC, H. & H., "Generating acetylene gas." July 23.
- 13,239.—FAJOLE, E., "Acetylene-gas generator." July 23.
- 13,259.—HILL, H., "Mantles for incandescent lighting." July 23.
- 13,281.—WISE, W. L., "Gas-brackets." A communication from R. Thayer. July 23.
- 13,289.—GUY, C., "Production of acetylene gas." July 23.
- 13,340.—WIEGAND, A. J., "Gas-cocks." July 24.
- 13,386.—SUTCLIFFE, H., "Generating, washing, cooling, and storing acetylene." July 25.
- 13,404.—BOULT, A. J., "Mixing gases." A communication from A. Molet. July 25.
- 13,408.—CHILD, J. F., and WHITE, R. J., "Gas-governors." July 25.
- 13,449.—SELLEY, R., and HOMER, F., "Valves for internal combustion engines." July 26.
- 13,451.—POTTER, W. G., "Incandescent gas-lamps." July 26.
- 13,528.—SIGURDSSON, O. V., "Automatically turning gas on and off at pre-determined times." July 27.
- 13,545.—HUDLER, J., "Incandescent gas-burners." July 27.
- 13,558.—BOULT, A. J., "Self-igniting incandescent burner." A communication from Chemisch-Technische Industrie-Gesellschaft, Limited. July 27.
- 13,563.—ACKERMANN, F., "Pressure-regulators for gas-burners." July 27.
- 13,568.—HONIGMANN, F., "Compressing gas or air." July 27.

**The Proposed Conference on the Price of Gas.**—The Town Clerk of the City of London (Sir J. B. Monckton) has forwarded to the various Local Boards and Vestries of the Metropolis a copy of the resolution passed by the Court of Common Council on the 26th ult. in reference to a conference on the subject of the price of gas (see *ante*, p. 299). He adds that it is intended to hold the conference in October, on a date to be fixed (which he will notify in due course); and he asks that three representatives may be nominated to attend.

**The Blackburn Corporation and Carburetted Water Gas.**—At the last meeting of the Blackburn Corporation, the Gas Committee reported that they had considered and approved numerous suggestions of the Medical Officer of Health put forward as a precaution against mishaps arising from the use of carburetted water gas. With regard to the recommendations that small bedrooms should not have gas laid on, and that the practice in many mills of turning on all the gas-jets from one tap, and lighting them some minutes afterwards, should be stopped, the Committee reported that they had no powers in the matter.



## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF COMMONS.

Thursday, Aug. 2.

#### THE SUPPLY OF COAL.

Mr. D. A. THOMAS (Merthyr Tydvil) asked the First Lord of the Treasury whether, having regard to the growing scarcity and dearness of coal, and in view of the altered circumstances of the trade since the inquiry into our coal resources made by Royal Commission a generation ago, and the fact that experience had shown the conclusions of that Commission to be erroneous, he could now see his way to cause a fresh inquiry to be made in order to remove the uncertainty that prevailed as to the quantity of coal remaining unworked and available for naval, domestic, manufacturing, and commercial purposes.

Mr. BALFOUR said he did not think the scarcity and dearness of coal had any relation to the larger issue dealt with in the main part of the question. The subject of a revised survey of the coalfields was engaging the attention of a Committee now sitting in regard to the geological survey; and he understood that a report would be made to the Lord President of the Council. He thought it would be found useful to collect tabulated information with a view to determining whether or not it was necessary to hold further inquiry into this important matter.

Friday, Aug. 3.

#### THE EXPORT OF COAL.

Sir HOWARD VINCENT asked the President of the Board of Trade if he could state to what countries the increased export of British coal had mainly gone, and, in particular, what Governments or countries had increased their purchases of coal suitable for naval use; and whether such export had increased the cost of coal for the Royal Navy or reduced its supply.

Mr. RITCHIE: The increase in the exports of coal, coke, and fuel from the United Kingdom during the first six months of this year over the exports in the first six months of 1899 was 1,073,000 tons. The increase, however, was not general among the various countries to which the coal was sent; there having been decreases in the exports to some countries amounting in the aggregate to 970,000 tons, and increases to others to the extent of 2,043,000 tons. The principal increases were: To Germany, 405,000 tons; to Holland, 451,000 tons; and to France, 810,000 tons. I am informed that the total exports of coal from Wales in the six months January to June, 1900, show a decrease of more than 400,000 tons, compared with the same period of 1899. The increase in the cost of fuel for the Royal Navy, therefore, cannot be attributed to increased export of the kind required.

**The Select Committee on Municipal Trading.**—The Joint Committee of the Houses of Lords and Commons appointed to consider and report as to the principles which should govern powers given by Bills and Provisional Orders to municipal and other local authorities for industrial enterprise within or without the area of their jurisdiction, have presented their report. The Committee express the opinion that, having been appointed at a comparatively late period in the session, it is not possible to bring their inquiry to a satisfactory conclusion during the present sittings of Parliament. They therefore recommend that they should be re-appointed next session.

## LEGAL INTELLIGENCE.

### JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Saturday, July 28.

(Before Lord HOBHOUSE, Lord MACNAGHTEN, Lord LINDLEY, Sir RICHARD COUCH, and Sir HENRY STRONG.)

#### Montreal (Canada) Gas Company v. Vasey.

This morning the Judicial Committee of the Privy Council, through Sir Henry Strong, gave judgment on the appeal of the Montreal Gas Company from the Court of Queen's Bench for Lower Canada (Province of Quebec), to which reference was made in the "JOURNAL" for the 17th ult. (p. 169).

The Hon. EDWARD BLAKE, Q.C., and Mr. BROSEAU, Q.C. (both of the Canadian Bar), appeared for the appellants; Mr. LAWSON WALTON, Q.C., and Mr. R. C. SMITH, Q.C. (of the Canadian Bar), for the respondent.

Sir HENRY STRONG said that on Dec. 15, 1886, the appellants entered into a contract with the respondent for the sale to him of ammoniacal liquor produced by them in the manufacture of gas, by the terms of which the appellants agreed to deliver to the respondent, during a period of five years from May 1, 1887, all the ammoniacal liquor they should produce at their works; and the respondent agreed to pay 20s. for every ton of sulphate of ammonia he should manufacture from such liquor, so long as the net price in London should exceed £9 10s. per ton. The appellants also agreed to supply the respondent, during the same term, with all their spent oxide of iron, free of charge. Five days after the execution of the contract, the President of the Company wrote to the respondent the following letter:—

Montreal, Dec. 20, 1886.

Dear Sir,—Referring to the contract made with you on the 15th inst. for the sale of ammoniacal liquor, I may say that, if we are satisfied with you as a customer, we would favourably consider an application from you at the expiration of the term for a renewal of the same for another period.

(Signed) JESSE JOSEPH.

At the expiration of the contract of Dec. 15, the appellants refused the respondent's application for a renewal. The respondent thereupon brought his action against the appellants, seeking to recover damages for alleged breaches of the contract, and also for the refusal to renew the original contract, which the respondent alleged they were bound to do according to the terms of the letter of Dec. 20. The appel-

lants filed an incidental demand claiming damages for breaches of the original agreement by the respondent. Mr. Justice Mathieu, before whom the case was heard, awarded damages to the respondent for the non-fulfilment in several particulars of the original agreement, and also for the non-renewal of the contract in accordance with the obligation to do so, which he held to be contained in the letter quoted; and in respect of this latter breach of contract, the Judge condemned the appellants in damages to the amount of \$10,000, with interest from the date of the judgment. On appeal to the Court of Queen's Bench, this judgment was maintained, as regards the damages for breach of the contract held to be contained in the letter; but it was altered on the question of interest, by allowing interest, not only upon the \$10,000, but also upon the other items of damages awarded to the respondent, from the date of the commencement of the action, instead of from the date of the judgment. The appeal to the Judicial Committee was from this judgment of the Court of Queen's Bench. The appellants insisted that the letter of Dec. 20, 1886, did not contain any contract or agreement susceptible of legal enforcement, and that the judgments of the Courts below, which treated it as imposing a legal obligation upon the appellants, were erroneous. This was the conclusion of the learned Chief Justice, who dissented from the Court of Queen's Bench. Their Lordships of the Judicial Committee were of opinion that the oral evidence admitted on the trial was improperly received. The letter must speak for itself; and if there was a contract to renew, its terms must be found in the writing. Their Lordships were unable to find in the promise made in the letter that the appellants would "favourably consider" an application to renew, anything legally binding the appellants. So far from this being so, the terms used implied that the appellants reserved to themselves the right to deliberate on the question of renewing the contract, if the respondent should apply to them to do so. The utmost that could be said was that the respondent, if he proved to be satisfactory as a customer, might, as the letter assured him, expect favourable consideration. It did not require demonstration to show that such an undertaking fell short of a contract. The appeal must therefore succeed, so far as it was sought to have the damages amounting to \$10,000 for non-renewal, and the interest on those damages, disallowed. As regarded the alteration made by the Court of Queen's Bench in the original judgment, in the matter of interest on damages not in question on the appeal to the Judicial Committee, their Lordships were unable to see that the alteration was erroneous. The learned Chief Justice had considered that the first judgment must be taken to include interest on the damages awarded up to the date of the judgment. This, however, did not appear to have been done; and in the absence of any evidence that it was so comprised, their Lordships thought they must treat interest from the date of the action as not included in the damages. Then, as it appeared that the respondent was entitled to recover interest from the date the appellants were put "en demeure" by the service of process, the judgment of the Court of Queen's Bench in this respect must be considered not to have been successfully impeached. Their Lordships would, therefore, humbly advise Her Majesty to allow the appeal, by discharging so much of the judgment as awarded \$10,000 for damages for not renewing the contract, and allowed interest thereon, and by so varying it as to award no costs to either party in the Court of Queen's Bench. There would be no costs of the present appeal.

### SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Aug. 2.

(Before Lords Justices A. L. SMITH and VAUGHAN WILLIAMS.)

#### The Costs in the Malvern Gas-Works Arbitration.

This was an appeal by the Malvern Urban District Council from the order of Mr. Justice Bucknill, in Chambers, in reference to arbitration on the subject of the gas-works. On Nov. 23, 1897, the Council agreed to purchase the undertaking of the Gas Company—the price to be ascertained by arbitration. By the agreement entered into, the Council undertook to pay all costs, charges, and expenses of the Company preliminary and incidental to the negotiations for the sale and the preparation and execution of the agreement and the arbitration. In the event of the parties differing, the costs were to be taxed. The arbitration lasted two days, and the Company sent to the Council a bill for £2200 as the costs of the reference alone. By consent, the Council applied to Master Pollock to tax the costs; and he fixed them at £1147. Afterwards the Master stated that he had taxed the costs on a lower basis than between solicitor and client; whereupon the Company appealed to Mr. Justice Bucknill, who directed a review of the taxation on the ground that, on the true construction of clause 7 of the agreement, the costs should be as between solicitor and client. Hence the appeal of the Council, on behalf of whom it was contended that the learned Judge had wrongly construed the clause, which contemplated costs as between party and party, and that he had no jurisdiction to deal with the matter at all, inasmuch as the Master, in taxing the costs, acted as arbitrator, and not as a Master of the Court.

Dr. BLAKE ODGERS, Q.C., and Mr. SPOKES appeared for the appellants; Mr. JELF, Q.C., and Mr. G. H. FARRANT represented the respondents.

Lord Justice SMITH, in the course of his judgment, said he arrived at the conclusion that the Master had taxed the costs on the wrong ground—viz., as between party and party—which would only give the Company two-thirds of their costs of so much all round. The taxation should have been upon the basis of costs as between solicitor and client, in order that the Company should come out scathless. This was the view taken by Mr. Justice Bucknill, who was substantially right in his decision, because, as far as possible, it followed the lines indicated in the agreement of purchase. It had been argued that there was no power to review the decision of Master Pollock, as he was acting as arbitrator, and not as a Master of the Court. But the agreement brought in section 1 of the Arbitration Act of 1889, which provided that the decision on a submission of arbitration should have the same effect in all respects as if it were an order made in Court. Therefore this gave the Master, or an officer of the Court, the power to tax the costs in this case. The Master would now be ordered to review the taxation on the basis of



costs as between solicitor and client. The appeal would therefore be dismissed, with costs; but there would be no order in respect of costs as to the proceedings before Mr. Justice Bucknill, as he had made no definite order in the matter.

Lord Justice VAUGHAN WILLIAMS concurred.

#### Embezzlement by a Gas Collector.

At the West Riding Assizes on Monday last week, Eli Crowther, a collector in the service of the Hebden Bridge and Mytholmroyd Gas Board, was indicted for making false entries in his books, and also for embezzling various sums amounting to £280, the moneys of the Board. It may be remembered that the accused was charged at Todmorden on the 5th ult. (see *ante*, p. 102). He pleaded guilty to both indictments, and was sentenced to six months' imprisonment with hard labour.

#### Claim by an Artesian Well Engineer.

Mr. Justice Mathew and a Special Jury recently had before them, in the Queen's Bench Division of the High Court of Justice, an action brought by Mr. R. D. Batchelor, artesian well engineer, of Chatham, against the Rainham Water-Works Company. Plaintiff's claim was for £105 for services rendered to the Company when selecting a site for their new works at Rainham, and advising them generally as to water supply. The defence was that Mr. Batchelor only inspected the site in order to try to obtain the work of sinking the well; and the Company denied that they were liable for any amount. The Jury decided that Mr. Batchelor had been consulted by the Company as an engineer, and that he had not acted with the view of obtaining work. A verdict was given in his favour, and he was awarded 50 guineas.

#### Automatic Meter Contracts.

At Willesden, on Thursday, the Gaslight and Coke Company summoned George Harding, of Palmerston Road, Wealdstone, for £1 1s. 6d. for gas supplied. Mr. Robert Humphreys, solicitor, who appeared for the Company, said the case arose under an automatic, or "penny-in-the-slot," meter contract. He called attention to a clause in the form of such contracts, to the effect that consumers when terminating tenancies must give at least five clear days' notice to the Company. The contract was proved; and three collectors were called, who deposed that the defendant was the tenant of 10, Shrewsbury Road, Harlesden, where he was supplied with gas through an automatic meter. On January 29 a collector found he could not gain admission to the house. On February 26 the premises were found to be open; and a workman allowed a collector to go in. No one was residing there. The padlock and money-box of the meter had been removed. There should have been £1 2s. in it, according to the index; and, in consequence of an alteration in the price of gas at that time, that would mean that £1 1s. 6d. was due. The defendant sent no notice of his intention to remove. A demand had been made; and he refused to pay. The idea of the clause in question, Counsel said, was to protect the Company from robberies from these meters in empty houses. The defendant, a traveller, could not attend the Court. Mr. Bird made an order for the payment of the amount and costs.

#### The Use of Domestic Water for Trade Purposes.

At the Thornbury Police Court last Wednesday, a case of importance to the inhabitants of the town was brought before the Bench. The prosecutors were the West Gloucestershire Water Company; and the defendants, Mr. George Witts, baker, of High Street, Thornbury, and Frederick Holly, a man in his employ, who were summoned for using water from the Company's mains for other than domestic purposes. Mr. Metcalfe, in opening the case for the prosecution, stated that on Sept. 16, 1898, the Company entered into an agreement with the Thornbury Rural District Council, whereby the latter agreed to let certain stand-pipes and mains belonging to them, which were fixed in certain parts of the town, to the Company at the rent of 1s. for 30 years, the Company agreeing to supply for the same period, for the sum of £30 per annum, these stand-pipes with pure and wholesome water, for the use of the ratepayers for domestic purposes, and not for purposes of trade, watering gardens, and so forth. He argued that the agreement clearly showed that the water should not be used for trade purposes. Mr. S. F. Andrews, Secretary and General Manager to the Company, stated that on the 16th of July, when near one of the stand-pipes, he saw the defendant Holly filling a barrel on wheels. Witness asked him if he was aware that he must not use the water for baking. Holly replied that witness had better see his master. Thereupon witness followed Holly to the bakery, and made the same remark to the defendant Witts. The latter replied that he had used the water for baking purposes, and should continue to do so, and if summoned he should defend the case. After a long legal argument, the Bench came to the conclusion that the defendants were not persons having a supply of water from the Company, and therefore the prosecution failed; but they would give every facility to the Company to enable them to have a case stated. The summons was accordingly dismissed, with costs. The Company entered into recognizances to prosecute the appeal against the decision. Two other similar summonses were withdrawn.

**No Increase of Price at Birkenhead.**—At the meeting of the Birkenhead Town Council last Wednesday, Alderman Bloor, in moving the adoption of the minutes of the Gas and Water Committee, said he was glad to intimate that, notwithstanding the higher price of coal, there would be no increase in the price of gas. This was accounted for by the existence of a strong reserve fund, which the Committee had formed during recent years.

**The Fatal Fire at an Oil-Gas Works.**—The result of the inquiry into the circumstances attending the death of Charles Thomas, which was caused by the fire at the oil-gas works of the Great Central Railway, Sheffield, as recorded last week (p. 293) was a verdict to the effect that the deceased was accidentally killed by an explosion of gas through the breaking of a sweated joint in the machinery. They added as a rider that, in their opinion, it would be better to have a safety-valve attached to the "receiving" pipe, and to have the joints above the ground.

## MISCELLANEOUS NEWS.

### THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held last Friday, at the Offices, Horseferry Road, Westminster—Colonel W. T. MAKINS (the Governor) in the chair.

The SECRETARY (Mr. J. W. Field) having read the notice convening the meeting, the seal of the Company was affixed to the register of stockholders, and the report of the Directors (given in the "JOURNAL" last week) was taken as read.

The GOVERNOR: Ladies and Gentlemen,—In moving the adoption of the report, I hope not to trouble you so long as has been necessary at the last two meetings. Our accounts for the past year, considering all the circumstances, I think may be deemed to be fairly satisfactory. As regards our gross income, gas sales show an increase of 3·3 per cent., which, after allowing for the value of the 1d. taken off in January last from the price of gas, has yielded an addition of £20,316. Coke sales have brought in an addition of £100,582; and the average price of coke per ton during the last half year has been 15s. 7d., against 12s. 3d. in the June half of 1899. Tar has yielded nearly 3d. per gallon more; and liquor and sulphate have brought in an addition of 3d. per ton of coal. So that altogether our residuals have yielded an improved revenue amounting to £154,740 for the half year. The high prices of these residuals are the result of the high prices of coal; so that before we have had to bear the full burden of an increased coal bill, we have been anticipating to some extent the relief afforded by the corresponding increase in the price of our residuals. Turning next to the debit side of the revenue account, there is an increase in the cost of coal and oil of £150,710, which is equal to an increase of 23d. per 1000 cubic feet of gas. This arises to some extent from the failure or the inability on the part of some of our coal contractors to send in their contract quantities; and in order to maintain our stock, we had to go into the market and purchase coal where we could, at, of course, higher rates than the contract prices. I may state that now we have practically completed our purchases for the twelve months ensuing; and the price comes out at 69 per cent. above that of last year, and 88 per cent. above the price of the year 1898. The gross cost of coal, including the cost of carburetted water gas, per 1000 cubic feet for the next two years will be increased, as compared with the figures of the past twelve months, by 8d. per 1000 cubic feet. The further advances in the price of coke and other residuals we cannot take at more than 1d. per 1000 cubic feet; and this figure we arrive at from the results of the recent sales by tender of our Beekton coke. Working expenses during the half year, other than coal, have averaged 16·45d. per 1000 cubic feet, as compared with 16d. in June, 1899. This shows a gross profit of £628,018, or 13·4d. per 1000 cubic feet, as compared with 14·28d. per 1000 cubic feet in the corresponding half year. Preference and other charges will absorb £194,749; and this leaves for the dividend on the ordinary stock £433,269. Our statutory rate, with gas at the present price, is £4 8s. per cent. This corresponds to the present price of 3s. 5d. per 1000 cubic feet, and will take £329,848; so that there will be a balance which we shall be able to carry forward and add to the sum brought forward from 1899, of £103,421. This makes the total undivided balance £296,755, which, of course, under the present circumstances, will be a very useful supplement to our working capital. There is one item in the working expenses which calls for special notice. I refer to the rates and taxes. This shows an increase, as compared with June, 1899, of upwards of £7000; and there is a prospect of a still further increase in this item. The rateable value of the Company's undertaking is at present £730,600. It has quite recently, during the present revaluation, been revalued at £791,800, which would mean that in future the item of rates will be further increased by £20,000 per annum. Of course, the Directors will, if necessary, appeal against this rating at Quarter Sessions, although such proceedings are very costly. But I think it is as well for me to state that, should the revaluation be confirmed, the consequence must be that the consumers of gas in the Company's district will have to bear the burden of a further addition to the price of gas; and it cannot be too often repeated that, in accordance with the terms of their deed of partnership—that is, the Act of 1876—whatever additional charge the Company has put upon it, five-sixths of the amount must be borne by the consumers, and one-sixth by the shareholders, and *vice versa* that out of any savings or advantages which come to the Company five-sixths go to the consumers and one-sixth to the shareholders. So that the chief sufferer by this extraordinary increase in the valuation of our property for rating purposes will be the consumer of gas. We shall do everything we can to protect him, along with ourselves; but having done that, we can do no more. Our expenditure on capital account has been limited to the provision of the necessary plant to meet the increase in our business; and I need hardly say that we are exercising, and shall continue to exercise, the strictest economy in regard to capital expenditure. Out of the £76,894, £62,187 is for the cost of mains, meters, and stoves. The remaining £14,706 is made up of purifiers £5500, oil gas £8600, and sundries £606. Before I pass from the accounts, I would like to draw the attention of the shareholders to a slight alteration we have made, with the sanction of the Government Auditor, in dealing with the cost of the fittings supplied to automatic-meter consumers. Hitherto these have been charged to a suspense account, which was liquidated by means of half-yearly instalments. On the present occasion the item—which amounts to £26,574—has been charged direct to revenue account; and at the same time, the old suspense account has been reduced by £35,413. I now have to deal with the question of the increase in the price of gas, which came into operation at the close of last quarter. The necessity for the increase, in view of the higher price of coal, must be evident even to that oft-quoted individual, "The Man in the Street;" and I am glad to be able to say that, though we have some 360,000 consumers or thereabouts whom we supply with gas, we have received protests against the rise from a quite insignificant number of those consumers, and the complaints have been confined to some few people who appear to expect the price of the quarter



loaf to remain the same whether wheat stands at 28s. or 40s. a quarter. To meet an increase in the net cost which is equal to 7d. per 1000 cubic feet of gas, after we take off the 1d. we have no funds available, except the gas rental and the dividend account. Therefore, as provided by the sliding-scale, on the one hand we raise the price of gas, and at the same time reduce the shareholders' dividend. This is all provided for in the Act of 1876. "Yes," say the London County Council, "that is all very well, but what are the relative proportions?" Does not the consumer have to bear five-sixths of the charge, and the shareholders only one-sixth? And then, without any consideration of the past working of the system, they assert that the sliding-scale does not work satisfactorily to the consumers. In fact, they condemn the system because it is not wholly a one-sided system working in favour of the consumer. Now what are the facts? Since the introduction of the initial price and the sliding-scale in 1876, the surplus profits of the Company over and above 10 per cent., amounting to £17,000,000 (I am giving only round numbers; but that is sufficiently near), have been apportioned in this way: In reductions of the price of gas and meter-rents, £14,000,000; and in augmenting the shareholders' dividends, £3,000,000. Surely, I think, this must be admitted to be a complete answer to the allegations of the critics of the system; and yet, with the full knowledge of these figures, which are all in evidence, Dr. Collins, an ex-Chairman of the London County Council, stated, in a recent debate at the Council, that the sliding-scale is now found not to work so well in the interests of the consumers as it does in the interests of the shareholders. Again, he says that the consumers' share of the burden has increased, although he must have known (for he had the figures of the Comptroller in his hands at the time, in the case of this Company) that for £87,000 gained by the consumer by a reduction in the price of gas, the shareholders' proportion was only £14,806; and he must have known quite well—or he might have known, at any rate, because I am about to quote a paper which was given in evidence—that the reductions in price have been the rule and not the exception. A statement was prepared by Sir Courtenay Boyle, and laid before the 1899 Committee, which showed that from 1876 down to the present time there have been fourteen alterations in price. Ten of them have been reductions, and four of them have been increases. The reductions amount, in the aggregate, to 1s. 7½d.; the increases to 1s. 3d. Another member of the Council, in the same debate, charged the Company with obtaining money by false pretences, and with obtaining an addition to their net profits of £500,000 because coals had gone up; and he also charged us with hoodwinking the public. Now, I ask—and this is the only opportunity I have of asking—on what evidence are such statements based? And if they are not evidence, I do not think this Company or any other company should be subjected to such slanderous attacks. As to the prospects of the continuance of the present price of gas, I cannot say more than this—that those who review the history of the Company, and know its history, know perfectly well that a reduction in price will be made at the very earliest moment. But everything depends upon the price of coal; and I am sorry to say that at present there is no sign at all of any reduction in coal. On the contrary, the prices at the present moment are higher than those at which we made our contracts in May last. I hope there may be somebody present who can give us a little light on this dark question, or give us a few gleams of hope. As far as we can see at the present time, the coal market is stiffer than it has been; and there is no prospect of relief. Paragraph 8 of the report tells you of the loss of our Bill for additional capital powers. Now our justification for bringing in the Bill in the form which we presented it to the House, was, first, that it was the same Bill which had been approved by the House of Commons the year before; and, secondly, because we were convinced—and we see no reason whatever to alter our opinion—that our scheme for raising the additional capital was the cheapest and most advantageous for the consumers of gas. A 3 per cent. capital—we proposed to raise our money by a 3 per cent. debenture stock—for a gas company would have been the cheapest capital on record. But public confidence has been so shaken by recent events, that I fear any such cheap form of capital must be lost to the consumers, if not for ever, at any rate for some time to come. It has been suggested, if not actually stated, that the Directors, in bringing in the Bill this year in the same form as last—that is, on the basis of debenture stock, instead of on the basis of share capital at the standard price—intentionally ignored the recommendation of the 1899 Committee. We are not so stupid and so ignorant as not to know that Parliament in such affairs is omnipotent; and nothing could be further from our minds than any idea of flouting, or treating disrespectfully, the recommendation of any Committee of the House of Commons. The future policy of the Company as regards further capital powers will, of course, engage our serious consideration; and the result of our deliberations will be made known to you in due time—probably at the next half-yearly meeting. Still referring to legislative matters, I may inform you—and perhaps many know—that the London County Council have also been unsuccessful in their gas legislative schemes this session; for they failed to carry the provisions of their Bill for the legalizing of the portable photometer. The evidence placed before the Committee in support of these proposals was certainly of a most extraordinary character; but it was not accepted by the Committee. It was, I am glad to say, noticeable that for once this Company did not suffer from the wholesale abuse which usually falls to its share when its affairs have been discussed by the London County Council. Not a single charge was brought against the Company. We were left severely alone, except so far as the costs are concerned, with which we were saddled. At least, the concern is saddled to the extent of some £3000, of which, of course, as I said before, £2500 is the increase in the working expenses, and comes out of the price of gas, while only £500 comes out of your pocket—that is, out of the dividend fund. Now this amount of costs (about £3000) is, of course, exclusive of the costs of the other Metropolitan Gas Companies who joined us in opposition to the Council's Bill, and is also exclusive of the costs of the Bill in question incurred by the London County Council themselves in the promotion of the Bill, which must be borne by the rates; so that those of you who are ratepayers will have to find a little more money on that account. The ratepayers and the consumers alike will be taxed to a serious extent in consequence of this, I may say, almost wanton attempt to interfere with existing testing legislation, under which we have gone on satisfactorily for so long; for out of 21,000 tests that were made, we were

only fined twice. Therefore the system cannot be said to have broken down, or not to be a proper system for the protection of the public. I may say also, in regard to this matter, that, if the portable photometer scheme had been accepted by Parliament, the Metropolitan gas consumers would have been taxed to at least 1d., if not 2d. per 1000 cubic feet, merely for the purpose of increasing the already very high illuminating power of the gas. The only other matter dealt with in the same Bill—that is, the London County Council Bill—was the charge made for the use of automatic meter fittings. This question was the subject of a conference between the Companies and the Council, with the result that the clauses were redrafted in a manner unobjectionable to the Companies, and will probably afford some slight additional protection to the small consumers of gas. I must refer again to that remarkable debate at Spring Gardens. A noble Lord, a very prominent member of the Council, appears to be dissatisfied with the provisions of the Bill—I mean the provisions with regard to automatic meters—because he deems it quite wrong to make any charge upon poor people for the extra accommodation which the Gas Companies afford to the working classes, and which is so much appreciated by them. If his remarks mean anything at all, they must mean that this popular system of gas supply should be abolished, or that the ordinary consumer of gas should be taxed to the extent of about 1d. per 1000 cubic feet to provide free fittings for the working man consumer. This appears, to my old-fashioned ideas, to be absolute Socialism, and nothing else. I think I have only one more matter to deal with, and that is the repulse which this Company and the South Metropolitan Company have experienced in the House of Lords in endeavouring to carry into effect one of the most popular recommendations of the 1899 Committee—I refer to the suggested sale to the South Metropolitan Company of our southern district and works. This has been the subject of anxious and prolonged discussion by our Court. We had two interests to protect—those of the consumers in the North, which would be damaged by the acceptance of too small a price for this section of our undertaking, and those of the shareholders. But as we were at the same time desirous of showing, as far as we could, that this recommendation of the Inquiry Committee should be carried into effect, we, with the Directors of the South Metropolitan Gas Company, provisionally agreed upon a figure—a figure which we all here looked upon as inadequate as consideration money for the sale. But, as I say, in order not to flout, but to meet, the recommendation of the 1899 Committee, we submitted to a small sacrifice. Of course, when I said "we here" considered it too small a figure, I have no doubt, on the other side of the water, they thought it quite an adequate figure—at any rate, it was the only figure we could get out of them. Then, to the surprise of everybody, the Local Authorities brought all their forces to bear against the proposed sale. Their contention was that, although we were to part with the district, we were to remain saddled with the obligation as regards the price to be charged for gas supplied to public lamps in the northern district, which we undertook in 1883, in consideration of obtaining the London Company's district. Of course, this was a suggestion we could not, in the interests of our private consumers, for a moment entertain; and apparently it was also one which the House of Lords did not consider reasonable, for they refused to confirm the Bill. So that the blame, if there is any blame, for the failure to carry out this recommendation, must rest with the Public Authorities, and not with the Metropolitan Companies. In conclusion, I can only offer you one or two observations on the policy of the Local Authorities, and of a small section of the public, with regard to this Company. I think we who administer this Company have a right to complain of the somewhat harsh and unfair treatment which is meted out to us by our critics, both in Spring Gardens and elsewhere. It cannot be considered fair treatment to make general charges of maladministration without submitting in support of them some evidence—and evidence which can be examined into—and without specifying what are the acts that are complained of, when they were committed, and who did them. If we had this information, we should be able, perhaps, to make a defence; but it is impossible to make a defence to vague charges which are not based upon specific acts or a specific policy. The charges always take the same form, because other Companies, or another Company, acting under similar legislation, can make and sell gas at a lower price than the Gaslight and Coke Company, therefore the management of this Company must be bad. No account whatever is taken of the differing circumstances, which now, as always, render the two cases absolutely incomparable. I refer to one circumstance, a prominent one, which specially prevents any fair comparison being made between the two Companies—that is, the relatively large increase in business which the Southern Company receives. Their increase for the past half year has been at the rate of 12½ per cent. I think that ours has been at the rate of about 3½ per cent., and the accounts for the two Companies show that for the whole period—and we can compare that—since the amalgamation in 1883, the increase secured by the South Metropolitan Company in business amounts to 136 per cent., whereas ours only amounts to 46 per cent. It must be obvious to everybody that an expanding business can be carried on at a cheaper rate than one which is not so expanding. Of course, the reason is also pretty obvious. The competition of the electric light does not affect the Southern Company to anything like the same extent that it affects ourselves. Criticisms are plentiful; but no one yet has ever had the hardihood, even in Parliament or elsewhere, to lay down or prescribe any course of action which could by any possibility assimilate the prices charged by the two Metropolitan Companies, short of total confiscation of the dividend of this Company. I use the words "total confiscation" advisedly, because the existing difference in prices between the two Companies to-day is 7½d., which represents in this Company's district £717,000. The dividend which I suppose you will declare to-day on the ordinary stock of the Company at £4 8s., represents £668,000. So that, after you have confiscated the whole of the dividend, you would still be £57,000 short of assimilating the prices of the two Companies. Now I do not know what sort of words to use in describing a policy of that kind. I think it had better be left undescribed. The Court of this Company will, therefore, as they are in duty bound, carry on their business with a view to the common interests of the consumers and the shareholders. It is apparently assumed by the London County Council that the interests of the Company and the interests of the shareholders are antagonistic. I have shown over and over again in this room that, under the sliding-scale and auction clauses, this cannot by any possibility be the case. Therefore,



we have no objection whatever to raise to any amount of inquiry and any number of conferences, such as those which are about to be held. Any investigation of our position must show this—that either the system of the sliding-scale and auction clauses which was so highly eulogized by Sir James Rankin's Committee must be maintained, or that some other system working as equitably must be substituted. There is only one other alternative, and that is that the supply of gas should be taken over by the Municipal Authorities; and as to that policy, I have no doubt you are aware there is considerable difference of opinion. I can only say that my colleagues and I have never since we sat at this Court deviated one hair's breadth from the terms of the bargain which was sanctioned in 1876. Taking one year with another, we have done quite as well as our neighbours in the purchase of our materials and the sale of our residuals, and in our efforts to extend the Company's business; but neither we nor any other body of gentlemen could possibly alter the different conditions and circumstances under which we carry on business as compared with other Companies. When we next apply to Parliament for capital powers, we shall lay before the House the whole history and full facts with regard to this Company's working under the legislative bargain of 1876. Notwithstanding the rebuffs we have received during the past two sessions, we still have every confidence that Parliament, when fully informed, will not fail to grant the fullest justice to the shareholders of this Company, who have *bonâ fide* subscribed their capital on the faith of the parliamentary bargain, and will grant us the capital powers necessary to enable the Company to fulfil their obligations to the consumers of gas in their district. I beg to move: "That this meeting do agree with, and confirm, the report of the Directors and the Auditor's report and statement of accounts of the Company."

Mr. HOWARD C. WARD (Deputy-Governor) seconded the motion.

Mr. FRAME asked whether the Company could not take action in respect of the breach of contract in the supply of coal by their contractors.

The GOVERNOR said the coal contract was drawn up in the usual terms, but there was a proviso which protected the coalowners in the case of strikes.

Mr. FRAME said that as the increased price was foreseen, and the Company had so large a sum in hand, he could not understand why they did not enter into the contract before.

The GOVERNOR replied that the contracts were made up from year to year.

Mr. FRAME supposed they had a right to make further contracts before the expiration of the year.

The GOVERNOR replied that it was never the practice to make the contracts much before.

Mr. FRAME said that for six months it had been known that coal was increasing in price, and he should like to know whether there was any restriction against the Company going into the market.

The GOVERNOR said there was not; but if they had gone into the market in the winter, they would have paid just the same price.

Mr. FRAME thought not. He happened to be connected with coal companies in South Wales.

The GOVERNOR remarked that they did not get any coal from Wales.

Mr. FRAME asked whether anyone connected with the Company was entitled to a free supply of gas.

The GOVERNOR said the practice was to allow their officers a certain quantity of gas free of charge; but this did not apply to the Directors.

A SHAREHOLDER said he thought it would be as well to return to the old practice of charging for meters, as the Company were now giving away a large sum, and getting no thanks for doing so.

The GOVERNOR said this matter was debated at the time the charge was removed, and approved by the shareholders. In the City of London, the consumers always had free meters, but in other places they had to pay; and, as this gave rise to some complaint, the Board suggested, and the shareholders approved of the policy of free meters.

Mr. MONK thought the most important part of the Governor's remarks in moving the adoption of the report was in regard to the future of the Company. He should have been glad if the Governor had been able to inform them that the Directors had good hopes of obtaining in the next session the capital which it was evidently necessary that a concern of this nature ought to possess. He should be glad to hear from the Governor that he had not lost all hope of coming to an agreement with the South Metropolitan Company with regard to the supply of gas south of the Thames. He should also like to know whether it was the intention of the Company to apply to Parliament next session for the powers which they were not able to obtain this year.

Mr. C. E. JONES said he felt sure the shareholders must be thoroughly satisfied with the statement of the Governor. The increase in the supply of gas was highly satisfactory, and showed that the progressive development of the Company had not been arrested by rival illuminants. He did not profess to be a prophet, but some years ago he warned the shareholders that coal would never be so cheap as it had been. The gas industry of the country would be saddled with an increased cost in the price of coal of over 5½ millions sterling, and there were other advances in the materials used in the Company's business which would considerably augment this. The coal trouble was not one of to-day. They must go back for the origin of it to the last strike, when there was a struggle made by the men to obtain the supremacy of the coal market. The colliery proprietors fought the battle, and the wives of the colliers enlisted public sympathy. The masters could fight the men, but they could not fight the public; and therefore they came to terms. This was another instance of the folly of the public rushing into questions which they did not understand. If men and masters fell out, the best thing was to let them fall in again, and for the public to remain spectators of the fight. Free labour in collieries was unknown; and yet this was called a free country. By restricting the output of coal, the collier was the master of the situation. Was he likely to restrict the output? He (Mr. Jones) thought that he was, because if he brought more coal to bank than was actually required at the time, it was put into stock, when down came the price and the rate of wages. It was time the Legislature interfered in this matter, and put a duty upon the export of coal. Some 40 million tons had been exported from this country, the large proportion of which went to foreign lands; but if it had been sold in the English market, there would have been a considerable reduction in price. He thought there was a precedent for

Parliament interfering, as it regulated the price of gas and water, besides allowing oil to come into the country free. If it was fair to tax the profits of the shareholders in gas companies, it was equally justifiable for Parliament to interfere in the matter of coal. He suggested that the Company should purchase a poorer quality of coal from other countries, and enrich.

Mr. G. LIVESEY: What about the price of oil?

Mr. JONES said there were other processes of enrichment besides oil.

Mr. LIVESEY said he should be glad to know what they were.

Mr. JONES thought it was not wise to go too much into details at that meeting. If they could get Australian coal, he thought they would be justified in making some experiments. The deterioration in the quality of coke was more apparent than real; and he had sufficient confidence in the scientific staff of the Company to know that, if they had a free hand, they would give a good account of this question. For his own part, he never believed in the sliding-scale. It was not a panacea for discontent, and never would be. The old process of sticking to the statutory dividend of 10 per cent. was the true policy for the gas industry to pursue. He much regretted that Parliament had not seen fit to allow the Company to raise cheap capital. Geographically, a portion of the district of the Gas-light and Coke Company belonged to the South Metropolitan Company, who had been hungering and thirsting after "Naboth's vineyard" for many years; and it was to be regretted that after the two Companies had agreed upon the price, Parliament was told that it was a matter of indifference whether they bought it or not. In conclusion, he congratulated the Directors upon the satisfactory report presented that day.

The GOVERNOR, in reply to a shareholder, said the amount of unraised capital was £450,000.

Mr. GEORGE LIVESEY said he thought Mr. Jones was a Job's comforter, especially in his remarks about coal, for what he had said was distinctly playing into the hands of coalowners, who were now making enormous profits. He estimated that the excess profits were not less than 5s. a ton; and in case of gas coal, 8s. a ton. But taking it at the lower figure of 5s. a ton, on 240 million tons that amounted to £60,000,000, or, in other words, the total cost of the Transvaal war. Mr. Jones told them that coal would never go down in price again.

Mr. JONES said his complaint was that it would not go down to its old price.

Mr. LIVESEY said he would accept that correction. He was old enough to remember the days of 1873, when it was said that coal would never go back to its old price. In 1871, the South Metropolitan Company made a contract at 6s. per ton, free on board in the Tyne. In 1873 they paid 20s. a ton; but in 1897 coal was bought at 6s. 3d., notwithstanding all the combination of the miners. Therefore he had very good hopes that history would repeat itself, and that before long they would see coal at very nearly its old price. While upon this subject, and as the Governor had asked for a little comfort on the matter, he thought he might say that he could see a great deal of comfort. There were obvious signs that coal must fall a good deal in price before long. The main cause of the increase of price was the abnormal activity of the iron industry, the same as in 1873; but the demand for iron was now considerably decreasing. Week by week he had noticed that the demand for iron was falling away; and in one district, there had hardly been any new orders in shipping this year. He had seen it stated in a Newcastle paper that last June the exports of iron from Middlesbrough were only two-thirds of what they were in the corresponding period of the previous year; they having fallen from 100,000 to 66,000 tons. Now why was the price of coal kept up? There was a certain amount required in consequence of the war, and the public had been led to expect that the price of coal would be very much higher next winter. Everything was playing into the hands of the coalowner, with the result that the public were induced to buy; and so long as the public continued to lay in a large stock, owners could hardly be expected to reduce the price. He believed that everybody who was selling coal got something out of it—at any rate, most fallacious arguments were given for the deficiency in the supply of coal. He had seen it stated that the deficiency was due to from 15 to 20 per cent. of the miners having been called out as reserves; but this was utter nonsense. There were about 600,000 miners employed in the kingdom; and taking the percentage at 15, this would mean that there were 90,000 reservists. He should like to know what proportion of reservists the remaining six millions of working men in the country had supplied. He thought the proportion was about 2 per cent., and not 15; and this was certainly no reason for keeping up the price. Another reason given was that the railway companies could not supply trucks. All he could say was that the South Metropolitan Company, not being satisfied with the prices asked for coal in the North, looked about, and ultimately bought some from Yorkshire and the Midlands at a lower price; and they asked for a larger quantity to be supplied than they expected to use. The deliveries had been quite up to the mark—indeed, so much coal had been pouring in, that they did not know what to do with it; and in the result they had to ask coalowners to defer deliveries, as the coal could not be taken. This got rid of the suggestion that there was a deficiency of coal waggons. All these things pointed to the fact that the price of coal must come down. He had been asked by a coal agent to make a three years' contract at 13s. 6d.; but he laughed at the suggestion. The Chairman had stated that the Company had paid £150,000 more for coal; but they had got £154,000 in the shape of profit.

The GOVERNOR: That was for the last half year.

Mr. LIVESEY said it was also stated that the increase in the cost of coal was partly due to their having had to buy because contractors had fallen short in their deliveries; but when a company bought coal at 8s. a ton and the contractors could sell it at 10s., it was not to be expected that they would keep up the deliveries. The South Metropolitan Company last winter nearly ran out of coal, and had to buy at 15s. a ton. The £150,000 extra paid for coal, of course, included oil; and oil was now nearly double what it was two or three years ago. If the statement went forth that £154,000 had been received in the shape of profits, the public would want to know the justification for the increase in the price of gas. The answer was that the increase in the price of coal had not come upon them yet, because the extra price only came upon them at Midsummer. When the sliding-scale was first proposed, the argument used against it was this—that it would enable the Company to pay higher dividends, which they had done without increasing the price of gas. When the



sliding-scale was introduced, the proportion was something like 3 or 4 to 1; the consumer got three or four parts of the advantage, and the shareholders one part; and as consumers had had the benefit one way, they must now put up with the inconvenience. If it was made clear to the consumer that the sliding-scale was a fair thing—that while they had the advantage on one side they must not grumble if it went against them for a short time—he was sure they would not object. His own impression was that it was not the consumers who objected, but the London County Council, who were not particular in what they said about the Gas Companies. The more it could be made clear that the sliding-scale was an advantage, the better it would be for everyone.

Mr. GIBBONS said it had been stated that the price of gas was less on the south side of the river than on the north, and that if the price was made the same there would be no dividend left. He would like to have some further explanation upon this point.

The GOVERNOR, in reply to Mr. Gibbons, said it had been given in evidence, and it had been published over and over again, that there were several reasons why the price of gas in the north was necessarily higher than in the south of London. The most important one was the amount of capital. The Gaslight and Coke Company were nearly a hundred years old, with a quantity of obsolete capital, which could not be struck out (having been subscribed *bonâ fide*), and on which dividends had to be paid. The amount of capital per ton of coal, or per 1000 cubic feet of gas, was higher than in the case of the South Metropolitan Company. The reason the increase in consumption was not so great, was that the district of the Gaslight and Coke Company was more completely filled up; and they also had competition from the electric light. They had higher rates to pay too; and the gas had been tested more strictly, which had necessitated a greater amount of enrichment. He was glad to hear what Mr. Livesey had said about the question of coal, and the comfort he had offered to the shareholders. He could confirm very much of what Mr. Livesey had said. The fact of the matter was that the British public, when prices went up, got into a "funk;" and "funk" was the most expensive luxury anyone could indulge in. A strong piece of testimony to this was that during the last few weeks the coal traffic of the Great Eastern Company had gone up by leaps and bounds, as the people in the suburbs were filling their cellars. When the cellars were full, he thought it very likely that prices would drop. He was certain that people in the North, who always understood the signs of the times better than those in the South, were of opinion that the tide had turned—that the boom had reached its height, and that the trade of the country in iron was on the down-grade. This must bring about a reduction in the price of coal; but it would not be just yet. It would be folly in him to hold out any hopes to the shareholders that they would get a cheaper price within the next few months. Their own course was pretty well chalked out for the next two half years. Mr. Livesey had said nothing about the proposed sale; but that, of course, was out of their hands now. They would not put anything about it into their Bill. If it was to take place, powers must be conferred upon the buying Company to raise the necessary capital. Mr. Jones had referred to water gas being used as a matter of economy; but the use of water gas was strictly governed by Parliament. There was no legislation at present; but there had been an inquiry, and it would be extremely foolish to prevent legislation upon the point. Mr. Jones had also referred to the abuse which the Company got; but the Company were accustomed to that. Anonymous letters by the score had come to them; and as an instance of this sort of thing, he might read one which he had just received. The notice was returned with a red-ink comment: "You are worse than highway robbers." Mr. Monk had asked what hope the Company had of getting fresh capital next year; and in reply he might state that the facts were these: As regarded the recommendation of the 1899 Committee that the sliding-scale standard price should be reduced from 3s. 9d. to 3s. 3d., if that was applied to new capital there could be no objection beyond this—that it would be a more costly way of raising capital than by 3 per cent. debentures. There was an intention on the part of those who opposed it to read the recommendation as retrospective; and the whole *crux* of the question was this: Was Parliament going to read the recommendation retrospectively? If it did, the new scale would deprive the Company of their right to pay the 10 per cent. standard dividend; and this would mean a loss to the shareholders of £67,000 a year. If the dividend were reduced by 10s. the amount produced would be under £85,000, which would take 1d. off the price of gas. It would be an absolute breach of public faith. The capital of the Company was subscribed originally on the terms of a 10 per cent. dividend, with a right to participate in allotments of stock which was at premium, giving something to the shareholders for back-dividend. In 1876, after protracted discussion, a Bill was brought in by agreement between the Metropolitan Board of Works, the London Corporation, and the Companies supplying gas in the Metropolis, by which the Companies gave up their 10 per cent., which was practically assured to them, because if for any cause they were unable to pay 10 per cent., a Commission was appointed which fixed such a price as would produce 10 per cent. Therefore there was a guaranteed 10 per cent. But this was given up, and the sliding-scale took its place. The Bill was not a contested Bill. It was carried through by agreement between the Companies and the Public Authorities. The Standing Orders of the House were suspended so that the Bill might go through; and the Companies undertook that, if it did not go through, they would not oppose a similar Bill brought in by the Board of Trade for the same purpose. No more solemn bargain was ever entered into than the Act of 1876. If after 25 years, when the public had subscribed the money and bought and sold in the market by tender, the terms were altered and the Act was repealed, it would be a breach of public faith of unparalleled atrocity. He refused to believe that the high court of Parliament, which was the fountain of justice, would be guilty of such an act as that. All they could do was to fully put the case before Parliament; and if Parliament came to the conclusion that the innocent investor should be penalized because of a vague charge of bad management or improvident expenditure of capital in years gone by, then the confidence of the public in any enterprise the capital of which had been raised under Acts of Parliament would receive a blow from which it would never recover. If they brought in a new Bill, it would be on the lines of applying the new scale to the new capital.

The resolution for the adoption of the report was then put, and carried unanimously.

The GOVERNOR next moved a resolution authorizing the declaration of

dividends at the usual rates on the preference stock, and of £4 8s. per cent. on the ordinary stock.

Mr. WARD seconded the motion, which was carried unanimously.

The GOVERNOR afterwards proposed a resolution authorizing the Company to dispose of such portions of their property as were not now required for the purposes of the undertaking.

Mr. WARD seconded the motion, which was passed unanimously.

Mr. MONK proposed a hearty vote of thanks to the Governor for presiding, and to the Directors for their management of the Company's affairs.

The resolution was seconded, and carried unanimously.

The GOVERNOR said that, on behalf of his colleagues and himself (and he hoped he might be permitted to include the officers), he begged to thank the shareholders for this renewed expression of their confidence. The Company had passed through a very anxious time; and they had still an anxious time to pass through. But the Directors were upheld by the knowledge that their efforts were appreciated by those who had elected them to their seats.

### CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. GEORGE LIVESSEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) having read the notice convening the meeting, the report and accounts, which were summarized in the "JOURNAL" last week, were taken as read.

The CHAIRMAN: Gentlemen,—It is now my duty to move that the report of the Directors and the accounts be received and adopted, and the report entered on the minutes. We endeavour to give as much information as possible to our shareholders in the report, because we hold that the property belongs to them, and they have a right to know as much about it as the Directors, and as we are able to give within the limits of the report. We find that taking you as thoroughly into our confidence as possible tends to our own comfort, because we always find that shareholders appreciate such treatment. The report, as no doubt you have noticed, is in some respects very satisfactory. The large increase of 11 per cent. in the quantity of gas sold over the corresponding half year is very unusual. I think part of that is due to the fact of the price of gas being kept down during the greater portion of the six months, while the price of coal last winter rose very materially; and people, I imagine, have used gas for cooking and heating to a greater extent in consequence of the high price of coal. However, that will not account for the whole of the 11 per cent., which, I think, is an indication that the business of the Company is in a very healthy condition. But the main burden of my remarks to-day is on this all-absorbing question for gas companies—the price of coal. The report says that once only in the history of the Company has this price been exceeded, and that was in 1873. The price of coal at that time, free on board in the Tyne, rose from 6s. a ton in 1871 to as much as 20s. in March, 1873. It soon, however, began to drop; and before six months had elapsed, it had gone down 4s. However, the contracts were made at the high price in March, I suppose, though I was not on the Board at the time, and, therefore, the Company were in for high prices for twelve months. Now, on this occasion we find that prices have gone up very much, though not quite to so large an extent, but from about the same starting-point. In 1897, the price of coal was about 6s. 3d. to 6s. 6d. a ton, free on board; and it has gone up to 8s. last year, and to 16s. this year for Newcastle coal, whence the Company drew their supplies exclusively. Seeing that the price has advanced to such a great extent, we were looking about us, and a coal agent called and suggested our getting coal from the Midlands. We found that it would be advantageous to do so, that we should get our coal at a somewhat lower price than the North Country coal was costing, or rather the price that they were asking for the North Country coal; and we are taking all our supplies for the present from the Midland district, with a decided advantage to the Company. I may say that our contracts expire at Lady-day; and we have had to pay the high price for coal for the last three months of the half year. It is no use taking the absolute figure of the total amount paid, and comparing it with last year, because last year we had no water gas. It is called "oil gas" in the report; but I do not think it is much use calling it "oil gas." The proper term for it is "carburetted water gas." That is rather a long name; but to call it "oil gas" is misleading. It really ought to be "water and oil gas," for the *corpus*, or substance of the gas, so to speak, is made by the decomposition of water and coke; and the illuminating power is given to it by petroleum spirit. In June, 1899, we had no water gas; but in the June half of 1900 we made a considerable quantity of it—something like 88 million cubic feet out of 600 million feet. So that it is no use taking the total amount paid for coal, and comparing that, because it would be rather misleading. According to the accounts, we paid £39,675 for coal in June, 1899, and £46,648 for the half year now under review; but if we had used all oil gas, it would be a good deal more than £46,000. The proper way, therefore, to take it is to take the price per ton; and though the advanced price only took effect in the latter three months of the half year, still it gives an average advance on the half year of 3s. 4d. per ton. The price of coal for the half year to June, 1899, was 13s. 11d.; and for the half year we are now dealing with it was 17s. 3d., or nearly 17s. 4d. per ton. This advance of 3s. 4d. a ton is the average for the whole half year, though the increased price was only paid for three months. The question that everybody is asking is: Is this price of coal going to be maintained? I believe that, as in 1873 so in 1900, the price of coal must fall, and must fall at no distant date. Of course, coalowners and coal merchants are doing everything in their power to keep up the price—to induce people to lay in stocks at this high price, under the impression that if they do not they will have to pay a great deal more in the winter. I heard it remarked to-day, at the meeting of another Gas Company which I attended, by Colonel Makins, who is the Deputy-Chairman of the Great Eastern Railway Company, that the Company (the Great Eastern Railway) was not a coal-carrying railway, but that lately there had been an enormous amount



of coal brought over the line for the domestic supplies of the southern and south-eastern counties—much larger than they are accustomed to—and that this was due to the public, under the dread that coal is going to be a great deal higher, laying in their stocks now preparatory to the winter. I do not believe it is going to be higher. I believe it is coming down; and my reason for thinking so is that the great cause of the increase in the price of coal was the enormous development and activity of the iron trade. It was so in 1873, and it has been so again last year, and this. That is the main cause; but now the iron trade is rapidly falling off; and the output of, and demand for, iron is month by month and week by week becoming less and less. One illustration may be given in proof of this. Every week I read "The Times" market reports; and I have noticed that in the Clyde district there have been scarcely any orders for new shipping the whole of this year. They have been completing their old orders; but new ones are very scarce indeed. And I think I saw last week that in that district there had only been booked in the last month an order for one ship. The same remark also applies to the North-Eastern coast. I, therefore, think that it will not be long before the price of coal comes down. It will not come down to the old price of 1897 just yet; but I think there will be a material drop within—I will not say what time—but not a very long period. The other items of the accounts, I think, are very satisfactory. As I have mentioned the carburetted water gas, I think I ought to give a little more explanation on that point. So far, we have not found that water gas is anything near so cheap as coal gas; but there is this to be said—that whereas with water gas we have paid a high price for oil during the whole of the year, as I have said, the price of coal has only reached its highest just now. We have given all the figures showing the cost of manufacturing this oil gas—the oil, the coke, the labour, the purification, and the quantity of oil gas made—which works out to 1s. 7d. per 1000 cubic feet; and the corresponding figure for coal gas is only 11-3d. (say 11½d.), against 1s. 7d. It is true that to be charged against the coal gas there would be a greater amount for repairs; but I find that our total repairs to works only amount to about 4½d. per 1000 cubic feet, and I do not think more than one-third of that would be due to retorts—say, 1½d. per 1000 cubic feet due to repairs of retorts, and another ½d. per 1000 feet for interest on the larger amount of capital required for coal-gas plant. Add 2d. to our 11½d., and we get 13½d. for coal gas, against 1s. 7d. for water gas. The next item I would refer to is the question of carbonizing wages; and here I am bound to say the statement I have to make is very satisfactory. Three years ago our carbonizing wages cost us 3s. 6d. per ton of coal. They have been gradually coming down half year by half year to 3s. 4d., 3s. 3½d., 3s. 1d., and 3s.; and now they are down to 2s. 4d. per ton of coal for the coal gas—from 3s. 6d. to 2s. 4d., or a reduction of one-third. The reduction would have been even more than that, because in the interim we have raised the stokers' wages about 2½d. a ton, or 7½ per cent.; so that if you take the 2½d. off, we should get our carbonizing wages down to 2s. 1½d., against 3s. 6½d. three years ago. Now how is that brought about? Of course, it is largely due to the increased use of machinery in the retort-houses for charging the retorts and removing the coke; and another thing I am bound to refer to is that it is due to the good working of the men. It is no use having first-rate machinery unless your men are willing to work it to the best advantage; and though the greater part of this improvement in the cost of carbonizing is due to the use of machinery, still a not inconsiderable part is due to the willingness of the men to do their best in working. I do not know that there is much else that I need refer to, except the increase in the price of gas. We have been obliged to increase the price of gas, but not so much as our neighbours; and the reason for that is that we are in rather a better position than some of them. We have a very large reserve fund. Comparing our reserve fund with that of the South Metropolitan Company, this Company have a reserve fund equal to two years' dividends. The South Metropolitan Company's reserve fund is only equal to six months' dividend. Consequently, our reserve fund is such that we may contemplate drawing upon it to some extent to meet the deficiency caused by the high price of coal. Then we have a certain amount of undivided balance. We shall carry forward about £4800. That will help us; and the remainder of the deficiency caused by the increased price of coal will be borne partly by a reduction of dividend—our dividend will be reduced slightly next half year—and partly by a reduction of the profit-sharing of the employees. It may seem rather hard upon them; but it is part of the bond. We undertook to give them a certain percentage on their salaries and wages for every 1d. that gas is sold under 3s. We were down to 2s. 6d.; and their bonus amounted to 6 per cent. We have now gone up to 2s. 10d., and their bonus will only amount to 2 per cent. They lose two-thirds of it. How have they taken it? They have taken it as the consumers have taken it, and as I am sure the shareholders will take it—in a proper spirit. They say: "We have had the smooth, we must put up with a little of the rough." They say: "It is not the Company's fault; and we will do our work just as cheerfully as before." Then as to the way that the consumers have taken the increase in the price, I will read extracts from a couple of letters we have received. We explained that the increased cost of coal would add 8d. per 1000 cubic feet to the cost of making gas, but that we saw our way to meet half that by drawing from our undivided balance and our reserve fund, by a reduction in the dividend, and by a reduction in the profit-sharing bonus, which together would cover about half the extra cost; and we called upon the consumers to bear the other half in the shape of an increase in the price they paid for the gas of 4d. per 1000 cubic feet. We explained this in a circular which I have in my hands; and this has elicited a few letters from our customers, but none of them uttering a word of complaint. One gentleman writes: "May I be permitted, after reading the circular which accompanied the accounts, to express appreciation of the efforts made by your Company to meet the difficulties arising from the enhanced price of coal?" Another one writes: "I think your explanation of the rise in the charge for gas is very satisfactory. It is a nuisance having to advance prices; but you have acted as fairly as possible." There are other letters of the same kind. That, I think, is very satisfactory indeed, as coming from our consumers.

Dr. FREDERIC HETLEY seconded the resolution, which, after some remarks from Mr. H. E. JONES, was put and carried unanimously.

The DEPUTY-CHAIRMAN (Mr. F. Lane Linging) then moved that a dividend for the half year ended June 30 be declared at the rate of

5 per cent. per annum on the preference stock, and 5½ per cent. per annum on the ordinary stock.

This was seconded by Mr. ROBERT MORTON, and carried unanimously.

The CHAIRMAN said he might explain that the 5½ per cent. was the exact dividend to which they were entitled with the advanced price of gas. The price was advanced 2d. last March. In the previous half year they paid ½ per cent. less than they were entitled to.

Mr. JONES proposed a vote of thanks to the Chairman and Directors for their management of the Company's business, which, having been seconded, was passed unanimously.

The CHAIRMAN, in returning thanks, said the Directors took this vote as a sincere expression of the proprietors' approval of their conduct of the business during the half year. He then proposed a hearty vote of thanks to Mr. Shoubridge, the Engineer, and his staff, including the foremen and workmen, with which vote he wished to couple the name of Mr. Ohren, the Secretary. He felt that all had done their best to steer the good ship through very troublous times.

The DEPUTY-CHAIRMAN seconded the vote, which was carried.

Mr. SHOUBRIDGE and Mr. OHREN having returned thanks, the proceedings terminated.

### MR. A. J. BALFOUR ON THE COAL QUESTION.

The First Lord of the Treasury (the Right Hon. A. J. Balfour) visited Cambridge last Thursday for the purpose of inaugurating the summer meeting of the University Extension students, and delivered to a large audience in the Senate House a highly interesting address on "The Nineteenth Century." Dealing with the subject of the union of science and invention, he said he did not propose to attempt any sketch of our gains therefrom, but he would make one remark on an aspect of it which was likely more and more to thrust itself unpleasantly on our attention. He then went on to deal with the penalty we have paid for our industrial development; his remarks on this subject being as follows: "Marvellous as is the variety and ingenuity of modern industrial methods, they almost all depend in the last resort upon our supply of useful power; and our supply of useful power is principally provided for us by methods which, so far as I can see, have altered not at all in principle, and strangely little in detail, since the days of Watt. Coal, as we all know, is the chief reservoir of energy from which the world at present draws, and from which we in this country must always draw; but our main contrivance for utilizing it is the steam-engine, and, by its essential nature, the steam-engine is extravagantly wasteful. So that, when we are told, as if it was something to be proud of, that this is the age of steam, we may admit the fact, but can hardly share the satisfaction. Our coalfields, as we know too well, are limited. We certainly cannot increase them. The boldest legislator would hesitate to limit their employment for purposes of domestic industry. So the only possible alternative is to economize our method of consuming them. And for this there would, indeed, seem to be a sufficiency of room. Let a second Watt arise. Let him bring into general use some mode of extracting energy from fuel which shall only waste 50 per cent. of it, and lo! your coalfields, as sources of power, are doubled at once. The hope seems a modest one, but it is not yet fulfilled; and therefore it is that we must qualify the satisfaction with which at the end of the century we contemplate the unbroken course of its industrial triumphs. We have, in truth, been little better than brilliant spendthrifts. Every new invention seems to throw a new strain upon the vast, but not illimitable, resources of Nature. Lord Kelvin is disquieted about our supply of oxygen; Sir William Crookes about our supply of nitrates. The problem of our coal supply is always with us. Sooner or later the stored-up resources of the world will be exhausted. Humanity, having used or squandered its capital, will thenceforward have to depend upon such current income as can be derived from the diurnal heat of the sun and the rotation of the earth till, in the sequence of the ages, these also begin to fail. With such remote speculations we are not now concerned. It is enough for us to take note how rapidly the prodigious progress of recent discovery has increased the drain upon the natural wealth of old manufacturing countries, and especially of Great Britain; and, at the same time, frankly to recognize that it is only by new inventions that the collateral evils of old inventions can be mitigated; that to go back is impossible; that our only hope lies in a further advance."

**Suffocation by Gas.**—An octogenarian named Mrs. Hope, who resided alone at 67, Love Lane, Heaton Norris, was asphyxiated by gas last Tuesday. A neighbour, who thought it unusual that the old woman was not to be seen, burst open the back door, and found the house full of gas. Mrs. Hope was in bed in an unconscious state, and the gas was full on. Death occurred later in the day, despite medical attention.

**The Sattley Gas-Works Accident Fund.**—In the volume of the "JOURNAL" for the second half of the year 1889, we recorded a serious accident at the Sattley Gas-Works of the Birmingham Corporation. A number of men were engaged in repairing a gasholder, the water in the tank of which was very foul. Two of the men—Joseph Beswick and Thomas Case—becoming overpowered by the fumes while in the holder, an attempt was made by two of their mates, named Smith and Chew, to rescue them. Beswick was drawn up, but Case could not be released from his position. As the rescuers were feeling the effects of the fumes, they made an effort to reach the top of the holder by means of a rope ladder. Smith was successful, though much exhausted; but Chew was overpowered, lost his hold, and fell back into the tank. Beswick and Smith were removed to the hospital, and ultimately recovered; and the lifeless bodies of Case and Chew were subsequently brought up. The account of the accident which appeared in the papers excited great public interest; and a relief fund was started which reached a total of £1032. A statement of account which has just been published by the Hon. Secretary of the fund (Mr. A. W. Smith) shows how the money has been disposed of. Mrs. Case was allowed 15s. per week until her death; her children receiving weekly amounts up to June 28 last. The total payments have been £212 18s. Mrs. Chew was allowed 15s. per week until her re-marriage, and 5s. per week afterwards till June 29 last; the total payments to her having been £339 5s.



## THE SULPHATE OF AMMONIA COMMITTEE.

The Third Annual General Meeting of this Committee was held last Tuesday, at No. 4, Fenchurch Avenue, E.C.—Mr. W. G. BLAGDEN, the Chairman, presiding.

The minutes of the previous meeting were confirmed; and the report for the past year (which was given in full in last week's number of the "JOURNAL," p. 301) was taken as read.

The CHAIRMAN, in moving that the report be received and the accounts adopted, said that, as so very few of the members were able to attend the meetings, he had always thought it desirable to make the report as ample as possible; and therefore he had very little to add to it. The past year had been principally distinguished by the rather large amount of work they had had in connection with the printing and distribution of essays, and by the increase in the number of Agricultural Societies who had undertaken to carry out the Committee's prize competitions. They still had on hand a fair quantity of raw material in the shape of essays, which they might print and distribute if they thought it desirable to do so. But it seemed to be the general opinion that, for the moment, the consumer had as much literature as he could conveniently digest; and therefore that they had better not for the present distribute any more essays. The expenditure of the Committee in prizes for the Agricultural Societies would steadily increase in a normal way; and they might perhaps make it increase more rapidly, if they were to push it. It would be seen from Mr. Hunter's report that, as was the case in 1898, sulphate of ammonia had during the past year carried all before it. The experiments undertaken seemed to prove conclusively that, if judiciously applied in conjunction with other fertilizers, sulphate of ammonia was far and away the best nitrogenous manure, and almost invariably gave the best results, if due weight was attached to the quality as well as to the quantity of the crops obtained. In a tentative sort of way, the Committee had this year begun, with Mr. Hunter's assistance, to carry out some comparative grain competitions—comparative in the sense that alongside the plots to be manured with sulphate of ammonia would be other plots which would be manured with nitrate of soda; and they hoped from these competitions shortly to obtain results which would prove quite as satisfactory as those which were now in the subscribers' hands. Turning to the accounts for the year, it would be noticed with regret that there was a certain falling off in the income of the Committee. This was attributable partly to the fact that one or two subscribers had seceded from the Committee, and partly to the circumstance that in some few instances the make of sulphate had slightly diminished. The Committee had, on the other hand, succeeded in obtaining one or two new subscribers; but at present there seemed to be little prospect of their being able largely to increase the contributions to their funds. With regard to the accounts themselves, there was nothing very striking to note. Owing to the large expenditure which the Committee had had to incur in printing and publishing their essays, they had been compelled to reduce by about £200 their outlay on advertising. It would also be noticed that, in the estimated expenditure for the coming six months, there was an item of £150, which the Committee believed Mr. Hunter would require in organizing the new grain competitions.

Mr. HANBURY THOMAS seconded the resolution.

Alderman MILES asked if the secession of subscribers from the Committee, to which the Chairman had referred, was owing to any feeling of dissatisfaction.

The CHAIRMAN replied that the gentlemen concerned had not stated that they were dissatisfied. One member seceded because he had ceased to manufacture sulphate of ammonia; and the other gave no reason whatever for his action.

Alderman MILES said he should be very sorry if any feeling of dissatisfaction arose among the subscribers, because he believed the Committee were actuated by the very best motives. Of course, he always looked upon the British farmer as being a very difficult person to move; and if the Committee could move him even very slowly, it was all they could be expected to do. At any rate, every effort was being made to encourage the use of sulphate of ammonia in the United Kingdom. This was a very praiseworthy object, and one that ought to be furthered as far as possible by all makers of sulphate. It was a matter of surprise to him that the Committee did not get more assistance in this way.

Mr. W. R. CHESTER said he thought it was so palpably in the interests of sulphate manufacturers that they should become subscribers to the Committee, that if the good work done could only be properly brought before them, there might be a considerable increase in the number of members. He understood that some of the large corporations were just about to commence the manufacture of sulphate of ammonia; and he thought it was very desirable that the work of the Committee should be properly brought before them. He referred more particularly to the Corporation of Manchester.

Alderman MILES remarked that a question had been put to him as to what were the objects of the Committee; and before he had an opportunity of explaining to the best of his ability, the further question was asked: "Is it for the purpose of forming a 'ring' to keep up prices?" To this he replied that the sole object of the Committee was to encourage the use of sulphate of ammonia, and so enhance the value of it; and he believed this would be the effect of their labours.

Mr. HANBURY THOMAS said he thought it was specially stipulated at the time the Committee was formed that its object was not to be to keep up the price of sulphate of ammonia.

Alderman MILES replied that of course he was aware of this; but the outside public did not always know these things.

The motion was then put, and carried unanimously.

It was next resolved that an Executive Committee be appointed, with full power to appoint officers, to take such steps as they may think fit in the interests of sulphate of ammonia manufacturers, and to levy subscriptions as required on members, not exceeding in the whole 6d. per ton, during the ensuing year.

On the motion of Mr. W. R. CHESTER, seconded by Mr. ISAAC CARR, the Auditors were re-appointed.

A hearty vote of thanks having, on the motion of Alderman MILES, seconded by Mr. W. R. CHESTER, been passed to the Chairman,

The proceedings terminated.

## BELFAST CORPORATION GAS SUPPLY.

## The Allocation of Profits.

At the Meeting of the Belfast Corporation last Wednesday, the minutes of the Gas Committee contained an intimation that they had passed the following resolution: "That the Council be informed that, having regard to the increased price of coal and oil, and the contracts made therein, the Committee cannot see their way to alter their previous resolutions to carry forward the amount at credit of profit and loss account this year, with the view of avoiding an increase in the price of gas; reserving the question of the application of future profits, when made, for further consideration."

Alderman DEMPSEY moved, as an amendment—"That £10,000 be allocated out of the gas profits to the Finance Committee for the credit of the general purposes rate." He said he thought the resolution which had been come to by the Gas Committee was a high-handed one. He was one of the deputation from the Finance Committee who waited upon the Gas Committee to make application for a grant; and the matter was then deferred until the accounts had been published. The ratepayers had never obtained any benefit out of the gas undertaking since it was instituted. It had been used to bolster up the extravagant expenditure in the Town Clerk's department. He held that the profits should be allocated for the benefit of the people.

Mr. J. JOHNSTON seconded the amendment, which he thought was a reasonable one. He pointed out that the profits for the last nine months had been £32,000; and, after calculating the increased expenditure on coal and oil for next year, he believed they would still have a profit of £9,000 on the working of the gas undertaking, which would make £41,000 to be disposed of at the end of the year.

Mr. McINNES said, knowing as they did the price of coal, and that Glasgow had had to raise the price of gas, wholly owing to the fact that they had thrown away their reserve fund, he would urge the Corporation, in justice to the consumers, to consider the position carefully before they passed a resolution which would benefit the large ratepayers at the expense of the others.

Mr. J. THOMPSON remarked that the profits for the twelve months really amounted to something like £53,000. He thought they had an excellent reserve fund when they had written down the whole assets of the undertaking from £1,250,000 to £350,000, though he held that the amount should not have been written down below £500,000. It was really £150,000 taken out of the ratepayers' pockets. The policy in regard to the gas undertaking had always been extremely conservative, and he could not understand it. So much money had been made from year to year, and yet hardly a penny of it went to the ratepayers as it ought to do. In some towns across the water, the entire profits were given to the ratepayers. He held that the profits should be allocated for the benefit of the ratepayers; and, if it was necessary at any time through increased expenditure, they could raise the price of gas.

Alderman PIRRIE said in one sense he should be pleased if the amendment were carried; but, as a large ratepayer, he thought it would be absurd to pass an amendment giving back £10,000, when the result would probably be that at the next meeting of the Gas Committee notice would be given to raise the price of gas. This year they had not been able to write anything off for depreciation—it was probably the first time this had happened; and he was not sure that at the end of the year they would have so much in their hands as the Chairman of the Finance Committee imagined. He hoped, under the circumstances, the amendment would be withdrawn.

Mr. TAYLOR said there was one injustice which seemed to have been overlooked. The profits of the gas undertaking were almost entirely made from the small consumers; and now it was proposed to reduce the rates, which would benefit the large consumers, while it would probably lead to an increase in the price of gas. The effect would therefore be that the less wealthy portion of the population would have to pay for the reduction of the rates. This was poor finance. The profits were almost entirely made out of the small shopkeepers. He thought the amendment should be withdrawn.

Alderman GRAHAM objected to the statement that the working classes produced the gas profits. Those classes did not burn gas; they used oil, and very little gas. So far as his impressions went, it was the middle-class ratepayers who enabled them to realize such profits upon the supply of gas. He thought they should allocate the £10,000 in the reduction of the rates. It might be said that this was an unfortunate year to begin doing anything of the kind, as the price of coal was high; but probably in another year it would go down to the usual rate.

Mr. YOUNG said he could state, on the authority of Mr. Stelfox, that if the amendment were passed the price of gas would have to be increased. A statement had been made to the effect that the profits from the gas undertaking for the past nine months were £32,000, and that the profits for the other three months of the year should be one-third of this amount. That, however, was a fallacy. The nine months referred to constituted the part of the year when gas was most extensively used; while in the three months not calculated, the profits were next to nothing, though during those three summer months the fixed charges were still going on. In London, which consumed one-tenth of all the gas used in the country, owing to the increase in the price of coal and oil, the price of gas had been increased 6d. per 1000 cubic feet. This course had been followed by 250 other towns in England and Scotland; and it would have to be followed in Belfast if this amendment were passed. It was really a mistake to say that they had any profits at all. They had already exceeded their expenditure for coal and oil last year by nearly £30,000, and they were as yet only at the fringe of it. They were bound, under the Act of 1874, to allocate the profits to any useful purposes, and they had made grants to Committees when they had been asked for them. As to paying off so much of the sinking fund each year, he agreed with Mr. Thompson that perhaps they should not pay so much away every year; but he could not go with him when he said that, by taking so much off the sinking fund, they had taken £150,000 out of the ratepayers' pockets. Every penny paid off in that way enhanced the value of the gas-works, which belonged to the ratepayers. He urged the Council not to interfere with the resolution passed by the Committee, unless they were prepared at the next Council meeting to deal with a motion to increase the price of gas.



The LORD MAYOR said he thoroughly agreed with the principle of the amendment, but he hardly thought the present was an expedient time to try the experiment. The gas-works formed a very valuable asset of the city. They had cost probably upwards of a million of money, and their predecessors had been good enough to write this down to such an amount that the undertaking was practically worth three times as much as it stood for on their books. He thought the Committee should now decide that the amount standing against the gas-works should remain at that sum, and that all future profits should be allocated to the reduction of rates—excepting, possibly, a floating balance which would act as a reserve fund to prevent the price of gas going up and down. If the Committee acted on a principle like this in the future, a very large sum would annually be brought in towards the reduction and relief of the rates. Several towns in England had as much as £40,000 to £60,000 a year from the gas profits, and other corporations had £20,000, £30,000, or £40,000 from electric undertakings. This enabled them to carry out extensive schemes such as they had undertaken in Belfast, but without increasing the rates as they were obliged to do. He thought it would be wise to allow the amendment to be withdrawn, and they could deal with that matter subsequently.

This suggestion not being accepted, the amendment was put to the meeting and declared lost. A poll was then demanded, and this resulted in 14 votes being given for, and 22 against the amendment. It was, therefore, declared lost, and the minutes were adopted.

## MANCHESTER CORPORATION GAS AND ELECTRICITY SUPPLY.

### The Gas Committee's Report—The Question of Deputations.

At the Meeting of the Manchester City Council last Wednesday, the annual reports of the Gas and Electricity Committees were brought up.

Alderman GIBSON, in moving the adoption of the Gas Committee's report and statement of accounts (see *ante*, p. 303), said he did not think it necessary to make any lengthy observations. Of course, it was very satisfactory to himself, and to members of the Committee to know that they had had so very successful a year; but it was questionable whether the outlook was so favourable for the next. He, for one, had no hope of doing anything of the kind again; but he was thankful for the blessings they had already enjoyed.

Alderman RUSHWORTH seconded the proposal, which was unanimously agreed to.

In moving the adoption of the Electricity Committee's minutes, Alderman HIGGINBOTTOM said he thought it desirable to let the Council know what had been done in connection with the Lancashire Electric Power Bill, which they had been fighting before the Commons and the Lords. The Bill was one which sought to obtain authority for the promoters to go through the streets of any borough in Lancashire, virtually without the consent of the Corporation, in order to lay electric mains to serve districts beyond the boroughs. The Manchester City Council decided that the Bill should be opposed, on the principle that they ought to have control over their own streets. The Bill covered Lancashire south of the Ribble, to the borders of Cheshire and Yorkshire; and there were five other Bills of a similar character which had to be considered. These were all remitted to a Special Committee appointed by the House of Commons, and the first sixteen days of the proceedings were expended in listening to evidence on the Durham Bill and the Tyneside Bill. The Committee set out with one object—viz., to establish, if possible, a set of principles which would be applicable to the whole of the Bills. But as the Bills were so very diverse in character, it seemed to him that they had before them a task which they could not fulfil. However, while dealing with the first two Bills, they virtually settled the principles that were to guide their decisions; and when the Lancashire Bill came on for hearing, the Committee made a declaration that they recognized the granting of way-leaves through the streets of boroughs, supplying cheap electricity over large areas, and giving powers to private companies, and decided that in any future Bills which came before them, and especially the Lancashire Bill, evidence need not be given on these points, but must be confined to special circumstances showing why any borough should be exempt. This naturally very much hampered the position of the united boroughs of Lancashire, of which Manchester was one. They did their best, however. The Bills were finally passed by the Select Committee, with certain amendments, which certainly helped the position of the municipalities. After this decision, a conference of the Lancashire boroughs was again held, and it was decided that, so far as united opposition was concerned, no further action should be taken before the Lords Committee; but it was left to any boroughs who pleased to petition separately. He felt it to be the duty of his Committee to petition in the Lords; and they agreed to this course. The Bill was heard before the Lords a week ago. There were seven boroughs petitioning—viz., Manchester, Salford, Liverpool, Bootle, Stockport, Bolton, and Southport. They did not call any witnesses; but the promoters of the Bill brought forward evidence to prove their case. These witnesses were cross-examined on behalf of the boroughs; and the result was that the Committee passed the Bill, but exempted Manchester, Salford, Liverpool, Bootle, and Stockport, and, as to Bolton, stipulated that the mains should not come within 2½ miles of the Town Hall. The result was that Manchester won its case, and the promoters of the Bill could not come into their streets to get to any district beyond. He congratulated the Council on having, at any rate on this occasion, kept command of their streets. They felt deeply in this matter; and very hard work had been necessary to carry their case. He might add that the Council were especially indebted to Mr. Lambert (Chairman of the Street Mains Committee) for the work he had done, at great cost to himself, on the Special Committee representing the Corporation.

Dr. DREYFUS said it would be remembered that at the last meeting of the Council, when the question of a deputation of the Electricity Committee to the Paris Exhibition came up for consideration, he called attention to the large number of persons on the proposed deputation, and it was referred back to the Committee as a kind of instruction—or, at any rate, a wish on the part of the Council—that the number of the deputation should not exceed two, apart from the Engineer. The Committee had now altered the number to four, in addition

to the Engineer. He could assure them that the public were taking very great interest in this question of deputations; and he had received numerous congratulations from different people on the action he had taken in trying to reduce the number in this particular case. As the Committee did not seem able to come to a decision that was acceptable to the Council, he thought the Council themselves should fix the number; and he begged to move, as an amendment, that the deputation should consist of the Chairman of the Committee and the Engineer only.

Mr. JOHNSTON seconded the motion.

Mr. J. R. WILSON said he supported the motion with all the strength he had. He considered that two out of the four gentlemen recommended by the Committee would be practically of no use if they went to the Exhibition.

Mr. BARRY hoped the amendment would not be passed. He thought that a gentleman like Mr. Lambert, who had sacrificed his time and professional duties in the service of the Corporation, by going up to London in connection with the opposition to the Electric Powers Bill, should not be excluded from the deputation.

Mr. JOHNSTON said that, while he could appreciate Mr. Lambert's services in opposing the Bill referred to, when it came to a deputation of the kind under discussion, they wanted someone with a knowledge of engineering and electricity. Apart from this, he believed in reducing the number of persons sent on deputations.

Mr. LAMBERT remarked that Mr. Wilson's theory meant that no one was to be a member of a deputation unless he possessed technical knowledge of the subject. If this principle were adopted all round, he would not have had a word to say. But why did Dr. Dreyfus not urge his arguments when the deputations from the Technical Education Committee and the Tramways Committee were sent abroad? Why did he single out the Electricity Committee? So far as he was personally concerned, he did not care at all whether he joined in the deputation or not; but he thought it only right to say that the reason he was put on by the Committee was that he was Chairman of the Street Mains Special Committee of the Electricity Committee. In order to discharge the duties of that office as well as possible, he had endeavoured, during the past twelve months, to master the principles, and to some extent the practice, of electricity, especially with regard to the laying of street mains and the appliances connected therewith. It was thought by the Committee that he ought to be added to the number of those who were going to see the modern appliances connected with electricity at the Exhibition.

Alderman SOUTHERN asked how much would have been saved if, before the mains were originally put down, some person with Mr. Lambert's intelligence had ascertained what was the best mode of laying them, and how much it had cost the city to take up and replace mains which had originally been ignorantly laid.

After some further remarks,

Alderman HIGGINBOTTOM said that, in deference to the wish of the Council, the Committee had reduced the number of the deputation from eight to four, including the Engineer. As for the names submitted, the Deputy-Chairman was always associated with the Chairman, Mr. Lambert was Chairman of the Street Mains Special Committee, and Mr. Rythian was an engineer.

The amendment, on being put to the vote, was lost.

## BROMLEY GAS CONSUMERS' COMPANY.

### The Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will submit to the shareholders at the ordinary general meeting next Tuesday, they state that the increase in the make of gas for the six months ending June 30 was upwards of 13 million cubic feet—the largest in any half year since the formation of the Company. They go on to point out that a most serious advance has taken place in the price of gas coal. Two years ago it was purchasable at from 6s. 6d. to 7s. per ton, f.o.b. in the Tyne, whereas similar shipments have this year commanded from 16s. 6d. to 18s. per ton. Fortunately, the Company's coal contracts made last year did not expire until Midsummer. This enabled the Directors to continue the price of gas to the consumers without alteration until that date; but from then an additional 4d. per 1000 cubic feet will be charged. They remark that this advance is moderate in comparison with the increase in price notified by some of the larger companies; and they trust that the better prices concurrently expected for coke and other residuals may, with this small addition, render it unnecessary to make any further advance. On the other hand, should this expectation be disappointed, and the high price of coal be maintained, further changes may become inevitable.

The accounts accompanying the report show that the revenue derived from the sale of gas amounted to £18,776, residuals produced £7110, and the total receipts were £26,841. The expenditure on the manufacture of gas was £14,717 (coals costing £11,225); on distribution, £1078; and on management, £1599—the total expenses being £19,437. The balance carried to the profit and loss account is £7404; and the sum available for distribution is £9126. The Directors recommend the declaration of dividends at the rates of 12 and 9 per cent. per annum upon the 10 and 7 per cent. capital (both subject to income-tax). This will absorb £6555, and leave a balance of £2571 to be carried forward. Under the supervision of the Company's Engineer (Mr. W. Woodward), 12,866 tons of coal and cannel were carbonized in the six months covered by the report; the quantity of gas made being 128,877,000 cubic feet, of which 124,062,200 cubic feet were sold. The residuals produced were: Coke, 12,866 chaldrons; breeze, 1336 chaldrons; and tar, 130,346 gallons. The ammoniacal liquor is worked up into sulphate of ammonia; 110 tons of the latter having been produced in the past half year.

**Extension of the Incandescent Gas System in Leeds.**—The Lighting Committee of the Leeds Corporation are so satisfied with the application so far of the incandescent gas system for street lighting, that they have decided to substitute it for ordinary lighting in York Road and other thoroughfares.



THE FINANCES OF THE BRADFORD CORPORATION GAS AND WATER DEPARTMENTS.

The Bradford City Council recently had a Special Meeting to hear from the Chairman of the Finance and General Purposes Committee (Alderman H. B. Ratcliffe) his annual budget statement. After explaining in detail how the estimates of the various Committees were made up, he went on to say that the question of the appropriation of gas profits would doubtless be considered worthy of special reference. There had been appropriated from the Gas Committee's funds in relief of the rates, £386,900; for water-works revenue, £14,000; fire insurance, £15,000; and depreciation of mains and other items, £49,918—making a total appropriation since the commencement of £435,818. The amount proposed to be applied during the current year in relief of the rates was £13,700, as compared with £14,950 last year. The position of the Gas Committee at the close of the year ending March 31, 1901, would probably be as follows: The unappropriated profit on March 31, 1900, was £39,700, and the advance of 3d. per 1000 cubic feet from July 1 last to March 31 next would mean £18,500, or a total of £58,200. On the other hand, the Gas Engineer estimated the increased expenditure in respect of the advance in the price of coal would be £41,928. Deducting from this the normal profit of £20,500 left £21,428 to be provided for, in addition to £5000 for the fire insurance fund, and the £13,700 in relief of rates; making a total of £40,128, against the £58,200, or leaving an estimated amount available on March 31, 1901, of £18,072. Turning to the water-works undertaking, when he brought in the estimates of the Water Committee for last year, he stated that it was calculated their estimated expenditure and receipts would pretty nearly balance. The Committee had during the year paid £142,227 for all purposes, including interest upon the money borrowed for the Nidd Valley extension scheme; and they had received £145,481, leaving an excess of receipts over payments for the year ended March 31 last of £3254—a result which he thought was very creditable indeed in face of the great difficulties with which the Committee had had to contend. Taking the last 29 years, as long a period as would satisfy any reasonable man (figures previous to that the City Accountant did not consider reliable), the Water Committee had received assistance from the Corporation, either in the shape of water or gas profits, to the amount of £56,390. But a very big item had had to be paid for interest and sinking fund on the Nidd Valley scheme. As they knew, by the Act of 1897 they obtained a suspension of the sinking fund for seven years, which term would expire in 1904. But the Corporation had to pay two years' sinking fund before that Act was passed, which amounted to some £16,000 or £17,000. Then they had to pay a large sum for interest on the money borrowed for the Nidd Valley extension, which approached three-quarters of a million; the interest amounting to something over £22,000 a year. Accordingly, they had had to pay during the past few years on unproductive works £85,262. Deducting from this the amount received in aid from all sources (£56,390), left a balance of £28,872, which would have to be spread over the whole of the 28 or 29 years; so that, without these items, a profit on

the water-works was shown from that period of, in round figures, £1000 per annum. The amount of money invested in the Nidd works on March 31 last was as follows: Gouthwaite reservoir, £211,426; Gouthwaite lodge, £2939; Ingram reservoir, £1704; lodge and Highwoodale reservoir, £19,673; Nidd aqueduct, £432,372; and Chellow Heights reservoir, £74,717—a total of £742,831. The Corporation had already invested in old works £2,377,758, or a total investment for water-works of £3,120,589. With regard to the coming year, it was estimated that the expenditure on the water-works would again be met by the income account, without having recourse to levying a rate or appropriating trade profits. Formal resolutions were passed approving of the estimates and levying the rates.

ROTHERHAM CORPORATION GAS AND ELECTRICITY SUPPLY.

Extensions at the Gas-Works—Commencement of Electricity Works.

Last Wednesday was a memorable day in the annals of Rotherham, inasmuch as two of the undertakings in the hands of the Corporation gave rise to functions at which the Mayor (Mr. G. Gummer), and members of the Town Council officiated. Under the Bill which received the Royal Assent on Monday last week, the Corporation have obtained powers to borrow £65,000 for gas-works extensions. Of this sum, however, about £45,000 has already been expended. Show-rooms and other accommodation have been erected. The old retort-houses have been modernized as far as possible, and are now capable of producing a million cubic feet of gas per 24 hours. The new retort-house is a substantial red brick building of neat design, and is furnished with inclined retorts and the auxiliary machinery. The condensers, exhausters, and purifiers have been provided, as well as a station-meter capable of passing 80,000 cubic feet of gas per hour. The works are complete in every detail, and when in full operation they will be equal to the production of 3 million cubic feet of gas per day. On the arrival of the Mayor and the other members of the party at the works, Mr. G. Winstanley presented his Worship with a silver key, with which the opening ceremony was performed. A vote of thanks having been accorded to the Mayor, he said, in reply, that six years ago the gas-works were considered to be out of date. Since that time, however, a great amount of money had been expended—something like £45,000 having been laid out in extensions, &c.; but he might say that this was a thing which did not fall upon the rates. The gas-works were a big asset of the Corporation. Six years ago the consumers numbered about 4000; but at the present time they were more than 10,000. He went on to speak of the completeness of the extensions, and said he regarded the plant as a model one. The party were afterwards conducted round the works.

Earlier in the day, the Mayor laid the foundation-stone of the generating station in connection with the electric power and lighting scheme for the borough. In 1898 the Corporation obtained an electric lighting Provisional Order, and shortly afterwards called in Professor Kennedy to advise. They adopted his report in January, 1899, and appointed him Engineer of the work. A site consisting of 22,110 square yards was

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 343.

Issue.	Share.	When ex. Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
590,000	10	Apr. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6	60,000	5	Feb. 23	7	Ottoman, Ltd.	5—5½	..	6 7 3
100,000	10	"	7½	Do. 1 p.c.	13—14	..	5 7 2	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101—103	..	4 17 1	851,070	10	Apr. 27	7	River Plate Ord.	10—10½	..	6 13 4
200,000	5	May 16	6	Bombay, Ltd.	6—6½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
40,000	5	"	6	Do. New, £4 paid	4—4½	..	5 6 8	260,000	10	Apr. 11	8	San Paulo, Ltd.	11½—12½	..	6 8 0
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250—260	..	4 12 4	135,000	Stk.	Mar. 14	10	Sheffield A.	242—247	..	4 1 0
870,000	"	"	9	Do. New	182—187	..	4 16 3	209,063	"	"	10	Do. B.	244—246	..	4 1 4
50,000	"	"	5	Do. 5 p.c. Pref.	140—145	..	3 9 0	447,427	Stk.	Feb. 23	5½	Do. C.	244—246	..	4 1 4
159,375	"	June 14	4	Do. 4 p.c. Deb.	116—120	..	3 6 8	1,520,000	"	July 12	3	South Metrop. 4 p.c. Ord.	126—129	..	4 2 7
226,320	Stk.	Mar. 14	11½	Brighton & Hove Orig.	225—235	..	4 17 10	380,940	Stk.	May 16	5	Do. 3 p.c. Deb.	91—97	..	3 1 10
999,500	Stk.	Feb. 23	5	Do. A. Ord. Stk.	160—165	..	5 3 0	70,825	"	July 12	4	Southampton Ord.	115—120	..	4 3 10
420,000	20	Mar. 29	10	Bristol, 5 p.c. max.	125—130	..	3 16 11	120,000	Stk.	Mar. 14	6	Do. 4 p.c. Deb.	117—122	..	3 5 7
60,000	10	Feb. 23	12	British	39—41	..	4 17 7	250,520	"	June 14	4½	Tottenham and Edmont. 4 p.c. Deb.	103—108	..	5 11 1
79,000	10	"	9	Bromley, Ord. 10 p.c.	24—26	..	4 12 4	55,100	"	Jan. 12	5	Do. 3 p.c. Deb.	80—85	..	5 5 11
500,000	10	May 16	6	Do. 7 p.c.	19—21	..	4 5 8	182,380	10	Jan. 12	5	Edmonton 4 p.c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Buenos Ayres (New) Ltd.	82—94	..	6 9 9	149,900	10	July 2	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8½	Do. 4 p.c. Deb.	99—101	..	3 19 3					Do. 5 p.c. Deb. Red.	98—102	..	4 18 0
100,000	10	June 14	8	Cagliari, Ltd.	23—25	..	6 12 0								
50,000	50	May 2	6	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4								
550,000	Stk.	Apr. 11	13½	Do. 6 p.c. 1st Mort.	55—57	..	5 5 3								
236,325	"	"	10½	Commercial Old Stock	270—280	..	4 16 5								
288,237	"	June 14	4½	Do. New do.	205—215	..	4 17 8								
800,000	Stk.	May 31	9	Do. 4½ p.c. Deb.	133—138	..	3 5 3								
200,000	"	"	7	Continental Union, Ltd.	153—158	..	5 13 11								
51,600	Stk.	Feb. 23	14	Do. 7 p.c. Pref.	170—175	..	4 0 0								
173,400	"	"	11	Croydon A 10 p.c.	335—340	..	4 2 4	780,404	Stk.	June 28	11	Chelsea, Ord.	285—295	..	3 14 7
555,000	Stk.	Feb. 23	5½	Do. B 7 p.c.	265—270	..	4 1 5	150,000	"	"	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
60,000	"	"	5	Crystal Palace Ord. 5 p.c.	110—115	..	4 11 4	160,000	"	Mar. 29	4½	Do. 4½ p.c. Pref. 75	143—148	..	3 0 10
486,090	10	July 27	11	Do. 6 p.c. Pref.	130—135	..	3 14 1	175,785	"	"	4½	Do. 4 p.c. Deb.	145—150	..	3 0 0
854,060	10	"	11	European, Ltd.	19—20*	..	5 10 0	1,720,560	Stk.	Apr. 11	7	East London, Ord.	125—190	..	2 13 8
14,993,075	Stk.	Feb. 9	4½	Do. £7 10s. paid	14—15*	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	145—150	..	3 0 0
2,500,000	"	"	3½	Gas- 4 p.c. Ord.	97—99	..	4 8 10	890,000	"	June 14	7½	Do. 3 p.c. Deb.	96—98	..	3 1 3
8,799,735	"	"	4	light 3½ p.c. max.	95—97	..	3 12 2	700,000	50	June 14	7½	Grand Junction 4 p.c. Deb.	106—109	..	2 8 10
8,993,975	"	June 14	3	and 4 p.c. Con. Pref.	116—119	..	3 7 3	810,000	Stk.	Mar. 29	4	Kent	130—135	..	2 19 3
70,000	10	May 31	8	Coke 3 p.c. Con. Deb.	94—97	..	1 3 10	708,000	Stk.	Feb. 23	14	Do. New, 7 p.c. max.	200—210	..	3 6 8
2,800,000	Stk.	May 16	19	Hongkong & China, Ltd.	134—144	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	270—285	..	3 13 8
478,600	Stk.	Feb. 9	3½	Imperial Continental	197—202	..	4 19 0	406,200	100	"	8	Do. 7½ p.c. max.	203—208	..	3 16 11
75,000	5	June 14	6	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8	850,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	130—138	..	3 0 2
560,000	100	Apr. 2	5	Malta & Medn., Ltd.	4½—5	..	6 0 0	500,000	100	Feb. 23	13½	New River, New Shares	415—420	..	3 4 3
250,000	100	"	4½	Met. of 5 p.c. Deb.	107—110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	128—133*	..	3 0 2
541,920	20	May 31	8½	Melbourne 4½ p.c. Deb.	106—108	..	4 3 4	902,300	Stk.	June 14	7½	South- work 7½ p.c. max.	187—192	..	3 18 1
667,946	Stk.	Feb. 23	9½	Monte Video, Ltd.	104—113	..	6 1 8	126,500	100	"	7½	and 5 p.c. Pref.	182—187	..	4 0 3
299,855	Stk.	June 28	8½	Newcastle & Gateshead Con.	215—220	..	4 4 1	489,200	Stk.	"	5	Vauxhall 4 p.c. A Deb.	155—160	..	3 2 6
150,000	5	May 16	8	Do. 3½ p.c. Deb.	104—107	..	3 5 5	1,019,585	"	Apr. 11	4	West Middlesex	129—134	..	2 19 9
135,000	5	"	8	Oriental, Ltd.	72—73	..	5 8 3	1,155,066	Stk.	June 14	10	Do. 4½ p.c. Deb.	270—275	..	3 12 9
15,000	5	"	8	Do. New, £4 10s. pd.	62—63	..	5 6 8	200,000	"	"	4½	Do. 5 p.c. Deb.	145—150	..	3 0 0
				Do. do. 1879, £1 pd.	12—13	..	4 11 5	200,000	"	Mar. 14	8		99—101	..	2 19 5

\* Next dividend will be at this rate.



purchased at a cost of £2664. Contracts were entered into for boilers, engines, dynamos, batteries, switch-boards, cables, &c., amounting to £15,138; and in March last the Corporation applied for, and have since obtained, the sanction of the Local Government Board to borrow £27,969. The scheme provides for both private and public (arc) lighting on the three-wire continuous current system. There will be about 35 public lamps. It is estimated that in two years' time the supply will be equal to 105,000 units per annum. Provision is also being made for the generation of power for the electrical tramway system at the same station. The buildings of which the foundation-stone was laid on Wednesday comprise engine and dynamo house, boiler-house, battery-room, engineers' offices and stores, and workmen's room, together with coal-bunkers, chimney-stack, and economizer, and the necessary smoke-flues, water-lodge, &c. The different structures are brick-built with buff terracotta dressings, with strong courses of moulded bricks and Lincolnshire yellow bricks. Every provision is being made for future extensions. The Architect (Mr. J. Platts), on behalf of the Engineers and Contractors, presented to the Mayor a silver trowel and mallet, with which he laid the stone, whereon was the following inscription: "Rotherham Corporation Electric Lighting Station. This stone was laid by the Mayor, Councillor G. Gummer, J.P., Chairman of the Electric Lighting Committee, August 1st, 1900. H. Hampton Copnall, Town Clerk; Dr. A. B. W. Kennedy, F.R.S., Westminster, Engineer; Joseph Platts, Architect; W. Thornton and Sons, Contractors, Rotherham." The Mayor said they all knew that for many years Rotherham had been holding back, and had been looked upon by many people as a town without progression; but he thought, considering the work they had in hand, and the number of undertakings in which they were engaged at the present time, it could not be said it was a town without some thought of the future. The electric lighting works would, he hoped, prove as successful an undertaking to the Corporation as any other in which they were interested—and he referred more especially to the gas-works. They felt a particular pride in connection with the illumination of the town. He intimated that it was his intention to ask the Council, at the end of the year, to elect another Chairman of the Electric Lighting Committee, so that there would be competition between the gas and the electricity works—competition which, he hoped, would be for the benefit of the town. He thought it would be better that the two undertakings should be under separate control.

**The Spalding District Council and the Water-Works.**—A special meeting of the Spalding District Council was recently held in connection with the purchase of the water-works. It was decided to raise a loan not exceeding £35,000, repayable over fifty years, for buying the works, and carrying out improvements. The price of the undertaking is £25,000, and there are in addition the costs of promoting the Bill, put at £1000, also £500 compensation to the Clerk to the Water Company. The improvements which it is proposed to carry out include new mains between Spalding and Bourne, the source of supply, and arrangements for increasing the storage at Spalding. The Council will take over the works from October next.

CLACTON-ON-SEA GAS AND WATER SUPPLY.

A Successful Nine Months' Working.

Our readers may remember that the Clacton-on-Sea Urban District Council acquired last year, by arbitration, the undertaking of the Gas and Water Company, and entered into possession in June—Mr. Sydney Francis being appointed Engineer and Manager. At a recent meeting of the Council, the Gas and Water Committee presented a report on the result of the working in the nine months ending March 31 last; and it showed considerable improvement on the final twelve months' operations—viz., for the year 1898—of their predecessors. The Company's profits amounted to £2340, whereas those realized by the Council in the shorter period were £3430—an increase of more than 90 per cent.; and it was estimated that they would go up to £4573 for the twelve months. Out of the £3430, there had, of course, to be paid the interest on loans, &c., £2146; leaving a balance of £1284. There was an increase to the extent of 20 per cent. in the sale of gas; but business was not pushed, owing to the inadequacy of the plant to stand any further strain. The Committee estimated that the increase in sales would result in a further £686 of profit. Put shortly, the following is the position: The current financial year started with a balance of £1284. Up to March 31, 1901, they had an estimated profit of £6543, and an expenditure, in principal and interest, of £5691, which would leave a balance in hand on that date of £852. The Chairman of the Committee (Mr. Sidney Smith), in bringing the subject before the Council, said a great deal of credit for the results obtained was due to their Engineer. They had, in fact, excellent officers, yet they were paying £100 less in salaries than the Company. He thought this very satisfactory. As the printed figures were not before the Council, the matter could not be discussed. With regard to the preceding statement as to the inadequacy of the plant, it may be mentioned that during the time Mr. Francis has been at Clacton he has been occupied in practically rebuilding the gas-works, besides extending the water-works. He has laid upwards of 4000 yards of gas and water mains, put in a new 10,000 cubic feet engine and exhauster, by Messrs. George Waller and Co., and a new waggon weigh-bridge, besides erecting an office on the water-works and new and commodious workshops and stores. The storage capacity is being increased by the erection of a two-lift holder, 80 feet in diameter, by Messrs. Cutler and Sons, in a brick and cement tank constructed by Messrs. J. McKay and Co., and plans are in preparation for a new retort-house with regenerative settings. At the meeting of the Council last Wednesday, they showed their appreciation of their Engineer's services by increasing his salary £50 per annum.

The cartmen employed at the New Wortley Gas-Works of the Leeds Corporation recently applied for an increase of 2s. a week in their wages and for one week's holiday, with pay, each year to men of not less than twelve months' service. The Gas Committee have decided to grant an advance of 1s. a week, but not to entertain the other proposal.

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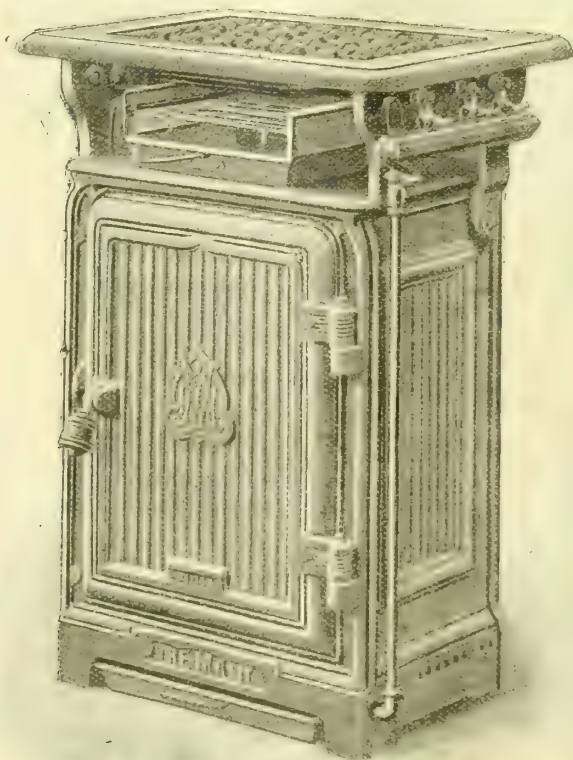
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Hot-Plate and Oven Burners, Fixed or Removable at will.

FITTED COMPLETE WITH GRILLING AND  
BOILING BURNERS ON TOP.

Enamelled Door Plate and Loose White  
Enamelled Crown, extra.

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List Prices	45s. 0d.	47s. 6d.	52s. 6d.	56s. 6d.

Full Particulars and Special Quotations on Application.



**ELECTRIC LIGHTING NOTES.**

At the meeting of the Crewe Town Council last Wednesday, a long discussion took place upon a proposal to spend an additional £10,000 upon electric lighting. By an overwhelming majority, the Council resolved to go in for the extended area.

The Bradford City Council have adopted a recommendation of the Electricity Committee that application should be made to the Local Government Board for authority to borrow an additional sum of £140,000 for the supply of electricity in the district.

At the meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that the total output of current from the central station for the half year ending June 30, was 489,055 units, against 342,327 units in the corresponding period of 1899; being an increase of 146,728 units, or 42.86 per cent.

On the suggestion of Mr. H. D. Munro, their Electrical Engineer, the Exeter City Council have decided to adopt a system of assisted wiring for domestic users of electricity. The plan favoured in Exeter is the one of employing a local firm to do the work; the Corporation making themselves responsible for the cost, and recovering the sum from the customer in instalments spread over three or five years. Mr. Munro advised the Electric Lighting Committee that the practice of carrying out installations themselves has been generally abandoned by corporations, and it is not advisable to revive it. He believes, however, that if the cost of the installation can be provided for on the easy payment system, the number of users of electric light will greatly increase in the city.

Some interesting statistics respecting the German electrical industry have, says the Berlin correspondent of the "Economist," just been published. On the 1st of March there were 652 electrical works in Germany, against 489 at the like date of 1899; and there were 122 works in course of construction, 17 of which have since been finished. The number of German towns having electricity is 900, while only 850 have gas. The rapid progress of the electrical industry is well illustrated by the statement that the ten largest companies, with a combined working capital of £10,900,000 in 1897, have already increased their capital to £40,900,000. The increase of capital is still going on this year. Nevertheless, the writer finds that a somewhat pessimistic tone prevails in the highest electrical circles of Berlin as to the future of the industry. It is felt that the field for electrical development in Germany has already been largely covered.

The Electrical Committee of the Bristol Corporation have submitted a statement of the accounts of the undertaking for the year ending the 25th of March last. The number of consumers on that day was 1215; being an increase of 248 during the year. The number of lamps connected was 85,956 (of 8-candle power), as compared with 68,536 at the corresponding period of the previous year. During the year, a number of motors were connected with the mains. The number of units sold was 1,812,511; being an increase of 449,725. The gross receipts amounted to £31,717, and the gross expenditure to £17,962; leaving a gross profit of £13,755, from which has to be deducted interest on loans and bankers' overdraft, £6019, and repayment of money borrowed, £7590—together

£13,609—leaving a balance of £146. The following statement exhibits the financial position of the undertaking on March 25, 1900: Total capital expenditure, £252,588; mortgage debt, £228,730, less £30,110 paid off or set aside, £198,620; balance at credit of reserve fund, £5000; and balance at credit of depreciation account, £2024 17s. 7d.

At last Tuesday's meeting of the Gloucester City Council, the Accountant presented a statement of accounts in connection with the electricity supply works, from which it appeared that the amount of the loan already authorized was £43,450, of which £10,000 had been borrowed at 2½ per cent. The total expenditure amounted to £30,722, including £6141 on buildings, £7198 for machinery, £1000 for accumulators at stations, £12,279 for mains and laying, £1072 for meters, £800 for electrical instruments, &c.; £1495 for Engineer's commission, &c., £496 for general expenses, and £285 for the cost of the Provisional Order. Some discussion took place in regard to extending the public lighting; and it was pointed out that if this were done the ratepayers must pay for the "luxury." With regard to the 44 arc lamps now erected, it was stated that the total cost was £1000 per annum for maintenance; while gas-lamps covering the same area only cost about £150 per annum. The matter was left in the hands of a Committee to ascertain what the cost of lighting the city generally with arc lamps would be.

Mr. John Harris last Thursday laid the foundation-stone of the new electricity supply station, which is being erected by the Board of Works for the Whitechapel district, in Osborn Street, at the same time opening the new refuse destructor which stands on the same site. The two are designed to be used in combination. The destructor consists of 12 cells, each of which is guaranteed to consume not less than 10 tons of refuse every 24 hours. The heat thus produced is to be used to work six boilers, each evaporating not less than 2000 lbs. of water an hour; and the steam obtained is to be employed in driving the electric lighting machinery. The destructor, however, does not afford all the steam required; hence eight Babcock and Wilcox boilers are also to be installed. At present, the Board of Works have about 40 miles of cable laid, and they have in hand applications from intending consumers of electricity which will involve the doubling of the output they can now give. By burning the refuse to generate power, they expect not only to destroy the dust of the district without expense to the ratepayers, but also to make a handsome profit on the supply of electricity.

**The Exmouth District Council and the Water Company.**—At a meeting of the Exmouth District Council last Wednesday, a letter was received from the Water Company giving notice of their intention to cut off the supply of water to the Council for all purposes unless they agreed to pay the sum of £60 for water supplied and to be supplied from the 1st of July to the 1st of December, and also stating that no water is to be used for flushing except after six hours' notice in writing. It was decided to reply that the Council could not pay the sum demanded, and to deny that the Company had any power to make suggestions as to the flushing of the sewers. The Council further resolved to serve notice on the Company for the purchase of the undertaking under the provisions of the Act of this session.

# JOSEPH AIRD

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## NOTES FROM SCOTLAND.

From Our Own Correspondent

Saturday.

The last meeting relating to the financial year of the Edinburgh and Leith Gas Commissioners was held on Monday. The Lord Provost of Edinburgh and the Provost of Leith being both absent on the annual visit of inspection of the lighthouses around the Scottish coasts, Bailie Manclark, of Leith, the Convener of the Finance and Law Committee of the Commission, presided. Almost the only business before the Commissioners was the approval of the accounts for the past year. Speaking to these, the Chairman said that he moved, in accordance with the recommendation of the Finance and Law Committee—"That the abstract of the accounts for the year ended the 15th of May, 1900, having been examined and found correct, the Commissioners do now allow and certify these accounts; resolve to set apart for the annuities' sinking fund a contribution of £9562 16s. 5d., being £1 per cent. in place of the minimum of 15s. per cent. on the capital value of the annuities; to set apart for the mortgages' sinking fund (inclusive of the portion applicable to the Granton works) the contribution of £3787 0s. 4d., being at the rate of £1 per cent. on £378,701 10s. 4d., the whole mortgage debt of the undertaking; and to carry forward to next year the balance of £28,349 7s. 1d." In submitting this motion, he asked to be allowed to congratulate the Commissioners, as well as the communities of Edinburgh and Leith, on the very prosperous year's business they had enjoyed, as shown by the accounts. Considering the keen competition caused by the use of oil and electricity, it would not have been surprising if they had found gas barely holding its own against such formidable rivals. Not only, however, had gas done this, but it had done much more. Taking a two years' comparison, the amount of gas sold for the year closed on the 15th of May last, as compared with that of the 15th of May, 1898, showed an increase of 179,090,900 cubic feet, almost 180 millions. The benefit derived by the increase of gas sold had been accompanied during the past year by a much larger return from residual products than in previous years. These yielded last year the substantial increase of £16,465 9s. 11d. Of that increase, £9000 accrued from tar and ammoniacal liquor, and £7000 from coke. This had brought about the gratifying result, that, though the actual prices paid for coal and oil during the year were considerably in advance of the year preceding, the net cost per ton of coal carbonized and oil, for the year to May 15, 1900, was slightly below that of 1899—a fortunate combination they need hardly expect again for some time to come. Taking these favourable circumstances into consideration, the Finance Committee were unanimously of opinion that two things ought to be done: (1) That the option of withdrawing the Granton capital expenditure from the operation of the sinking fund clause should not be exercised for this year—that represented a benefit to the mortgages sinking fund of about £1000. (2) That the contribution to the annuities' sinking fund be increased from the minimum of 15s. per cent. to 20s., benefiting the fund by about £2400. After giving effect to these recommendations, there remained to be carried forward to this year the favour-

able balance of £28,350. This, he was quite of opinion, should be agreed to in view of the outlook for the immediate future. They knew that coal and oil were both going up in price, and they hardly knew that they had got to the top price; and consequently they were convinced that it would be well to have a nest-egg to start next year with. The accounts were approved.

Mr. John S. Gibb, the Treasurer to the Edinburgh and Leith Gas Commission, has prepared his annual analysis of the accounts of the Commission for the year ending May 15 last. From this, it appears that the total expenditure upon coal was £103,231, the average price per ton of which was 11s. 4-27d.; the cost per 1000 cubic feet of gas made was 1s. 1-16d., and per 1000 cubic feet sold 1s. 2-27d. Gas oil cost £9969 for 3252 tons, the average price being 1s. 1-16d. per ton, 1-27d. per 1000 cubic feet of gas made, and 1-38d. per 1000 cubic feet sold. Purification and sundries cost 1s. 0-27d. per ton of coal carbonized, 1-18d. per 1000 cubic feet of gas made, and 1-29d. per 1000 cubic feet sold. Salaries at works cost 3-38d. per ton of coal, 0-33d. per 1000 cubic feet of gas made, and 0-35d. per 1000 cubic feet sold. Wages at works cost 4s. 10-38d. per ton of coal, 5-64d. per 1000 cubic feet of gas made, and 6-11d. per 1000 cubic feet sold. Repairs and maintenance of works cost 1s. 5-15d. per ton of coal, 1-66d. per 1000 cubic feet of gas made, and 1-80d. per 1000 cubic feet sold. The total cost of manufacture was at the rate of 20s. 0-61d. per ton of coal, 1s. 11-24d. per 1000 cubic feet of gas made, and 2s. 1-20d. per 1000 cubic feet sold. The total cost of distribution was at the rate of 2s. 2-78d. per ton of coal, 2s. 5-9d. per 1000 cubic feet of gas made, and 2-80d. per 1000 cubic feet sold. Management cost at the rate of 11-67d. per ton of coal, 1-13d. per 1000 cubic feet of gas made, and 1-22d. per 1000 cubic feet sold. The gross cost of gas was at the rate of 25s. 0-66d. per ton of coal, 2s. 5-04d. per 1000 cubic feet made, and 2s. 7-48d. per 1000 cubic feet sold. Receipts for residuals were at the rate of: Coke, 1s. 5-42d. per ton of coal, 1-68d. per 1000 cubic feet of gas made, and 1-82d. per 1000 cubic feet sold; waste lime, 0-04d. per ton of coal, 0-01d. per 1000 cubic feet of gas made, and 0-01d. per 1000 cubic feet sold; tar, 2s. 11-25d. per ton of coal, 3-40d. per 1000 cubic feet of gas made, and 3-69d. per 1000 cubic feet sold. The total return from residuals was thus at the rate of 4s. 4-71d. per ton of coal, 5-09d. per 1000 cubic feet of gas made, and 5-52d. per 1000 cubic feet sold. After deducting other receipts, the net cost of gas was at the rate of 20s. 6-93d. per ton of coal, 1s. 11-85d. per 1000 cubic feet of gas made, and 2s. 1-85d. per 1000 cubic feet sold. The gross profit was at the rate of 7s. 7-69d. per ton of coal, 8-85d. per 1000 cubic feet of gas made, and 9-60d. per 1000 cubic feet sold. The revenue from gas was at the rate of 28s. 2-62d. per ton of coal, 2s. 8-70d. per 1000 cubic feet of gas made, and 2s. 11-45d. per 1000 cubic feet sold. Contributions to sinking funds, and the cost of annuities, interest on money borrowed and on mortgages redeemed, and the expenses of mortgages were at the rate of 6s. 4-31d. per ton of coal, 7-19d. per 1000 cubic feet of gas made, and 7-81d. per 1000 feet sold. The balance carried forward was at the rate of 4s. 7-65d. per ton of coal, 5-31d. per 1000 cubic feet of gas made, and 5-76d. per 1000 cubic feet sold. The average price per ton of coal given above is arrived at by reckoning the 3252 tons of oil carbonized as 20,428 tons of

## GAS COOKERS.

Charles Dickens amongst his immortalised works has made a piece of coal tell its own history in a fascinating style. Were Charles Dickens alive now, and wished to write up a similar and up-to-date article, he could hardly do better than take a gas cooker as his topic. The writer has very briefly endeavoured to make a gas cooker speak for itself as follows:—

## MY SPEECH.

I am a cooker, known as a "Richmond," size No. 120, to be on hire from the Gas Company for 2s. 6d. per quarter, and about to be exhibited, like a slave in the Market-place of Cairo—"on hire, or for sale."

I have been called a silent servant, and like most domestic servants, I need a moderate share of "gas," but unlike the majority of such, I hold my tongue, do not give "back answers," and am always under control. To prove I am not praising myself without cause, please listen to what Miss Lillie Richmond, the sister of my founder, has to say at the Public Hall. Next week she will practically demonstrate that I am strong, well built, easily managed, with good references, and can cook a dinner at a cheaper rate than Charles Dickens' coal fire. Other virtues I possess are, no smoke, no dust, no smell, as I heard someone bluntly describe them. But now for a page from my diary:—

I was born at Stratford, Essex, a fortnight ago, and am waiting to be sent to . . . Brothers I have innumerable all around me, and those nearest to me, as I speak, are known as the No. 75's and 100's, who although smaller, are for hire at the same rate. I have an elder brother much bigger, which rents at 8s. How I envy him!

We all come of the same stock and pedigree. From the raw "pig," sent down by barge to London, then put into a large cupola until melted into liquid iron, and run off into a receptacle or cauldron on wheels, which is moved about in the foundry at the will of the foreman. The hot metal is presently poured into bowls held by men and afterwards ladled into moulded sand. All our parts when we are cool are fitted together and others added, some from one quarter and some from another, till we each have a complete body. Quite a dozen strong men had a go at me, and it was marvellous how I found my feet and felt my sides stand upright, till I was self-supporting and had a bright clean appearance. Before I go out I am to have an enamel crown to wear, a tabulated list of my accomplishments, and how I should be treated.

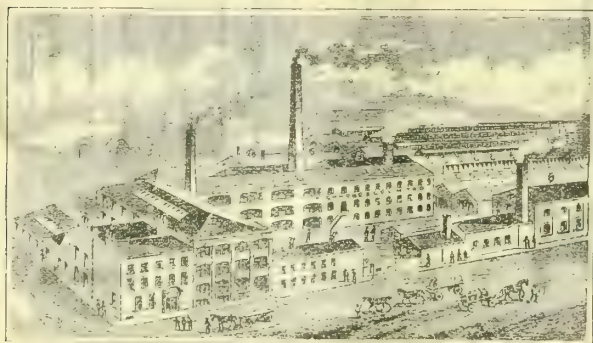
This is how my diary runs. I want to give you preliminary notice of my coming, so that everyone who reads this may bring their friends and come themselves to see me. I am at home at three o'clock and 7.30 on any day but Sunday in the Public Hall, from Wednesday next for a week.

Ladies and Gentlemen,—Hire me or one of my Brothers, and I know you won't be disappointed—

Where first-class cooking must be done,  
Try Richmond's "Model"—that's the one.

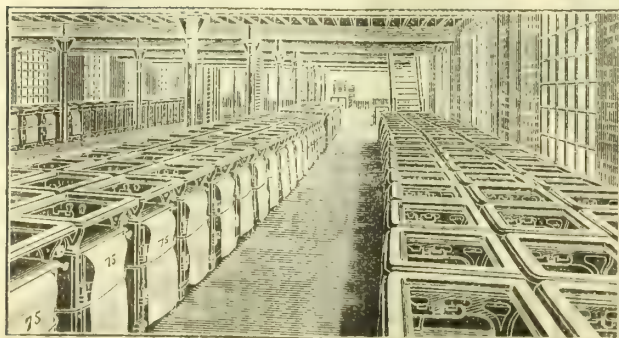
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Its results are seen in our increasing sales.



"Noble stock, I'd wish no better choice."—

Pericles V., 1.



"Fetch forth the stocks, ho!"—Lear II., 2,



coal. Taking coal alone, the average price per ton was 12s. 9-52d. The yield per ton of coal (making the same allowance for oil) was 10,355 cubic feet; and the gas sold was at the rate of 9484 cubic feet per ton. Gas unaccounted for was at the rate of 7-77 per cent. The average illuminating power was 25-18 candles. The price of gas was 3s. per 1000 cubic feet.

On Wednesday, the Perth Town Council paid a visit of inspection to the new gas-works in course of erection. They were shown over the place by Mr. A. Gillespie, of Glasgow, the Engineer for the work, who explained to the visitors the uses of the different appliances. Refreshments were served, after which Lord Provost MacGregor proposed the health of Mr. Gillespie; and in doing so, he complimented him and Mr. Watson, the Convener of the Works Committee, on the manner in which they were carrying on the work. Mr. Watson, in returning thanks, said it was the desire of the Committee to have the new works making gas in the course of a few months. Mr. Gillespie also acknowledged the toast. The company afterwards drank the health of the Contractors and of Mr. W. B. M'Luskay, the Manager.

The Gas Committee of the Glasgow Corporation have this week agreed to recommend the Town Council, in terms of the report of a Sub-Committee, to increase the price of gas from 2s. 2d. to 2s. 6d. per 1000 cubic feet.

A special meeting of the Forfar Gas Corporation was held this week, for the purpose of considering the annual accounts for the past year, and the estimates for the current year. Provost McDougall stated that the Auditor had not yet finished his audit; and, although the estimates had been prepared and circulated, he thought it would be better to adjourn consideration of both accounts and estimates for a week, when, he expected, they would have the Auditor's report before them. The estimates show that £100 was derived from last year's working, and that the price of gas is to remain at 3s. 9d. per 1000 cubic feet.

At a recent meeting of the Directors of the Lochwinnoch Gas Company, it was agreed to raise the price of gas 5d. per 1000 cubic feet. Plans were submitted and passed for alterations at the works, consisting of a new retort-house with regenerative settings. The Directors afterwards visited the works, and expressed themselves as thoroughly satisfied with their condition, and complimented the Manager (Mr. E. Davies) on his successful management since his appointment.

The Milngavie Gas Company held their fiftieth annual meeting on Thursday. It was reported that the make of gas for the year was 13 million cubic feet—an increase of over one million cubic feet upon the previous year. More gasholder accommodation is required. If ground cannot be obtained from neighbouring proprietors, it is suggested that the holder should be erected on the site of the Manager's house and the lawn in front of it; but this, it is felt, would spoil one of the best spots in the town. There are 41 shareholders of the Company, with a holding of £4500, who receive a dividend of 2½ per cent. so long as the price of gas is kept at the same figure—4s. 2d. per 1000 cubic feet. Mr. John Learmont, the Manager, has been in the Company's service forty-one years. On the 1st of December he celebrates his jubilee as a Manager.

At a meeting of the Edinburgh and District Water Trust on Monday, Mr. Wood, of Portobello, Convener of the Finance Committee, submitted

the accounts for the past year. He said the results indicated a satisfactory record of the financial progress and prosperity of the undertaking. The revenue from rates alone, including special and meter rates, amounted to £104,893. The revenue in the previous year from those sources was £101,369, which showed an increase for the year of £3529. The revenue from other sources for the year amounted to £5881, as compared with £8754. In the year 1898-99, the repayments on account of expenditure incurred in connection with the tramway operations largely accounted for the difference; there being a corresponding decrease in this year's expenditure on account of tramway operations. The gross revenue for the year amounted to £110,621, to which fell to be added the accumulated balances in favour of revenue; making a total of £139,859. The gross expenditure for the year, including payment of interest and contribution to the sinking fund, amounted to £105,119; leaving a balance in favour of revenue of £5502 for the year, and with the accumulated balance of £34,700. The mortgage debt of the Trust now stood at £1,186,261, an increase over the previous year of £142,595, and there was on short loan the sum of £40,000. Out of the total assessment of £105,302 for the past year, there had been collected £104,695, equal to 99-42 per cent. Mr. Wood concluded by remarking that within a few years the important works now in course of construction would be completed, and the communities assured of an abundant supply of pure and wholesome water for many years to come, and that without any addition to the rates. The accounts were adopted.

The annual meeting of the shareholders of the Airdrie and Coatbridge Water Company was held on Tuesday. The usual dividends of 10 per cent. on the original ordinary £5 shares, 5 per cent. on the ordinary £10 shares, 6 per cent. on the £10 preference shares, and 5 per cent. on the later preference shares, were declared.

**West Bromwich Gas Supply.**—At the monthly meeting of the West Bromwich Town Council last Wednesday, the Gas Committee reported that the sales of gas for the Midsummer quarter were 50,331,775 cubic feet, and the amount of the gas-rental was £6393 9s. 5d., exclusive of public lighting. In consequence of the advance in the price of coal, the Committee recommended that the price of gas be increased, and the following scale of charges adopted, to take effect for the Michaelmas quarter: Gas for motive-power purposes—less than 200,000 cubic feet per quarter, 2s. 3d. per 1000 feet; 200,000 cubic feet and upwards, 2s. For other purposes—less than 25,000 cubic feet per quarter in one building, 2s. 9d.; 25,000 to 50,000 cubic feet, 2s. 7d.; 50,000 to 500,000 cubic feet, 2s. 5d.; and 500,000 cubic feet upwards, 2s. 4d. A corresponding advance in the price to be charged for gas for public lighting purposes. Mr. Bushell, in moving the adoption of the report, said the increase in the sales of gas for the Midsummer quarter was 8½ per cent. compared with last year. In the face of the heavy increase in the price of coal, they had advanced the price of gas very moderately. An amendment that the recommendation respecting the charge for gas used for motive-power purposes be referred back to the Committee was defeated by a large majority; and the report was adopted.

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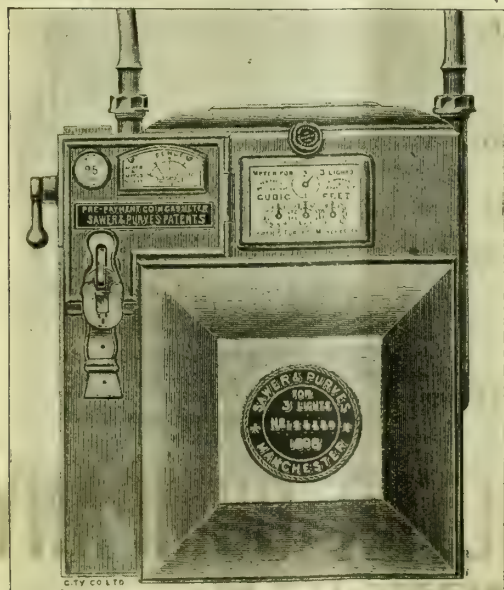
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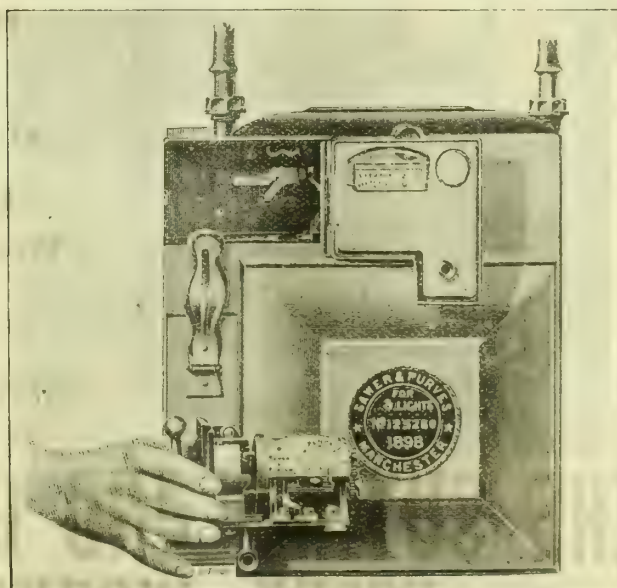
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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 3.

**Sulphate of Ammonia.**—There has been a quiet market throughout the week and some decline in value; the closing quotation being £11 to £11 1s. 3d. per ton f.o.b. at the ports. Prompt requirements being satisfied, consumers will not go in unless at a further decline; and parcels offered have been mostly taken for "covering" purposes. There is considerable inquiry for August-September delivery; but in this position, makers will not sell unless at a premium on prompt values. For delivery further ahead, there is less interest; and although a decline on prices recently quoted would now be accepted, no important business is reported.

**Nitrate of Soda** is very firm in all positions; available supplies on the West Coast not being plentiful, tonnage being scarce, and up to 40s. per ton freight having been paid. For autumn sailing, up to 8s. 7½d. per cwt. has been paid for ordinary quality. Spot prices have been advanced to 8s. 3d. per cwt. for ordinary, and 8s. 6d. for refined quality.

LONDON, Aug. 3.

**Tar Products.**—The high price now being asked for fuel is seriously felt by distillers, many of whom, however, have now returned to burning creosote and other oils in lieu of coal and coke. There is much to commend this course, as at present prices not only is it a more convenient fuel, but it is distinctly the cheapest. This new outlet for creosote and oils will undoubtedly reflect itself on the market value of them. Carbolic acid is still firm, and in good inquiry. Benzols are steady, with an excellent business being booked for early forward delivery, and are likely to maintain their improved position. There is still a good business to be done in naphthalene in its various forms. The quality turned out by English makers has greatly improved of late, and the business is assuming very large proportions. Naphthas are realizing fair prices, always excepting crude naphtha, which is not easy of sale. Solvent naphtha is, as is usual at this time of the year, strong; but the production of both it and other products at the moment is at its lowest ebb. More money is again being asked for coal; and this is likely to influence the price of pitch, which is marked stronger with important business reported for next season's delivery.

Prices may be taken as follows: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 7½d. to 8½d., according to position; special qualities for gas, 9½d.; and 50's, 10½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 45s. to 75s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—There is a decided shyness on the part of buyers, and during the week the market has been undoubtedly flat. The dulness, however, may be only temporary, as there is very little business doing, and makers have no stocks. There is not likely to be much improvement in values until the holiday season is over. The average price to-day in all positions may be taken at about £11 2s. 6d. per ton, less 3½ per cent. The improved position of nitrate of soda may help sulphate.

## COAL TRADE REPORTS.

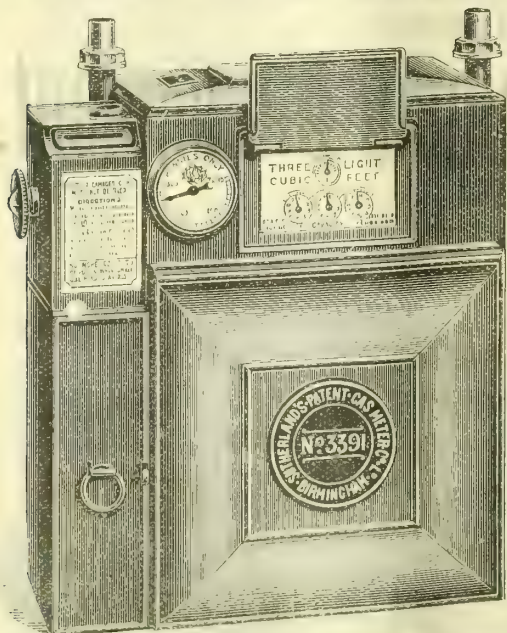
From Our Own Correspondents.

**Lancashire Coal Trade.**—The further advance on house fire coals with the 1st of the present month has come rather as a surprise, but is not more than might have been anticipated considering the excessive pressure of demand all through July for every description of fuel suitable for house-fire purposes, and which was obviously not intended to meet current requirements, but in reality to get in extra supplies prior to the upward move of 1s. 8d. per ton, which Lancashire collieries had agreed among themselves to put in force on the 1st of September. The advance which has now been declared—a month earlier than was originally intended—has put some check upon the rush of buying; but local collieries report that they are still booking orders freely at the advanced rates, all unexecuted orders having been cancelled unless they are renewed at the higher prices. This advance scarcely does more than put house-fire qualities on a level with the upward move which had previously taken place in other descriptions of round coal; and it is hardly likely that prices for gas making coals, or steam and forge qualities, will mark any further appreciable rise. In fact, the tendency of the market is rather towards lessening firmness than otherwise for some descriptions of steam coal; and contracts have been placed during the past week at lower prices than collieries were prepared to entertain a month or so back. This no doubt is due to the less favourable outlook of the large coal-using trades generally, in which here and there undoubted signs of slackening off are already becoming apparent. The extra demand for screened coal during the past month has, of course, thrown increased quantities of slack on the market; and engine fuel continues generally plentiful, with prices barely maintained at late rates. Engine fuel, in fact, in the open market is purchasable at decidedly easier prices; and it would seem more than probable that Lancashire collieries which are still holding to their full basis rates will have to give way to meet the keen competition which is coming forward from surrounding mining districts. With the exception of the advance on house coal and nuts, there is no other actually quotable change in prices, which at the pit mouth may now be given as follows: Best Wigan Arley about 16s. 6d. to 17s. per ton, Pemberton four-foot and seconds Arley 15s. to 15s. 6d., common house coal 14s. to 14s. 6d., steam and forge coal 12s. 6d. to 13s., and engine fuel from 10s. 6d. for common to 11s. and 11s. 6d. for best sorts. The shipping trade is not nearly so pressing as it has been; and although the Association basis rates for screened steam coal delivered at Mersey ports remain at 15s. 3d. per ton, business is becoming very difficult to do at this figure, which is being cut under by some outside sellers.

**Northern Coal Trade.**—There has been more activity in the coal trade in the past few days; and prices have been generally firmer through the fuller demand for shipment. Steamers have been rather more plentiful; and the tendency is towards increased activity for the next week or two at least. In the steam coal trade, this is perhaps the most noticeable—best Northumbrian steam coals being now 18s. 6d. per ton f.o.b. for early delivery; but some of the pits have contracted for the great bulk of their production, and thus are able to ask even higher prices. Steam smalls

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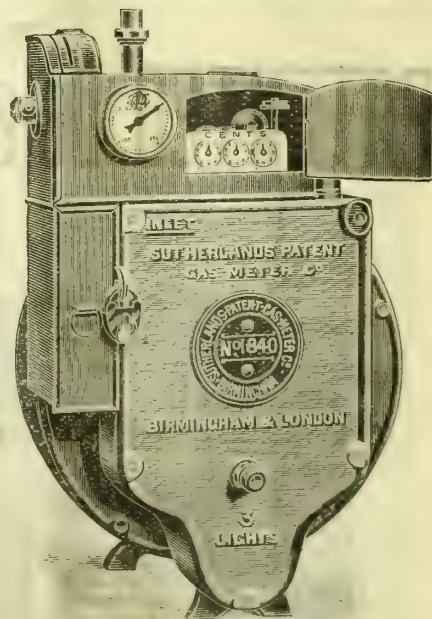
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are steadier at from 11s. 9d. to 12s. 3d. per ton. In the gas coal trade, there is a little fuller consumption; and it is evident that the stocks are not heavy with the great companies, so it is probable that increased requirements will soon show themselves. The output, however, is fairly full; and it is supposed by some of the producers that there may be difficulty in keeping up full supplies a little later in the year. The price of gas coals is firmer now that the export is larger—about 16s. 3d. to 17s. per ton f.o.b. being the quotation for best Durham. Sales of occasional cargoes are slight at present; and a few contracts at low rates still linger. In coke, the market is firm all round; 34s. 6d. being the medium price for best foundry kinds f.o.b. for export. In gas coke manufacture, there is little alteration this week; and there is still some irregularity in the quotations.

**Scotch Coal Trade.**—The demand for all classes of coal continues good; and prices are still maintained. House coal is being advanced 1s. per ton, retail prices. The Conciliation Board met in Glasgow on Tuesday, and it was reported that the men had agreed to the masters' terms, which were: "(1) That the Conciliation Board be continued for one year from 1st August. (2) Miners' and underground workers' wages shall not fall below a point 37½ per cent. over the 1888 basis, nor be advanced above 100 per cent. over the 1888 basis for one year from 1st August. (3) Miners' and underground workers' wages shall be advanced an additional 25 per cent. on the 1888 basis on 1st August, the wages so fixed to continue in force until the 1st of February, 1901." Harmony in the coal trade is thus assured for another twelve months. Under this agreement, the maximum wage will be 8s., and the minimum 5s. 6d. per day. The prices quoted are: Main, 14s. 6d. to 14s. 9d. per ton, f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. 6d. to 17s. The shipments for the week amounted to 168,989 tons—an increase upon the previous week of 29,439 tons, and upon the corresponding week of last year of 1604 tons. For the year to date, the total shipments have been 5,980,647 tons—an increase upon the corresponding period of last year of 1,054,272 tons.

**Final Meeting of the Frith Hill and Godalming Water Company.**—As arrangements have been completed for the transfer of the undertaking of the above-named Company to the Corporation of Godalming, the final meeting of the Company took place a few days ago, when the statement of accounts for the five quarters ending March 31 last, prior to the winding up of the concern, was presented. The profit was £2283; and it was decided to pay a dividend of 6½ per cent., which would leave £107 or £108 for the Directors. The Chairman (Mr. T. E. Page) pointed out that the net income of the Company for the past 15 months was £2400, thirty years' purchase of which would come to £72,000; and the amount paid by the Corporation was £72,185. Out of the purchase-money £500 had been voted to the Directors; and it had been decided to take a portion of this amount, and purchase a testimonial which could be handed to Mrs. Collier, the wife of their late and much-esteemed Vice-Chairman. A useful dressing-bag, fitted with silver mounts, and a silver tea and coffee service, had been purchased, and an appropriate inscription placed thereon.

**Maxim Carburettors at the Leeds Gas-Works.**—The result of the trial of these carburettors at the Sheepscar works of the Leeds Corporation has been so satisfactory, that they are to be installed at the other stations, at a cost of £1000.

**Stockport Gas and Electricity Supply.**—At the meeting of the Stockport Town Council last Wednesday, the Mayor, as Chairman of the Gas and Electricity Committee, proposed the adoption of the report of the Committee, which stated that the net profit on the past year's working of the Gas Department had been £8976, and on the Electricity Department £118 for the first sixteen months. He expressed the hope that this would be considered a satisfactory result. The Committee had resolved—"That the price of electric current be modified by adopting the principle of differential charging—such charge to be at the rate of 5d. per unit for the first hour's daily capacity and 2½d. per unit for all current used in excess." This was agreed to.

**New Gas-Meter Testing Office for the London County Council at Newington.**—At the meeting of the London County Council last Tuesday, the Public Control Committee brought up a report stating that the site for the proposed new gas-meter testing office at Newington having been acquired, plans had been prepared for a suitable building, the cost of erecting which was estimated by the Architect at £8550, and a provision of £10,000 had been included in the Council's Money Bill for the purpose. The Committee expressed their intention of carrying out the work without the intervention of a contractor, and of entrusting it to the Works Department, in the event of the Manager being satisfied with the Architect's estimate. This having been forwarded to the Finance Committee of the Council and approved by them, the work was sanctioned.

**Anglo-Belgian Welsbach Incandescent Gas-Light Company, Limited.**—At the second ordinary general meeting of this Company, held last Tuesday, the Chairman (Mr. G. E. N. Ryan) stated that the net profit for the 16 months of the Company's existence was £8800, of which £7100 only (for the past year) was divisible. The dividend upon the preference shares absorbed £4700; and, after the payment of 3 per cent. upon the ordinary shares, there remained a balance of between £500 and £600. The Company had been obliged to reduce the prices of burners from 14 frs. to 8 frs., and mantles from 2½ frs. to 1½ frs. They had sold in the first twelve months of working—from May 1, 1899, to April 31, 1900—178,250 mantles and 49,652 burners. Such a record as this ought to enable them to place the greatest reliance in their Managing-Director (M. Sepulchre), and justify them in hoping for substantial dividends in the future. He moved the adoption of the report. Mr. A. Marshall Jay, in seconding the motion, said he had no doubt the Company would take a first-class and prominent position in Belgium at a very early date. The mantles were being used in the King's Palace, and orders were being given daily by the Government, in addition to railway companies and other large organizations. Since the prices had been reduced, the sales had doubled, and were increasing daily. The report was adopted without discussion. Dividends at the rate of 7 per cent. per annum on the preference shares, and of 3 per cent. per annum on the ordinary shares, were then declared; and the proceedings closed with the usual votes of thanks.

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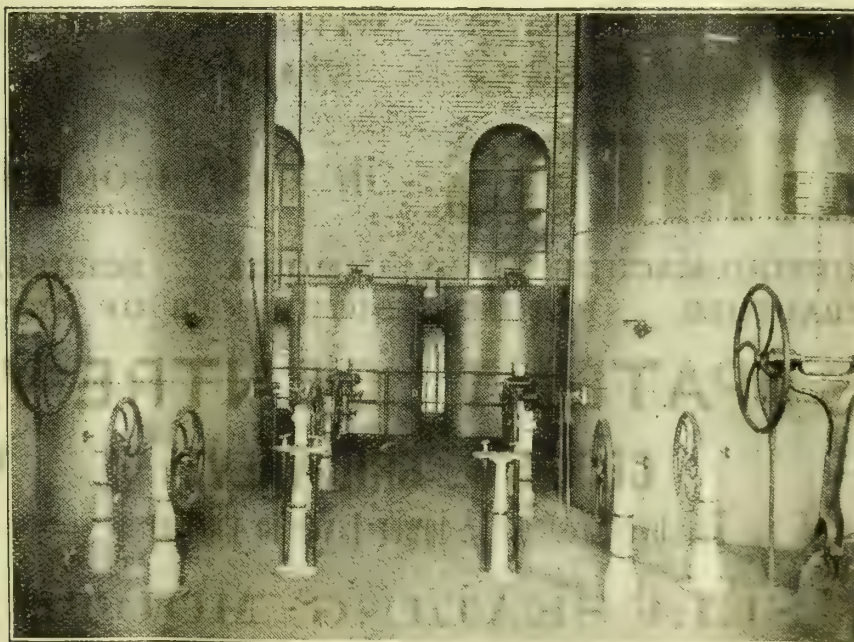
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**Opening of the Wetherby Water-Works.**—Last Wednesday the promoters and shareholders of the Wetherby District Water Company and the members of the various public bodies in the rural district of Wetherby were invited to take part in the official opening of the pumping station of the Company and a temporary reservoir on a site near Brandon Hall, Bardsey, capable of holding two million gallons. The idea out of which the present Company has arisen was first mooted some nine years ago; but it was not until April of last year that boring was commenced, and water was struck in the following June. The source of supply is a well in the lower millstone grit; and two separate sources have been tapped, from which it is expected a daily average of three-quarters of a million gallons will be pumped. The reservoir is situated about seven miles from Wetherby; and the water will be conveyed to the town in cast-iron mains. In the course of the subsequent proceedings, the Chairman (Mr. Richard Barnes) complimented Mr. T. H. Rhodes, one of the Company's Engineers, upon his success in indicating a site from which a supply of water might be obtained. The first source tapped yielded half-a-million gallons every twenty-four hours; but as this was felt to be insufficient, another bore-hole was sunk close by, from which they were fortunate enough to obtain a fresh supply—sufficiently shown by the fact that it rose 50 feet higher than the old supply. They now had enough water to supply within 6000 of the entire population of the district covered by their powers; and they had the right to bore for two more wells and erect two more pumping-stations.

**United States Coal in Europe.**—The British Consul at Philadelphia mentions, in his last report, as "one of the most interesting features of the present great commercial activity in the United States," the extraordinary demand in Europe for American coal, in consequence of the threatened coal famine on the Continent. For the first time in their history, he says, the United States have become exporters of coal to Europe. Within a short time inquiries for placing orders from London and Germany have been made in Philadelphia. In Germany the demand has arisen through the exceptional activity of German manufacturing establishments, supplemented by the exertions of the Coal Trust, which has forced the price of coal much inferior to American up to the exorbitant figure of about £1 19s. 8d. per ton to all who are not fortunate enough to have contracts placed earlier. Italy, in particular, is using American coal largely; a great number of shipments having been made there lately in consequence of the high prices of British coal. The American coal is said to be placed in the market of Genoa from 6s. to 8s. per ton cheaper than British coal. Our Consul at Trieste also mentions in his report for the past year that, in consequence of the great rise in the prices of English coal, three steamers laden with American coal reached Trieste; this being the first occasion on which American coal has been imported to Austria in competition with English coal. The Consul says he is told that coal from the Pocahontas mines, which is reported to be equal to the best Welsh steam coal, can be imported at 5s. under the price of Welsh coal. The freight charged on three cargoes of 10,000 tons that were under the Austrian flag was 20s. per ton. The imports of British coal at Trieste last year amounted, according to this report, to upwards of 166,000 tons.

**Wolverhampton Corporation Water Supply.**—The annual report of the Water Committee of the Wolverhampton Corporation shows that the profit for last year, after paying interest on capital and providing for the sinking fund, in respect of the portion of the water debt represented by the Wolverhampton Corporation stock, amounts to £6163, of which £4000 has been transferred to the credit of the improvement fund. The income for the year reached £30,080, an increase on that of the previous year, which was £28,877, while the expenditure amounted to £23,916.

**The Waste of Water in Leeds.**—The Water Committee of the Leeds Corporation held a special meeting last Tuesday, under the presidency of Mr. Denison (the Deputy-Chairman), to consider the position of the city as regards its water supply. The ascertained waste of water is very serious; and, notwithstanding the urgent appeal made to the public by the Committee, the consumption is daily increasing. It was felt by the Committee that the means at present employed for detecting waste are not sufficient to cope with the situation. A report from a Company who make a speciality of meters for the detection of waste was considered, and a Sub-Committee were appointed to deal with their offer. They were instructed to visit other towns where the Company's system has been adopted, and, if satisfied with the results, they have power to arrange for an installation in one district of the city as an experiment. This work will probably occupy from four to six weeks. The present consumption per head of the population for domestic supply is nearly 32 gallons per day; but it is hoped to reduce this by almost one-third. The Engineer (Mr. Hewson) was instructed to put down a number of meters to ascertain the true domestic consumption of water by typical households; and also, in future, in all cases of ascertained waste for trade purposes, to at once place a meter to check the quantity used.

**Gas v. Coal in Manchester.**—In a recent number of the "Manchester Guardian," Mr. E. Sykes offered a few comments on the review of Mr. Jones's pamphlet on the "Air of Rooms," which was noticed in the "JOURNAL" last week (p. 273). Mr. Sykes believes the alarm caused by the publication of the pamphlet is due simply to a re-statement of the case with no suggestion beyond that of the abandonment of the gas-stove. He says: "I am of opinion that the difficulties in connection with products of combustion emanating from the gas-stove are surmountable. The entire fault lies in inefficient ventilation or draught. I also think that the humidity could be made to approach normal conditions. If the research of Mr. Jones had continued on these lines, it would have possessed considerable utility. A modified gas-stove might have been the result; the pecuniary and hygienic aspects of the householder's situation would have been improved; and the outside atmosphere would be purified to a large extent through diminution of smoke, which at the present time is a very large factor in atmospheric contamination." Mr. Sykes gives the following figures as embodying his own experience in regard to the comparative economy of coal and gas in Manchester: 1½ cwt. of coal per week, at 1s. per cwt., 1s. 3d.; cost of firewood, 3d.—total 1s. 6d. Cost of gas, including stove hire, 8-27d.; showing a saving of 9-73d., with "greater cleanliness, less labour, and one chimney less turning its smoke into the atmosphere."

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## EDITORIAL NOTES.

## The Affairs of the South Metropolitan Company.

THE meeting of the South Metropolitan Gas Company on Wednesday last was signalized by the delivery of one of the longest and most informing addresses on the general London gas situation which even Mr. George Livesey has ever given to his old friends the South Metropolitan shareholders. It must have been noticed that of late Mr. Livesey has carried to the greatest possible length the policy he has deliberately adopted of taking the public into the confidence of the directorate of the most enterprising and expansive of London Gas Companies. He appears to have discovered, in the course of an unrivalled experience, that popular ignorance and distrust of gas companies' methods is one of the chief sources of the trouble, unnecessary expense, and downright persecution which such undertakings are commonly made to endure at the instance of local authorities. Accordingly, he has lately more than ever drawn upon the stores of his knowledge, and given free expression to his judgment on every opportunity that has offered itself for getting home to the perceptions of the intelligent public. Perhaps in due time the gas industry will reap the benefit of all this prodigality of expert testimony, and even the London County Council will be ashamed to vent such ineptitudes and meannesses as those vigorously scourged by Mr. Livesey on Wednesday. Even "the man in the street," one supposes, learns while he lives; and the London County Council are such faithful mirrors of the worst weaknesses of this much-quoted individual—they so thoroughly adopt his view that every kind of commercial dealing is a thinly-veiled robbery of the purchaser—that when he is brought to see that the term "gas shareholder" is not exactly synonymous with "thief and liar," they will instruct those who do their parliamentary work to oppose future Gas Companies' Bills on another general principle.

On the subject of gas coal prices, Mr. Livesey is persistently optimistic. He is firmly persuaded that the coal-owners will not be able to keep up the present excessive prices much longer. On their side, it may well be supposed, antagonistic views prevail. It must be taken for granted that the colliery interests will do their very utmost to keep prices up; but all experience shows that this is, in the long run, a task beyond the power of any producers. Time and again there are seasons of inflated values for most commodities, for which no generally satisfactory reason can usually be assigned. Latterly it has been the turn of the coalowners to line their pockets; and much good may they derive therefrom. They may at least rest assured that next time they find themselves in a tight place, owing to falling values, labour troubles, or anything else of the kind, the public will not forget the fat years of the close of the century. It may be said with perfect truth that this time the coalowners have a strong ally in their own workpeople, who will be careful not to make stocks which would act in the sense of depressing values. But circumstances will probably prove too strong for even so unholy a combination to bleed the British public as that of colliery proprietor and Trade Union pitman. Again, if the pitman is proved to have a hand in this game, for the sake of the stakes, it will be remembered against him next time he sends round the hat. We do not believe that, with all the will to do so in the world, the coal trade can keep the bubble from bursting. The advance of value is altogether too much. A shilling or two per ton, which the outer world has so often been assured makes all the difference between penury and comfort to coalowners and workers, might have been defended on economical and industrial grounds; and nobody would have wondered at it. But when it comes to a jump of 8s. to 10s. per ton, one is forced to believe that the possibility of realizing such an advance must be due to accidental circumstances which were not organized by the trade, although it has known how to take advantage of them. That is really the view of the situation which Mr. Livesey advertises so plainly as his own.

It is unnecessary to paraphrase Mr. Livesey's observations on the working of the sliding-scale in the reverse way to that with which the public have hitherto been familiar. He admits that the machinery might be expected to creak a little, when started in the opposite direction; but here again he is a believer in the sovereign virtue of candour. A little explanation, he is assured, is competent to lubricate the movement; and he thinks the public are entitled to this

## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.



attention. They do not always get it. In regard to the South Metropolitan advance, the hardest case is undoubtedly that of the beneficiaries under the profit-sharing scheme, who lose the whole of their bonus. In the face of such a sacrifice, even the loud voice of County Council calumny is hushed. Nobody has ventured to suggest that the Directors have put up the price of gas wantonly—nobody, that is, except the professional gentleman who is the head of the technical college where they are supposed to teach “Gas Manufacture;” but perhaps the exception is here apparent rather than real!

Mr. Livesey's references to the recent parliamentary experiences of the Company were sufficiently scathing. They were not too severe, as those who have followed the course of these proceedings will agree. Opposition to a proposal for legislation on the merits can be understood and appreciated. It is natural, and even desirable from the point of view of the promoters; because in the light of criticism defects appear which can be rectified. Rancorous opposition, however, supported by imputations and innuendoes such as those which galled Mr. Livesey on the occasion in question, is always an unworthy performance, whoever stoops to it. It cannot be wondered at that after all this year's experience—which embraced, be it remembered, some stiff fighting over certain Tramway Bills of the County Council—the South Metropolitan Company, by the voice of the Chairman, should claim to be treated *prima facie* not as thieves and vagabonds, but as honest and well-intentioned men. It is satisfactory to notice that Mr. Livesey dealt adequately with the recent imperfect statement of the Comptroller of the London County Council as to the rate of interest received by shareholders in the London Gas Companies. This statement required such a commentary as it has now received; and possibly this clearing up of the matter will suffice. Mr. Haward not only omitted to take account of transfers of stock at the market value, but he also ran up against the “increased increment” itself which has rewarded the fidelity of those who stuck to gas property when it was not in the repute it enjoys to-day.

#### The Way of Progress.

WE have received some expressions of appreciation of our last week's article insisting on the necessity for gas directors to bestir themselves in the sense of pushing the trade in gas. Gratifying as such communications must naturally be to ourselves, we should grieve at the prospect of their remaining no more than empty compliments. The best proof of our readers' agreement with the “forward policy” persistently advocated in these columns would be the production of patent evidence that they were acting upon our advice. It is for this reason that we have addressed our appeal to Directors in the first place, and principally; because unless the Board of a gas company realize their responsibility as the heads of a commercial concern, the manager can do very little outside his works. The curse of the joint-stock company system, statutory or otherwise, is guinea-piggery in the Board-room. In the case of British Gas Companies, the measure of statutory protection they enjoy has fostered the spirit of automaticity, to coin a word, in the administration, which is highly detrimental to commercial efficiency. One eminent exponent of this quality of gas administration flatters himself that he has exactly defined the position of the gas undertaking with which he is connected in calling it a “*quasi* Department of State.” We have all heard and applauded of late the declaration of a prominent statesman that the chief need of the British Empire is reorganization upon a business footing. So, let us say after him, the necessity of the hour for British gas undertakings is the getting rid of this wooden style of government, this contentment to follow on the lines of a Department of State, or even of a Municipal Corporation, and the adoption of a determination to run the business upon business lines.

The early statutory association of gas with water supply doubtless encouraged this idea of automatic administration as being equally appropriate to both. The practice of pushing trade is obviously inapplicable to the case of a water company. Not that there is no room in a water undertaking for intelligent and enterprising administration. On the contrary, there is plenty of scope for administrative talent of a very high order in a water undertaking; but the staple commodity of the business is not subject to the laws of ordinary trade. While gas and water supply offer many parallels, they differ fundamentally in this respect, that while one can be replaced by something else, the other is a

prime necessary of life. Nevertheless, we find in far too many instances a gas undertaking administered without any apparent recognition of the difference between the nature of the demand for gas as compared with the need for water. People are supposed to consume gas because they cannot help it. Nothing is done to encourage gas consumption; much to repress it. Public opinion is treated as a negligible quantity. Gas chairmen “do not hesitate,” as they say, to put up the price of gas to any figure they think necessary, without deigning to acquaint the public with the reasons for an increase. In very few undertakings is original enterprise fostered or suitably rewarded. Boards of directors follow one another, at irregular intervals, like a flock of sheep, in adopting such revolutionary methods of increasing gas consumption as establishing a hiring-out department for kitcheners and stoves, or adopting prepayment meters; but they usually strike the public as more anxious to do as little as they dare than as much as they can in the interest of the community they are privileged to serve. This is the spirit, and the reputation, that we are always working to exorcise and remove.

Gas companies must be prepared to do more for their public than they ever did in the past; and gas directors should consider their position accordingly as being analogous to a seat on the board of a brewery or a cash “stores.” The keenest and most cutting businesses can be, and are, conducted by boards of directors; and these might be the training schools for modern gas administrators, rather than any Government circumlocution office, filled with Tapers and Tadpoles. Gas companies do not need any more lessons in the art of “how not to do it.” There is so little difficulty in the business at bottom, that a director habituated to the work of carving out dividends from the midst of a crush of competitors (say) in the “coffee-roll-and-butter” trade, would smile at what passes for enterprise in a statutory gas undertaking.

Only, it is necessary to repeat, it will be neither right nor reasonable to shift upon the manager the responsibility for actually doing all aggressive work. If the manager is capable of doing it, and is paid accordingly, there is nothing to be said against his having the additional work; but certainly not otherwise. What interest can the engineer and manager ordinarily have in taking upon himself the burden of an additional department which was “not in the bond” of his engagement? Many a man so situated would say, justly, “I should not even get thanks for it; and if anything “turned out unsatisfactory, or I was outside when I should “have been at the works, I should never hear the last of it.” *Verb. sap.*! Even gas managers are but human. But at the same time, where a new department of distribution is created, it is essential that this should be under the superior control of the engineer and manager—not to interfere with, but to see that it does not give rise to any conflict of interests. The policy of every department of a gas undertaking should be settled by the engineer and manager in consultation with the Board, and nothing should be done behind his back. This rule sounds simple and obvious enough; but unhappily it is not infrequently broken in the most highly-organized concerns.

Lastly, we have received a suggestion from an esteemed correspondent and friend of long standing, which deserves mention in this connection. He alludes to the trade organizations which cover the country, and asks why gas managers do not have something of the kind for themselves. The members of these trade associations meet in private, as well as (some of them) publicly, for the discussion of matters of common interest. Perhaps one reason why District Associations of Gas Managers fail to keep up their attractiveness to the mass of members might be found in the circumstance of everything except the Committee work, which is usually trivial, being done in public. Yet members of these Associations who have served on the Committees freely confess that they have been amply repaid by the friendships found and the help received in the privacy of these gatherings, ostensibly held for other purposes. Well, now, when the union of the national technical societies is consummated, it will be quite feasible to convert the existing District Associations into District Committees, or to appoint all the members residing in certain areas *ipso facto* committeemen for that district. The meetings of these Committees might be either public or private, at will; and, in the latter case, all those vital points of gas administration and management which it is not expedient to bruit abroad might be considered freely and fully. As our correspondent remarks



in his letter, "At present we tell the public everything, and "there is no unanimity amongst us." The accounts of gas undertakings are published; and this ought to suffice. It is not as if gas managers could form themselves into "rings" with objects inimical to the interests of the public. They have no temptation to do anything of the kind. But a technical committee, meeting without reporters, might prove a very useful institution. We should like to hear other readers of the "JOURNAL" on the suggestion. Even the much-vilified circular of inquiry is at bottom a witness to the need for something of the kind.

#### Mr. Livesey and Others on the Coal Outlook.

THE robust optimism as to the nearness of an easing of the coal market with which Mr. Livesey has taken more than one recent opportunity of endeavouring to reassure the gas consumer and coalowner, is, it is to be observed, shared by more than one other competent authority. The Midland Railway Company, as was noted in these columns some while since, have adopted a course similar to that followed by the South Metropolitan Gas Company—namely, that of making shorter contracts for coal than usual, and trusting to buy their further requirements at a lower price. The latter Company, as is well known, only entered into six months' contracts from the end of March last, instead of the usual purchases of a year's supplies. The Midland Company, Sir Ernest Paget informed the shareholders last Friday, who, in the ordinary course, enter into yearly contracts on the 1st of July for about 100,000 tons, decided this year to only contract for four months' requirements from that date. So far, then, as both Companies are concerned, the cards are on the table; the most pessimistic thing that could be said of their chances in the game at the present moment being that they will not do any worse at the end of September than they would have done three or six months earlier. We, however, think the chances of their doing better can be put higher.

The facts adduced by Mr. Livesey as to the way in which the coal bought by his Company for delivery during the summer months had, contrary to expectation, been sent in sharp to the stipulated date, certainly justify his deduction therefrom that the supply has not fallen short of the demand to anything like the extent that the coalowners and merchants would like the public to believe. It is indeed remarkable that the South Metropolitan Company should have 32,000 tons more of coal in stock at the end of June than their neighbours north of the Thames, whose stock, be it said, was then well up to the normal. The former Company's store of 162,000 tons is, we estimate, equal to five maximum winter weeks' requirements.

While, therefore, the organs of the coal and allied trades report weekly continued activity in the coal market and prosperity of the coalowners and dealers, signs are not wanting that the price-curve which has so persistently moved upward since last autumn will soon begin its return course towards the normal level. Mr. Livesey referred the other day to one of those signs—namely, the falling off in the export of iron and of goods manufactured therefrom. Since then the Board of Trade returns for July have been published, and show further and equally striking decreases in those exports. The total weight of iron and steel goods shipped to other countries during the month was 267,143 tons, which compares with 370,014 tons in July, 1899, and is actually less than the exports—281,194 tons—in the same month of 1898. Further, the total value of steam-engines and machinery other than steam-engines sent abroad was, even at the present higher prices, less than last year by £164,292, or 9 per cent., and £12,742 below the corresponding figure in 1898; while the ships sold to other countries were of less value than in 1899 by 16 per cent. Again, turning from the trades that indirectly affect the coal market to the actual exports of coal, we find there also a falling off in the shipments, which though small it is gratifying to note. The total quantity of fuel exported in July was 3,981,021 tons, and the coal shipped for the use of steamers engaged in foreign trade equalled 979,097 tons. The corresponding figures for last year were 3,993,942 and 1,029,360 tons respectively; the aggregate in 1900 being  $1\frac{1}{4}$  per cent. less than in 1899. A further man "in the know" who does not join the chorus of the "coal at 50 shillings" party, is Councillor Johnson, the Warwickshire miners' agent. If only people, he says, would wait till October before buying their winter stock of coal, they need fear no further rise in price. How-

ever, led by an ignorant but talkative Press, the public have taken a different course; and so we read that "it is said that the demand for house coal at this time of the year has never been so active since 1872." We will see what the same report says in two months' time.

#### A Fortunate Gas Company, and their Duty to the Consumers.

IT is not an infrequent occurrence that a man finds himself in a situation in which he has to determine which of two courses he shall pursue. In his own mind, he can find arguments both for and against each. He sees some uncertainty in both, knowing that either may in the future, by a turn of events, prove to be wrong. Anyway, he has to decide, and can only trust that he has selected aright. Trading companies are not exempt from this experience of the individual; and, although it is said that there is "safety in numbers," even a Board of Directors, however good and prudent they may be, are not infallible. But there are times when two courses present themselves in connection with a question, and give little anxiety—the right one being palpable. The Directors of the Brentford Gas Company were recently in that happy position in respect of the price of gas; and, it seems to us, they chose the obviously correct course. The Company, as things now go, are in a fortunate and enviable condition. They have a coal contract running, at an advance of only 3s. 7d. per ton on the previous price, which will carry them on to this time next year; the profits of the past six months have enabled them to pay their usual dividend, and carry £6000 to the undivided balance; and the Directors can see sufficiently far ahead to predict, with almost absolute certainty, that the profits of the twelve months ending Christmas (at the present price of 2s. 11d. for gas) will suffice for the year's dividend. In addition to this, they have a substantial amount of undivided profit. This was the position in which the Directors found themselves when they had to consider which of two courses they should take in regard to the price of gas. All around them they saw their neighbours were advancing their charges; and the questions for them to choose between were: "Shall we do the same, or shall we, as we can afford to do, continue selling gas at the existing figure, although the time may come when we shall have to pay more for our coal?" But the present outlook gives promise that that time may not be yet. The Board determined not to raise the price.

In this directorate runs a strong vein of the Court of the Gaslight and Coke Company; and therefore their resolution on this question is all the more refreshing. At the meeting of the shareholders last Friday, the Chairman, Mr. Howard Charles Ward (who is the Deputy-Governor of the larger Company) announced the reason for the decision of the Board in a pithy and admirable sentence: "With such a prospect before us," he said, "we considered it would be *unjust to the consumers* to raise the price of gas." And we agree with him, and think most gas administrators will do the same. But, as our report shows, Mr. H. D. Ellis (whose ability as a financier is well known, and has been frequently acknowledged by the Board of the Commercial Gas Company, of which he is Secretary) disagreed with the Brentford Directors' policy on this point. He considered it was inadvisable not to raise the price when everybody else is doing so; and he tried, in a gentle way, to persuade the Directors to alter their decision by drawing a picture of the odium they would bring upon themselves, and the brunt of which they would have to bear alone, if, by force of circumstances, they had to increase the price later on, while at the present time, in the general movement, a rise would not attract particular attention. There is some truth in this; but there is also a trace of weakness about it which would be unworthy of a strong Board in the felicitous position of the Brentford Directors. If, happily, the necessity does not arise for advancing the price, we venture to think that the revenue of the Company will show the wisdom of the Directors' policy. But if, unfortunately, an increase should prove inevitable, the bulk of the consumers, we believe, will recognize that the Company have not been unmindful of the interests of those whom they supply, and have dealt with them wisely and well.

Mr. Ellis tendered his advice with the best of intentions; but in doing so in public meeting, he has simply put a seal on the Board's policy which cannot be broken until such time (which we hope will not come) as the Directors find they cannot continue to supply gas at the current rate. After the Chairman's statement, and after the publication of Mr. Ellis's remarks, what a howl of indignation there would



be if the Directors now turned right-about-face. Counsel such as this, affecting as it does the consumers' pockets, is better given in private than at a public meeting. Even the Chairman and Directors of the Brentford Company would hardly care to face the torrent of abuse which would flow if they were now to adopt Mr. Ellis's advice, well meant though it was.

#### The Parliamentary Session.

THE session of Parliament which came to an end on Wednesday last will not greatly occupy the attention of the historian. Its debates and proceedings were—with scarcely an exception—as dull and uninteresting to "the man in the street" as events occupying the public mind throughout its duration were stirring and engrossing. This—with the attention both of the Government and the nation so pre-occupied with foreign affairs—was perhaps inevitable; for the legislative proposals of the Front Bench were necessarily of only a second or lower order of importance. The chaotic condition of party politics, and the impending dissolution, further contributed to the unwonted stagnation of parliamentary life.

The legislative record of the session (we are, of course, now speaking only of the public, not of private legislation), while not containing any measure of really first importance, except the Australian Commonwealth Act, comprises one or two enactments of interest to the commercial and industrial worlds. First among these must be placed the Limited Liability Companies Act, which, though not heroic in its provisions, is a considerable step in the direction of the much-needed reform of the Companies Acts. It is a matter of regret that the Government deemed it expedient, in order to facilitate the passing of the Bill, to delete some of the most important of the original clauses, from the investor's point of view. As the Bill was drawn, it contained a provision that the prospectus of a company should disclose "the dates of, and parties to, every material contract;" and that "a seasonable time and place at which any material contract or a copy thereof" might be inspected should be therein nominated. These provisions, as well as others relating to the disclosure in the prospectus of material particulars concerning the promotion and flotation of a company, have been dropped. But, even in its watered-down form, the Act contains some useful amendments of the previously existing law, not the least important of which is the provision that the annual return made to Somerset House shall differentiate between shares issued for cash and those issued otherwise than for cash. It is further satisfactory that the new law will tend to strengthen the hands of auditors; it being provided that their report shall be read at the general meeting of shareholders. When all is said, however, it cannot be urged that the Act of 1900 will render the way of transgressors of the moral laws, who wish to avoid offences against the law of the land, much harder than before. We must nevertheless be thankful that something has been done to render it less easy.

The Railway Accidents Bill, placing on the companies the obligation to provide methods of coupling designed to reduce the danger of that operation to a minimum, only affects such Gas Companies as own rolling stock; and of those, the Gaslight and Coke Company (who have a fairly extensive railway system running through the Beckton works) are the only considerable instance. The Housing of the Working Classes Act (in amendment of the Act of 1890) gives power to local authorities to erect or acquire houses for the prescribed purposes outside the area of their own jurisdiction, and improves somewhat the procedure under the existing law in rural districts. It does not pretend to be more than a small and cautious step towards the settlement of the wide problem comprehensively known as the Housing Question. As we said upon the opening of Parliament last January, it is better that so large and so difficult a problem should be left standing over until less strenuous times (so far as foreign affairs are concerned), than that it should be dealt with in an ill-considered and perfunctory manner in a listless session. The proposal to enable local authorities to render greater aid to institutions designed to provide Secondary and Technical Education, and the Bill to amend the Factory Acts, were among the measures that were introduced by the Government, but were subsequently dropped through lack of time for their successful prosecution. Among the crowd of Private Members' Bills brought in (most of them for show, not use) were several for the extension of the Workmen's Compensation Act to agricultural

labourers—there being not unnaturally a rivalry for the credit of that extension—and one of these Bills was successfully steered into the desired haven of the statute-book.

No other enactment or proposal made during the session calls for any special mention here; the financial expedients to which the Chancellor of the Exchequer resorted for the provision of the extraordinary expenditure necessitated by the war (which, like King Charles, is an unconscionable while a-dying) being only too painfully brought home to the income-tax payer at the time when his dividends are about to be, or have been, received. Much may happen between the reading of the Queen's Speech which closed what Sir Michael Hicks-Beach called the dullest and least interesting session he ever remembered, and of that which will open the next sitting of the House of Commons. So far as the gas industry is concerned, the session of 1901 cannot fail to be full of interest, and to see events of the first importance. It is not from that standpoint that the session of 1900 can be described as dull and uneventful.

#### Re-Starting of Strike Factories.

REPORTS from different parts of the country give clear warning that the present era of brisk trade has encouraged the moving spirits in the various Trade Unions connected with the rougher callings, and with unskilled labour, to agitate for all sorts of things, including "recognition of the Union." The case of the Great Eastern Railway Company is typical. Employers remain in blissful ignorance of anything being wrong with their workpeople, till some fine morning a strange gentleman appears on the scene, announces himself as the "General Secretary of the Amalgamated Wait-a-Bits," and declares himself to be in possession of a "mandate" from the firm's employees to require certain concessions, on pain of a strike. Then the same weary old round begins. First the Society claim to have started it; then they deny their complicity, and say they only took the demand up after the men in the factory had determined to act. "Interviews" between employers and employed, which could have been arranged at any time, become points of much acrimonious contention because outsiders want to be present. Of course, if employers are wise and strong, they resist this kind of interference in their affairs to the uttermost. Where they mean business, and take counsel with the Federation, their ultimate triumph is certain. But in some cases the employer weakly buys up his enemies for the sake of present peace; and the result is that he has an Old Man of the Sea on his shoulders for ever after. The strike of 1889 cost the South Metropolitan Gas Company a lot of money; but the other Companies who fell under the domination of the Union have paid considerably more than they, and yet are not free.

#### More London Lamp-Posts.

AFTER all that has been written and said about the obstinate Philistinism that condemns the streets of our chief towns to such depths of unmerited and superfluous ugliness, in respect of those accessories like the lamp-posts, which provide almost the only openings that exist for the display of a little of the power of Art to redeem the aspect of common things from uttermost condemnation, it is very saddening to read the report of the Highways Committee of the London County Council on the supply of lamp standards for the Victoria Embankment and for Westminster Bridge. This report refers to a part of the job of electric lighting for these great thoroughfares, which the County Council have had in hand for goodness knows how many years. It is now coming to something like a head. It is unnecessary to do more than allude in passing to the place of Westminster Bridge and the Embankment in the picturesque aspect of the greatest city of the world and of all time. From Wordsworth, whose sublime sonnet first revealed the supreme charm of the prospect from the former, to the pilgrims from all lands who come to survey and to saunter along the latter, there is a universal agreement that earth has nothing more impressive and beautiful to show than this magnificent reach of the Thames. Yet the London County Council will not be happy until they have spoilt it. They have shown what they are capable of in the arc lamp-sticks—they are not worth calling lamp-posts—with which they have insulted Waterloo Bridge. The design of these must have been suggested by some caretaker of Spring Gardens; for they are like nothing so much as a broom set up on end, all head and no body.



Now they are bent on treating the other bridge, and the Embankment, differently. Variety is charming. So the Highways Committee advertised for tenders for the supply of the next lot of arc lamp-posts, at an approximate price of about £30 apiece. We say nothing about the price; but consider the system! Everybody in the castings trade was invited to submit his own "design;" and, in the event, two "designs" submitted by one "firm" were approved of as being the most satisfactory. In order to improve upon the best, however, the "firm" were asked to submit a further design "embodying what we considered to be the best points of each of those submitted with their "tender." This is, of course, the way that Michel Angelos and Cellinis are made—and encouraged. It is very sad, but what better could be hoped for? There is this grain of consolation in the tale, that neither the Waterloo Bridge abominations nor the outrageous vagaries admired of the St. Martin's Vestry were regarded as worthy of reproduction. The new fancy of the County Council can hardly be worse than these. When the Council trams heave their crude profiles into the sky-line across the bridge, and rattle along between the plane tree avenues bordering the river, the picture from Westminster Bridge or from Waterloo Bridge—new style—will be perfect. Who will be bold enough to say after this that civilization does not progress?

### WATER AND SANITARY AFFAIRS.

OUTSIDE the Metropolis, the session which came to a close last Wednesday was not marked by any very remarkable topic in connection with water supply. The attempt of the London County Council to obtain legislative sanction for their purchase and Welsh schemes was once more frustrated by the rejection of the former and the subsequent withdrawal of the latter proposal—only, however, it may well be supposed, to be revived next year. As far as the London Companies are concerned, their combined action with the view of having conferred upon the Local Government Board further authority in the direction of requiring them to provide additional storage reservoirs, was nullified on a point of procedure. But the East London and Lambeth Companies each succeeded in obtaining power to extend their works in this particular, and to draw an additional quantity of water from the Thames. Both Companies encountered opposition, though not of a very formidable character. Its effect was, however, to put upon them certain conditions, which they will probably not find to be very onerous. At all events, it was better for the Companies to take the Bills under these conditions than to lose a session. In the Provinces extensions were authorized at Bristol, St. Albans, Rickmansworth, and Great Berkhamstead, as well as by the Mid Kent Company; and arrangements were completed for the transfer of the undertakings of the Exmouth, Spalding, and Hemel Hempstead Water Companies to the Local Authorities of the towns. The principle of the combination of such bodies for the control of the water supply of their area was once more recognized by the passing of the Bury Water Board Bill; though it was not considered to be applicable in the case of South Essex, the District Councils of which were desirous of being associated for the purpose named. The Lea Conservancy Board obtained an Act sanctioning their reconstitution. Two noteworthy incidents in regard to the legislation of the past session arose in connection with the Westgate and Birchington and Spalding Water Bills. The former, though strongly opposed in the Upper House, and threatened with equally serious opposition in the Commons, actually went through without a verbal alteration. The latter was jeopardized on a question of compensation claimed by two of the officers—the Engineer and the Collector—who had not been provided for in the Bill; but in one case the claim was withdrawn, and in the other it was satisfied. This matter actually gave rise to a debate in the House of Commons. Mr. Cornwallis, the member for Maidstone, reintroduced his Water Supply Bill of the previous session, but was unable to carry it forward.

The revolt of the water consumers at Guiseley against the increased charges of the Water Company, to which reference was made in a paragraph in the "JOURNAL" last week, furnishes another example of the trouble likely to arise from making the price of a commodity in one town

depend upon what is charged for it in another, regardless of local circumstances. Guiseley is supplied by a Company started about forty years ago; and for some time the service was adequate. But with the growth of the town came the necessity for a larger supply of water than they could furnish; and arrangements were consequently made for obtaining it from their neighbours at Yeadon, on what were regarded as satisfactory terms. The auxiliary supply was given by the Yeadon Company conditionally on the water being sold at the price charged by them in their own district. By virtue of this condition, the Guiseley Company were compelled in the spring of the year to alter their charges in accordance with those prevailing in Yeadon, although they were making a fair profit under the old conditions. The announcement of the change excited the District Council; but they could not do anything in face of the agreement. The new scale accordingly came into force, and things went on very smoothly until the bills were sent in. Where the revised charges resulted in a reduction, as it is stated to have done in the case of some 300 houses occupied by working-class people, no objection was raised. But where there was an increase, the change, as might well be expected, was received in a very different spirit. Some of the consumers have absolutely refused to pay on the revised scale, which in many cases is twice as high as the old one; and as the Company do not appear to have any statutory powers to recover debts, they have simply cut off the supply to those who decline to pay for it. The carrying out of these operations has been attended with considerable difficulty; the Company's servants being in some cases drenched with their own water from a hose-pipe. One locality having been entirely deprived of a supply, the District Council and the Medical Officer of Health were so indignant that the members of the Council are reported to have proceeded in a body to the spot where the tap was fixed, and deliberately restored the service. On the water question, Guiseley has, in fact, become a battle-ground for the Local Authority, the consumers, and the Company; and the progress of the contest is being watched with interest, not to say amusement.

As will be seen by our "Legal Intelligence," the liberal interpretation put by the Tendring Hundred Water Company upon the clause in their Act of 1884 authorizing them to supply water in bulk within their district, has not only led them into trouble with the Corporation of Harwich, but evoked a rebuke from two of Her Majesty's Judges. The circumstances which have led to this result can be explained in a few words. Eight years ago the Company were ordered by the Local Government Board, at the instance of the Corporation, to provide a supply of water constantly laid on under pressure within the limits of the borough. The Corporation, speaking on behalf of the inhabitants, complain that this order has not been carried out, for the reason that the water which should be available for domestic purposes is sold in bulk. They do not for a moment deny the right of the Water Company to sell their commodity in this way; but they urge that it should be subject to the condition expressly laid down in the above-named Act—that the domestic supply is not prejudiced. The Company reply that if there is a shortage of water in Harwich it is due to defective fittings and connections; while as to pressure, they put on as much as the pipes will stand. Complaints addressed to the Company not having resulted in improvement, the Corporation recently applied for, and obtained, a rule *nisi*, commanding them to carry out the order of the Local Government Board; and on Tuesday last the Company endeavoured to show Justices Day and Darling why the rule should not be made absolute. We think the arguments adduced were singularly weak. It was submitted that the Corporation had other remedies for their complaints than a *mandamus*—that they could apply for an injunction to restrain the sale of water in bulk, or proceed under section 36 of the Water-Works Clauses Act, 1847, which provides for the imposition of a penalty for neglecting to supply water for domestic use. It was further submitted that, in the event of the Company's supply being insufficient, the Corporation could themselves, under the provisions of the Public Health Act, 1875, provide one. Their Lordships were not impressed by the arguments adduced; and they came to the conclusion that the remedies suggested would not afford any real redress to the parties aggrieved, and that the issue of a *mandamus* was the only adequate remedy in the circumstances.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 429.)

WE are now in mid-August, which is perhaps the slackest period of the year for the Stock Exchange, and this, coming after a long-continued stagnation of the markets, has brought business down to about the lowest level it has touched for many a year. News from what we must now call the two seats of war have had but the slightest influence. Prices have not moved much, simply because there was nothing to move them; and there were about as many changes in one direction as the other. The Money Market has been more interesting, especially in connection with the late issue of Exchequer Bonds, the mode of action in regard to which appears to be a grave blunder which will one day be felt. If American allottees can realize here at a small premium, there will not be much gold to come across the Atlantic. Rates are holding on very firm; but how things are going to shape in the future is not quite clear. Business in the Gas Market was decidedly disappointing. When the Exchange reopened on Tuesday, there was a little stirring, and there really seemed to be some prospect of the market rousing from its lethargy. But the slight puff of activity fell away to a dead calm; and on the closing day not one single transaction was marked. Prices, of course, have moved but little; and they were irregular too. As more and more Gas Companies' accounts come out, so more complete is the evidence that the last half year has been a good one. But it must not be forgotten that the full pinch of the coal prices will be felt in the half year now current. Dealings in Gaslight ordinary were at good, steady middle figures; but the debenture stock was set back a couple of points. Only two or three bargains were marked in South Metropolitan; but it changed hands at top price. Commercial were steady at middle prices. A few changes took place among the Suburban and Provincial group; Alliance gaining and Brighton losing. The Continental Companies were noticeable for a recovery in Union. A few changes occurred among the remoter undertakings as noted below. The Water Companies exhibited their usual calm; only a few irregular movements taking place.

Operations were too few to follow; but the daily changes were: On Tuesday, Continental Union rose 2. In Water, East London debenture gained 1. On Wednesday, Union moved up 2, but Gaslight debenture fell 2, and Oriental new  $\frac{1}{4}$ . On Thursday, Union rose 1. On Friday, Brighton "A" receded  $2\frac{1}{2}$ . In Water debentures, Lambeth fell  $1\frac{1}{2}$ , and West Middlesex 5. On Saturday, Alliance gained  $\frac{1}{2}$ ; but Cape Town was set back  $\frac{1}{2}$ .

### MR. BALFOUR ON THE CONSERVATION OF ENERGY.

THOSE who are philosophically minded always rejoice with Mr. Balfour when he escapes from the domain of party politics and the routine and stress of the House of Commons—the rough-and-tumble of which is so obviously not congenial to his temperament—into the calmer regions of science, philosophy, or letters. Such an excursion he made in his recent Inaugural Address to the summer meeting of University Extension students at Cambridge, an extract from which was printed in the "JOURNAL" for last week. Mr. Balfour took, or had prescribed, as his subject the very comprehensive theme of "The Nineteenth Century." This not being a journal devoted to the discussion of literary or metaphysical subjects—by the way, was it not Lord Justice Bowen who spoke of the study of metaphysics as comparable to a blind man groping in a dark room for a black cat that was not there?—but rather to matters of practical importance germane to the interests of the industries it claims to represent, we are not here concerned with the questions of the respective literary, artistic, or theological attractions of the different centuries so entertainingly discoursed upon by Mr. Balfour. It does, however, fall within our province to discuss that portion of his address in which he referred to the remarkable industrial developments witnessed during the dying century—developments due so largely to the "fruitful union between science and invention."

Few will be found to dispute the judgment that the characteristic note of the century is to be found in the growth of science: "The cumulative products of scientific research, to which no other period offers a precedent or a parallel." It is, moreover, especially characteristic of our own times that there is not only an immense addition constantly being made to the sum of our knowledge, but an ever-growing tendency to apply our theoretic knowledge to practical purposes. The enormous strides taken in recent years in all quarters of the industrial world by reason of this increasing utilization of the results of scientific research, have one aspect which at the present time is much in the minds of practical men as well as theoretical economists, and to which Mr. Balfour drew attention—namely, the dependency of all industry upon the supply of usable power, and the fact that such power is derived almost exclusively from coal. That being so, it is naturally a matter of first importance that our stores of that prime energy should be utilized to the very best advantage, and economized in every possible way. It is most interesting to observe that on this question Mr. Balfour takes up what one may

be allowed to call the common-sense, as opposed to the hysterical or unpractical, attitude. With remote speculations as to what humanity will do for its means of existence when the world's stored-up resources of energy are exhausted, and it has to depend upon the diurnal heat of the sun and the rotation of the earth for its motive power, Mr. Balfour refused to deal. On the other hand, while recognizing that the contents of the mines are limited and beyond our power to increase, he declined to join forces with those who call for an artificial limitation of the drafts being made upon our coalfields. Our one hope, in his opinion, lies in the possibility of a greater economy being practised in the consumption of our stores of coal.

Mr. Balfour used, perhaps, the language of exaggeration when he said that our methods of utilizing our supply of power have altered strangely little in detail, and not at all in principle, since the days of Watt; but there is a broad substratum of truth underlying his words. The steam-engine is undoubtedly not the most economical extractor of power from coal that can be imagined; and it at present holds the field. In that fact lies the possibility of a discovery of some means by which the power-value obtainable from every ton of coal in the mines might be doubled, and the duration of our coalfields be vastly, if not proportionately, increased. We say "not proportionately," because, as Jevons long ago pointed out, every cheapening of the unit of power stimulates the industries to which it is vital, and increases its consumption. Mr. Balfour, then, pins his faith for a solution of the problem of the possible exhaustion of our coal supplies—a problem which really only concerns generations remote from the present—to the advent of "a second Watt." He speaks the true philosophy of the question, we believe, when he says that we must frankly "recognize that it is only by new inventions that the collateral evils of old inventions can be mitigated. To go back is impossible; our only hope lies in a further advance." Such a far-seeing judgment is indeed refreshing reading after the vapid chatter of the uninformed but unashamed daily Press.

### THE BETTERMENT OF THE WORKING CLASSES.

THE writer of this book,\* Dr. N. P. Gilman, will be already known to those of our readers who have followed closely the efforts made in recent years to popularize profit-sharing as a step in the direction of promoting industrial peace by means of creating a community of interests between capital and labour; for his work on "Profit-Sharing between Employer and Employed," published in 1889, has enjoyed a considerable popularity. The purpose of his present work has been to investigate, and to describe collectively, the various schemes that have been devised and put into operation by employers in different parts of the world for the betterment—social, moral, and pecuniary—of their workpeople; and his "practical aim has been to present these facts, which appear to exhibit a finer conception of the employer's function than is commonly held, in such a way as to incite other intelligent and successful employers of labour to go and do likewise." The book is, therefore, addressed to employers chiefly, but with the desire to convey information rather than advice; for the author recognizes the fact that, in these days, the capitalist receives more than enough of the latter commodity from any "number of persons, quite inexpert in practical affairs, who are ready to tell him the only just way of managing his business so far as concerns his employees."

Dr. Gilman explicitly disclaims posing as the advocate of the working man. He does not make the mistake of those who adopt the "cult of the horny handed"—the mistake of thinking that working men as a body could dispense with the employer's brains and capital, and would, indeed, prosper more greatly without them. "I have," he says, "a profound conviction that a true and natural aristocracy—the leadership of the competent—is to endure in the industrial world, as elsewhere, for an indefinite time. . . . I have no difficulty in believing in the fundamental rationality of the men who employ their fellow men in large or small enterprises; I do not doubt their predominant desire to be fair and just in their dealings." With this prefatory evidence of reasonableness and fairmindedness before us, we turn willingly to the consideration of the ideal which the writer sets forth as realizable by the employer of men on a large scale, the essence of which is the combination of financial success in the business with the moral and material welfare of the employed. Dr. Gilman, at the outset, observes with perfect truth, what is too seldom recognized, that "it is far more important for the workman that his employer shall be financially successful, than that he shall be kind or generous in his dealings. A hard employer who keeps his men steadily at work for years, on the average wage, is much more of a real benefactor to the operative than a genial employer whose inexperience or lack of capacity closes the factory in a few months. The latter will have the sympathy of his employees; but he is not their best friend. The responsibilities of a typical great *entrepreneur* of this century are many and varied, and they call loudly for the strong man in the manager's chair. . . . A fine morality, in the sense of sympathy or kindness or generosity, on the employer's part, is a secondary matter, however important, just as in deeds

\* "A Dividend to Labour: A Study of Employers' Welfare Institutions." By Nicholas P. Gilman (Houghton, Mifflin, and Co.).



of war the morality of a Napoleon or a Moltke is not primary. But assuming the existence in him of all the abilities required for the prosperous working of a great industrial establishment, then good-will to men, sympathy with one's kind, and the human touch [as in a Roberts] are happy and fortunate and admirable additions to the vigour of mind and the power of will which have taken a bond of fate."

It is not, in short, absolutely essential that the employer, in order to be a successful, should be a moral man; but the difficulties of the labour question can never be overcome unless employers increasingly recognize the moral obligations and opportunities of their position. For it is undoubtedly true that much of the hostility of the better-informed among the working classes of the present day towards employers as such is an inheritance from the early days of the factory system in England, when, as Dr. Gilman puts it, "the duties, not alone of justice and kindness, but even of ordinary humanity, as we to-day understand it, were frequently and grossly disobeyed, especially in the treatment of women and children." Those employers who strive faithfully to fulfil their moral obligations to their workpeople may not always reap an immediate harvest of gratitude; but they are as undoubtedly sowing the seeds of a better relationship between master and man in the future, as the millowners of 1780-1830 sowed the tares of hatred and discord, which are by no means yet uprooted, in the minds of the working classes.

Enlightened selfishness on the one hand, and the force of public opinion on the other, have brought about at the end of the century a very different state of affairs from that existing in its earlier years; but it is truly said that the employer who recognizes no obligation towards his workpeople other than the legal, however moral he may be in his life as a citizen, has not achieved true industrial morality. "He has not realized the full demands of a sound morality, *which has no conflict with economic truth or economic law*, but the force of which cannot be excluded from any relation which is human." The sentence we have italicized is vital to a true appreciation by employers of their opportunities, and consequent obligations. It was the failure to realize its truth that marred the conduct of the Cobden school, though that failure did not, as some think, disprove the soundness of the economic principles taught by that school. The Cobdenites allowed one truth to occupy their vision to the exclusion of others. The duty of the present day is to comprehend and apply economic and moral principles in harmony, and to realize that there is no conflict between them if rightly understood and rightly put into practice.

The application of moral principles to the relations between employers and employed involves for its full scope and ultimate success—that is, for its complete achievement combined with avoidance of conflict with economic law—the co-operation of the workman with his master. The former, as well as the latter, must appreciate and perform his moral duty. "If a workman simply work hard enough and carefully enough to retain his position in a factory; if he feel no desire that his employer shall prosper because he himself does his best, with all his fellows; . . . he, too, is imperfectly moralized, so far as his relations to the employer are concerned. He, too, needs an ethical development, if he thinks that the whole duty of industrial man is thus discharged by him." That is a truth too seldom realized, and still more rarely preached, by the labour leader or by the political "friend of the working man." But its appreciation is essential to the ultimate prosperity of the working classes. It has been the failure of some of their men to grasp this fact of mutual obligation that, as we understand it, has proved one of the hindrances to the absolute success of the South Metropolitan Gas Company's profit-sharing scheme—described at length by Dr. Gilman—and it is obvious that patience, tact, and firmness on the part of the employer are needed, in addition to the mere will to fulfil his moral obligations. Schemes intended to benefit may be utterly futile, and even demoralizing, if they be merely instituted and not given care and thought in their administration. It is, indeed, just by reason of careful and thoughtful administration that the South Metropolitan scheme has achieved the large measure of success to which it has attained.

So far, and at some length, we have been discussing generalities; but we have not got beyond Dr. Gilman's prefatory chapter to the bulk of his book, which is strictly particular and practical. In fact, we do not now propose to deal with those practical sections (for our space would not enable us to do so with justice to the author or value to the reader), but will be content with saying that those sections are full of most valuable information as to what has been already achieved by employers in Germany, France, Holland and Belgium, America, and Great Britain for the social, moral, and general welfare of their employees. Scores of benefit schemes and institutions are described in detail; and in bringing them together, Dr. Gilman has done most useful work. Upon the basis of his acquaintance with these actual achievements, Dr. Gilman founds the First Part of his book (with which alone we have concerned ourselves in this article), wherein he sketches out a "realizable ideal" at which an employer may reasonably be asked to aim. The following quotation, in which the limitations that the conditions of commercial and social life set around such an ideal are recognized and enumerated, may serve to commend, as we would wish to commend, this most excellent book to all concerned with the future relations between capital and labour.

The ideal presented by the earnest man of thought to the practical man

of business should, of course, accord with the plain necessities which beset his occupation. The ideal should be distinctly realizable by men who are neither heroes nor saints nor philanthropists; they might fail in business if they attempted to be any of these! The ideal must not be a pattern set in the mount to which those who cultivate the common levels of life can have no inward attraction. It must be in close touch with reality, make no cruel demand on the average man, and harmonize with the laws of economic success. It must tally with the practice of the best men in different walks of business—those who stand highest in point of ability and character before the world at large. It must not be an ideal which requires that the individual employer shall act as if the making of his living were a minor matter with him, or shall conduct his business according to an economic or social system profoundly different from the one prevailing all about him. It must be an ideal, however, which necessitates the "human touch" in all social relationships, and rejects every tendency on the part of an employer to treat the men whom he employs as if they were machines, or animals of another and lower species than himself.

Does not the author's common sense bespeak consideration for his "realizable ideal"? At a future time we shall hope to mention some of the realized workmen's benefit schemes upon which this ideal is founded. For its description, we refer our readers to Dr. Gilman's admirable little book.

## PERSONAL.

Mr. J. HAMPSHIRE has been appointed, out of a large number of applicants, Outdoor Superintendent to the Canterbury Gas and Water Company. He has been Meter Inspector at Littleborough for nearly six years.

Dr. LAWRENCE W. ADAMSON has resigned the office of Chairman of the Newcastle and Gateshead Gas Company, and Alderman Sir W. HASWELL STEPHENSON, the Deputy-Chairman, has been elected to succeed him. Mr. E. ARMORER HEDLEY will fill the position vacated by Sir W. H. Stephenson.

The Chester Water Company have recently lost by death their Chairman, Mr. WILLIAM BROWN, who was the holder of the position for the long period of thirty years. Mr. F. E. ROBERTS, the Deputy-Chairman, succeeds to the office. The Company have also lost the services of their Secretary, Mr. E. LLOYD; and his old assistant, Mr. W. S. MOSS, has been elevated to the vacancy.

Alderman J. MILES, the Chairman of the Bolton Corporation Gas Committee, among his other accomplishments, is a musician; and he is the organist and choir master of Deane Church. Between the members of the choir and the master there has existed for the last 36 years the greatest good-feeling and unanimity; and, as a testimonial of this, a few days ago the members presented him with a handsome ivory silver-mounted *bâton*, bearing the following inscription: "Presented to Alderman Miles, J.P., by his choir, as a token of esteem. July 28, 1900."

The official changes in connection with the Derby Gas Company, which have already been announced in the "JOURNAL," were features of the meeting of the shareholders last Wednesday; and it is exceedingly gratifying to find that the long and faithful services of Mr. RICHARD FISHER and Mr. CHARLES TAYLOR, who have lately relinquished the positions of Secretary and Engineer respectively, have been recognized. Mr. Fisher had been with the Company for upwards of fifty years—Mr. Taylor's period of service being thirty-five years; and the shareholders decided to grant the former gentleman a life pension of £200 per annum, and approved of the Directors' decision to allow the latter £250 per annum. On the same occasion, the selection by the Directors of Mr. H. Bullivant and Mr. J. Ferguson Bell as their successors was unanimously confirmed. We may mention, in this connection, that Mr. Taylor is commencing practice as a Consulting Engineer at Derby.

We regret to learn that Mr. B. W. SMITH, who was not long since appointed Engineer and Manager of the Walsall Corporation Gas-Works, recently met with a serious accident. While playing golf at Sandwell Park, he put his foot into a rabbit-hole, and broke his ankle. It was found impossible to remove him to Walsall direct, so he was taken to the house of a doctor at Smethwick, where the bone was set. Things progressed favourably, and the injured limb was put into plaster of Paris, and arrangements were made to remove the patient to Walsall. He was placed in a car, and, accompanied by two doctors, started for home about nine o'clock in the evening. On the road there occurred a succession of accidents to the vehicle and its occupants, the account of which in a local paper reads almost like romance. One of the doctors had his nose badly injured, the other sustained a cut over the eye (his head being sent through the glass at the back of the carriage), and the top of Mr. Smith's head was badly bruised. After much difficulty, a fresh car was procured, and on this he was conveyed home, which was duly reached at six o'clock on the following morning, after what must have been an agonizing and certainly a most remarkable experience.

## OBITUARY.

The death is announced of Mr. JOHN PARKER, Chairman of the Finedon Gas Company, at the advanced age of 83. Deceased had resided at Finedon for upwards of sixty years, and took an active interest in the public life of the town. He had consequently a large circle of friends.

We regret to record the recent death, at the age of 78, of



ROBERT DARNEY, who for a period of forty years held the position of Manager of the Faversham Gas Company, which he relinquished as recently as April last, and was appointed Consulting Engineer. When the water-works were established, in 1864, he was selected as the first Manager; but he resigned about three years ago.

We have to-day to announce the recent death, at Brooklyn, New York, of Mr. WILLIAM ROMANS. Deceased, who had a good number of friends in the gas profession, was a brother of Mr. John Romans, from whom he received his training. He was at one time Assistant to the late Mr. David Methven, at the old Imperial Gas Company, and subsequently Chief Engineer in Dublin, Sheffield, and Rochdale. He was brought up as a millwright in Scotland, and was on the staff of Messrs. J. Scott Russell and Co., the builders of the *Great Eastern*, the keel of which he laid.

The death is announced of Mr. R. L. HATTERSLEY, who from 1877 to 1894 (with the exception of one year) was Chairman of the Gas Committee of the Keighley Corporation. It was during his tenure of the office that the gas-works at Thwaites were erected. Mr. Hattersley co-operated heartily with Mr. John Laycock, the Gas Engineer to the Corporation, in carrying out this undertaking; but he ceased to be a member of the Corporation before it was completed. Six weeks after his retirement, the employees of the Gas Department presented him with a handsome silver inkstand, which he very highly valued, inasmuch as it was the first testimonial he had received during his 58 years' association with the work of the town. Deceased was in his 80th year.

**The Proper and Improper Use of Gas-Stoves.**—In the Architecture and Engineering Section at the Public Health Congress in Aberdeen, Mr. Durward Cecil, of London, referred to the use of gas-stoves, and said that while he was perfectly sure it was possible to use these appliances for heating and cooking without any injury to health, there were immense numbers of them in operation which were hostile to healthy conditions. Unless perfect combustion was ensured, the general promiscuous use of gas-stoves would, in his opinion, be dangerous to health—not in the way of fatal illness, but in the lowering of vitality, which rendered the body more susceptible to the attacks of the enemies of human life.

**An Alizarine "Combine."**—The "Chemical Trade Journal" says that, after many years of savage competition, the half-dozen alizarine makers of the world have arranged with each other as to the future position and price of alizarine. It has been decided that two of the Continental makers (Messrs. Neuhaus and Messrs. Gauhe) are to cease manufacturing; so that the world's requirements for the moment will be left in the hands of the Baden Aniline and Soda Works, Messrs. F. Bayer and Co., Messrs. Meister, Lucius, and Brunning, and the British Alizarine Company. The manufacture of alizarine has been a very unprofitable one for years past, and, as a consequence, anthracene has been such a drug in the market that many distillers of coal tar have ceased to recover it. Our contemporary says, however, that Messrs. Sadler and Co., of Middlesbrough, who for some years produced alizarine on a large scale, but ceased to do so when prices became unremunerative, are now reopening their works; and it is thought that, not being members of the "combine," they ought to have no difficulty in disposing of their make in the British market. The ultimate effect upon the anthracene market cannot be easily foreshadowed; but, according to the above-named authority, there is so much anthracene, especially "B" quality, at the moment absolutely a waste product, with which the market could be promptly deluged, that it is feared that any substantial rise in price must not be looked for in the immediate future.

**The Annual Report of the Chief Inspector under the Alkali Acts.**—The report of Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali, &c., Works Regulation Acts, giving an account of the labours of himself and his colleagues in the past year, was issued yesterday. It possesses more than the usual interest, inasmuch as Mr. Carpenter embodies in it the results of some researches he has made into the condition of the market for raw material and for residual products of gas manufacture at the close of the first half of the century. He gives an analysis, compiled from an early number of the "JOURNAL," of the return made to the House of Commons, to the order of Mr. Joseph Hume, on the gas undertakings of the United Kingdom in 1849, which shows that the price of caking coal then ranged from 5s. 4d. to 19s. 6d. per ton, and the value of residuals from 20s. to 55s. per cent. of the cost of the raw material. Some interesting figures in this regard are supplied by Mr. J. H. Cox, of Sunderland, who, as our readers are aware, last year celebrated the jubilee of his connection with the Gas Company in that town. We cannot notice the report at any length to-day. Suffice it to say that we learn therefrom that the quantity of sulphate of ammonia produced last year in the United Kingdom was 208,481 tons, as compared with 196,357 tons in 1898 and 198,280 tons in 1897; gas-works furnishing 136,529, 129,590, and 132,724 tons respectively of these totals. The number of works registered under the Acts is 1182, of which 127 are in Scotland. The number of visits paid to these works was 5011; and 5585 tests were made. We shall deal more fully with the report in an early issue.

## NOTES.

### The Rate of Depreciation of Electric Power Plants.

Following up his study of the cost of electric power production, Mr. Philip Dawson has published in "Engineering" some particulars relating to the cost of the plant. The author remarks that, being actual records, they will at least be useful for the checking of engineers' estimates. The figures, of course, vary greatly in these examples. One point of general application, however, is the cost of the capital expended, whatever it may amount to. This cost includes the interest, the sinking fund, and the rate of depreciation. The two former must be first computed on the basis of fact, then the latter is to be ascertained in accordance with the following table: Buildings, from 1 to 5 per cent. on prime cost; boilers, 8 to 10 per cent.; dynamos and engines and all belted machines, 5 to 10 per cent.; direct-driven plants, 4 to 8 per cent.; transformers, 5 or 6 per cent.; accumulators, 9 to 11 per cent.; meters, motors, rotary transformers, &c., about the same. Accidents and insurance should be put down as from 0.75 to 2.25 per cent. of the gross receipts. Very little electrical plant is worth anything after twenty years. An average charge of 3 per cent. for depreciation must be made on the gross capital expenditure. If this statement is correct, the number of solvent electricity supply undertakings in the United Kingdom is far smaller than is generally supposed.

### The Quantitative Measurement of Sensations.

Professor C. Lloyd Morgan has described in "Nature" some attempts made by himself to measure the quantitative relation of stimulus to sensation in human vision. As he remarks by way of introduction to the subject, nothing has done more to place on a scientific footing the discussion of the phenomena which the study of matter and energy presents to the eye of reason, than the establishment of a doctrine of quantitative equivalence. So much oxygen and hydrogen, so much water; this amount of energy of chemical separation gone, that amount of sensible heat gained. In the sciences that deal with problems of life and mind, the endeavour to measure stimuli and effects quantitatively is productive of some curious results. There is obviously some general relation of this kind. Increased physical pressure is, within certain limits, increasingly felt. More light gives a higher degree of visual sensation. Such statements are, however, indefinite. We want to know how much the physical increase must be to give just so much increment in sensation. If we double the strength of the stimulus, do we double the strength of the sensation? If not, by how much do we increase it? Ernst Heinrich Weber was the first to experimentalize upon the quantification of sensation. He used the method of the least observable difference. Thus, if a pound weight is placed upon the hand, a sensation of pressure is experienced. If now an ounce weight is added to the pound, no difference is felt; nor is the added weight of two or three ounces perceptible. It takes another third of a pound to give the sensation of greater pressure. Professor Morgan has tried the sensitiveness of the eye to graduated tones of grey produced by rapidly spinning a disc with white and black sectors; and he finds that, for constant increments of sensation, the concomitant increments of stimulus are in geometrical progression.

### The Truth about Motor-Cars.

The "Engineer" recently published some valuable observations on the French mechanical road carriage industry, in connection with the show of motor-cars at the Exhibition and the holding in Paris of a congress of specialists in this branch of mechanical engineering. It appears that no real progress is being made in electrically-driven motor-cars; the enormous weight of accumulators being the obstacle. Most French motors are of the lighter kind, driven by petroleum spirit engines; and a large and increasing trade is done in these. Still, it was confessed by the President of the congress, M. Forestier, that there is yet much to be done in putting motor-car makers in the way of turning out really satisfactory vehicles. At present, the patent system is militating against the development of the manufacture on common-sense lines. Every maker has his patents to consider; and he makes all his motor parts as special and exclusive as he can, regardless of the users' interest in having simply made and cheap cars, with nothing about them that could not be replaced at the first smiths' shop met with on the road. While manufacturers try to protect themselves with patents, the public will have to wait in vain for a car embodying all the essentials to success in a simple and cheap form. Meanwhile the congress confirmed the impression which has been spreading for some time, that the application of steam to the driving of waggons on common roads, apart from the traction engine, is a failure. M. Bollée, who built the first steam-car in France 25 years ago, said that his experience had been that a steam-car selling at 14,000 frs. cost 15,000 frs. for repairs, and at the end of five years is only fit for the scrap heap. M. Forestier declared that steam haulage will never be so economical as horse haulage; the ordinary draught animal being able to do 5000 times its weight in work in the course of a day. It may be remarked on the same head that the experience of the Chiswick Urban District Council has not been favourable to the use of steam motor-vans for dust collection.



## TECHNICAL RECORD.

### THE INTERNATIONAL GAS CONGRESS IN PARIS.

#### The Official Programme.

Those who have signified their intention of taking part in the International Gas Congress to be held, as previously announced, in Paris during next month, will have received from M. Th. Vautier, President of the Société Technique du Gaz en France, and of the Organizing Committee of the congress, the programme to be gone through, with a list of papers to be read, and tickets of admission into the Exhibition grounds, where the meetings will take place in the Palais des Congrès. The opening ceremony is timed for nine o'clock on the morning of Monday, the 3rd prox., after which the President will give his address. A start will then be made with the papers to be read. In the evening a reception will be held by the members of the Société Technique at the Hôtel Continental. The following day will be fully taken up with the reading of papers; while in the evening members will be afforded an opportunity of seeing different gas appliances at the show-room of the Paris Gas Company. The technical communications will be concluded on Wednesday, the 5th prox., in order that the next day may be spent in sight-seeing in the Exhibition, and in the afternoon in visiting the Clichy Gas-Works, by the kind invitation of the Paris Gas Company. Adherents of many Gas Associations will be present, from Germany, America, Austria, Belgium, Holland, Italy, Switzerland, and England; so that the international character of the congress will be fully maintained.

The list of papers numbers 28, among others, of which details will be given in due course, being one on "Inclined Retorts," by Mr. C. E. Brackenbury, of London, and one by Mr. Frederick D. Marshall, of Copenhagen, on "Coal-Handling Plant." There are two from the pen of Dr. J. Bueb (of Dessau), the first dealing with the manufacture of cyanides, and the second on "Means to be Adopted for Avoiding Naphthalene Obstructions." Dr. A. Smits, of Amsterdam, contributes a paper, as also does Dr. H. Bunte, of Carlsruhe; and among several other authors are Messrs. Eichelbrenner, of Paris, Miller and Forstall, of New York, Sospizio, of Trieste, Gibbons and Shelton, of Philadelphia, and Bouvier, of Lyons. The variety of subjects dealt with, and the names of the contributors, lead one to anticipate an instructive as well as an entertaining congress.

### THE SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP.

Everything relating to high-pressure incandescent gas lighting is of exceptional present interest to the gas industry; and therefore our columns are open to all who have in this particular line anything new which bears the stamp of merit, and is worthy of special notice. The advantages of the high-pressure system have been extolled in these pages time and again; and we have shown that they are of a character that something far beyond the present view of scientists will be required to depose the new method of obtaining such a high lighting intensity at such low cost. It could not, however, be expected that invention would stand still, and that efforts would not be made to attain to yet greater excellence—if not in the lighting power, in the method of obtaining it. Busy brains have been, and are now, working in this field; and, as a result, we have to-day to call attention, with greater prominence than has yet been done, to an invention which is distinctly novel, and which will, an examination gives us the hope, greatly assist in strengthening the backbone of the gas industry in its competition with the electric light. Speaking of electric lighting leads us to say that gas engineers have almost ceased to regard incandescent electric lighting as serving any more useful purpose than to provide data for calculation showing the overpowering relative advantage of gas as an illuminant. With the spreading knowledge of high-pressure gas lighting, too, there are signs that arc electric lighting will also similarly recede, even in such applications as the illumination of large open spaces, streets, and the like.

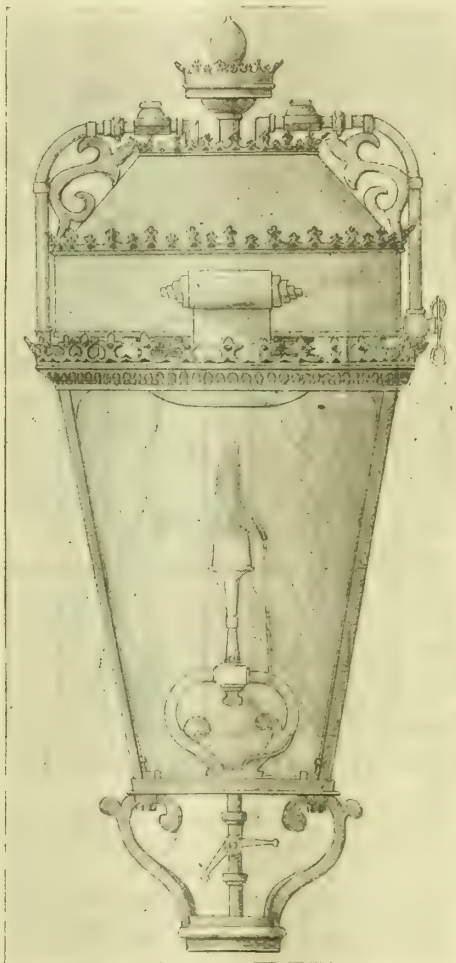
We have been shown that the new invention of which we have now to speak will enable the gas engineer to change the character of any street gas-lamp from an ordinary 60-candle light to one of 300-candle power or more without any additional pipes, without any cost for "power," and without disturbing a single underground connection; and this is no mean achievement. To quote the patentee's own remarks—

There are hundreds of thousands of gas-jets burning nightly in our streets, possessing potential advantages almost undreamed of by our Vestries and Gas Companies. From each light, indeed, there runs to waste the "power" to change its own character until its illuminating power is multiplied by five or more. This is now utilized by such simple means, and in so natural a manner that there is no clockwork, neither joint or lever, to require oiling, and virtually but a single moving part; and, further, the lamp may at will be used either as an ordinary 60-candle power burner, or allowed to intensify itself to 300-candle power or more.

The inventor of this new self-intensifying lamp we may at once say is Mr. C. Scott-Snell, who has had considerable previous experience in incandescent gas matters, having been associated with the Welsbach light upon its advent about fifteen years ago. As readers may also recollect, a gas-compressor which he had invented was exhibited in the Gas and Allied Trades Exhibition

at the Royal Aquarium in the early part of the year. But although an inventor of a compressor, Mr. Scott-Snell's further experience and study have convinced him that external compressors are not the best means of attaining the desired goal. Upon him rests the responsibility for the following views on this point; and readers are free to coincide or disagree with him as their experience dictates. He remarks—

Given the possession of the most perfect compressor, ignoring all question of cost of water power for driving, trouble from frost, usual occasional attention to mechanism and such-like, the troublesome factor of expense blocks the way. £ s. d. and economical vestrymen are hard to reconcile. They admire a powerful and economical light; but the patentee can see with their eyes when a concession for a trial at his own expense is offered. It looks so simple. Fifty pinholes in a row to be supplied with gas at 9 inches pressure, or, more correctly speaking, two rows exist—one each side of the street; and the trifling matter of 50 yards may intervene between the pinholes. A snug corner for the compressor having been selected (with the certainty of quarterly reminders that it is not your own freehold), and your troubles begin. The trifling 50 yards (more or less) of space between the pinholes proves a hard nut to crack. Two inches of asphalt is of no great moment; but 9 inches of concrete is another matter. More exasperating still is the knowledge that gas is already laid on at each desired point. So farewell to compressor and piping. The advantage of the system is only to the pocket of the navy. One sighs for some kind of overhead system; but it cannot be. Hence the evolution of the self-intensifying lamp. This has changed the picture. It enables the lighting authorities to crown the already erected lamp-posts with a brilliancy previously undreamed of. And so easy too! A single lamp at the patentee's expense is a small matter; and it will assuredly result in the delight of the local authority. Extensions can then be made, as desired, at the rate of half hour per lamp, without interruption of the traffic. Thus, by a moderate expense and little trouble, the appearance of the streets at night time may be transformed.



Before proceeding further, we will give some constructive details of the new lamp, which was illustrated in our "Register of Patents" on April 24 last. Certain improvements which have recently been made may form the subject of a notice on a future occasion. The lantern to which we saw the invention applied (at the office of the Scott-Snell Phillips Syndicate, No. 51, Victoria Street, S.W.) was an ordinary one with circular top; and therefore, we assume, the invention can be adapted to any existing suitable lantern. Describing it in plain language, the invention may be said to consist essentially of a hollow vessel arranged immediately above the central aperture in the reflector. The underside of this vessel is, of course, heated by the ascending products of combustion, which are then led away through two side chimneys. The upper surface of the vessel (hereafter we shall refer to this vessel as the body) is cooled by a water-jacket, formed by the outside skin or cover of the lantern-top; and from this surface the heat is radiated as the water warms. Inside the hollow body referred to is a "displacer," in shape similar to the body itself, but being clear of the sides, and of about  $\frac{3}{4}$  inch less vertical depth. With this displacer resting upon the heated bottom of the body, it is obvious that a layer of gas (for the body is connected with the gas supply, a check-



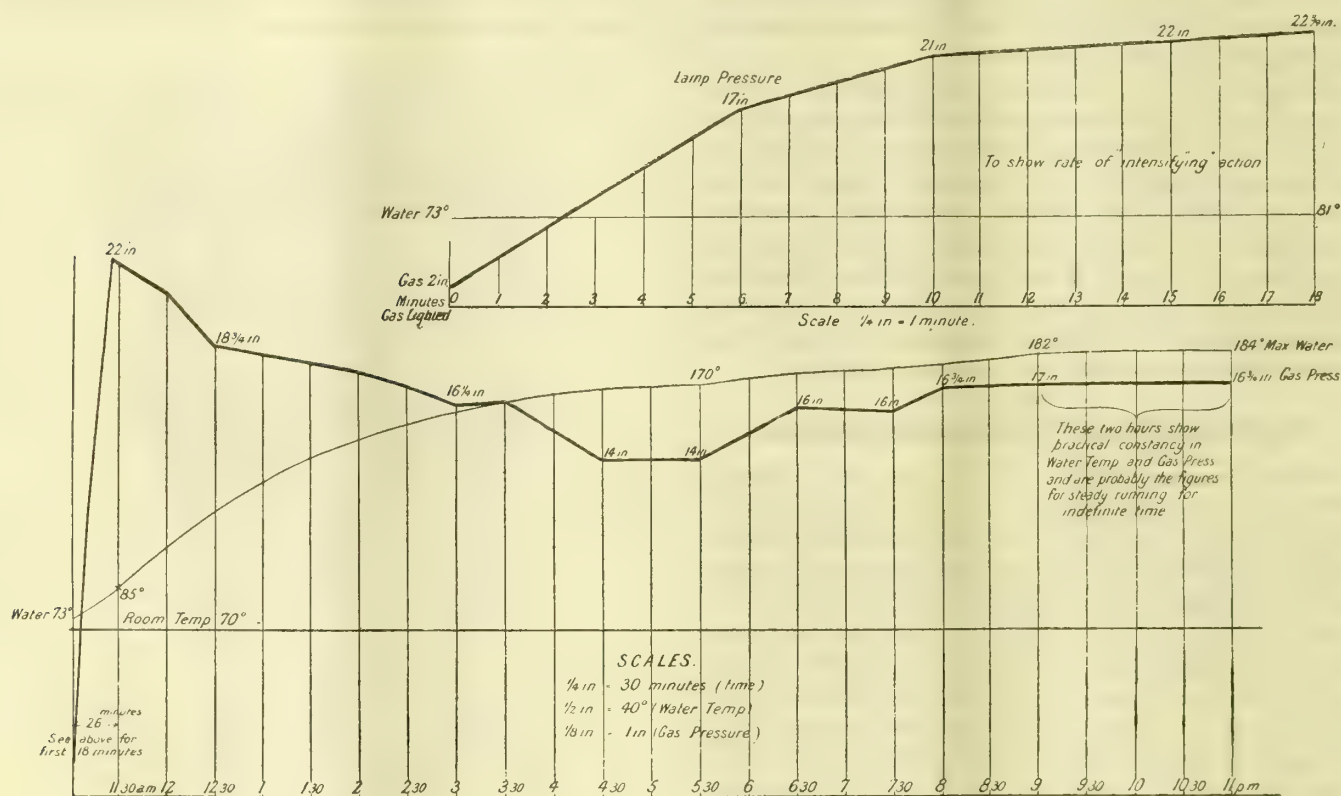
valve being in the circuit), about  $\frac{5}{8}$  inch deep, occupies the upper part of the body. If the displacer be lifted, the gas is caused to accumulate at the base of the body, a clearance of  $\frac{5}{8}$  inch now existing under the displacer. But the bottom of the vessel is heated, and the gas therefore expands. It cannot return by the inlet-pipe on account of the check-valve; but it finds its way out by another pipe (also fitted with a check-valve) into a small container or reservoir, from which the burner is fed. The downward return of the displacer now transfers the remnant of heated gas to the space at the top, which, being cool, causes condensation and vacuum. The expelled heated gas cannot return on account of the check-valve; and the vacuum therefore causes a suck upon the inlet-pipe, and the body is recharged with gas. Thus, provided the displacer be reciprocated vertically, the action is exactly equivalent to a pump; and the result is accumulated gas under pressure in the reservoir.

The necessary reciprocation is effected in a very simple manner. A tube runs centrally upwards from the body into a small box, the lid or cover of which when screwed down embraces a horizontal disc or diaphragm. Through the centre of the diaphragm (and clamping it between two screws) runs a rod ending in the displacer to which it is secured. The rod projects beyond the diaphragm at the top, and, with a suitable spring secured thereto takes the weight of the displacer—the diaphragm being then horizontal. The pressure produced by the heated gas acts upon the diaphragm, and causes the rod

and displacer to be lifted—thus permitting more gas to pass to the heated section until the full vertical lift has been accomplished. The surplus gas meantime is feeding into the reservoir. The initial impetus communicated by the diaphragm to the displacer having been expended, this begins to fall by gravity, and starts the condensing action which follows the change of position of the displacer. The resulting vacuum acting on the diaphragm accentuates the speed of falling—thus causing a stress on the spring, which culminates in a rebound directly the vacuum ceases by the influx of more gas. In short, a continuous dancing of the displacer takes place; and this is the only moving part in the appliance except the slight movement of the little check-valves. No oiling is required; and no friction exists. This description, without liberal illustration, may not be very clear. But it all amounts to this—that the gas, at ordinary pressure, is led from the lamp service-pipe to the automatic arrangement situated in the head of the lamp. It is there compressed in the manner explained, and is then led down the other side of the lamp, and supplied to the burner at any suitable pressure.

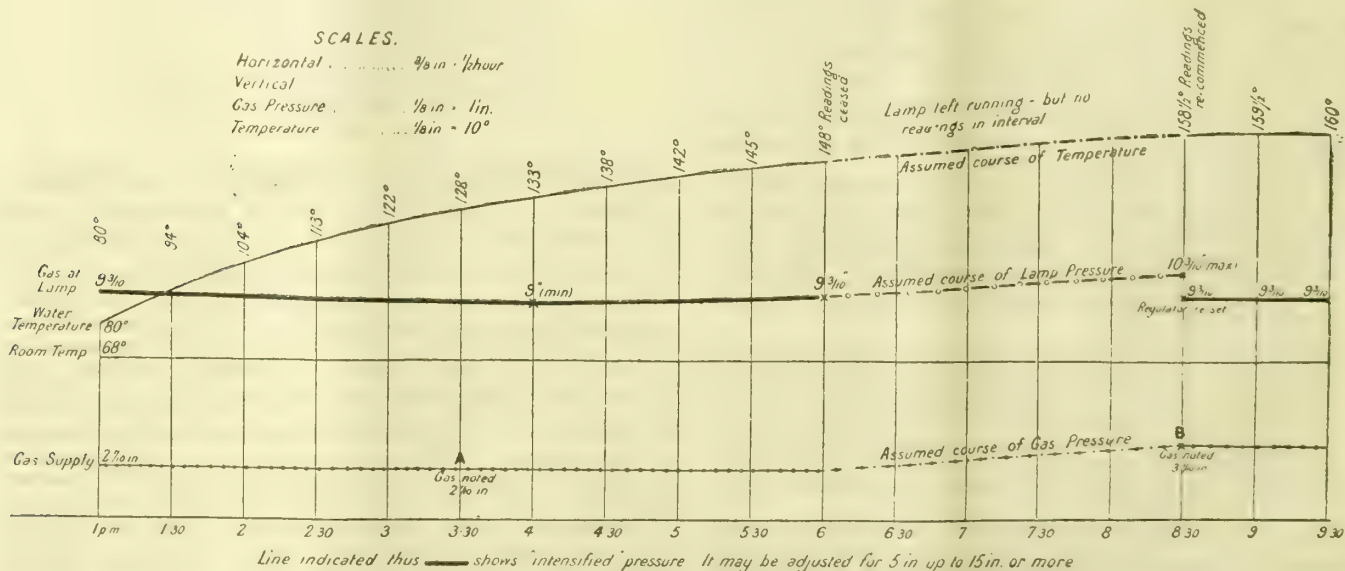
Among other interesting points upon which information may be desired, we have gathered these: The size of head involved in converting a lantern into an intensified lamp is not greater than normal. Evaporation of the water is guarded against by sealing up the vessel with the addition of a pressure and a vacuum valve. This at present is effected by a rubber disc, with

DIAGRAM 1.—Twelve-Hour Test of the Self-Intensifying Lamp.



Note.—The depression between 3.30 and 6.30 is probably due to the spring at the head, which was unsteadily mounted, and was subsequently changed, and gave steadier results.

DIAGRAM 2.—Eight-and-a-Half Hour Test of the Lamp on Aug. 2 last.



Note.—This diagram shows that the lamp pressure only varied  $\frac{1}{10}$  inch during the first five hours when continuous observations ceased. At 8.30, when observations were resumed, the lamp pressure had risen 1 inch in accordance with the 1 inch rise in the supply pressure. On a circuit with a different governor, the lamp pressure would be practically even.



a knife-cut in it; so that normal sealing is effected, but the sagging or bulging due to vacuum or pressure causes an opening to appear. At the base of the burner is mounted a special two-phase nipple, the exact function of which is to provide duplicate feeding apertures—one for high and one for low pressure. By a special arrangement, when first lighting the lamp, the low-pressure feed alone is in action; but on the intensifying action setting up, this feed automatically closes, and the high-power aperture is in action. It is thus possible to use the lamp, if wished, as an ordinary (say) 60-candle power burner, or, by merely opening a cock, admit the gas to the body containing the displacer, and allow the lamp to "intensify." In response to general demand, the lamps will be sent out adjusted to any pressure between 8 and 10 inches. But the reserve of power is such that, if desired, users can permit the pressure to rise to 15 or more inches upon special occasions, and so materially increase the light. The gas reaches the burner in a highly heated state; and this (although no photometrical tests are yet available for publication) without doubt produces further economy. As the cost for power is *nil*, and some of the attendant capital expenses involved in compressor systems are absent, this light should certainly show specially economical figures. But that is a matter on which we have at present nothing definite to say. Commercially considered, the system is easily introduced; the cost of a single lantern enabling any local authority to test intensified lighting in any position to which gas is already led. Even if conservative tendencies prevented further advances, the lamp cannot be regarded as a "white elephant," as it can be left to run as an ordinary lamp. There is no danger; and each lamp being independent, an accident will not cause the disablement of a number of lamps. The lanterns may be fitted with single burners or clusters, giving a light of 1000 to 1500 candles.

The two diagrams which we publish are interesting; and they are almost self-explanatory. Diagram 1 shows that the lamp when not governed or retarded produced a pressure of 17 inches of water within six minutes of lighting up; in ten minutes this had risen to 21 inches; and in 18 minutes it was 22½ inches. The lamp was then allowed to run uninterruptedly for twelve hours. The gauge gradually fell until a minimum of 14 inches was reached, rising again to 16½ inches, which was the lowest reading for the concluding three hours—the variation being only ½ inch in the interval. The dip to 14 inches is explained by bad adjustments, which were set right; and the pressure consequently rose again. As the lamp-head had to be kept cool by water, it is interesting to note that the maximum temperature never exceeded 185°, although inside a room having a temperature of 70°. In Diagram 2 (a trial in which the gas pressure was controlled so that its maximum did not reach 10½ inches) the maximum water temperature is given as 160°, after 8½ hours' run. As already mentioned, water evaporation is prevented by an ingenious arrangement, so that inspection for refilling need only be made when the mantles are being renewed. The illustration of the lamp gives a general idea of its outward appearance. Although it accomplishes so much, there is to the eye very little about it different from other large street-lamps. The chief part of the arrangement is contained in the upper part of the lantern; and this does not materially increase its size.

A point of considerable importance in the system seems to be the two phases of the light. Possibly lighting authorities would find economy in running the lamps for the first hour after lighting up at their ordinary power of 60 candles, and then up to midnight at 300 candles—again changing to 60 candles for the remaining time. This, it is true, would mean a little more labour; but it would be an easy matter of calculation to find the economy in gas consumption. Certainly in shops, railway stations, and many other positions, where there is always someone in attendance who could undertake the duty, there would be an advantage in adopting this course. In shop lighting the power to run the lamps at higher pressures—say, 15 inches or more—is easy of attainment by throwing the regulator out of action; and this might be an advantage on occasions when extra brilliance is required.

We give these particulars about the new invention as they were gathered and supplied at the time of our inspection of the lamp; and we have to acknowledge the courtesy and freedom with which Mr. Scott-Snell and Mr. Charles W. Phillips, the Managing-Director of the Syndicate, replied to inquiries on all points. It is our impression that the lamp has a future before it. Longer experience may reveal small weaknesses; but we could not, in the short time the lamp was before us, place a finger on a single spot in which might lurk danger to success—that is, assuming the Syndicate fix the cost of installation at a fair figure. There is no clockwork to get out of order—indeed, there is only one working part. All portions of the device, too, may be easily renewed; but renewal is not likely to be a frequent requirement. The lamp inspected (which was fitted with a No. 8 Kern burner and a mantle specially made for high-pressure work) was tried in our presence both with and without the new arrangement in use; and the difference in intensity was very marked. Without any adjustment, there was no vibration, when running with pressures purposely varied between 8 and 10 inches.

Here for the present we leave the new comer, with a simple expression of good wishes for success in the big field which exists for high-power gas lighting. It must, however, expect to meet with strong opposition from existing systems,

## NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Edinburgh.

We conclude to-day our report of the proceedings at the recent annual meeting of the Association by giving the last of the three papers read, together with the discussion to which it gave rise.

### OBSERVATIONS ON RETORTING AND CONDENSING TEMPERATURES.

By FORBES WADDELL, of Forfar.

Calculating on bases supplied by respected authorities, it is found that, even in the best forms of regenerative settings, the coke required to gasify one ton of coal has a calorific value of 4,914,000 B.T.U.; while the amount of heat required to gasify the coal is represented by 809,760 B.T.U.—less than one-sixth of the value is used for its proper purpose. There is, of course, to be reckoned the heat energy lost in getting through the material of which the retort is made, and the maintenance of the internal surface of the bench walls at the same temperature as the retorts, &c. But even allowing a reasonable amount under these heads, there is certainly a great quantity of heat wasted or badly applied in retort-houses.

In the first place, the retort-houses are kept warm at the places where the men have to do the hottest work. But we are prone to get used to things not being as they should be; and, though we admit that there is a lot of heat expended on the men and their surroundings, we have to be content with the conditions. These conditions are, however, unsatisfactory; for they are evidence of heat badly applied at the best, or altogether wasted. "Altogether," of course, refers to heat expended on floors, walls, roofing, and the air which at times rushes very rapidly over the bench surfaces; and "badly applied" is suggested to me by coals being dried in front of retort-benches in winter. The latter instance, perhaps, looks somewhat of a paradox; but when it is considered that the coal must be kept more than 20 feet from the source of heat, one must admit that the drying is done at great expense, though it is certainly better than letting the heat radiate on to the wall. Retort-house walls, to my knowledge, sometimes get too hot for the hand, though there are many openings in the walls of the house referred to. On the other hand, the mouthpieces of retorts in action sometimes get cold enough to handle.

In considering whether a remedy, or a partial remedy, can be found, this occurred to me: In a setting of brick-built retorts 4½ inches thick, with a 4½-inch front wall, there is never the least tendency on the part of the front surface to become red hot; though it is observed that, at the end of a charge, the retort is a bright red. Further, the same temperature is applied to the brick retorts as to the front brick wall; and, therefore, if a door were put over part of the front wall, that part would soon get red hot, and would keep so as long as the door was shut. The door being closed only keeps the air off that part of the wall; and the two results are: (1) bricks get red; (2) air passing over that part is not much heated.

Here, however, another point occurs to me. Say that there is within the setting (I have not attempted to use thermometers therein) a temperature of 2000° Fahr., and at times the hand can be put on the mouthpiece. Then there is a difference of nearly 2000° between the temperature surrounding the retort and that round the mouthpiece; and though the latter is seldom so cold as to be handled, there is at all times a very great difference, which must mean a rapid fall in the temperature of the products of the distillation of the coal.

From a very early period in the history of gas making, managers have been exhorted to cool such products very gradually; and the importance of doing so is being brought home now with more force than ever it was in the past. It is no new thing to take the gas out of tars. There have been many ways, of which I presume the most outstanding are the Dinsmore and the Peebles processes. Both have shown remarkable results. Mr. Isaac Carr, of Widnes, in a paper read before the Manchester District Institution of Gas Engineers, stated that by passing the distillation products, on their leaving the retort, through a heated duct, the quantity was increased 10 per cent., and the quality by 4 or 5 candles. From the distillation of one ton of tar in the Peebles plant, according to Mr. Bell, there are obtained about 15,000 cubic feet of 25-candle gas and 15 cwt. of excellent coke.

In Blairgowrie, I made some slight alteration of the fittings of a setting of three retorts with the view of condensing as much tar as possible, and returning it to a specially heated part of the ascension pipe; and the results were so good that at the time I was sceptical, but was ultimately quite satisfied as to their accuracy. It has, therefore, been interesting to me to further experiment with these two points before me: (1) The saving of heat and returning it to the setting; and (2) cooling the products of the distillation of the coal more gradually. My aim has been to bring about at a single retorting the gasification of as much of the coal products as possible, with the lowest expenditure of the coke produced; and these modifications have suggested themselves to me, and been carried out from time to time.

The temperature of the gases surrounding the retort being say) from 1800° to 2500° Fahr., and that of the air playing about mouthpieces and ascension-pipes from 50° to 100° Fahr., there is, in addition to the sudden cooling, a great fluctuation—more



sudden as the temperature of the atmosphere falls, and improving as it rises. This fluctuation is from day to day and from season to season.

The experimental plant was, to begin with, an iron retort, 3 feet long by 7 inches diameter, and other plant corresponding. The first help to more gradual cooling that suggested itself was a larger ascension-pipe, giving increased duration of travel from the retort to the hydraulic main, and thereby, according to our best authorities, giving gas of increased illuminating power. The first arrangement had the stand-pipe 1½ inches diameter, and it was substituted by one 3 inches diameter, provided with a cooling vessel at the top (see fig. 1).

FIG. 1.—ARRANGEMENT FOR CONDENSING HEAVY TARS AND RETURNING THEM TO MOUTHPIECE.

At this point, I cannot refrain from saying a few words on my experience of different diameters of ascension-pipes, the choking of which has given most managers some trouble. First, they are simply a means of conveying gases and vapours from the retort to the hydraulic main; and although those who are troubled with chokes in them might well reason, even from a mechanical point of view, that, if there was more room for pitched tars, there would certainly be fewer chokes, still the pipes I come across are not being much increased. In addition to the extra area, there is greater cooling surface. An 8-inch pipe, for instance, has an area of fully 50 square inches compared with an area of 23-75 square inches in a 5½-inch pipe. The comparative rates of travel through 5½-inch and 8-inch diameter pipes are as their areas; so that the cooling efficiencies of the two are (respectively) 409 and 12,600—that of the 8-inch pipe being three times that of the 5½-inch pipe. One thing that change has brought about is the complete absence of chokes. I have not had a choked ascension-pipe for five years.

In very cold weather, however, even with high heats, there is liquid tar on the mouthpieces—evidence that a great quantity of hydrocarbon vapours is being condensed in the mouthpiece, where the temperature is much greater than in the hydraulic main. At other times, with no better heat in the setting, but with warmer air round the mouthpieces and ascension-pipe, the former is quite dry; and from the tar coke on the mouthpiece, it is evident that a good deal of tar has been gasified.

The last modification I have made is one that, while controlling the temperature of the air round the stand-pipes, returns to the setting the air which, in cooling the ascension pipes, mouthpieces, and bench front, becomes itself heated. Fig. 2

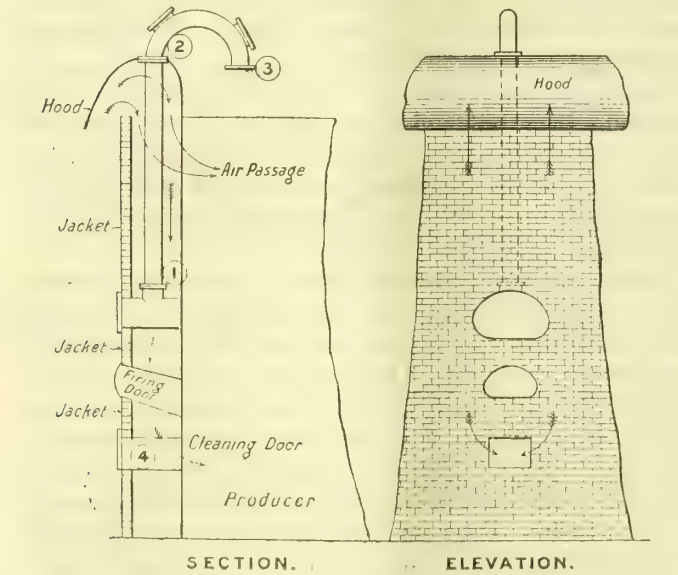


FIG. 2.—SUGGESTED METHOD OF HEATING MOUTHPIECE AND AIR FOR COMBUSTION.

illustrates the setting and ascension-pipe covered with sheet-iron in such a way that the chimney draws all the air needed for the producer and combustion chamber down between the bench surface and the bench front covering. The advantages of this are two: (1) There is, in the first place, brought about that desirable gradual reduction of temperature, or the cooling is at any rate more gradual; for, instead of the air first getting into contact with the mouthpieces when at its coldest, it commences to cool the top of the ascension-pipe, and as it gets warmer, descends to cool the mouthpieces and, indirectly, the distillation products. That order of things—the cold air first cooling at the top—means the falling out of a greater quantity of heavy tars than is the case in ordinary practice; and, further, it means the retention of hydrocarbons in their gaseous state at the mouthpiece, by reason of the air coming into contact with the mouthpiece being

first heated, and on that account not cooling the coal products so rapidly. (2) The other advantage is in the air, thus heated by contact with the ascension-pipe and mouthpiece and with the bench walls' surface and the inside of the covering of bench front, being still further led over the bench surface, till, when entering the producer and secondary-air flues, its temperature has been increased from (say) 70° to 500° Fahr.

The result of this arrangement, considered in relation to better results in make and quality of gas, is tabulated side by side with results from the plant under the other conditions already mentioned. The saving of coke was quite appreciable, even with the experimental plant; and in view of this, the figures for coke-saving per ton of coal carbonized may interest you. Counting on each ton of coal producing 13 cwt. of coke, and allowing that 25 per cent. of the coke made is required to keep up the heats, we have  $\frac{13 \times 112 \times 25}{100} = 364$  lbs. of coke used per ton

of coal carbonized. Say that each pound of coke requires for its combustion only 12 lbs. of air—not much more than the theory figure—then the amount of air required for firing per ton of coal carbonized is:  $364 \times 12 = 4368$  lbs. The specific heat of air being 0.238, and all the air required for combustion, 4368 lbs., being heated through a range of (say) 430° Fahr., then the heat given back to the setting in this way means—

$4368 \times 430 \times 0.238 = 447,020 \text{ B.T.U.}$

That is a saving in coke at the rate of 33 lbs. per ton of coal carbonized; and I may say the estimate is very moderate, as the air was heated to the extent calculated by taking back only the air which had heated the front surface, while the air heated in the remaining surfaces was allowed to escape through the roof. A further disadvantage with this experimental plant is that the jacket protecting the bench front is of thin sheet-iron, which is not a good non-conductor. I have not had a brick covering tried; but I have no doubt it is quite applicable to a working setting, in which case I believe a temperature of about 700° Fahr. could be maintained about the mouthpiece. Such a saving as would result from tars so heated is gauged to some extent by the improved results Mr. Carr realized with the Dinsmore process; and the sale of coke per ton of coal carbonized would be increased to the extent of about 60 lbs. No doubt those figures are good, and I have not obtained them in practice; but the experiments have been carried out under fairly disadvantageous circumstances, and the results given in Table III. can, I am sure, be improved by arranging a practical setting.

Anything I have up till now said about temperatures does not specify the actual degree unless in one case; and I may further state that, on account of the unreliableness of thermometers for high temperatures, I made no attempt to use them inside the setting. But the heats were very carefully regulated so as to work off to the same colour charges of the same weight of the same coal from the first test to the last one.

The quantity of splint nuts used in each test was 1½ cwt.; and the results here given are just as found:—

OBSERVATIONS ON RETORTING AND CONDENSING TEMPERATURES.

I. Ordinary Plant.					II. Enlarged Ascension Pipe.					III. Large Ascension Pipe and Bench Front Covered.				
Temperatures, Degr. F.					Temperatures, Degr. F.					Temperatures, Degr. F.				
Hour.	Mouthpiece.	Top of Stand-pipe.	Hydraulic Main Outlet.	Primary and Secondary Air.	Hour.	Mouthpiece.	Top of Stand-pipe.	Hydraulic Main Outlet.	Primary and Secondary Air.	Hour.	Mouthpiece.	Top of Stand-pipe.	Hydraulic Main Outlet.	Primary and Secondary Air.
6	185	80	110	66	6	184	70	112	68	6	350	82	86	440
7	180	84	144	70	7	240	80	104	70	7	346	90	128	420
8	172	89	134	69	8	240	84	134	70	8	348	90	134	428
9	185	93	130	66	9	204	86	130	66	9	350	91	140	440
10	184	92	132	64	10	222	88	140	65	10	352	92	160	460
11	234	94	156	62	11	184	86	144	63	11	355	80	158	460
12	193	84	150	60	12	190	90	146	63	12	345	88	156	462
1	190	78	144	58	1	192	82	144	60	1	330	90	148	468
2	184	82	146	60	2	200	80	142	58	2	327	88	144	450
3	178	78	140	60	3	220	82	140	60	3	320	86	140	456
4	170	76	138	60	4	190	78	140	62	4	320	86	148	440
5	212	90	150	62	5	188	78	142	60	5	326	88	160	442
6	204	92	152	64	6	190	88	144	62	6	330	90	156	450

IV.—RESULTS COMPARED.

	Tar Made per Ton.	Gas Made per Ton.	Illum. Power.	Sperm Value.	Coke Saving.
	Gals.	Cub. Ft.	Candles.	Lbs.	Per Ton.
I. Ordinary arrangement.	13½	9,150	16.8	527	..
II. Stand-pipe enlarged.	10½	9,300	17.5	634	..
III. Ditto, and bench front covered.	10½	10,750	19.9	733	33 lbs.

Temperatures marked 1, 2, and 4 refer to atmosphere; and those marked 3 are for gases. The points at which these were taken are shown on fig. 2.



The temperatures given in the various tables are actual thermometer records. My reason for giving them is to show the effect of temperature on the quantity and quality of the gas, and on the quantity of tar deposited in and beyond the hydraulic main. In ordinary retort-house conditions, these temperatures fluctuate and do much harm, and control of temperatures by chimney draught or by valves let into the bench covering could, with careful working, mean better and more gas, more coke sold, no worry with choked pipes, and much better working conditions for stokers.

#### Discussion.

The PRESIDENT said he had to congratulate Mr. Waddell on bringing forward his most interesting paper. It was one of those papers which improved as time went on. Mr. Waddell's results had been most successful; but he (the President) presumed that if his suggestions were worked out in a practical manner, even more startling results than those named would be obtained. Mr. Waddell referred to choked ascension-pipes. These were not quite common things in Scotland; but years ago he did have a little trouble in this way, and he found that by constructing the ascension-pipe so that there might be about 6 inches of an incline (either inwards or outwards), all tendency to the choking of the ascension-pipe disappeared. Perhaps other circumstances had changed; but his firm opinion was that the disappearance of chokes was due to the condensing hydrocarbons coming down the one side of the ascension-pipe only, instead of spreading round about and becoming deposited until the pipe was carbonised up.

Mr. A. YUILL (Alloa) thought there were one or two points on which it would be better to have a little information. In the table of results given, they would find that 10½ gallons of tar were obtained per ton of coal, with 9300 cubic feet of gas, of 17½ candles illuminating power. But with the stand-pipe enlarged, and the front of the bench covered, the make of gas was increased to 10,750 cubic feet, the tar to 10¾ gallons, and the illuminating power to 19.9 candles. The sperm value was also raised. He did not see where they could have this increase, because they all knew that if they increased the quantity of gas per ton of coal they had a factor that was raising the sperm value of the gas; but in raising the sperm value, they were decreasing the other factor—viz., the illuminating power. In this case, the illuminating power was raised 2.4 candles. Now, they knew that if they gained in volume, and if they increased the illuminating power, they might get the increases from the distillation of the tar; but in this case the volume of the tar was also increased. Consequently, they did not get both the illuminating power and the volume from the tar. What struck him was where the increased volume had been derived, because if the increased volume resulted from higher heats, they all knew that it would be at the expense of the illuminating power. Perhaps Mr. Waddell might enlighten them on this point. The diagram, fig. 2, showed a hood on the top of the bench. He formed the opinion that there would have been a better command of the heat if they took up the front building in line with the front of the retort—still retaining the hood on the top of the bench, because, by the arrangement shown, they were increasing the velocity of the current, robbing the heat of the ascension-pipes, and taking it from the primary air. Did Mr. Waddell not think that, were he not creating any current in front of the retort-bench, he would be able to raise the temperature of the ascension-pipes still more?

Mr. WADDELL: Certainly.

Mr. YUILL: Then what is the use of the building in front? Continuing, he said he knew that, in his own case, he was able to get the primary as well as the secondary air heated as high as he needed it, by the products as they left the setting.

Mr. A. WILSON (Dawsholm) thought they were all indebted to Mr. Waddell for the trouble he had taken in getting up his paper. He did not think this was the first time he had seen the front of a retort-bench jacketed; but it was always more with the idea of keeping in the heat. He presumed that Mr. Waddell was trying to get some benefit from the heat that would otherwise go to waste. The results he obtained were certainly very striking. He did not know whether it was possible to get the same results in practical working. There was always such an amount of movement in retort-benches that he thought it would be very difficult to keep a jacket tight. At the same time, from the results given in the paper, there seemed to be something in the suggestion; and perhaps it would be worth while carrying on the experiment a little further, and seeing what might come of it. He was very glad to see that Mr. Waddell had the time to go in for experiments of this sort. They could not all go in for them; and they were certainly indebted to those who did.

Mr. J. WHYTE (Seaham Harbour) said last winter he was engaged in making similar experiments in the heating of the air; and he had difficulty in getting a friend to acknowledge that it was possible to do what was done, until he saw the results.

Mr. WADDELL said he was rather sorry that there had not been more discussion on his paper. Mr. Yuill's remarks did not bother him in the least, because this idea had only been matter of experiment with him. He thought there might have been further suggestions as to whether the ideas he had put forward were practical or not. When he put the bench down at Forfar, he utilized a flue running alongside the waste-gas flue for the heating-up of the primary air, and used it for a year or two. It

was very hot, and certainly he thought the hotter they could get their primary air the better, because, if they were putting in air at 50° Fahr., instead of 500° Fahr., they would certainly be dropping a great deal of heat. As to the heat that, in the meantime, was allowed to go to waste, whose retort-house did they go into on a winter night, and did not find a draught which sometimes made the surface of the bench walls quite cold? At least, he knew that it was so in his retort-house; and he knew houses which were worse than his. They would even find a draught between the back of the bench and the back wall of the retort-house. The air, as it was getting away to the roof, or out through the door, was very hot; and it carried away a great deal of heat from the retort-bench. If two objects placed near each other were interchanging heat, the interchange would be the greater the more the difference between the two. The colder the air that impinged against the bench front, the quicker would the bench give up heat to the atmosphere. It was on these lines that he commenced. He felt convinced that there was a lot of heat which was not under control. It did not matter what kind of night they had, the retort-bench was always very much hotter than the atmosphere. The atmosphere coming in contact with the bench, got heated up; and as soon as it did so, the heat rushed out by the ventilator. One of the points Mr. Yuill brought up was the having of a hood on the top without a covering on the bench front. He (Mr. Waddell) did not think that would do very well, because he had had it tried. If they put a hood there without a jacket, the air would go up the front of the bench the same as now; but it would just curl out at the top of the hood, and go right away back over the hood. The current was, as far as he could find, not very much less in the one way than in the other. The arrangement he had shown did not mean that there was very much air going up. It only meant the quantity that was drawn down by the chimney; and therefore it was under control. As to the sperm value of coal, Mr. Yuill was no doubt quite right about the ton of coal having just a certain sperm value; but let them take what they got from the ton of coal, and he was told that in an oil-works they got about twice as much sperm value from coal as they did in a gas-works.

Mr. YUILL said, to make the matter clear, he could mention that it was now a recognized fact that the lower the temperature (within a certain ratio) at which they distilled coal, the higher the sperm value obtained. Consequently, in oil-works they got a higher sperm value. But in this case they were raising the temperature by covering the front of the bench; and yet they were getting a higher sperm value. They were going contrary to the results obtained in oil-works, where shale was distilled at a much lower temperature. It was a recognized fact that the lower they distilled coal or shale, within (say) a maximum and a minimum, a higher sperm value was obtained. Mr. Young had placed this very clearly before the Association on several occasions.

Mr. WADDELL said that was so; but he thought that Mr. Yuill was going a little too far in saying it was a recognized fact. However, he did not think it touched the point he was at. They knew very well that if they distilled coal at a very low heat, they obtained a great quantity of tar; and they did not get a rich gas. A certain shale he knew of, if distilled in a practical plant, gave about 11,000 cubic feet of 32-candle power gas; and this same shale, if distilled at a lower heat, gave about 9500 cubic feet of 28-candle gas. In his paper recently to the Gas Institute, Mr. Young said that if they distilled coal in a heated atmosphere, better results were obtained. Mr. Wilson was not very sure whether his arrangement could be applied practically to a retort-bench. Neither was he himself; but he believed that something to prevent the front fittings of the retort-bench from getting so cold would do a great deal of good. He knew that he was constantly troubled (with the large ascension-pipes which he had) with tar in the mouthpieces, in very cold weather; and he had no doubt but that, if there were sufficient heat at the mouthpieces, if that could be turned into gas, it would be so much extra gas, and very rich gas. The Peebles process was just that. They took the tar out of the coal, and put it into the tar-well. The Peebles process was just a lot of heated tubes, in which the tar was kept. An ascension-pipe, if made big enough, would be a retort—it would be a vertical retort; but that did not matter if they put a sufficient amount of heat round the pipe. He was rather surprised to hear one who had worked the Peebles process—both with oil and, he supposed, tar—speaking as Mr. Yuill did; because, as he said, by putting a higher heat round about the ascension-pipes, they were practically making the Peebles process out of their retorts and their ascension-pipes. However, this was but a little experiment of his. He read the paper to get some suggestions; and he thanked the speakers for what had been said about it.

Readers of the "JOURNAL" are familiar with the name of Mr. HENRY C. REW, of Chicago, in connection with his process for the manufacture of carburetted water gas by one operation and in a single apparatus, as carried on at the Cicero Gas-Works, Chicago, and also in Kansas City. Mr. Rew, who is an entirely self-made man, passed his early years, up to the age of eighteen, at Newark (N.J.). As his life-work has been attended with success, he is about to permanently associate his name with that place by presenting it with a free public library, thoroughly equipped, at a cost of about £2000, on condition that it will henceforth be maintained at the cost of the inhabitants.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Mr. Francis Jones's Tests of the Air of a Room.

SIR,—I fear you would not be willing to grant me space to say all I could in reply to the review, in the "JOURNAL" for the 31st ult., of my pamphlet on "The Air of Rooms." But, with your permission, there are a few points on which I should like to say a word.

Your reviewer asks: "If it be granted that there is a point at which the natural consequences of the absence of adequate ventilation in the case of occupied, warmed, and lighted rooms become injurious to health, what is the nature of the danger, and to what should it be ascribed?" In answer to this question, I must refer him to the work of Carnelly (which he appears to notice with approval), who has determined not only the amount of the carbon dioxide given off in breathing, but the number of organisms which accompany it, and which are well known to be more injurious than the carbon dioxide itself. He and other chemists have stated, as the result of their researches, the maximum amount of carbon dioxide which they consider consistent with healthy conditions of breathing. That maximum varies from 6 to 13 parts in 10,000 parts of air; and I have adopted the higher limit because I consider the lower one to be practically unattainable. Now, with a coal-fire and electric light in use, I found the average amount of carbon dioxide in the evening to be 9.892 parts in 10,000; while with a gas-fire and electric light it reached 14.513 parts. I may be wrong; but just as I prefer country air, with 3 parts of carbon dioxide in 10,000, to the best town air, so I prefer the air of a room in which the amount of carbon dioxide is as low as possible.

As regards the amount of carbon dioxide in different parts of the room, I lay no claim to the discovery that the best air is at the floor and the worst at the ceiling. This has been affirmed by many observers; and my own experiments support the view. Although not referred to in my pamphlet, I have made similar experiments in ordinary rooms, and with the same result.

Your reviewer picks out two or three exceptional results, as that on a fine, bright December day the amount of carbon dioxide was much higher than on a foggy one a few days later. Quite so; and it was in order to obviate contradictory results of this sort that I considered it necessary to make a very large number of experiments. Two or three determinations of carbon dioxide prove little or nothing; the average of observations extending over a month is a very different matter. The reviewer complains that no temperature observations were made. This is not so; ten or twelve readings of the thermometer had to be made daily both for the humidity and Petteukofer tests. It would have been inconvenient, and I think useless, to record so many temperature observations in the pamphlet. They are preserved in my note-books, and, if really needed, can be readily given.

I quite agree with your reviewer that "a reasonable requirement in regard to ventilation is that every inmate of a room shall have a fresh air supply of 2000 to 3000 cubic feet per hour." But I wish to ask him if he thinks that, "looked at from the point of view of the practical person," this requirement is usually to be found in the ordinary kitchen, or still smaller scullery, in which the gas-stove is frequently found? I do not agree with him in suggesting, as the remedy for the bad effects of the gas-stove, the opening of the window and the door. Is this scientific ventilation, which has been defined as "keeping the carbon dioxide in a room as nearly as possible at 5 volumes in 10,000 of air, without producing a draught?"

I wish only further to say that nowhere in my paper do I state that the door of the laboratory was kept shut. This was not possible; and, indeed, I point out (p. 7) that the opening of the door was sufficient to cause a marked difference in the results. Hence the necessity for making a large number of observations, and relying on the average result.

Manchester, Aug. 4, 1900. FRANCIS JONES, F.R.S.E.

[We have nothing to retract from what we have said in condemnation of Mr. Jones's method of experimenting. Now we notice he introduces a fresh question—that of the number of "organisms" in a polluted atmosphere. But gas-burners do not create organisms. We object altogether, not as he says to "two or three exceptional results," but to his Procrustean style of referring everything to the conditions prevailing in a "laboratory" about 10 feet square, and calling this an investigation into the "air of rooms."—Ed. J.G.L.]

## The Absorption of Naphthalene by Indiarubber.

SIR,—Our attention has been called by Mr. J. W. Morrison to the fact that india-rubber tubing absorbs considerable quantities of naphthalene from gas, and that a length of from 18 inches to 2 feet of such tube is sufficient to remove the whole of it from gas containing from 6 to 10 grains per 100 cubic feet, when passing at the rate of 0.5 to 1 cubic foot per hour. Our own tests have confirmed this; and it is therefore necessary to avoid india-rubber tubing as far as possible in making tests for naphthalene by the method we have recently described. The connection to the test-bottles must be made with glass or metal tube; rubber being only used for the actual joints—the ends of the tubes thus joined being placed as close together as possible. This method was adopted in the case of the results already published,\* as it was thought that rubber might have some absorbent action on the naphthalene, and cause too low results, although it was not anticipated that it would effect anything like the complete removal of the hydrocarbon.

The action of rubber on naphthalene is interesting also, inasmuch as it may perhaps afford an explanation of the fact recorded by Mr. R. W. Allen, in his paper read in February last, that Professor F. D. Brown was unable to detect anything but traces of naphthalene in gas leaving the works at Auckland, New Zealand, at a time when great trouble was being experienced with it in the district of supply. It is not unlikely

that Professor Brown used india-rubber tubing for the connection from the gas supply to the test apparatus, and that this removed all the naphthalene before it reached the solution used for its absorption.

HAROLD G. COLMAN.  
JAS. F. SMITH.

Saltley and Halifax Gas-Works, Aug. 6, 1900.

## PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The session was prorogued by Royal Commission last Wednesday, by which day the following Bills in which our readers are interested had passed their final stages and received the Royal Assent: Airdrie, Coatbridge, and District Water Trust Bill, Barnsley Corporation Bill, Bradford Corporation Bill, Bury and District Water (Transfer) Bill, East London Water Bill, Exmouth Urban District Water Bill, Falkirk and District Water Bill, Falkirk Corporation Bill, Gas Orders Confirmation (No. 1) Bill, Gas Provisional Order (No. 3) Bill, Glynceorwg Urban District Council Gas Bill, Hartlepool Gas and Water Bill, Hemel Hempstead Corporation (Water) Bill, Lambeth Water Bill, Margate Corporation Bill, Metropolis Gas (Prepayment Meter) Bill, Mid-Kent Water Bill, Morley Corporation Bill, Mountain Ash Water Bill, Oldham Corporation Bill, Paisley Water-Works Provisional Order Confirmation Bill, Perth and Paisley Gas Provisional Orders Bill, Portland Urban District Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, Rotherham Corporation Bill, St. Albans Water Bill, Salford Corporation Bill, South Metropolitan Gas Bill, Spalding Urban District Council (Water) Bill, Walsall Corporation Bill, Wandsworth and Putney Gas Bill, Water Orders Confirmation Bill, Westgate and Birchington Water Bill, Wolverhampton Gas Bill.

## HOUSE OF LORDS COMMITTEE.

Thursday, July 19.

(Before the Earl of CAMPERDOWN, Chairman; the Marquis of BATH, Earl TEMPLE, Lord DE RAMSEY, and Lord MONK BRETTON.)

## LONDON COUNTY TRAMWAYS (No. 2) BILL.—THE RIGHTS OF GAS AND WATER COMPANIES.

This Bill, which was to empower the London County Council to employ electricity as a means of traction on the tramways which they now control, or may hereafter control, was considered by the above-named Committee of the House of Lords. A report of the proceedings when the measure was before the House of Commons will be found in Vol. LXXV. of the "JOURNAL," p. 812.

Mr. POPE, Q.C., Mr. FREEMAN, Q.C., and Mr. DU CANE appeared for the promoters. The petitioners were represented as follows: Lambeth Water-Works Company, by Mr. PEMBER, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C.; the Lambeth Vestry, by Mr. WHEELER, Q.C.; the South Metropolitan Gas Company, by Mr. CASTLE, Q.C.; and the Wandsworth Board of Works, by Mr. E. F. VESEY KNOX.

Mr. FREEMAN, in opening, said at present there were 115 miles of tramways in the Metropolis, of which the County Council had already purchased 72 miles; and by 1903 they would have acquired nearly all the rest. Power was being sought, under another Bill which would come before the Committee, to couple up all the trams in London into one system; and it was very desirous that they should all be worked as one. There were practically three ways in which electricity could be applied to trams—the overhead trolley, the conduit, and the surface-contact system. The overhead system was very disfiguring; and it had been decided that it should not be used in London, except with the consent of the local authority. The conduit system had been tried with marked success, and, though it involved considerable interference with roads, once laid it worked smoothly and without inconvenience. This was the system the Council proposed mainly to adopt. The surface-contact system would be laid in certain parts of London, to see how it worked. Dealing with the petitions of the Water and Gas Companies, he said they raised two points. First, they were very much afraid of the action of electrolysis upon their mains. The answer to this was that there had been inserted in the Bill all the Model Clauses which had been drawn up by the important Committee presided over by Lord Cross, who sat on this question of electrolysis in 1893, and recommended these clauses for insertion in all Bills dealing with electricity. If there was to be an alteration in the clauses, it should only be made by a similar Committee, and not by a Bill dealing with a comparatively small length of line. Then the Companies asked that in all cases they might do the road work themselves. This, however, was a matter to be settled on clauses. There were a large number of Gas and Water Companies in London who were affected by the Bill; but only two of them appeared in opposition. He did not know whether the Companies present claimed to represent the other Companies.

Mr. PEMBER said he was authorized to intimate that the Lambeth Company's was taken as a test case.

Friday, July 20.

Sir Alexander Binnie, Engineer to the Council, was called in support of the Bill. With regard to the proposal of the Gas and Water Companies, he said the mode of dealing with pipes in the Metropolis had worked very well; and he saw no reason to interfere with the present general law on the subject.

Cross-examined by Mr. CASTLE: He was not prepared to give a clause that the Gas and Water Companies should be able to do the work themselves. Under the present system, if interferences with the streets by road authorities were carried out by an indiscreet engineer, there might be very serious consequences. As a matter of fact, the Council never dreamed of doing such work themselves; the practice was to consult with the Engineer, and then to permit the Companies to do the work. He did not see much objection to legalizing the practice.

\* See "JOURNAL," Vol. LXXV., p. 798.



Mr. J. W. Benn, Chairman of the Highways Committee of the London County Council, also gave evidence in support of the scheme.

Cross-examined by Mr. CASTLE: As a matter of policy, he did not agree that there was no objection to legalizing the practice with regard to dealing with roads. The existing law afforded sufficient protection to the Gas and Water Companies. The Model Clauses should not be departed from.

Professor Kennedy gave evidence regarding the systems of electricity to be used, &c. With reference to the question of electrolysis, he held that the clauses drawn up in 1893 by the Joint Committee of both Houses of Parliament would afford ample protection for the Gas and Water Companies.

The CHAIRMAN: The clause in the Bill says electrical power shall be used only in accordance with the Board of Trade regulations. Therefore the Board of Trade will satisfy themselves as to whether the pipes are going to be injured.

Mr. POPE: And will make such provision as shall secure their safety if they are injured.

The CHAIRMAN: Quite so. That duty is thrown on the Board of Trade, not on us; and we are quite incapable of undertaking it.

Witness, in further examination, said he did not know of any injury done to gas or water mains by electrolysis since the Board of Trade issued the regulations which had been in force now for some years.

The CHAIRMAN remarked that, even if injury had occurred, it would have happened under the regulation of the Board of Trade; and a section of the Bill dealt with such a case.

Mr. PEMBER did not intend to say whether the Board of Trade provisions were sufficient or not, though, as a fact, he thought them insufficient. The point was that, if complied with, and the Water Companies were injuriously affected, they would get no compensation at all. His case was that there was danger of accident; and he asked for protection, so that if accident did occur compensation should be given.

Mr. PEMBER (in cross-examination): Are you prepared to say that the Board of Trade regulations are perfect, and absolutely stop all danger of electrolysis?

Witness: I cannot say they are perfect; but I think they practically prevent danger. They have been in actual use for a good many years; and I have not heard of any case of accident to pipes.

Are you prepared to say that electrolysis may not be going on now undiscovered? It would not be discovered till it had got to a serious point?—It is not discovered at once; but a good many years have elapsed.

Until the escape of water became very serious, the Water Companies would not discover the damage; that would be so, would it not?—Yes.

And when it was discovered, it would be a very expensive matter to set it right?—Yes; if the pipes were seriously damaged.

Would it be clear to what cause the damage was attributable?—In most cases.

You admit that the amount of electrical tramway work done in England is comparatively slight?—Yes.

It is very much larger in America?—Yes.

And there a great deal of damage has been done?—A great deal; but the electrical arrangements were laid down without the consent of the Board of Trade—that is a mild way of putting it—and without any control at all.

That is to say, what has happened in America is no test of what would happen under the Board of Trade regulations in England?—That is so.

At the present moment, are not the Corporation of Manchester seriously apprehensive that the working of their tramways has caused great damage by electrolysis in their own water-mains?—I did not know that.

Cross-examined by Mr. CASTLE: Electrolytic action was caused by electricity which had escaped meeting water and a pipe, in which case the water would be decomposed, and the oxygen would attack the iron and eat through it. If this occurred, it might cause great danger to the community. He did not think there was danger of fusion occurring by contact of unprotected wires and pipes. The Council were taking power to adopt any system of electricity which the Board of Trade might sanction—among them that of uninsulated returns; but that system, he was almost sure, would not produce electrolysis. Under the Board of Trade regulations, a certain amount of leakage of electricity was permitted; but not sufficient to produce electrolysis.

Mr. CASTLE: Seeing that you are asking for powers which may produce electrolytic action on our pipes, and seeing that you are working under regulations which you say are not absolutely perfect, do you see any reason why you should not give us compensation if you do us injury?

Witness: I have considered the question. The point is that we, as Engineers, have to work and to construct our system according to particular rules and regulations devised by skilled persons—officers of the Board of Trade; and we think, if we carry out these things which are prescribed, and are looked after in carrying them out, we should not be held liable for further consequences.

The CHAIRMAN: That is perfectly right as regards yourselves; but the question is whether the persons who employ you ought not to be liable.

Witness: I meant the owners of the tramways.

The CHAIRMAN: You think that, having done what the Board of Trade asked them to do, they ought to be free from further consequences, even though the result of their operations may be that the pipes are injured?

Witness: That is my view, because the Board of Trade have power at any time to strengthen their regulations.

Mr. CASTLE: I think you are going too far. You are bound to lay these tramways under the existing Board of Trade regulations; but they have no power over you in the future.

Re-examined: He held that the Council ought to be exempt from the results of working under the regulations of the Board of Trade, providing they would not be negligent. Lord Cross's Committee of 1893 found that the danger from fusion or electrolytic action appeared to have arisen from a faulty system of constructing electric tramways; and they were of opinion it could be reduced by improved methods of construction so as to be practically negligible. They recommended that the Board of Trade should make regulations accordingly, and such regulations were made.

This closed the case for the Bill.

Mr. PEMBER then addressed the Committee for the Lambeth Water Company. He did not ask them to alter the regulations, but merely to

amend the provision that whatever might be the injury which might arise from working a tramway under the regulations of the Board of Trade, the tramway company or authority should not be liable. The Water Company naturally were in possession of the roads first; and if the tramways did them any harm, they, as the later comers—the aggressor so to speak—should compensate the Water Company.

### Monday, July 23.

Mr. CASTLE said there were one or two points on which he wished to address the Committee for the South Metropolitan Gas Company. His clients were asking for protection from damage which might accrue to them under peculiar circumstances. This was the first Bill in which Parliament had been asked to delegate its powers to a Department of the Government, without retaining any sort of control. The suggestion in clause 3 was that in future the County Council should act, in connection with the system of electric traction to be used on these tramways, with the consent of the Board of Trade. The matter of tramways was very much like that of light railways, which in turn were similar to the question of the construction of ordinary railways. If anyone had had the audacity to come before Parliament, and ask to make a railway—say, from London to York—on such and such a system, and according to such a method as the Board of Trade, apart from Parliament, might consent to, Parliament would have made short work of the request; and yet this was what was being asked in the present Bill. Even when the Board of Trade permitted a scheme to be carried out under Provisional Order, it was always the rule that the Order should be confirmed by Act of Parliament. But here they were asked in a most extraordinary way to deal, not with what the Board of Trade had already done, as in the case of a Provisional Order, but with what the Board of Trade might do in the future.

The CHAIRMAN: Your contention is that the ordinary practice is at present for the Board of Trade to sanction an electric system, and for the matter subsequently to come before Parliament for confirmation.

Mr. CASTLE said that was the arrangement he wished the Committee to make in this Bill. If the Board of Trade authorized a system, the opponents should be able to come to Parliament and say that the Board of Trade had erred; and the question should be reconsidered by Parliament. The County Council came there, and asked that what the Board of Trade might sanction in the future should have all the authority of an Act of Parliament. This would not be allowed in the case of any Railway Company making their own lines. For this reason, he asked for protection.

The CHAIRMAN: What is it you are asking for?

Mr. CASTLE: I ask for the same clause as Mr. Pember.

The CHAIRMAN: I thought you were going to ask for a clause saying that the electrical system selected by the Board of Trade should require to be confirmed by Parliament as in the case of a Provisional Order.

Mr. CASTLE said he was asking for the compensation clause which Mr. Pember contended for, and obtained. There were special reasons in this case why they should have it. The County Council in these matters should not be allowed to shelter themselves behind the Board of Trade. In an ordinary case, Parliament would object to persons coming with an ill-digested experimental scheme, and would insist on the whole matter being put before them.

The CHAIRMAN: Do you want us to throw out the Bill on that argument, or simply to insert a compensation clause?

Mr. CASTLE said a compensation clause was all he asked for.

The CHAIRMAN: Then you do not appear against the preamble of the Bill?

Mr. CASTLE: Yes; if the compensation clause is not inserted, I ask that the Bill shall be thrown out. The promoters are seeking to introduce any electrical system which the Board of Trade may desire. There are three systems. First the trolley—

The CHAIRMAN: That system is barred by the Bill. Besides, we have had all three systems gone into; and I do not think you need repeat them.

Mr. CASTLE said that all the objections to the trolley system applied equally to the surface-contact system. His point was that this was an exceptional Bill, framed in an exceptional form; and he asked that it might not be passed without a compensation clause.

The CHAIRMAN: You do not offer evidence?

Mr. CASTLE said he did not; but he might have to call witnesses as to the Council doing their own work, if the Bill were allowed to proceed.

Mr. WHEELER, in addressing the Committee for the Lambeth Vestry, said the Bill raised the question of the control of the roads and streets in London. By the Metropolis Management Act of 1855, and subsequent Acts, the public streets were placed under the control of the London Vestries. The present Bill sought to repeal what was the general law of the land; and he asked the Committee to say that, in a Private Bill of this character, this should not be done, as it would be inconsistent with the general practice of Parliament.

The CHAIRMAN (after deliberating in private with his colleagues, and without calling on Counsel for the promoters) said the Committee had decided that the Bill might proceed.

The Committee then commenced the consideration of clauses.

On clause 4, which provides that the Council shall take all reasonable precautions in constructing, placing, and maintaining their electric lines, and so conduct their undertaking as not to injuriously interfere by electrolytic action with any gas or water pipes.

Mr. PEMBER submitted, as an addition—"and the Council shall make full compensation to any company or person suffering loss or damage by reason of any such fusion or electrolytic action as aforesaid." His point was that the County Council were the aggressors; that the Gas and Water Companies were in the roads first; that their business was quite as important as, if not more important than, that of the County Council in regard to the trams, from the public point of view; and that those who caused the damage should suffer—not those who bore the damage. Lord Cross's clauses were good, as far as they went; but, however careful the Board of Trade might be in framing regulations and carrying them out, damage might arise, and if it did, the proper people—the County Council—ought to pay. It was not desired to stop the County Council, but only to make them pay for any damage they might cause.

Mr. BALFOUR BROWNE said he understood the decision of the Committee on this Bill would regulate their decision on the following Bill, in which the same point was raised.



The CHAIRMAN remarked that this must not be taken for granted.

Mr. BALFOUR BROWNE said he appeared for the Great Northern Railway Company; and he entirely concurred in Mr. Pember's statement. What the Railway Company feared was that these wires of the County Council might be blown, or otherwise caused to fall, upon the signalling wires of the Railway Company. If they did, surely the County Council ought to pay for the damage.

Mr. CASTLE also agreed with what Mr. Pember had urged.

Mr. PEMBER said the question was whether the Committee would, or would not, legalize a Bill with a clause in it distinctly stating that, if the promoters did certain things—viz., obeyed the regulations of the Board of Trade, which might themselves be insufficient—they should then escape all danger for liability to his Company's water-pipes which they might injure, or to his learned friend's signal wires.

Mr. POPE said this was a much more important point than it at first appeared. It was an attempt, for the benefit of one Water Company, one Gas Company, and one Railway Company to alter the law which regulated all such undertakings. The law was that if Parliament chose to give statutory authority for the exercise of certain powers, so long as those powers were exercised without negligence, there could be no liability for damage. The Committee had already decided that statutory power should be given for the creation of electrical traction, subject to the regulations of the Board of Trade—those regulations being incorporated as part of the conditions of the statute; and if anybody obtained these powers at the hands of Parliament, and exercised them in conformity with the regulations of the Board of Trade, and was not guilty of negligence in carrying them out, no claim for damages could arise. There ought not to be inserted any provision for damages for the benefit of one Gas Company and one Water Company.

Mr. BAGGALLAY pointed out that this was an error, because the Lambeth case was a test case.

Mr. POPE said in that case he would put the proposition in another way—viz., that for the benefit of the Gas and Water Companies of London the Committee were to alter the general law in regard to the power of an undertaker who used his statutory authority without negligence. The clause would make the County Council, if they used without negligence the power the Committee proposed to give them, liable in any event to pay for damage done. The evidence was that there was no imminent danger of the kind, and that the Board of Trade regulations were sufficient.

The CHAIRMAN said it had not been proved that the regulations were sufficient, while it had been admitted that they might be imperfect.

Mr. POPE said the whole of this question was threshed out before Lord Cross's Committee, with the assistance of all the Water and Gas Companies, and the result was that the Committee made a report in which they said that, with proper regulations made by the Board of Trade, the whole danger might be a negligible quantity. The Committee suggested, as a clause to secure proper regulations, one to the effect that the undertakers should adopt all reasonable and proper precautions in constructing, placing, and maintaining electric lines, and should work them so as not to interfere with the operation of any wire, line, or apparatus of other persons using electric power. This met the case of the Railway Company. Then it was provided that the undertakers should be deemed to take such reasonable and proper precautions as aforesaid, if and so long as they adopted and employed, at the option of the undertakers, either insulated returns or uninsulated mechanical returns of low resistance, and such other means of preventing injurious interference as the Board of Trade might direct. Therefore Lord Cross's Committee, after hearing all parties, recommended that the clause should contain a compliance with the regulations of the Board of Trade, which should free the undertakers from any charge of negligence. The amendment now sought really meant that, where undertakers were simply using statutory powers without negligence, they should, contrary to the general principles of law, be held liable for the exercise of those powers. This would be a total reversal of all legal principles, and of all Lord Cross said.

Mr. BAGGALLAY remarked that Mr. Pope had been referring to the report of the Committee of 1893. But before Lord Cross's Committee of 1898, Sir W. Preece gave evidence; and, as a result, that Committee directed attention to the observations he made as regarded the difficulty arising from the working of tramways by trolley wire—his suggestion being that a strong control clause should be carefully considered. Nothing, however, had since been done. His (Counsel's) sole position was that, if the Board of Trade made efficient regulations, and they were obeyed, the amendment would not hurt the London County Council. If the provisions made by the Board of Trade were effectual for the prevention of electrolysis and fusion, the County Council would incur no liability. It was only in the event of those regulations proving ineffectual, and damage resulting to his clients, that they would be liable. In such a case, he contended that, as between two parties, one being wholly innocent, and the other, however unintentionally, the cause of mischief, the latter should pay.

Mr. CASTLE said if power were given to a corporation by an Act, and no conditions were attached, it was very clear negligence must be proved before the corporation became liable. The whole question was whether the Committee would give statutory powers to the County Council which would grant them immunity, or whether they would attach as a condition to their decision a proviso that they should be liable. Were the conditions such that the County Council should be able to shelter themselves behind the Board of Trade regulations?

The room was then cleared, while the Committee deliberated in private. On the re-admission of the public,

The CHAIRMAN said: The Committee have decided to admit the principle of the clause.

The parties then proceeded to consider the clause in detail. In the course of the discussion which followed,

Mr. POPE suggested that the County Council should be bound to take all reasonable precautions in the working of the undertaking, so as not to affect gas and water pipes. If they did not take such precautions, they should be liable; if they did, they should not be liable.

Mr. BAGGALLAY asked if that was not going back on the decision of the Committee. It would be taking all reasonable precautions if the Council were to follow exactly the regulations of the Board of Trade; but if those regulations proved ineffectual, the Companies would suffer damage and get no remedy.

Mr. POPE: In other words, my friend says: "You shall take all reasonable precautions, but shall be liable, whether you take them or not."

Mr. CASTLE: Yes.

The CHAIRMAN: That is it.

Mr. POPE: The damage must be caused by our not taking reasonable precautions.

The CHAIRMAN: That is going back on our decision.

Eventually, the matter was adjourned to enable the parties to bring up a substantive and separate clause.

## Tuesday, July 24.

Mr. PEMBER brought up the following clause to carry out the decision of the Committee regarding protection for Gas and Water Companies:—

The Council shall make full compensation to any Gas or Water Company suffering loss or damage by reason of any fusion of, or electrolytic action on, their mains, pipes, or apparatus, which may in any way be caused by the Council in the exercise of any of the powers conferred upon them by this Act.

A long discussion followed.

Mr. POPE said the effect of the clause would be to make the Council the insurers of the gas and water pipes of the Metropolis from any electrolytic action arising from any cause whatever. Though possibly this matter was not one of very great pecuniary consequence to the Council, because they did not propose to use a system which could result in electrolytic action, as a matter of principle the question involved was very important—being to what extent the Committee would alter the general law in this particular case. What difference was there between these and any other statutory powers involving, it might be, some amount of damage, which could or might be avoided by reasonable precautions? If the damage could be avoided or prevented by reasonable precautions, every such precaution ought to be laid on the Council; and if every reasonable precaution was not used, whether under statutory power or the common law, the Council should be responsible. But they should not be liable if, using every precaution and effort to avoid the damage, Parliament had satisfied itself that the risk of damage was so slight that the liability ought not to attach to the exercise of statutory powers.

The CHAIRMAN said the intention of the Committee was not, by giving the County Council statutory power, to exempt them from anything which they would have been liable for otherwise in law—anything in regard to which they would have been liable if this Bill giving statutory powers had not been passed.

Mr. POPE said if that was the view of the Committee, it was directly contrary to his argument. He would suggest the following clause as meeting the justice of the case:—

If it be proved that any injury or damage to any gas or water pipes or other metallic pipes, structures, or substances of any Gas or Water Company shall have resulted from fusion or electrolytic action caused by any currents negligently generated or used by the Company for the purpose of electric traction under this Act, the Council shall be liable to make compensation to the Company for such injury or damage.

This would make the Council liable if they did not use every precaution, irrespective of the Board of Trade.

Mr. PEMBER submitted that the clause did not give him the protection the Committee said he should have. He did not wish to stop the Council; but he did say that, if they caused damage, they should pay.

The CHAIRMAN remarked that the Committee were anxious not to do away with any liability which the Council were under at present.

Mr. POPE, after further argument, suggested a modification of the clause he had brought up, as follows:—

If it be proved that any injury or damage to any gas or water pipes or other metallic pipes, structures, or substances of any Gas or Water Company shall have resulted from fusion or electrolytic action caused by any currents generated or used by the Council for the purpose of electric traction under this Act, nothing in this Act shall relieve the Council from any liability to make compensation for such injury or damage.

He wanted to make it clear that the injury for which they were to pay was caused by the Council, because, he pointed out, electrolysis arose in part from moisture, which might be due to carelessness of the Companies in allowing their mains to be leaky.

The CHAIRMAN: Certainly.

The clause was discussed further, and in the end was accepted by the Committee in the form last suggested by Mr. Pope, but with the addition at the end of the words "which would have existed but for the passing of this Act."

The Committee then proceeded to consider other clauses of the Bill.

Mr. VESSEY KNOX and Mr. WHEELER brought up several amendments for the protection of their Authorities, chiefly as to road matters; but the Committee declined to accept them.

Mr. CASTLE, on clause 14 being reached, proposed, for the protection of the South Metropolitan Gas Company and the Lambeth Water-Works Company, the following:—

If within seven days after a notice under the preceding section of this Act shall have been served upon any Gas or Water Company, that Company so elect, such Company shall themselves execute all such alterations to their mains and pipes as may from time to time be necessary; and the reasonable costs of executing such alterations shall be repaid by the Council to the Company; provided always that such alterations shall be carried out in accordance with the directions, and to the reasonable satisfaction, of the Chief Engineer of the Council.

By the Bill, the work was not to be done by the Companies, but under their superintendence. This, however, was not sufficient, as was shown by a recent explosion at Manchester, in which an Engineer lost his life owing to the incautious way a main had been handled.

Mr. C. C. Carpenter, Chief Engineer to the South Metropolitan Gas Company, was then called to give evidence in support of the amendment. Clause 14, he said, would enable the County Council to alter at any time the position of, and otherwise interfere with, the mains and pipes of his Company. This power had been possessed by local authorities since 1870, though they had not acted on it. Since 1870, the reasons against a tramway authority doing the work had increased; the conditions being now quite different from what they were then. Whereas in 1870 the tramway had the use only of the skin of the road, under the electric systems now proposed they might—as with the conduit system—sink



iron structures to a depth of 30 or 36 inches, which would interfere with a considerable number of large and important mains. His Company held that they should have control of any alterations. The tramway authority should be able to direct the removal of the mains; but the work of removal should be done by the Company. It was a dangerous thing to shift large mains; and such work was done under witness's personal supervision. Under the Bill, not only the County Council, but their contractor, and even his workmen, would have power to deal with the mains; and this would be fraught with great danger. The provision suggested had been inserted in three Bills; two of them being measures of the London County Council.

By Mr. FREEMAN: At present, the powers of the Gas and Water Companies and the tramway authorities in regard to this matter were regulated by the Tramways Acts, which contained elaborate provisions for the protection of the Gas and Water Companies. So far, the Company had always removed the mains, when they had required to be moved; and this had been done without difficulty, because the County Council had never interfered. He wished to alter the conditions now because the circumstances had changed.

Mr. FREEMAN said he had no desire to fight this matter in a hostile spirit. It was simply a balance of convenience. Inasmuch as the County Council were the road authority, charged with the duty of relaying the tramways, they thought the matter should be in their hands; liberty to go to the Board of Trade being provided, if it were thought they suggested anything unreasonable.

Eventually, the Committee accepted the clause; but they amended it by leaving out the words "as may from time to time be necessary," which the Chairman thought might lead to litigation.

The remaining clauses having been adjusted, the Bill as amended was ordered to be reported to the House; and it received the Royal Assent on Monday, the 6th inst.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Aug. 7.

(Before Justices DAY and DARLING.)

**Welsbach Incandescent Gaslight Company, Limited, v. Todd and Others.**

Mr. WALTER said this was a motion for judgment in default of defence. The statement of claim alleged infringement of the patents of 1885, 1886 and 1893. As the two first had expired, it was now only a question of damages; but as the 1893 patent was still in force, he applied for an injunction restraining further infringement. He also asked for delivery upon oath of the infringers, for costs as between solicitor and client, an inquiry as to damages, and liberty to apply.

Their LORDSHIPS made the order as asked.

Similar orders were made against the following defendants, the facts in each case being the same: Andrews, Courtney, Busse, Shackleton, Logan, Sinclair, Edward, Ward, and Lord.

**The Queen v. The Tendring Hundred Water-Works Company (ex parte the Mayor and Corporation of Harwich).**

Mr. HAMMOND CHAMBERS, Q.C., said he appeared on behalf of the Water Company to show cause against a rule obtained a few days previously why a writ should not issue commanding them to obey an order of the Local Government Board, dated 1892, to provide a supply of water constantly laid on under pressure within the limits of the borough of Harwich. The Company supplied Harwich, Walton-on-the-Naze, Dovercourt, and all the country from the sea extending over some considerable area, of which Harwich was the centre. They had a pumping-station at Manningtree, and supplied consumers direct by pipe, with this exception, that there was a reservoir at Dovercourt. The Company was incorporated under Acts obtained in 1884 and 1886. By the terms of the original Act, they were not under any liability to supply the district at any particular pressure. It was provided, however, that a consumer might go to the Local Government Board and obtain an order for a constant supply at a given pressure; and some seven or eight years ago such an order was granted. The affidavits on which the rule was obtained were very general in their terms; but the complaint appeared to be, first, that the Company did not supply water under pressure, and next that they sold in bulk to the Great Eastern Railway Company and to the training-ship *Ganges*. Section 39 of the Act of 1884 empowered the Company to enter into contracts for the supply of water in bulk so long as the domestic service was not interfered with. His answer to the rule was twofold—first, that, as a matter of law, no *mandamus* would lie; and, secondly, on the question of fact, that the Company had, for the last three or four years supplied water constantly under pressure, and that they could not do more than they were doing. If there was any defect in the supply, it was not due to the fault of the Company, but to the defective fittings in the houses of the consumers. In support of this statement, he read the affidavits of the Managing-Director and the Engineer. If the applicants had any fault to find as to the sale of water in bulk, their remedy was to apply for an injunction, and in the event of a deficient supply, they could recover penalties. But it was well established that, where a specific remedy was given by statute, a writ of *mandamus* would not lie.

Mr. BOXALL followed on the same side, and pointed out that, if a water company failed to furnish a proper supply, the public authorities had power, under the Public Health Act, 1875, to take the matter into their own hands. Here there was no specific allegation that the wells, pumping plant, or mains were insufficient; but merely a general one that there was not a constant supply, and upon this there was a direct conflict of evidence.

Mr. ENGLISH HARRISON, Q.C. (with him Mr. TINDAL ATKINSON), supported the rule, and argued that a writ of *mandamus* would lie, as there was no complete remedy provided by the Act. The rule was that the remedy must be "equally convenient, beneficial, and appropriate." It could not be said that it was an adequate remedy to fine the Company £10 for not having sufficient pressure of water in the fire-plugs, when the

result might be that the whole town would be burnt down. Neither was the infliction of a penalty of 40s. an adequate remedy for a person who wanted a supply of water. He had evidence that the service in Dovercourt was intermittent and most unsatisfactory, and that during the day there was no pressure in the mains on the Marine Parade. His complaint was that the Company were supplying water at Parkeston to the Great Eastern Railway Company for their steamships, and also to the *Ganges* training-ship, which was outside the limits of supply.

Justice DAY thought the evidence proved that the deficient supply was due to the Company selling water in bulk; and he ordered the rule to be made absolute.

Justice DARLING said it had been argued that a *mandamus* would not lie because there was a remedy provided by the Private Act. But this rule did not apply if the remedy was not real. Here the inhabitants had a right to have water, while the remedies under the Act could only be put in force after the expiration of 28 days. As no other remedy was "equally convenient, beneficial, or appropriate," he thought the proper remedy was by *mandamus*.

### Abstracting Money from Prepayment Meters.

At the Bolton Police Court last week, the Magistrates heard a case in which Joseph Walker was charged with having broken open a prepayment gas-meter at his house in Lode Street, and stolen therefrom 7d., the property of the Corporation. Mr. J. H. Hall, who prosecuted, said the amount involved in the case was a small one, but it was a matter of considerable importance to the Corporation, in view of the number of prepayment meters which were in use in the town, and the fact that there had been previous prosecutions consequent upon thefts of this particular character. The Magistrates found the prisoner guilty; and the Chairman, in committing him to prison for one month, with hard labour, said it was a mean theft. It must go forth to the public that such robberies would not be tolerated.

### Stealing Gas at Halifax.

At the Halifax Police Court, last Wednesday, Robert Gay, described as an engineer, of Mount Street, was charged with an offence under the Gas-Works Clauses Act, 1871. Mr. W. E. Willans, who defended, put in a plea of guilty, and accepted the outline of the facts of the case given by the prosecution without calling evidence. Mr. T. M. Tordoff, Assistant Town Clerk, said the accused was charged with tampering with gas-pipes, &c., belonging to the Corporation; but the case was practically one of stealing gas. The defendant had an engineer's shop at the top of the premises in Mount Street, and had a gas-meter in the room. On the 13th of July, at 10.45 a.m., Samuel Horsfall, a gas inspector of the Corporation, called, and found the door at the bottom of the stairs locked as usual. He rang the bell, and the defendant appeared. He said to the inspector, "Oh, I am just at dinner. Will you call again?" The inspector, who began to suspect something wrong, insisted upon seeing the meter then. Gay tried to prevent him, and a struggle ensued; but the inspector succeeded in getting into the room, and discovered a state of things which explained the defendant's anxiety for him to delay his visit. The inlet-pipe of the meter and the outlet-pipe from the room were disconnected, while an india-rubber pipe was attached to the gas-main and to the defendant's service pipe; thus carrying into the room an unregistered supply of gas. In extenuation, Mr. Willans said the defendant was doing some soldering work, and finding the pressure insufficient, brought into requisition the india-rubber pipe. He now expressed his regret for having done so. The Chairman (Mr. R. W. Evans) said the Bench thought the offence a serious one. It was a disgraceful, shabby way of stealing; and they would impose a fine of £5, with 11s. 6d. costs.

**Improved Street Lighting at Bolton.**—The Gas and Lighting Committee of the Bolton Corporation are at present engaged in carrying out an extensive scheme for improving the lighting of the streets by gas. Already some 300 Welsbach incandescent lamps have been fixed in the principal thoroughfares, and in the evening, when lighted up, the streets present a very fine sight. In the centre of the town, the lamps are of the double pattern.

**New Premises for the Bridport Gas Company, Limited.**—The Secretary and Manager of the Bridport Gas Company, Limited (Mr. J. H. Cornish), presided a few days ago at a dinner given by the Directors in the Company's new premises, which have lately been completed to his designs. The guests comprised the Company's employees, the workmen and staff of the Contractors (Messrs. Bartlett and Sons), and others, to the number of about forty; and the proceedings were characterized by much heartiness. The new premises have an attractive frontage; the ground floor, containing a large shop or show-rooms, being beautified by two handsome plate-glass windows—one filled with stoves, gas-fires, &c., and the other with chandeliers, lamps, brackets, globes, &c. A staircase leads up to the Board-room, which is spacious and lofty. On the same floor is the Manager's office; and the testing-room is a few feet farther off. The whole premises are of ample dimensions, and reflect the highest credit on the designer.

**The Price of Gas at Oldbury.**—At the last meeting of the Oldbury District Council, the Gas Committee recommended that the charge for gas should be raised 3d. per 1000 cubic feet as from the next reading of meters. They estimate that, with their present stocks of coal and the increased price of residuals, this advance will be sufficient to cover the additional cost for the current year; but if coal prices continue at the present level, they will have to recommend a further advance next year. Mr. J. W. Wilson, M.P., in moving the adoption of the recommendation, said the increase in the price of coal was from 40 to 50 per cent., whereas the advance of 3d. per 1000 cubic feet to all consumers, except those by penny-in-the-slot meters, was a very small one; the enhanced rate they were paying for coal being equal to 6d. per 1000 cubic feet of gas. The Committee had two things as a set-off—they always kept a heavy stock of coal; and they expected to realize well from residuals. Therefore they were able to advance the price of gas practically only half what the additional cost of coal would be. The recommendation was agreed to.



## MISCELLANEOUS NEWS.

### SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel last Wednesday—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) having read the advertisement convening the meeting, and the minutes of the last general meeting, the seal of the Company was affixed to the register of shareholders, and the report of the Directors, with the accounts for the six months ending June 30 (see *ante*, p. 297), was presented.

The CHAIRMAN: Ladies and Gentlemen,—It now becomes my duty to move that the report and accounts be received and adopted, and the report entered on the minutes. The report, as usual, gives as much information as we can crowd into its compass. There are a number of important points to which I feel it necessary to direct your attention; and I can only hope that I shall not weary you. But I have this feeling at starting, that a long speech gives the impression that one has rather a bad case. Well, that is not so at all. I can assure you that we have not a bad case in any sense of the word. But these are times when I think I may say the difficulties and anxieties of those who have the conduct of gas undertakings have been greater than they have ever been on any previous occasion. Of course, the first question nowadays with all gas people is the price of coal. The report tells you that there is a precedent for this—in fact, in 1873 the price went up higher than it has done on the present occasion. But it is of no use going into the point as to the whys and wherefores of the great rise in the price of coal. There is no doubt that now, as in 1873, the main cause—not the only cause, but the first cause—of the increase in the price was the abnormal activity of the iron trade. Other things have helped, no doubt. The demand for coal for the Navy and for export has also helped to harden and to stiffen prices. But there is this satisfaction, at any rate—that the principal cause of the rise in the price of coal is passing away. There is no doubt whatever that the “boom” in the iron trade has passed the summit, and that we are now on the down-grade so far as the demand for iron is concerned; and although it is likely to be some little time before the effect is shown on the coal market, still the effect must be apparent before long. I have been referring to some old papers of the 1873 period, and I find that whereas the price of gas coal rose in the year or two before from 6s. per ton to 20s. per ton free on board in the Tyne in the spring of 1873, it began to drop soon after; and by December, 1873, it had fallen 5s., to 15s., by January, 1874, another 1s., to 14s., and by the succeeding March to 12s. I expect that, on the present occasion the price of gas coal, which reached 16s. in the spring of this year, and is still maintained at that figure, will fall before long. I do not see any reason why the precedent of 1873 should not be followed, and why the price should not come down to reasonable figures before next year is over. I certainly expect a drop in the winter. There are two facts which I think I may mention. One is that I saw in to-day’s “Times” that the stocks of pig iron in America, which were 68,000 tons on the 31st of December, had increased to 342,000 tons on the 30th of June—showing that, in the United States at any rate, the supply of iron had exceeded the demand. The other fact is from our own experience. Last winter we had great difficulty in getting our supplies of coal; I think I told you at the last meeting that, whereas we had laid in a very large stock by September—much larger than we had ever had on any previous occasion at that time of the year, or on any previous occasion whatever—the contractors could not supply the stipulated monthly quantities. Though we had so large a stock in September, it had practically all gone by Christmas, and we had to go into the market and buy largely; and for three months we were hovering with just a week’s stock in hand—sometimes a little less. Now, I am happy to say, circumstances have entirely changed. We made contracts last spring (about April) for six months only, as was done by the South Metropolitan Company in 1873, in the hope that there might be a fall in price before the year was out; and knowing the difficulty we had experienced in the previous six months, we arranged for larger monthly quantities than we expected we should require, as we thought it probable that the contractors would fall behind in their deliveries. However, they have not done so; and whereas in the winter six months we were put to the greatest possible inconvenience by deficiencies in delivery, now we are put to almost as great inconvenience, though of a different kind, by excesses of deliveries. We do not know what to do with the coal; we have a far larger stock than is usual. It is 162,000 tons; but at this time of the year, if we had 50,000 tons we should consider it a large stock. We have tried to dispose of some of it to other companies; but we found they are equally full, and we have been obliged to ask our contractors to delay deliveries. I think this is tolerably strong evidence that the supply of coal has now fully reached the demand; and having reached the demand, it will not be very long before it is in excess of the demand. I therefore think we may well look forward to an early falling off in the price. There is one other point about coal I should like to mention. It is often said: “You get back in products the extra price of coal.” Now, for every shilling that coal rises in price coke ought to rise 2s., if we are to get back the extra cost, because we sell only half-a-ton of coke for every ton of coal carbonized. But coke does not rise to anything like that extent. During the past six months, we have had the advantage of coke at higher prices, necessitated by the general rise of coal, because the price of coke has followed the market price of coal—not the contract price, but the market price. We have only had to pay the higher price for coal during the last three months of the half year. Coal has cost us £154,000 more than in the corresponding half of 1899; but products—coke, tar, and pitch—have only brought us back £71,000. Now we are coming into the second half year, we cannot expect a very much further advance in products. So far, therefore, from getting back anything like the whole of the extra cost from the residual products, we estimate that we shall only get back from 20 to 25 per cent. of it. The next important subject in the report relates to the sliding-scale. It is a singular fact that the sliding-scale, as applied to gas companies, was brought into existence in consequence of the rise in the price of coal in 1873. It was then felt by the promoters of the movement that it was not fair that, when an abnormal rise of the kind took place, shareholders

should be absolutely protected, absolutely secured in their dividend, and that the whole extra burden of the cost of coal, less the return from products, should be thrown on the consumers. Hence the sliding-scale was proposed, in order to distribute the burden; and when it was first adopted, the extra cost was shared. About three parts of the extra cost were borne by the consumer, and one part by the shareholder. The sliding-scale has continued to work on the same lines; but owing to the increase of business having been in a greater ratio than the increase of capital, the proportions now are about six parts to the consumer and one part to the shareholder, or it may be seven out of eight. The consumer, remember, has been having the advantage all these 25 years or so of the progressive savings in the manufacture of gas. We have been reducing prices gradually during the whole of these 25 years; and now that the process is reversed, and we are obliged to increase the price of gas, the consumer, having had the advantage in past years, must bear the brunt of the extra cost. The consumer will have to bear from about three-fourths to seven-eighths of the extra cost; and the shareholders will have to bear the remainder. I am quite certain of this—that let the consumers but understand this point, and they will not grumble. In proof of this, I may say that out of the 200,000 customers to whom we sent out an explanatory notice when we raised the price in March, and when we increased it again in June, in March there was not a single letter or word of objection; but there were one or two letters commending us for the manner in which we had explained the matter to them. In June, however, we had 28 letters, not complaining of the increase of price, but saying, as regards 25 of them: “You ought to have given us notice when the index was taken,” instead of giving notice, as we did, when the bills were sent out. The letters are all very courteous and very civil; and that is shortly the burden of their complaint. Some of them also said we had acted very fairly. There was, in fact, no complaint at all. None of the consumers object to the increase of price; but 25 of them say: “We ought to have had notice a little sooner.” We explained how the increased cost of coal would affect them; and we said: “Consumers, shareholders, and employees have been partners in prosperity; they now become sharers in adversity.” I am sure you will take the matter in the same spirit that the consumers and the employees have taken it. They have all taken it in the right spirit, and have said: “We have had the smooth; we must now put up with the rough.” It is a characteristic, I will not say of the British race, but of manhood generally, that when adversity or difficulty comes it brings out certain virtues which are not developed in times of prosperity—the virtues of patience, of courage, and of hope—which induce men to do their best, and to put forth exertions which otherwise perhaps they would not make. This increase in price from 2s. 1d. to 2s. 8d. per 1000 cubic feet reduces the dividend payable to the shareholders by nearly £40,000 a year, but not the dividend paid, because you, very patiently I think, put up with a deficiency of dividend during the last two or three years. You might have had a higher dividend than we were distributing; but I think it has turned out that you adopted a wise course. You were entitled to a dividend of £5 14s. per cent. on the last occasion; but you only had £5 6s. 8d. Consequently, the actual reduction of dividend will not be at the rate of £40,000 a year in the next half year, but only at the rate of £20,000 a year. It is, however, perfectly true to say that the shareholders, in consequence of the increased price, give up an amount of dividend to which they were entitled of £40,000 a year. Then comes the case of the Company’s employees. We adopted, just before the strike in the year 1889, a system of profit-sharing which was simply an extension of the sliding-scale to the employees. The sliding-scale identified the interests of shareholders and consumers; and by its extension to the employees, we identified all three interests. It was to the interest of all three to reduce the price of gas as much as possible; and the profit-sharing bonus to the employees was on the basis that for every penny at which gas was sold below 2s. 8d. per 1000 cubic feet, they were to have a certain percentage on their salaries and wages. It amounted to 9 per cent. last year; the price of gas being 2s. 1d. The price having now gone up to 2s. 8d., the employees lose the whole of this 9 per cent. They do not lose merely a part of their dividend, as the shareholders do; they do not have a fraction added to the price of gas; but they lose the whole of their profit-sharing bonus, equal to 9 per cent. on their salaries and wages, and aggregating in the total £24,300. They have taken this, as I have already said, most cheerfully, and in one sense there is some advantage in it. It has often been said: “Your profit-sharing system is all very well. A concern like yours, always making profits, can always distribute a bonus; and your people will be satisfied with it. But let the time come when there is no bonus, and you will see.” I never was afraid of that time. Now we do see, and what we see is that these false prophets of evil have been thoroughly and utterly wrong; and our employees in all ranks, from our chief officers down to the humblest labourer, have taken it in the spirit I have already referred to, and are doing their best for the Company just as if they were in receipt of the full bonus. I have already said that the consumers have accepted the advance in the same spirit. The next paragraph in the report, paragraph 6, says: “In all other respects, the condition and prospects of the Company have never been better.” I think I may say that we are served by an admirable staff; we have a contented body of consumers; and we have an increasing business. I do not think I have ever known such an increase as this—an increase of 12½ per cent. on the half year. A part of it is no doubt due to consumers using gas instead of coal. In the winter, when the price of coal went up, they used more gas and less coal; but notwithstanding the increased price of gas and the hot weather, the gas sold is in excess, and considerably in excess, of the quantity sold last year. This is a point which I think the shareholders may take to heart, and feel that their property was never in a more sound position than it is at the present moment. This stability is assured. The cloud will pass, and when coal returns to a reasonable price, which is certain to come to pass, their old prosperity will be renewed. I have nothing to add to, or withdraw from, this statement. Now I come to another matter—the question of the Company’s Bill. It is an important subject. Last year the House of Commons appointed a Committee, called the Powers of Charge Committee, to inquire into the circumstances of the three Metropolitan Gas Companies. They gave a great deal of time to the question. A great amount of evidence was heard by them; and a very important report was issued. In this report the Committee made certain recommendations. One was that, when the Companies were going to Parliament, the initial price in the sliding-scale



should be reduced. The recommendation did not act adversely to us; because they recommended that, while the initial price should be reduced from 3s. 9d. to 3s. 3d., the rate of increment of dividend per penny should be increased on our converted capital to 2s. 8d. per cent., instead of 2s., or by one-third, which is a considerable increase. This will have the effect of reducing the proportion of saving which the consumers get, while it will increase the proportion of the shareholders. They also made one or two other recommendations. One was that the southern district of the Gaslight and Coke Company should be transferred to this Company; and they also recommended that there should be some regulation of the supply of gas by means of slot meters. There were also one or two other points which did not affect us at the time. Your Directors accepted these recommendations; and I think I may tell you that one main reason for accepting them was that they thought it was a favourable opportunity of getting a very important modification of the conditions affecting the supply of gas. Parliament for many years past has been egged on by the local authorities. Whenever a gas company were going to Parliament, the local authority were sure to oppose, even in the best cases. We had an instance this year, in the case of the Wandsworth and Putney Company—a small Company supplying gas at as low a price as ourselves, and even lower now, because they have not raised the price to the extent we have. They were supplying gas at 2s. 1d., and they wanted fresh capital; and the opposition to that was just as strong as if they had been charging 3s., instead of 2s. 1d. Whenever a gas company go to Parliament, the local authority attack them, under the impression, I suppose, that anything they can get out of the pockets of gas companies comes out of the pockets of the shareholders. They are too short-sighted, I presume, to perceive that it comes out of the pockets of the consumers. In the past, they have always proposed an increase of illuminating power; and the illuminating power of the gas has been forced up beyond what can be obtained from the available supply of coal. In our case, it was forced up to 16 candles; and to make 16-candle gas, we had to resort to expensive and unnecessary processes of enrichment. We formerly used cannel; but cannel having become too scarce and dear for the purpose, we adopted the system of enriching by means of petroleum spirit. The money spent on this spirit was money wasted. It did no good to the consumer, and cost him a lot of money. So we took advantage of the recommendations of the Powers of Charge Committee to introduce an arrangement for reducing the illuminating power in our own case; and we succeeded. Fortunately, we had a strong Committee, a Committee of able men who were not bound by precedent, but were prepared, when they were convinced that a thing was good, to act on their convictions. They gave us our Bill; and provision is made in the Act (for it has now received the Royal Assent) for a gradual reduction of the illuminating power from 16 to 14 candles. In fact, it has had the effect of turning back the policy of Parliament. We speak of Parliament with the greatest respect; but Parliament, you know, is not always right. I will, however, say this for Parliament—that when it is shown, as it was shown to this Committee, that a certain course was a mistake, they reversed it; and I think in this action of ours we have rendered service to the gas industry generally. Of course, we were very much opposed by the County Council; and in paragraph 8 we have a word or two to say about that to-day. I do not want to use any hard words about them—that sadly mistaken body in many of their proceedings. The London County Council introduced a Bill to carry out one of the recommendations of the Powers of Charge Committee—the regulating of the supply of gas by means of slot meters. They had some most absurd proposals for standardizing fittings, and I do not know what, which practically were laughed out. It was shown that they were utterly impracticable and useless; and their Bill was cut down simply to provide that the Metropolitan Gas Companies should not charge more than 10d. extra on the price of gas for the use of the fittings. I think this was a mistake, because the effect of it will be to stereotype the 10d. as the proper price to charge to the slot-meter consumer for the use of fittings. We are all of us trying to reduce it. In our case, it was 9d.; and we were looking forward to coming down to 8d. But the effect of this will be that Parliament has said 10d. is the proper charge. I think a mistake has been made by the London County Council. But that is not the worst of it; that is a small matter. The main part of the Bill was that it introduced a different system of testing gas—that is to say, they were not satisfied with the present method. They wanted the gas tested in other ways. I need not go into a long explanation about it. I think I explained it at the last meeting. The effect would have been that we should have had to increase the illuminating power from 2 to 3 candles. That would have been an absolute necessity if the Bill had been passed; and for this, the consumers would have had to pay an extravagant price. It would have been of no value to them; and the worst of it was the consumers never asked for it. It is said in our report here that the London County Council, with no mandate from the consumers, introduced the Bill. Now, we thought we would put them to the test. When their Bill was in Committee, our Secretary wrote to the Clerk of the County Council, and asked him for information as to the complaints. Their witnesses said they had had numerous complaints from the consumers; and in consequence they had promoted their Bill. We asked him for a list of complaints—I will not speak of slot-meter consumers—that they had received during the last ten years. There were no complaints from the slot-meter consumers, as we only introduced the system four or five years ago; but there are 100,000 ordinary consumers, and how many complaints do you think they had received in the ten years? If they had received 1 per cent., it would not have been a large proportion; 1 per cent. would have been 1000. They actually received in ten years complaints from only one consumer—a thousandth part of 1 per cent. From that one consumer they had two letters. One of them is as follows:—

Sir,—I beg to ask your earnest attention to the very poor quality of our gas during the last few days. [This was November, 1894.] Its lighting power has been very poor. It makes my eyes ache to read by it.

Then the same man writes in November, 1897:—

Dear Sir,—I am sorry to complain, but our gas has been very poor lately. It was much better six weeks ago. I shall be obliged if you can bring pressure to bear on the South Metropolitan Gas Company to induce them to give us a better light.

If he had written to the Company, we should have sent and cleared his service. It is perfectly plain that that is what was the matter, because he says it was all right six weeks before, and we do not vary the quality

of our gas like that. They had a complaint from one consumer; but they also had complaints from three Vestries—the Vestry of Rotherhithe, the Vestry of Battersea (there are Socialists on both of these Vestries), and the Vestry of Eltham, which comprises the Lee district. Eltham is at the very extremity of our district, where we had great difficulty in giving full pressure. We have remedied it; but if the people who could not get quite enough pressure had written to us instead of to the Vestry, we should have given them satisfaction. When we got the copies of these letters from the Vestries, we applied to the Vestries for particulars of these complaints, and not one of them could give us a single particular—not one. We repeated the request, and told them we would pay the expenses of a search; but not one of these Vestries could give any particulars whatever. Now, I will tell you what happened. One knows pretty well what John Smith says to his neighbour on the Vestry: "I say, Jones, my gas is very bad." "Oh!" says Jones, "so is mine. Let us move that the Vestry send a letter to the London County Council about it"—or something of that sort. At any rate, we gave them every opportunity, and not one single particular could we obtain. We threatened one of them with a Speaker's order if they would not give the information; but it was no good—we could not get it. Now, I say we are perfectly justified in saying that the London County Council, with no mandate from the consumers, introduced a Bill to alter the method of testing the gas of the Metropolitan Gas Companies, and then endeavoured to support their case with some very questionable evidence—evidence which the Committee did not accept. Their witnesses did not say it in so many words, but they deliberately implied fraud on the part of the Company. They as good as said—they did not say it, but they insinuated it, which is quite as bad—"It is true that the gas at the official testing-place is up to the mark; but that is not the gas you send out from the works. We believe"—they did not put it in those words—"we believe that you enrich it at the testing-places for the testing only." Well, it was too gross to be accepted; and those witnesses did themselves a great deal of harm in the eyes of the Committee. The Chairman of the Committee put it to more than one of them: "Then you impute deliberate fraud to the Company?" And the witness was obliged to say: "No; I do not attribute deliberate fraud." Then the Chairman said: "What does it mean?" and there was no answer. I will give you a specimen of the evidence of one of these witnesses. He is not one of the worst by any means. He has the reputation of being an honest man; and I believe him to be one. But he lacks one qualification, one striking characteristic, of the honest man—he does not believe in the honesty of other people; he does not believe in our honesty. This is the Chemist to the London County Council. I really believe him to be an honest man—I do not wish to say one word against him; but he insinuated this against our workpeople. Speaking of the inducement on the part of the Company to send out inferior gas: "With regard to the present Company"—that is ourselves—"I may say that there are some special inducements to the workmen to carry out their work in a manner unsatisfactory to the consumer. Assuming that all those who have the general control of the works have the most honourable intentions with regard to the consumer"—he assumes that, you see—"in the South Metropolitan Company the workmen are, I believe, largely, if not wholly, shareholders; and although that is a very satisfactory arrangement in other respects, it is, I should think, not a satisfactory arrangement for the consumer, because evidently a small workman, who has not so much conscience perhaps, would say: 'If I can get out gas of a somewhat inferior quality, it is very much to my advantage as a shareholder.' I think that that system should be remembered in the present case." Now, I can speak for the workmen. Such a thought has never entered the mind of any one of them. Has it? [addressing the two workmen Directors.] I ask you two gentlemen—Mr. Butcher and Mr. Austin. He says: "Assuming that those who have the general control of the works"—but he has put me rather in the same boat as the workmen as having very little conscience. In 1894, being so dissatisfied with the result of enrichment, it was at my suggestion that the proposal was made to the London County Council that we should try unenriched gas for a fortnight, and that the Council should make their tests in the ordinary way to try the effect of the absence of enrichment on the quality of the gas. They did make the tests, and they found that the quality of the gas was just as good without enrichment as with it. In the succeeding fortnight, we enriched as before with petroleum spirit; and they made their tests just as they did during the fortnight of the experiment. The results were these—that in out-of-the-way localities away from the testing-places they found gas of 14·85 candles when it was enriched, and 15 candles when it was not; so it was practically the same—15 candles in both cases. Then the Chemist to the Council was asked a question about that (I may say it was not under his supervision, but under that of his predecessor): "During those tests, you had substantially the same results." Witness asked: "With enrichment and without enrichment?" Counsel said "Yes;" and the answer was: "I think that was quite possible. We have had it from practical men that gas of 16-candle power can be obtained from coal direct—there is no doubt about that; so that, if the South Metropolitan Company wished, they could undoubtedly send out better gas." Then he was asked this question: "Your explanation is that the South Metropolitan Company during that fortnight were using coal that would give 16-candle power gas." That is the suggestion—that during the fortnight when we asked that the tests should be made we produced special gas for the purpose. His answer was: "I do not say they did; it is quite possible. (Q.) Is that the explanation you suggest? (A.) I think it is a possible explanation." Then a little farther on he states the average power of uncarburetted gas as 15 candles, and the average of the carburetted gas—that is the enriched gas—as 14·85 candles; and he is asked: "What explanation do you suggest as to these results? (A.) I say that they can be explained by a variation in the quality of the coal used. (Q.) Do you suggest as your explanation that the Company were using a coal that would give 16 candles? (A.) I do not say they did. There may be other explanations, but that is a possible explanation." I think that gentleman is an honest man; but he ought not to have made such an insinuation. We made a *bona fide* offer to the London County Council to make an experiment; and his suggestion is that we played tricks with the gas during that fortnight. Now, that is the sort of thing we have to meet. The Council give us trouble in every way. We have had to spend a great deal of money in opposing certain Bills of theirs. This session they were going for electric tramways which would seriously interfere with



our mains. In certain cases our mains would have to be removed; and they wanted to take power to remove them. We said: "We are perfectly willing to remove the mains; but we object to your doing it. We are responsible for the supply of gas; we are responsible for the mains; and we are responsible for the escapes that take place." "But," they said, "we shall employ you." "No," we replied, "we contend for the right to do our own work." Well, we had to fight that in both Houses, and at last we got it; and we were told afterwards that their own officials and their Counsel said that ours was a perfectly reasonable contention, but the Chairman of the Council Committee insisted on the Council doing all this. Well, now, the Chairman of the Committee, though no doubt a very honest man, is also, I should say, a very ignorant one to put us to all this trouble for nothing, and expense, too. If I might make a suggestion to that body, it would be this: That instead of treating us as thieves and vagabonds, they should treat us as a public body with duties to the public—a body who are quite willing to work loyally and cordially with them in the public interest. Now I come to the last paragraph, which relates to the dividend. Here I must say another word about the London County Council. We said in our circular to the shareholders: "The Directors take this opportunity of correcting the common mistake that gas shareholders receive large dividends. Since 1876, Parliament has enacted that all new capital shall be raised under the auction clauses—that is, it has been issued to the public (a large proportion being the Company's consumers) at the market price of the stock, which only yields 3½ per cent. interest to the purchaser." The Comptroller of the London County Council, who I must say in all the evidence he has given on the gas question has been perfectly fair, falls foul of us on that circular, and says that it is misleading. In the circular, we say it is a mistake to suppose that gas shareholders receive large dividends. But this gentleman says that it is only on the auction capital that a small dividend is paid, and that on the original capital a very large dividend is paid. In our case, of the ordinary stock some 30 per cent. has been raised under the auction clauses, and on that he quite admits that the dividend is small; but he contends that on the rest it is large. Well, I maintain that the Company did not say here that the gas shares received a small dividend. We said the gas shareholders; and that applies not merely to those who have bought under the auction clauses, but to those who have bought or inherited gas stock of late. We took out the other day the number of shareholders that are now in existence who held stock in 1880. Out of 2000 shareholders in the three Companies that are now amalgamated that we had in 1880, only 500 of them now hold stock in the united Company. Our shareholders, who then numbered 2000, now number over 8000. A large proportion of these 8000 shareholders have bought stock of the Company under the auction clauses, and another large proportion have bought stock in the market; and I say that it is perfectly true that these shareholders who have bought stock in the market, or those who have inherited it if you like also, are only receiving a very small dividend at the rate of about 4 per cent.—that is, on the present market price. Now I will put it to you in another way. Take a property in the City. Supposing somebody here had purchased a piece of property on the other side of the street and had given £20,000 for it, and it is bringing him in £1000 a year—that is, just 5 per cent. Forty years ago, probably that property was only worth £4000; and as £1000 a year is 25 per cent. on the £4000 that the property was worth forty years ago, is it fair to say that the purchaser is getting 25 per cent. on it? Is it not fair to say that the rate of interest he is getting is 5 per cent.? Some of the shareholders have inherited the stock; but the Government have not been content with the probate duty on the original payment. They have insisted on duty on the full value; and, therefore, I contend that the Comptroller here is wrong in saying that the Company are paying large dividends. In the report he made to the London County Council, he says: "The following are the dividends to which they are now entitled, even with gas at the present advanced prices: Gaslight and Coke, 11 per cent.; South Metropolitan, 12½ per cent.; and Commercial, 11½ per cent." We had one letter from a consumer saying it is a most unfair thing, a most unreasonable thing, for you to raise the price of gas when you are paying 12½ per cent. Mr. Bush was able to write a letter to the gentleman and explain to him that he had been misled by the statements of the London County Council, and that settled the matter satisfactorily; and I do say again that the dividends that the shareholders are getting are at a very low rate indeed—about 4 per cent. I think it is too low. I think gas property ought to yield more; and perhaps one result of the present advance in coal will be to put down the excessive price of gas stock, so that investors in future will be able to purchase at something like reasonable rates, that will pay perhaps 4½ per cent. Now, I thank you for the great patience with which you have listened to me, and I conclude by proposing the motion for the adoption of the report.

Mr. SIMPSON ROSTRON seconded the motion.

A SHAREHOLDER asked the Chairman if he could give the meeting any information as to what had been done in regard to the negotiations with the Gaslight and Coke Company.

The CHAIRMAN said this formed one of the recommendations of the Powers of Charge Committee. It passed the House of Commons Committee; but when it got to the House of Lords, it was rejected—he believed on the ground that they thought it would give capital to the Gaslight and Coke Company, to enable them to go on for a few years. The House of Lords in effect said: "We are not going to let you have this. You must come direct to Parliament for it."

The resolution was carried unanimously.

The DEPUTY-CHAIRMAN (Mr. Ewart) moved—"That a dividend at the rate of 5½ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." He observed that they would all appreciate this resolution, more especially as it was the last occasion, for some while at all events—but he hoped only for a short time—that they would enjoy the same dividend. They must bear in mind that the great railway companies, who, like themselves, were very large consumers of coal, had nearly all reduced their dividends for the past year; and he thought they might fairly congratulate themselves that they had been able to maintain theirs. But, as business men, they knew that when the price of an article was abnormally increased production also invariably increased, with the result that prices were brought down to a lower level than before; and he thought they might anticipate this result with regard to coal.

Mr. BUTCHER (a workman Director), in seconding the motion, assured the meeting, on behalf of the employees, that they were working heartily and cheerfully under the altered circumstances; and they certainly would not do such a mean thing as was imputed by the County Council in the evidence that had just been read. Such a thing also was impossible, as any sensible person ought to know. The workmen were under the management of capable engineers and foremen; and it would be impossible to depart from the usual line of work laid down by these gentlemen. With regard to profit-sharing, he had been benefited financially by the system for the last ten years; and for this benefit he had first of all to thank their worthy Chairman, and secondly the shareholders for their acquiescence in, and adoption of, the principle. He could assure them that the workpeople were sensible of the advantage of profit-sharing, by which they had become holders in the Company to the tune of something like £100,000. This was a golden lever which influenced all their work, and induced them to show a proper spirit when bad times came. They also stood to lose in this matter; and the sooner they got back to profit-sharing prices, the better they would like it.

The resolution was passed unanimously.

The CHAIRMAN said there was one other formal resolution which he would move. It was—"That the Directors be, and are hereby, authorized to raise the sum of £250,000 further capital by the issue of ordinary stock and debenture stock, in such amounts, at such times, and in such manner, as they may deem desirable, pursuant to the powers contained in the Company's Acts of 1882 and 1896." The further capital would not, of course, be issued all at once; but as the increase in consumption amounted to 590 million cubic feet in the half year, they must spend money in order to provide plant to meet the increased demand.

Mr. EDWARD CARDWELL seconded the resolution, which was unanimously adopted.

Mr. JONES proposed a vote of thanks to the Chairman and Board for their services during the half year.

Mr. FRANKLIN seconded the resolution, which was cordially agreed to.

The CHAIRMAN, in making acknowledgment, said the approval of such a meeting as this was compensation for the trouble and anxiety they had experienced. His colleagues and himself stood before them a thoroughly united Board—workmen Directors and all; there had never been a shadow of division. They had all worked for the general welfare of the Company, and therefore appreciated very much indeed this expression of the shareholders' feelings. Before the meeting broke up, he would ask them to also pass a very hearty vote of thanks to the employees, with whom he associated the names of Mr. Carpenter, the Chief Engineer, and Mr. Bush, the Secretary.

Mr. EWART seconded the motion, which was carried unanimously.

Mr. C. C. CARPENTER acknowledged the compliment on behalf of the engineering staff, and said he had never known a staff who worked together in such a cordial spirit.

Mr. BUSH also thanked the meeting for the vote; and, with regard to the apparently frequent quotation of the Company's shares, which might give the impression that very large transactions took place in them, he observed that the shareholders would perhaps be surprised to hear that during the last six months on an average only twelve transfers a week had come through from brokers. This showed, he thought, that shareholders who had invested money in the Company meant to stick to their stock, and were not what might be called "Saturday to Monday" shareholders.

## CROYDON COMMERCIAL GAS COMPANY.

### The Half-Yearly Report and Accounts.

The report which the Directors of the above-named Company will present at the half-yearly meeting of shareholders next Friday opens with the satisfactory statement that the quantity of gas sold in the six months ending the 30th of June was 16'98 per cent. more than in the corresponding period of last year. They then go on to say that the increase in the cost of coal and oil during the ensuing year will amount to a sum equal to nearly 9d. per 1000 cubic feet of gas sold, and, in addition, considerable advances have been made in the prices of nearly all other materials used by the Company. The receipts from coke having already benefited by a steadily rising market, the Company cannot expect a proportional increase from this source. The Directors are pleased to be able to state that, so far, it had not been necessary to advance the charge for gas. In view, however, of the large prospective increase in expenditure explained above, they are compelled to do so now, and propose from Michaelmas next to raise the price 2d. per 1000 cubic feet. They hope this increase will be but temporary.

The accounts accompanying the report show that the revenue from the sale of gas was £53,472; the rental of meters, stoves, and fittings, £3573; residuals produced £18,556; and the total receipts were £75,681. The expenditure on the manufacture of gas was £39,250 (coal and oil costing £27,022, as compared with £19,832 in the first half of last year); on distribution, £6314; and on management, £2344—the total expenditure being £53,360. The balance carried to the net revenue account is £22,321, against £16,813; and the amount available for distribution is £25,300 as compared with £17,021. The Directors recommend dividends at the rates of 14, 11, and 9 per cent. per annum, free of income-tax. These will absorb £15,834, and leave £9466 to be carried forward. Under the supervision of Mr. J. W. Helps, M.Inst.C.E., the Company's Engineer and Manager, 26,972 tons of coal and 333,889 gallons of oil were used in the production of 402,295,000 cubic feet of gas, of which 385,487,600 cubic feet were sold and 390,211,500 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 16,183 tons; breeze, 3391 tons; tar, 340,066 gallons; and ammoniacal liquor, 663,008 gallons—the make of sulphate being 218 tons, the whole of which, with all that was in store, was sold.

**New Gas Borrowing Powers for Burton-on-Trent.**—The Burton-on-Trent Town Council are applying to the Local Government Board for sanction to the borrowing of £17,480 for gas-works purposes. A large proportion of this is to be spent in gas cooking-stoves and prepayment meters and fittings.



**BRENTFORD GAS COMPANY.**

The Half-Yearly Meeting of this Company was held on Friday, at the Charing Cross Hotel, W.C.—Mr. HOWARD C. WARD in the chair.

The SECRETARY (Mr. W. Mann) read the notice convening the meeting; and the report and accounts, which were summarized in the "JOURNAL" for July 31, were taken as read.

The CHAIRMAN, in moving their adoption, said he thought the Directors had very great reason to be more than usually satisfied in meeting the proprietors, as they had what he ventured to think was a most gratifying account to present to them. In spite of the high price of coal that had ruled, and punished as several gas companies had undoubtedly been by it, their Company had had, he might say, the privilege of having a contract at about 13s. 10d. per ton for a considerable amount of coal. While they knew what had been paid for coal during the past half year by many people, and what they had got to pay in the future, the Directors cancelled the contract, and entered into another for a considerable extra quantity of coal, which would last up to this time next year, at an advance of about 3s. 7d. a ton. Some of the gas companies with whom gentlemen present were connected had had to enter into contracts at an advance of no less than 6s. and 7s. per ton. This was unavoidable on the part of the companies; but, as a consequence, in the case of almost every Metropolitan Gas Company a substantial rise in the price of gas had been necessitated. He believed even that very successful Company the Commercial had to increase their price. The Directors of the Brentford Company, however, were able to come before the proprietors on this occasion without having the slightest intention of raising the price in their district—at any rate at present. And from what they could see with the contract for coal they had, and the prospects of residual products, they thought very probably they would not have to raise the price—certainly not before next Christmas, and they hoped not even after that. He believed he might say they were the only Metropolitan Gas Company who had gone through this—well he was going to say "crisis," but he would call it the tyranny of the coal owners in putting up the cost of coal as they had done—without having to raise the price of gas to the consumers. On the half-year's working, they would have a surplus of about £6000 after paying their dividend of 12 per cent. The Board expected they would have very little, if any, deficit at Christmas; certainly they would be enabled to pay the dividend for the twelvemonth. With such a prospect before them, they considered it would be unjust to the consumers if they were to raise the price of gas. Gratitude to gas companies was not a common thing; and therefore it was a pleasure to him to find complimentary remarks about them in the Press. The "Investors' Review" said: "We are glad to find the Board of a gas company that is not panic-stricken at the advance in the price of coal. In a refreshingly cool manner, the Directors of this concern [the Brentford] state that, in view of the increased value of products generally, and a favourable contract for coal, they have decided not to give notice of any increase in the price of gas, which will therefore remain at 2s. 11d. per 1000 cubic feet." Then another paper said: "At this juncture, it is rather refreshing to take up the report of a gas company which has not to announce an increase in its price. The Brentford Gas Company is in this happy position."

Mr. J. W. FIELD: What paper is that, sir?

The CHAIRMAN: The "Capitalist."

Mr. FIELD: Then it is all rot.

The CHAIRMAN: That is not rot.

Mr. FIELD: Everything you find in the "Capitalist" is utter rot, sir.

The CHAIRMAN: I beg to tell you that that is a very absurd remark to make. I cannot understand why you should describe it as "utter rot" when they say "it is refreshing to take up the report of a gas company which has not to announce an increase in its price." There is no justification for saying it is utter rot; it is absolutely true. I cannot understand that sort of thing when we are in a position to do it. Proceeding with his address, the Chairman said he did not think they could, in the interests of justice, increase the price of gas. If there had been any necessity for it, he should have been the first to have done it. That necessity had not arisen; and, with their good friend (Mr. Livesey), they hoped the price of coal would soon go down. Mr. Livesey had said the price of coal would drop; and he had, by some of his recent utterances, provoked the wrath of the coalowners. He (the Chairman) hoped that Mr. Livesey's predictions would prove true. They all knew that the price of oil had come down. As to the results of the half-year's working, they had made a profit of £42,743, as against £37,437 in the June half of last year. They were enabled out of this to pay the dividend of 12 per cent., and have a surplus of £6543. Adding the surplus to the balance of undivided profit, they would carry over £42,502.

Mr. Ulick J. BURKE seconded the motion.

Mr. H. D. ELLIS said he understood the Chairman to say that their former price for coal was 13s. 10d.; and the current contract showed an increase of 3s. 7d. This made 17s. 5d. per ton; and he should like to know whether this was f.o.b.

The CHAIRMAN: That is into barge.

Mr. FIELD: 17s. 6d. delivered into the Thames.

The ENGINEER (Mr. J. Husband): And 15s. into barge.

Mr. ELLIS (continuing) said he heartily congratulated the Directors on the statement of accounts they had laid before the proprietors. He only wished the Commercial Company could show anything like them; but he was afraid they would not. Here the Directors were able to pay the dividend, and carry forward a substantial sum, without having raised the price of gas; and, moreover, they did not contemplate an increase for some time. This was the point on which he wished to make a remark or two. He really doubted whether, when everybody else was raising the price of gas, as the Brentford Company must inevitably do at some time (he did not suppose they would be able to go through next year without increasing it), it was not advisable to do so at once rather than defer it until they stood by themselves—an object of public odium, without any co-partners in their "crime" to help them out. The Commercial Company did that at one time; and they got a great deal of *kudos* for it. But the inevitable time came when they had to raise the price; and the storm it brought about their ears, he should never forget. There were other companies who had been equally prosperous half year after half year; but they had given notice of increases in price. He could mention the Wandsworth and Putney Company, and the Croydon Company, who

had an increase of no less than 17 per cent., and yet they were going to give notice of a rise from Michaelmas. He said this with all respect; and, with the greatest submission, he would suggest whether it was not unadvisable to defer the inevitable—whether it would not be better for them to raise the price of gas when everybody else was doing so than delay it and attract greater attention to themselves. He believed they were selling gas at 2s. 11d. per 1000 cubic feet; and this would entitle them to increase the price 2d. without reducing the present dividend.

Mr. W. HUGHES could hardly see the force of Mr. Ellis's argument. Why one company should follow the suit of others when there was no necessity, he could not see. In his opinion, the Directors were pursuing a right course in supplying the consumers cheaply while they could afford to do so, to keep them in hand, and not drive them to the electric light.

The CHAIRMAN, in reply, said they regarded this as a matter of justice. It was all very nice to raise the price of gas 2d., and have a large surplus; but he thought it was only what was due to the consumers if the Company could, upon a fair estimate of a year's working, keep the price of gas at its existing rate. Then, if the necessity arose for increasing the price, he believed the consumers would very readily fall in with it. The Company had a great many competitors; and they had competition with the electric light in the worst form, because it was supplied by Vestries who used public money for the purpose. The Board therefore thought it was necessary, both in the interests of the consumers and the proprietors, to keep the price of gas as low as possible.

The motion was unanimously carried.

A dividend at the rate of 5 per cent. per annum on the 5 per cent. preference stock, of 12 per cent. on the consolidated stock, and of 9 per cent. on the new stock having been declared,

An Extraordinary General Meeting was held, to authorize the Directors to raise any sum not exceeding in the whole £46,875 by the issue of 4 per cent. perpetual debenture stock.

The CHAIRMAN, in moving the necessary resolution, explained that a resolution to this effect was passed on a previous occasion; but they afterwards found that the notice of the resolution did not extend to debenture stock. Therefore, although they had settled everything, and people had tendered for the stock, the Directors thought it better to withdraw it, in order to be perfectly safe. They had now given a proper notice, and again submitted the resolution. He added that the proprietors would notice that the Directors had not spent much capital during the past half year. The greatest sum had been expended on additional meters and stoves—£6972; but the proprietors would be glad to know that, by the system the Directors had adopted, the depreciation on stoves and prepayment fittings and meters amounted to no less than £8000. Under this system the expenditure on stoves, fittings, and meters would be gradually wiped out; and they would become the property of the Company without any charge on capital.

Mr. BURKE seconded the proposition.

Mr. ELLIS asked whether the Directors were thinking of issuing any of this stock now. It was not a very good time to do so.

The CHAIRMAN replied that they would be issuing some of it during this half year. He did not know how the Commercial Company stood, but in their own case they only had a balance of £320 on capital account.

Mr. ELLIS said the Commercial Company always overdrew their capital account; and they worked with a large balance borrowed from their bankers. When the market was flat, they never put stock out, but borrowed from their bankers.

Mr. FIELD: And pay a high rate of interest.

Mr. ELLIS: Less than we can get it at in any other way.

The motion was unanimously agreed to.

The usual complimentary votes terminated the proceedings.

**NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.**

An Extraordinary General Meeting of this Company was held at Winchester House, Old Broad Street, E.C., on Friday last, to consider the questions of the proposed compensation of the Directors and the advisability of winding the Company up voluntarily. Mr. J. H. DUNCAN, the Chairman of the Company, presided.

The SECRETARY (Mr. Lawrence Fletcher) having read the notice convening the meeting,

The CHAIRMAN said the shareholders had already accepted the contract made with the Welsbach Company, and given the Board general directions as to how to give effect to it. They had met to-day to take the first step in the matter—namely, putting the Company into liquidation. Another question they had to consider was the proposal to pay £5000 to the Directors, in consideration of their extra services. This matter had already been referred to in a circular issued to the shareholders. In this circular fuller explanations were promised at the meeting; and he (the Chairman) thought these explanations were necessary in order to make the matter quite clear. The shareholders did not seem to understand at all the burden that had been thrown upon the Directors of the Company. At the time of the reconstruction, the litigation with the Welsbach Company did not promise to be of a very serious character; and on several occasions he had pointed out to the shareholders that it looked like nothing but "bounce." No sooner, however, had the new Company got fairly in the saddle, than the opposite side showed their intentions clearly; and the Sunlight Company had to make preparations to meet them. This led the Directors into a state of things which he could easily understand the shareholders did not quite appreciate, but which became a necessary part of the whole proceedings. The Welsbach Company brought their actions, not only against the Sunlight Company, but also against the Directors. No doubt this was a very sensible course for the Welsbach Company to take; but it placed the Directors in a very awkward position. Then, again, customers had to be secured; and this was not accomplished simply by advertising for them. The Directors had to coax them, and to give them their personal guarantee that they should run no risk whatever in dealing with the Company. In addition to this, at the time when heavy legal costs were being incurred, the Directors had again to step into the breach, and give their personal



guarantee for the money required. They were also now asked to sign very serious obligations for the future. All the knowledge gained by them through their connection with the Sunlight Company was to be at the service of the Welsbach Company; and they were to be bound absolutely for three years not to have anything to do, either directly or indirectly, with incandescent gas lighting. All this was of the essence of the contract with the Welsbach Company. Many Directors, in circumstances like these, would have taken care of themselves, by making their compensation part of the agreement; but instead of taking that course, the Board left themselves entirely in the hands of the shareholders.

Mr. JAY said he thought that a body of men who studied the interests of their shareholders as the Directors of the Sunlight Company had done, were certainly entitled to the comparatively small remuneration suggested. He had therefore much pleasure in moving—"That a sum of £5000 be paid to the Directors out of the assets of the Company for their extra services, and as compensation for their proposed loss of office or the reduction of their numbers and remuneration (as the case may be), such sum to be divided amongst them in proportions similar to the division of their present remuneration, or in such proportions and manner as the Directors may determine amongst themselves, provided that if the distribution in the liquidation does not amount to 11s. per share, the said sum of £5000 shall be reduced in proportion to the amount actually distributed."

Mr. PARKER seconded the resolution.

Mr. HOLMES moved, as an amendment, that the question of additional remuneration to the Directors be postponed till after the accounts had been placed before the shareholders.

Mr. KLENCK, in seconding the amendment, said that before they voted this £5000 to the Directors, they ought to be informed how the Company stood, and as to the amount of money available for distribution among the shareholders.

The CHAIRMAN explained that the Directors had made every effort to get the accounts out in time for the meeting; but as they had, for the purposes of the amalgamation, to make them up to July 31, this was not possible. The accounts would, however, be completed in time to be submitted to the confirmatory meeting which it would be necessary for the Company to hold.

After a long and somewhat animated discussion, the amendment was lost, and the original motion declared carried by a large majority.

Mr. KLENCK thereupon presented a formal demand for a poll of the shareholders on the question, which he, however, subsequently withdrew, on it being intimated that the Directors held proxies in their favour representing nearly 90,000 shares.

On the motion of the CHAIRMAN, it was next decided—"That the Company be wound up voluntarily, under the Companies Acts of 1862 and 1867."

The CHAIRMAN said that, with regard to the stock they were to receive from the Welsbach Company, he had been advised that the best thing to do would be to advertise it for public subscription, and so get it properly introduced on the Stock Exchange. While the cost of doing this would be from £1000 to £1500, it would certainly add ten points to the value of the stock, and would greatly facilitate dealings in it. His recommendation was, therefore, that the expense be incurred.

Some conversation on the subject having taken place, it was decided that the matter should be left over till the next meeting.

The proceedings concluded with a vote of thanks to the Chairman.

## GLASGOW CORPORATION GAS SUPPLY.

### The Committee's Report—The Accounts for the Past Year.

The report of the Committee on Gas Supply to the Corporation of Glasgow, with the Corporation gas account for the year ending the 31st of May last, has been issued. The report states that the gross revenue amounted to £770,002, and the gross expenditure to £646,281; to which is added depreciation written off capital, £37,979, and a further depreciation written off the Dalmarnock station and works of £7700—making the total expenditure £691,960, and leaving a balance of £78,042 to be carried to the profit and loss account. Out of this the Committee had to meet the following requirements during the year: Annuities on stock, £34,763; interest on borrowed money and redeemed loans, £35,581; and sinking fund, £7665—together, £78,009; leaving a surplus of £33 on the year's operations. To this sum there falls to be added the balance of £551 brought from last year; making a sum to be carried forward to the credit of the current year's account of £584. The report proceeds:—

Your Committee have pleasure in stating that the market for residuals has been very favourable to the Corporation, with consequent increase of income from this source and from the greater quantity of coal carbonized. The average price received per ton of coal carbonized for the past year has been 3s. 5½d., as compared with 2s. 6½d. for the previous year. The quantity of coke sold during last year was 259,679 tons, as compared with 240,832 tons for the previous year; the average price received being 6s. 0½d. per ton, as compared with 5s. 0½d. for the previous year.

Your Committee as usual advertised for tenders for coal to be supplied during the coming year, and have concluded contracts for almost the whole quantity required, at a considerable increase per ton over last year's prices. Having regard to this fact, and to the erection of new works at Provan, which will necessitate a much larger charge for interest on capital to be expended, a larger contribution to sinking fund, that this expenditure will be non-productive for a considerable time, and also keeping in view that the market for residuals may not continue throughout the year at its present high rate, your Committee regret that they have no alternative but to recommend to the Corporation that the price of gas be increased from 2s. 2d. to 2s. 6d. per 1000 cubic feet; this increase to take effect as from the date of the last survey.

The quantity of gas made during the past year was 5,969,110,800 cubic feet, and the quantity sold or accounted for 5,399,535,930 cubic feet; the quantity unaccounted for being 569,574,870 cubic feet, or 9½ per cent. The sinking fund, with its accumulations, now stands at £388,665.

As will be seen from the statement of loan capital, the unexhausted borrowing powers of the Corporation, under the Gas Acts, both for gas and electricity purposes, as at 31st of May last, stood at £306,565. A much larger amount than this will be required within the next year or two to meet the capital expenditure which will be involved in the erection and equipment of the new Provan Gas-Works, and for additions to the chemical works at

Dawsholm; and further capital moneys will also have to be expended on account of new works and plant, in connection with the Electricity Department, within the same period. Your Committee have, therefore, to recommend that an application be made in Parliament next session for authority to increase the borrowing powers under the Gas Acts from £2,000,000 to £3,000,000 sterling.

The works and mains have been maintained in an efficient condition during the past year.

The new gasholder at Dawsholm is now completed, and will be at work during the coming winter.

As mentioned in last year's report, ground has been acquired adjoining the Dawsholm works for the erection of new tar-distilling works. Plans are being prepared for these works, and their construction will be commenced as soon as possible.

Additional scrubbing apparatus and an additional station-meter are being erected at the Tradeston works.

Parliamentary authority for the purchase of the land required for the new works at Provan, referred to in last year's report, was obtained in August last. Plans have been prepared; and the contract for the excavation and brickwork of the first section of the works has been entered into. The erection of the works will be pushed on as rapidly as possible.

About 18 miles of new mains have been laid during the past year.

The number of meters in use on the 31st of May, 1900, was 201,978; being an increase of 7674 over the number in use at the same date last year. During the year, 17,487 meters were repaired; and 24,206 were examined while in use, of which 21,369 were found in a satisfactory condition, and 2837 were found defective and removed.

The number of gas-stoves lent on hire as at the 31st of May, 1900, was 17,722. The number of gas heating and cooking appliances sold during the year was 1490.

The site of the old gas-works in Pollokshaws was sold by the Corporation to the Commissioners of that burgh at the price of £1251, with entry at Whitsunday last. The Corporation, however, have purchased from Mr. John Campbell, with entry at the same term, a portion of ground situated a short distance to the south of the burgh of Pollokshaws, and extending to 10,843 square yards; and this ground will be available for the erection thereon of gasholders.

The statement of accounts shows the stock capital to remain the same as last year—viz., £300,000 of shares in the Gas Companies, bearing perpetual annuities at the rate of 9 per cent., and £115,000 of shares bearing perpetual annuities at the rate of 6½ per cent. The total annuities payable are £34,762 10s. Of loan capital, the amount authorized is £2,000,000. The sum borrowed for the Gas Department has been £766,500 at the rate of £3 5s. per cent., as compared with £661,500 at the rate of £3 1s. 6d. a year ago; and for the Electricity Department, £628,500, the rates of interest being the same. There have been redeemed, of gas loans, £286,935, the same sum as last year; and of electricity loans, £11,500, as compared with £8000 a year ago. A new capital account is stated with great elaboration, so as to show the outlays in the period between 1869-1900. The amounts expended, less depreciations and sums realized for properties sold, are stated at £1,400,921, as compared with £1,315,609 a year ago. Capital liabilities, including £286,935 of redeemed debt, are stated at £1,468,435; leaving a balance in the books of liabilities over assets of £67,513, as compared with a similar balance a year ago of £47,825. The capital account for the past year shows that there was spent, in additions to the Dawsholm works, £3475, and that £9041 was expended in acquiring land at that station; that £1385 was spent upon additions to the Tradeston works; that £13,810 was spent upon additions at the Temple works; that £274 was spent upon additions to the chemical works at Dawsholm, and £400 upon additions to the chemical works at Tradeston; that £11,586 was expended upon extensions to mains, and £13,231 upon new gas-meters; and that the expenditure upon the new works at Provan amounted to £71,526, of which £58,873 was the cost of acquiring the site, £1094 was paid as compensation for disturbance of position, and the sum of £11,553 has been expended upon work.

The revenue account shows that of the total sum of £770,002 received, £577,933 was for gas, as compared with £557,788; £68,707 was for coke, as compared with £49,932; £121,347 was for ammoniacal liquor and tar, as compared with £89,000; £480 was for waste lime, as compared with £732; and £1526 was rents of house properties and chemical works, as compared with £2638. On the expenditure side the manufacture of gas cost £556,329, as compared with £489,379. The quantity of coal used was 666,769 tons, as compared with 644,925 tons; and the price was £382,398, as compared with £324,810. Purifying materials, and oil, water, &c., at works, cost £30,460, as compared with £27,910; salaries of Engineers, superintendents, and officers at works cost £4406, as compared with £4834; wages amounted to £83,567, as compared with £76,896; and repairs and maintenance cost £49,327, as compared with £49,680. Distribution of gas cost £56,141, as compared with £55,019. Rents, rates, and taxes cost £21,629, as compared with £18,881. Management cost £10,086, as compared with £10,515. Law charges amounted to £33, as compared with £95; and parliamentary charges to £1803, as compared with £756. Retiring allowances to old servants of the Companies amounted to £258, as compared with £320. Depreciation is stated at £45,679, made up of £27,281 on works and pipes, at 2½ per cent., £10,698 on meters, at 6 per cent., and the £7700 extra depreciation on the Dalmarnock works. The general balance-sheet shows deposits in security of gas-rents to the amount of £29,464; a fire insurance fund of £539; and a contingent fund of £16,008. The department own a stud of seventy horses. The receipts from stoves and fittings sold amount to £834, as compared with £813; and the rents of stoves hired amounted to £5072, as compared with £4440. The quantity of gas sold was 185,621,430 cubic feet more than in the preceding year. The increase reported a year ago was 413,557,550 cubic feet; and in the year preceding that, 174,376,000 cubic feet.

The London correspondent of the "Yorkshire Post" says that since the subject of water gas was recently mentioned in the House of Commons, there has been a good deal of discussion about it among people connected with science and the manufacturing industries; and there seems to be a general desire that some parliamentary restriction should be placed on its use. This is especially the view of one or two of the Medical Officers of Health, who hold that it is essential in the interests of the public. He thinks that another session is almost certain to see legislation on the matter.



### THE PRICE OF GAS AT BOLTON.

The proposal on the part of the Gas Committee of the Bolton Corporation to raise the price of gas 3d. per 1000 cubic feet as from the 1st of October next, is being strongly opposed by the tradesmen of the town. There was a short discussion on the question at a recent meeting of the Town Council, and Alderman Miles, as Chairman of the Gas Committee, accepted a friendly amendment referring the matter back, so that the tradesmen might have an opportunity of laying their views before that body. Since then the several Tradesmen's Associations have met, and it was arranged that a joint deputation should wait upon the Committee. The tradesmen argue that the Gas Department should not be looked upon to produce large sums out of profits in aid of the rates, because this mode of taxation is not equal in its treatment. For example, non-users of gas—and a good many firms now exclusively employ electricity—will participate in the profits without paying a single halfpenny towards the increased revenue. The Co-operative Society, with a membership of some 25,000, generate their own electricity; and so do a number of manufacturing and machine-making firms. Another point is that the cottager would pay the advance, while the landlord, through the compounding of rates, would reap all the advantage in the rating. On behalf of the Gas Committee, it is pointed out that the increased price of coal means this year an extra £25,000; and if they are expected to provide a large sum in aid of rates, they can only do it by advancing the charge for gas to the consumer. Last April, the Gas Department handed over £20,000; and in the year 1898-9 the sum was £25,000. The price of gas now is 2s. 3d. net.

At a meeting of the Gas Committee last Friday, a deputation of tradesmen attended to protest against the proposed increase in the price of gas. Their argument was that to get large profits out of the Gas Department in relief of the rates brought about an uneven form of rating. It was pointed out in support of this that certain firms in the town who did not use gas, but generated electricity on their own premises, obtained the benefit of reduced rating while contributing nothing to the gas revenue. It was further argued that tradesmen in the centre of the town, being large consumers of gas, and using this illuminant long after private and public offices were closed, would feel the pinch by having to pay the proposed increase in price. Another point was that the majority of the consumers in the borough paid their rates in their rent, and therefore, if called upon to pay the enhanced price for gas, they would not benefit by the amount handed over from the Gas Department in aid of the rates. The deputation handed in a memorial signed by a large number of tradesmen protesting against the proposed advance. On behalf of the Gas Committee, it was shown that coal was costing the department £25,000 more this year than it did last, and that the Finance Committee had for the current year estimated upon a profit of £20,000 from the gas-works. After the deputation had retired, the Committee considered the points raised, and eventually passed the following resolution: "That the Committee, having authorized the Borough Treasurer to estimate that the sum of £20,000 would be available out of the profits of the Gas Department for the next year, are unable to free themselves from that obligation. But, in view of the increased price now being obtained from the sale of residual products, they find that the sum mentioned can be provided by an increase of 2d. per 1000 cubic feet in the price of gas, instead of 3d. as previously proposed; and they therefore recommend that the price of gas be increased on and after Oct. 1 next 2d. per 1000 feet."

### PROVINCIAL GAS AND WATER COMPANIES.

We commence to-day our usual notes on the progress made by Gas and Water Companies in various parts of the kingdom whose reports and accounts come to hand about this time.

#### Gas Companies.

The accounts presented at the half-yearly meeting of the Aldershot Gas and Water Company on the 10th inst. showed that the revenue from the sale of gas in the six months ending the 30th of June amounted to £10,000, from the supply of water to £3331, and from residual products to £4327; the total receipts being £18,302, as compared with £14,871 in the first half of last year. As the expenditure amounted to £13,238, there was a balance of £5064 to go to the profit and loss account, against £4199 before. The amount available for distribution was £9144; and after providing dividends on the preference shares and interest, the Directors recommended the payment of a dividend at the rate of £11 8s. 6d. per cent. per annum on the "A" shares, of £8 8s. 6d. per cent. per annum on the "B" shares (these rates being in accordance with the sliding-scale), and of £7 per cent. per annum on the ordinary "E" shares—all less income-tax. They reported that the business of the Company generally showed satisfactory progress. As the price of the coal contracted to be delivered during the twelve months dating from the 1st of July last shows an increase of more than 50 per cent. above the previous contracts, the Directors have found it necessary to raise the price of gas to ordinary consumers in Aldershot and Farnborough by 3d. per 1000 cubic feet from that date.

At the half-yearly meeting of the Bristol Gas Company on Thursday, the Directors will report an increase of 10 per cent. in the sale of gas in the six months ending the 30th of June, as compared with the corresponding period of 1899; while the revenue account shows a substantial profit. The receipts amounted to £158,553, against £142,613; and the expenditure to £119,546, against £108,434—the balance carried to the profit and loss account being £39,007, as compared with £34,179. The amount available for distribution is £60,689; and the Directors recommend a dividend at the rate of 5 per cent. per annum. This will amount to £24,987 10s., and leave a balance of £35,701 10s. to be carried forward. The Company spent in the past six months £27,111 on capital account, which has overdrawn it to the extent of some £5000; and, in view of the small balance (£13,000) of unissued capital authorized by the Act of 1891, and the increasing demand for gas, the Directors propose to ask for power to issue the ordinary and debenture stock sanctioned by the Act of 1899.

The half-yearly meeting of the Cambridge Gas Company was held on

the 1st inst.—Mr. E. H. Parker in the chair. The Directors reported that the trading for the six months ending June 30 had been satisfactory; and they recommended the declaration of the maximum dividends. Referring to the advance in the price of coal, and the necessity for raising the charge for gas, they expressed the opinion that the burden caused by the extraordinary (and it was hoped temporary) rise in coals should not fall exclusively upon the consumers; and they suggested that during the period of abnormal prices a reduction should be made from the maximum dividends. In moving the adoption of the report, the Chairman said there had been an increase in revenue of £3079; and the amount carried to the profit and loss account was £7652. The output of gas had increased; and the production had been fair. From each ton of coal carbonized they had made 10,146 cubic feet of gas, of which they had sold only 9605 cubic feet—a difference of about 500 cubic feet. This represented a loss of £1080 in gas unaccounted for. He believed that this was due to large escapes resulting from drainage works. They were constantly discovering underneath the surface large chasms, pipes sunk, and gas escaping. Owing to these works, he thought the Company were losing £900 a year, or, if he did not take the selling price of the gas, he would say from £700 to £800 a year. In this, the Company had been very badly hit. They had adopted all means of detecting the leakages, but had not succeeded. With regard to manufacturing operations, a certain quantity of brickwork had been laid for a new inclined retort-house; but the work was not yet completed. He regarded the erection of the inclined retorts as the right policy, as they resulted in a saving in the cost of labour. As he had pointed out, the gas made per ton of coal was 10,146 cubic feet. The total quantity made was 146,521,000 cubic feet, at a cost of 2.48d. per 1000 feet. The quantity made to Midsummer, 1898, was 133,388,000 cubic feet, at a cost of 3.21d. In other words, if they had produced this large amount of gas without the inclined retorts, the wages would have been £1959 instead of £1519; therefore they had an actual saving by the inclined retorts of £440 for the half year, while they were not using anything like the same amount of cannel. Mr. Gibson seconded the motion, and it was carried. The Chairman then brought forward the following resolution: "That this meeting approves of the proposal of the Directors recommending that during the existence of the present high price of coals a dividend less than the maximum dividend shall be distributed among the shareholders." He explained that this was a new departure. The Directors had very carefully considered the matter, and they were unanimously of opinion that, under the exceptional circumstances now existing, it would be politic and right for the shareholders to take a sum less than the maximum dividend. It was being done by companies who were under the sliding-scale; and he wished he might see the principle adopted by the Company, as he thought it was a great premium on good management. He added that the resolution was a declaration of policy, and he thought the step proposed was a wise one to take. If the price of gas was materially increased, they must be hurt by the Electric Light Company. He might say the Directors did not move in the matter without first consulting Mr. Livesey; and he agreed with them that it was a good and proper policy to adopt. Mr. Oke opposed the proposition; saying that if it was carried they should alter the name of the Company to the Cambridge and Town Philanthropic Gaslight Company. Mr. Redfern said the decision was arrived at by the Directors through a desire to be politic in what they did. There was a very strong feeling in the borough against the Company, and they tried to nullify it by what they considered an act of justice. After some discussion, the resolution was withdrawn. A vote of thanks having been accorded to the Chairman and Directors, and Mr. Brown complimented on his management of the works, the Chairman returned thanks. He said the Board had only one object in view—the success of the Company. At the same time they tried to recognize that the Company was a quasi-public undertaking, and that there were certain things to be considered besides the maximum dividends.

The 64th half-yearly general meeting of the Chester United Gas Company was held on the 2nd inst.—Mr. J. Gamon in the chair. The Directors reported an available balance of £3623, out of which they recommended the declaration of dividends of 5 and 3½ per cent., which would absorb £3499, and leave a balance of £124 to be carried forward. In moving the adoption of the report, the Chairman stated that, owing to the great outlay which the Company had had to incur in the maintenance and repair of the works, the balance, after payment of the dividends for the half year, would be only £124, instead of £281, as it was in June, 1899, notwithstanding that they had had a very large increase in the output of gas—as much as 6,200,000 cubic feet. It was satisfactory to notice that this was nearly all accounted for by the increase in the city, notwithstanding that the electric light was generally adopted. Having alluded to the advance in the price of coal and other material, he said it had been necessary to increase the manufacturing power of the works, and the Directors had entered into a contract with West's Gas Improvement Company, Limited, for rebuilding the retort-house and retorts throughout. It amounted to £15,000, with extras, which would probably raise the total to £16,000. By this expenditure they would produce 33 per cent. more gas than they were able to do at present. Their unexpended capital stood at £8549. They had in stock, to the credit of this account, £8000, which locked up that portion of it. Besides this, for trading purposes they required a capital nowadays of from £5000 to £6000; so that they had come practically to the end of their capital, and the Directors were contemplating promoting a Bill next session. They would then take the opportunity to ask for powers for the consolidation of the capital, and for making provisions which they considered would be advantageous to the shareholders, and also enable them to secure the cheapening of the gas supply. The report was adopted.

At the meeting of the Coatbridge Gas Company last Thursday, the Directors reported a satisfactory state of affairs; the aggregate consumption of gas having been 53,384,000 cubic feet, or an increase of 9.76 per cent. The gross revenue amounted to £10,244—being a rise of £2165; and the net profit was £2079. The amount chargeable against this for interest is £143; and the remainder, with the addition of the balance of £909 brought forward, makes a sum of £2845 applicable for distribution. During the half year, £1925 was expended on capital account—for extra automatic and ordinary meters, gas-stoves, extensions of pipes, and erecting a new ammonia still. Owing to the continued high price of coal and the increased cost of labour, the Directors have



been compelled to raise the price of gas still further by 2½d. per 1000 cubic feet as from the 1st ult., which makes the charge 2s. 11d. to ordinary, and 3s. 4d. to automatic consumers. The works and plant have been carefully maintained under the supervision of Mr. T. Wilson; and the Directors have no hesitation in saying that when the present scheme of alterations has been completed they will be found to be in a state of efficiency which will serve the requirements of the district adequately for many years. Dividends at the rate of 10 per cent. per annum on the original stock, and 7 per cent. per annum on the new shares (1887 and 1898 issues) respectively, less income-tax, were declared.

The half-yearly meeting of the Derby Gas Company was held last Wednesday—Mr. H. Swingle in the chair. In making his customary statement upon the accounts, the Chairman congratulated the proprietors upon the profit made, notwithstanding the fact that they had been working in adverse times, so far as the price of coal was concerned. In looking back at the prices paid by the Company in the past, he found that for the half year ending June, 1898, it was 10s. 1d. per ton. In December last they paid 11s. 1d.; in June, 13s. 6d.; and now they were paying 16s. When he told them that the coal consumption of the Company was estimated at 60,000 tons per annum, they would see what this increase meant. They had been compelled to call upon the consumers to share their difficulties by paying 3d. per 1000 cubic feet more for the gas supplied to them. Incidentally, he might say that the coal account of the Company for the past half year had increased by £6700. Their capital account had not increased much; but what additions there were, were in a direction which pointed to continued prosperity. They had spent upon their new buildings £265; upon mains, £473; upon new meters, £842; and upon new stoves, £640. The two latter items were very important, because they meant an augmented consumption of gas. With regard to the manufacturing account, he was pleased to say they had again a very satisfactory advance. The increase in the ordinary and public lighting amounted to 27 million cubic feet, or a little over 10 per cent. for the six months. This time last year, it was 7 per cent. In money, it amounted to £3425. The increase in cookers and gas-fires for the half year was more than 200; and there was also an addition of 11 gas-engines. The prepayment meters had increased by 323. With regard to residuals, the Company had had to pay a good deal extra for coal, but they had obtained a considerable additional amount for residuals. For coke, they had received, roundly speaking, £3000 more; for breeze, about £200; and for tar, about £450. In sulphate, there was a slight decrease of about £700—not in consequence of the reduction in price, but because the usual quantity had not been sold. The total increase in residuals amounted to £2916. On the other hand, in carbonizing and various charges connected with it, there was a rise amounting to £5527; but what they had shown for this was 27 million cubic feet more gas. The net balance carried forward, after paying the usual dividend, was £3340. What the position would be in six months' time, he did not know; but, as far as he could make out, it would not be so satisfactory in one way, although it would in another. He could assure the proprietors, however, that the Directors would always endeavour to look after their interests. In conclusion, he moved the adoption of the report and accounts; and the motion was carried unanimously. Dividends at the rates of 10, 7, and 5 per cent. respectively were then declared. The Chairman next referred to the resignation of the Secretary (Mr. R. Fisher), after more than fifty years' service with the Company, and stated that the Directors had decided to recommend to the meeting that he be allowed a life pension of £200 per annum. He had very great pleasure in moving a resolution carrying this proposal into effect. Mr. Jefferson, as the oldest Director, seconded the motion; and it was carried unanimously. The Chairman next referred to the resignation of the Engineer and Manager (Mr. Charles Taylor), and said that although he was not prepared to bring a resolution before the meeting, the Directors had come to the conclusion to allow Mr. Taylor, who had been in the service of the Company for 35 years, and had been a valuable servant, a pension of £250 per annum. He then moved the confirmation of the appointment of Mr. H. Bullivant as Secretary, and Mr. J. Ferguson Bell as Engineer and Manager; and this was agreed to. The proceedings then closed.

The Directors of the Dorchester Gas and Coke Company, Limited, at the half-yearly meeting to-day, will present accounts which show that the revenue in the six months ending June 30 last was £3689, and the expenditure £2628; leaving a balance of £1061. The amount available for distribution was £1175; and the usual dividends were recommended. There was an increase in the quantity of gas sold in the half year.

The half-yearly report of the Directors of the Durham Gas Company recommended a dividend at the rate of 5 per cent. on the original capital and 3½ per cent. on the additional capital. At the meeting of the shareholders last Tuesday, it was stated by the Chairman (Mr. John Coward) that, in consequence of the high price of coal, there had been an extra expenditure of £2200. The report was adopted.

At the half-yearly meeting of the Grantham Gas Company on Tuesday, a dividend at the rate of 10 per cent. per annum was declared on the old shares and 7 per cent. on the new shares. It was stated that, in consequence of the increased cost of coal, the price of gas had been raised 4d. per 1000 cubic feet. Authority was given to issue 4000 ordinary shares of £1 each, under the provisions of the Company's Act of the past session.

The annual report of the Kildwick Parish Gas Company states that the total profits for the past year, including £267 brought from the previous account, are £2626. An interim dividend at the rate of 6 per cent. per annum on the ordinary shares and of 4 per cent. per annum on the preference shares was paid for the half year ended Dec. 31 last. This leaves a balance of £1640, which it is recommended should be disposed of as follows: Dividend on the ordinary shares at the rate of 6 per cent. per annum, £862; dividend on the preference shares at the rate of 4 per cent. per annum, £115; added to reserve fund, £200; balance to next year's account, £463.

Mr. R. Lloyd's speech at the meeting of the Newtown (Mon.) Gas Company last Friday week showed that the Directors regarded the result of the working of the past year as very favourable. The year, he said, had been a prosperous one; and the profits were considerably in advance of any previous year. They amounted to £1728; being an increase upon last year of about £520. Regarding the proposed purchase of the works by the District Council, he said it would be entirely the fault of the

Council if they were not able to come to terms; and thereby save the town the expense of an arbitration. The Bill had passed the House of Commons, and received the Royal Assent; but the Company had heard nothing definite from the Council. It was proposed to pay a dividend of 4 per cent. for the half year free of income-tax, which, with the interim dividend declared in February last, made 8 per cent. for the year. After paying this they would have £590 to carry forward. The report and accounts were passed.

At the meeting of the Town and County of Poole Gas and Coke Company, Limited, yesterday, the accounts presented showed a profit of £1140 for the six months ending June 30 last as compared with £1408 for the corresponding period of 1899. The total revenue was £4369; the expenditure, £3229. The Directors state that the difference is more than accounted for by the advance in the price of coal. The available profit, however, enables them to recommend the payment of the full dividends upon the whole of the capital issued.

In their half-yearly report, the Directors of the Whitworth Gas Company say that, owing to the greatly enhanced price of materials, particularly coal, they have been compelled to advance the price of gas. The net profit for the half year was £782. With the amount brought forward, the Directors are enabled to recommend the full dividends of 10 per cent. on the original shares and 7½ per cent. on the new "B" shares. The profit in the corresponding half of last year was £904, and the same dividends were paid. The accounts show that the sale of gas produced £2239 in the six months ending June 30, against £2146 in the first half of 1899. Coal cost £1105, as compared with £867; but residuals produced £520, against £478.

At the half-yearly meeting of the York United Gas Company on the 2nd inst., the report presented by the Directors, which was read by the Engineer and Secretary (Mr. Charles Sellers), showed that the balance of revenue carried to the profit and loss account amounted to £8018. When to this sum was added the balance of interest from the reserve investment fund of £231, it made a total for the past half year of £8249. Of this sum, £190 had been paid for interest on money borrowed on mortgage; leaving £8059 available for distribution. The Directors recommended that the usual dividends be declared of 5s. per share upon the original and 1878 shares, and of 4s. per share upon those created in 1898, free from income-tax. These would absorb £7400. The Directors went on to say that the half year had been favoured by certain coal contracts which the Company fortunately secured before prices advanced, which contracts had not run out. It had also been helped by a very satisfactory increase in the consumption of gas; the increase having been no less than 8 per cent., although competition from the electric light commenced on the 15th of March last. The Directors pointed out that 8 per cent. was much greater than the ordinary increase, as shown by comparison with the past ten years when the electric light did not exist. The average for the last ten June half years was 3·71 per cent., while for the last ten whole years it was 4·01 per cent. The Directors therefore felt that the most timid shareholder need have no fear for his interest in the Company. In addition to the continued growth in the public demands for gas, improved trade had increased the value of residuals. The recent reductions also in the cost of incandescent burners and mantles gave additional assurance to the future of gas; for, regardless of all interested statements to the contrary, the incandescent use of gas was unquestionably the cheapest and pleasantest form of lighting. The Chairman (Mr. J. R. Hill, J.P.), in moving the adoption of the report, said he thought the consumers would join with the shareholders and Directors in expressing gratification at the financial results of the past half year, as they had been achieved without increasing the price of gas. The report was adopted.

#### Water Companies.

The Cambridge Water Company held their half-yearly meeting on the 3rd inst.—the Master of Corpus Christi College (the Rev. Dr. Perowne) in the chair. The Engineer and Manager reported that water had been laid on to 103 new premises—bringing up to 15,651 the number now supplied; and the Directors in their report recommended dividends at the rates of 10 and 7 per cent. per annum. They also announced that the settlement of the claims arising out of the fraudulent transactions of the late Secretary was nearing completion. The report was adopted.

The shareholders of the Chester Water Company met last Thursday, and received a report which stated that the half-year's accounts showed a surplus of £2875, which, added to the balance from December last (£8224) made a total of £11,099. Of this sum the Directors proposed to transfer to depreciation account £2000 to meet the cost of a new engine now in course of construction to replace an old one; and the interest on preference capital required £450—leaving £8649. Out of this it was recommended that the usual statutory dividends be paid (free of income-tax). These would absorb £1890; and leave £6759 to be carried forward. The report also recorded, with the Directors' great regret, the death of the late Chairman (Mr. W. Brown), and announced the election of the Deputy-Chairman (Mr. F. E. Roberts) to the position. The Company had also during the half year lost the highly-esteemed services of their late Secretary (Mr. E. Lloyd); and the Directors expressed their sense of the loss sustained through this event. Mr. W. S. Moss, who for many years had assisted Mr. Lloyd in his work, has been appointed to the secretaryship. On the motion of the new Chairman, the report and accounts were adopted.

The report of the Directors of the Cleveland Water Company for the half year ending the 30th of June states that, after providing for all expenditure, there remains a balance of £4849, enabling the Directors to recommend that a dividend at the rate of 9½ per cent. per annum on the original and "A" shares, and £6 13s. per cent. per annum on the "B" shares (free of income-tax), be declared; and that £125 be reserved for contingencies. This will absorb £3355, and leave a balance of £1494 to be carried to the credit of the next half-year's account. The dividends for the corresponding period of 1899 were 8½ and £5 19s. per cent.

The half-yearly meeting of the Leatherhead and District Water Company was held last Thursday. Mr. John Boustead occupied the chair, in the absence of the Chairman of the Company. The report stated that the receipts for the half year to June 30 last amounted to £2296, and the working expenses to £1332; leaving a profit of £964. To this had to be added an amount of £883 brought forward from the previous half year, making a total of £1847. Deducting from this sum £161 for interest on



debenture stock, there remained £1686 available for division among the shareholders. Out of this, the Directors recommended a dividend at the rate of  $5\frac{1}{2}$  per cent. per annum, which would absorb £888, and leave a balance of £798 to be carried forward to the next account. During the half year, 48 new services had been laid on, and applications for more were still being received. Accompanying the Directors' report was the report of the Engineer of the Company (Mr. F. S. Cripps). In it he said that the water supply during the past six months had been satisfactory, and the quality perfectly pure. A new 6-inch main had been laid from Padeshams to Water Lane, Cobham, alongside the existing 4-inch main. Mr. Cripps adds that, owing to the large increase in the demand for water, it will shortly be necessary to augment the supply by sinking another boring, and connecting it with the present pumping machinery. The Chairman, in moving the adoption of the report, said that in the half year under review the Company had pumped 53,499,000 gallons of water, as against 44,370,000 gallons in the corresponding period of the previous year, or an increase of 9,129,000 gallons. Unfortunately, however, owing to the rise in the cost of fuel, &c., this result had been accompanied by a more than proportionate increase in the expenditure. During the period of excessive drought, the Company had been obliged, in consequence of the great diminution in the amount of water in their reservoir, to suspend for a few nights the supply to the consumers. The 48 new services referred to in the report were estimated to produce an income of £165 a year. At the present time, a system of drainage was being carried out at Leatherhead; and this would necessitate the careful looking after of their mains. Some small extra outlay might thus be incurred; but at the same time the Company were bound to benefit, because a well-drained district was always popular for residential purposes. He thought the shareholders might look forward to enjoying at no distant date their full statutory dividend. In answer to questions, the Chairman admitted that the quantity of water supplied to the consumers worked out to at least 60 gallons per head daily. The report was adopted, and the dividend recommended was declared.

The Directors of the South Hants Water Company state in their report that the accounts for the six months ending June 30 show that the rent-roll during this period increased by £509 13s., and that 458 additional houses were supplied with water. On the profit and loss account there is an approximate available balance of £4105. They propose to pay an interim dividend (free of income-tax) at the rate of 7 per cent. per annum on the 10 per cent. stock, of £4 18s. per cent. per annum on the 7 per cent. stock, and of  $3\frac{1}{2}$  per cent. from the 15th of May on the 5 per cent. maximum ordinary shares. The reservoir at Twyford has been completed, and is now available for affording an auxiliary supply by gravitation.

At the meeting of the South Staffordshire Water-Works Company on the 30th inst., the Directors will report that 2176 houses were laid on during the half year ended June 30; making the total number supplied 106,141. The gross amount of water-rates was £54,175, against £51,408 in the corresponding period of the previous year. After providing for interest on debenture and preference stock, the amount remaining for division (including £9723 brought forward) is £25,551; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 6 per cent. per annum, tax free. There will then remain £7701 to the credit of next half year. The Engineer (Mr. H. Ashton Hill, M.Inst.C.E.) reports that the machinery, buildings, and plant of the Company are in substantial order and repair.

The report of the Directors of the Whitby Water Company states that, subject to outstanding liabilities, there is a disposable balance of £1701. Out of this, they recommend dividends for the past half year as follows: On the preference stock already issued, at the rate of  $3\frac{1}{2}$  per cent. per annum; on the original shares, 8s. 6d. per share, or at the rate of 3s. per cent. per annum; and on the new shares (1897) 5s. 11d. per share, or at the rate of £5 19s. per cent. per annum. These payments will, less income-tax, absorb £1169, and leave a credit balance of £532 to be carried forward.

The Yeaton Water Company's balance-sheet for the six months ended June 30 shows a profit on revenue account of £1038. Adding this to the £334 brought forward, the sum available for distribution is £1372. The Directors recommend dividends of 6 and  $4\frac{1}{2}$  per cent. respectively on the two classes of stock, which will absorb £1100 and leave £272 to be carried forward. The total outlay on works up to date is £55,511.

In the report which the Directors of the York Water-Works Company submitted at the half-yearly ordinary meeting of shareholders on the 2nd inst., they stated that they were glad to record that the extension of the mains to Towthorpe to supply the military camp at Strensall and the village of Huntingdon with water had been completed, and the water laid on. Having fully considered various schemes for effectively increasing the filtering capacity of the works, they had decided to extend the area at Acomb Landing, so as to obtain an additional quantity of about  $1\frac{1}{2}$  million gallons of filtered water per 24 hours. It was anticipated that this increase would make ample provision for all requirements for a number of years. For these and other purposes capital was required; and the Directors asked the shareholders, at the special meeting held immediately after the ordinary meeting, to authorize the raising of a further part of the capital under the Act of 1895, by the creation of 2000  $3\frac{1}{2}$  per cent. £10 preference shares. They recommended dividends at the following rates per cent. per annum: On the preference shares, 1876, 5; on the preference shares, 1896,  $3\frac{1}{2}$ ; on the ordinary shares, 10; and on the ordinary shares, 1878 and 1879, 7. These dividends were declared.

**Increased Water Storage for Gloucester.**—At the last meeting of the Gloucester City Council, the Surveyor submitted a plan for an additional reservoir to be constructed adjoining the existing one at Madam's Wood, in the parish of Newent, on land acquired for the purpose in 1895. He said he proposed that the new reservoir should be constructed of concrete instead of stone, and stated that it would hold about 1,250,000 gallons, which, added to the capacity of the existing reservoir, would provide a total storage of 1,850,000 gallons. He was instructed to prepare contract drawings and a specification of the proposed works, and an estimate of the cost, so that the Corporation may be in a position to invite tenders and apply for sanction to borrow the amount required for carrying out the work.

## THE CORPORATION OF LONDON AND THE SOUTH METROPOLITAN GAS BILL.

At the last Meeting before the recess of the Court of Common Council of the City of London, the Streets Committee presented a report on the Bill of the South Metropolitan Gas Company, which received the Royal Assent on the 30th ult. It set forth that, in accordance with the reference to them of the 5th of April, they instructed the Remembrancer (Mr. Prior Goldney) to take the necessary steps to oppose the Bill, with the view of obtaining the insertion of a clause protecting the Corporation from having to pay a higher price for gas supplied to them than is charged to private consumers by any other London Company. It went on to remind the Council that the Bill proposed to authorize the Gaslight and Coke and South Metropolitan Gas Companies to agree for the purchase by the latter Company of the district of supply of the former on the south side of the Thames. On the 31st of May, the Town Clerk directed the attention of the Local Authorities on the northern side of the river to the Bill, requesting them to present petitions to the House of Lords (the Bill having passed the Commons) against the proposed purchase clause, as this, unless the Bill was amended, would have the effect of largely increasing the price of gas to the authorities on the north side beyond the rate fixed by the Amalgamation Scheme of 1883 of the Gaslight and Coke Company and the London Gas Company. The Committee caused to be circulated among the Local Authorities a memorandum prepared by the Remembrancer as to the existing prices for public lighting, and they appointed a Sub-Committee to attend the Houses of Parliament during the progress of the Bill. The Remembrancer presented to the Committee a report on the matter which they appended to their own. It showed that the action of the Corporation had resulted in practically all the Local Authorities petitioning against the Bill, most of them appearing by Counsel in support of their petitions, which were practically on the lines of that presented by the Corporation. In the result, the Committee of the House of Lords unanimously rejected the preamble of the portion of the Bill relating to the proposed purchase, without calling any witnesses on behalf of the opponents. In conclusion, the Committee acknowledged the valuable and active assistance rendered by Mr. Alpheus C. Morton, one of the members of the Sub-Committee, in connection with the Corporation's opposition to the Bill. The report was ordered to be printed, and distributed to the members of the Council, as well as to the Local Authorities on the north side of the Thames.

## AUSTRALIAN GASLIGHT COMPANY.

### Extension of the Company's Mains to North Sydney.

The last anniversary of the Queen's Birthday (May 24) saw the completion of the Australian Gaslight Company's latest extension—viz., from Ryde, via the Lane Cove River and Stoney Creek Road, to the rising suburbs of Roseville, Lindfield, Killara, Gordon, Pymble, Turramurra, Wahroonga, Waitaira, and Hornsby, on the north side of Sydney Harbour. The work was longer in hand than was originally contemplated, owing to the delay in the arrival of the necessary pipes from England; but as soon as they were received they were laid. The greatest difficulty was experienced in the crossing of the Lane Cove River, at which point a wooden tresselled bridge had to be erected in which to lay the main. This bridge, however, is only of a temporary nature; the Government having commenced a permanent structure. Arrangements have been made to transfer the main thereto, when it is completed. The extension included the laying of 25 miles of mains and 2 miles of service-pipes, and the erection of two governor-houses, with governors—the whole involving an expenditure of upwards of £30,000. The above-named suburbs are very popular, and houses are being built in all directions; so it is anticipated that in a few years they will rival the old, and at present more populous, places on the Western Line. The Australian Gaslight Company now command the whole of the lighting area on both sides of Sydney Harbour, except the portion on the north side supplied by the North Shore Gas Company.

The most pleasing feature in connection with the extension is that the Company have decided to supply the gas at the Sydney rate—viz., 4s. per 1000 cubic feet—which is highly appreciated. At the same time it shows the faith the Company have in the gas-consuming probabilities of their fresh customers. These new suburbs are not yet under municipal control, and this will delay for a time the erection of public lamps; but as the inhabitants are moving in the matter, it is to be hoped that before very long incandescent gas-lights will be installed in the streets, when Sydney will be literally encircled by "the greatest illuminant of modern days." It is a notable and pleasing fact, in connection with the history of the Company, that from the time their works were started on May 24, 1841, nearly every extension has either been commenced or completed on a Queen's Birthday. Whether or not this has been arranged by the officers, it is not for us to say. It is nevertheless a happy coincidence.

## GAS COMPANIES AND THE PRICE OF COAL.

The following letter on the above subject, from Mr. George Livesey, in answer to the communication to which reference was made in a paragraph on p. 375 of last week's "JOURNAL," appeared in "The Times" on Thursday:—

The anonymous letter in "The Times," of the 4th inst., from "A North Country Coalowner," was apparently written to lead the "gas-consuming public of London" to believe that the present enormous advance of about 10s. per ton in the price of gas coal is reasonable. He states that during the last thirteen years he has realized on the average "6s. 6d. per ton at the pit," or about 8s. per ton on board ship in the Tyne. This proves nothing to convince the gas consumers that the gas companies are not being unreasonably dealt with. "A Coalowner" must say what profit he makes, and must show that it is not unreasonable, which, I venture to say, he will not do, or the unreasonableness of his contention would be apparent.



In about five of the thirteen years, the price obtained for gas coal was at or under 5s. per ton at the pit, or from 6s. to 6s. 6d. f.o.b. in the Tyne. But even then, when coalowners were complaining that they were working at a loss, our contractors year by year pressed us to take constantly increasing quantities; and two or three years ago, when the price of coal was low, one of the largest Durham coal properties was purchased by a neighbouring owner, whose annual output is now perhaps the highest in the kingdom. It is difficult to reconcile these and other facts with the statement that coal is produced at a loss when prices are low. Nothing will satisfy either gas consumers or coal users but an assurance that the price of coal will shortly be reduced, which important question is completely ignored by your correspondent, though he probably knows, or at least expects, that the boom must soon pass away. The chief cause of the rise—the extraordinary activity of the iron trade—to quote the remark made to me last March by one of the best authorities in the kingdom, “has passed the summit.” This is confirmed by “The Times” weekly trade reports, which show, among other indications of falling trade, that orders for new ships are not forthcoming—very few comparatively having been placed this year. Although coal is still in large demand, no difficulty in getting supplies is now reported. Nothing is said about the scarcity of railway trucks, which caused so much difficulty last winter; the supply of engine fuel in Lancashire and the Midlands is beginning to exceed the demand. But the house coal trade is in a very active state, caused by the fear—propagated through various channels, and, strange to say, by a section of the Press, no doubt unintentionally—that unless coal-cellars are filled at what I should say are ironically called “lowest summer prices” they will have to pay much more in the winter, whereas it is quite possible prices may then be lower. At any rate, this excessive demand is met by ample supplies, for there is now no difficulty in getting coal. During the six winter months, from October to March last, gas companies generally had very great difficulty in obtaining the delivery of the coal they had contracted for, and at Christmas stocks at the works were very low indeed; but this is now quite changed—very large stocks being the rule. When making our contracts in the spring, we expected the contractors would fall somewhat into arrear. We therefore arranged for deliveries in excess of our requirements during the summer months. The unexpected has happened. There are no arrears, and we have been put to great inconvenience by the plethora of coal, which has filled our stores to overflowing, and would have enabled us to supply other companies had they wanted coal.

The coal question was referred to by the Right Hon. W. L. Jackson, M.P., when presiding at the meeting of the Great Northern Railway Company last Friday. In the course of his remarks, he alluded to the foregoing letter, which he said appeared to him to be an extremely sensible one. Its instructive point was that the difficulty of Mr. Livesey's Company was not to get coal, but to find means of storing the large quantities which the collieries were delivering under contract. Altogether, it looked as if “top prices” had been reached; and he should be much mistaken if there was not a reduction before long.

#### SOUTH WALES LOCAL AUTHORITIES AND THE SUPPLY OF ELECTRIC POWER.

The Town Clerk of Cardiff (Mr. J. L. Wheatley) recently submitted to the Parliamentary Committee of the Corporation a detailed report on the South Wales Electrical Power Distribution Bill, which, it may be remembered, was considered by a Select Committee of the House of Commons presided over by Sir James Kitson (see *ante*, pp. 32, 94). The Bill was opposed by the Corporations of Cardiff, Newport, and Swansea, as well as by the Barry District Council. Negotiations were opened between the promoters and the Cardiff Corporation, with the view of arranging terms on which the opposition might be withdrawn; and, after several conferences, a clause was agreed upon to the following effect: “(1) Notwithstanding anything in the Act, the Company shall not, without the consent of the Corporation, under their common seal, raise, sink, or alter the position of, or make any excavation or do any work which would affect the safety of, any water-main or conduit of the Corporation, nor shall the Company lay or place any electric line so as to be within 3 feet of any water-main other than distributing mains or pipes. (2) The Company shall not lay distributing mains in the borough until the Board of Trade have determined that the consent of the Corporation thereto has been unreasonably withheld. (3) The Company shall grant to the Corporation for supply electricity upon terms and conditions as favourable as those granted by the Company to any other company or person. (4) If the Corporation agree with the Company for a supply in bulk sufficient for all reasonable requirements of the borough, the Company shall not be entitled to supply electricity directly or indirectly to any consumer in such district—any difference to be settled by an arbitrator to be appointed by the Board of Trade. (5) In case the Corporation be willing to supply electricity to any person, but be prevented by reason of want of power of access to the premises of such person, the Company shall not be entitled to supply such person unless the Corporation fail within a time which is in the opinion of the Board of Trade reasonable for the purpose to procure the necessary powers to obtain access to the premises. (6) The determination by the Board of Trade that the consent of the Corporation to the Company to supply electricity within the borough has been unreasonably withheld, so as to entitle the Company to supply under the Act, shall apply only to each application or appeal to the Board of Trade, and shall not be deemed to authorize the Company to supply electricity generally in the borough. (7) If any electric line be disused for a space of three months, and such disuse be proved to the Board of Trade, the Board may sanction the removal of such line by the Corporation, and the Corporation may remove the same, and charge the cost thereof, as well as of the re-instatement of any street, or part of a street, to the Company. (8) Notwithstanding anything in the Act contained, the Company shall not supply electricity in Barry except with the consent of the Barry Urban District Council; but such consent shall not be unreasonably withheld.”

The promoters also gave to Cardiff, Swansea, Newport, and Barry an undertaking that, in the event of any of these authorities taking a supply of electrical energy in bulk from the Company, they would use their best

endeavours to obtain an agreement to give facilities for enabling the authorities, or such of them as take a supply, to receive a fair and reasonable profit in connection with the distribution of the electrical energy. They likewise gave an undertaking to the Barry District Council not to oppose in the next two sessions any application by them for a Provisional Order or Private Act authorizing the generation and supply of electrical energy for the district; and in the event of the Council obtaining such Order or Act, the promoters are not to be entitled to make any claim under the Bill as to the taking over of any supply then given by the Company, except as regards any distributing mains, sub-stations, and junction-boxes which may then be laid by the Company within that district.

The benefits to Cardiff of the joint opposition to the Bill by the four Local Authorities may be summarized as follows: (1) That whereas the Company sought power to supply electrical energy in the borough, the Bill, as amended, provides that they shall not supply it in such districts without the consent of the Corporation, which must, however, not be unreasonably withheld. (2) That the Corporation are amply protected as regards the laying of the mains of the Company in their district. (3) That they are entitled to receive from the Company a supply in bulk. (4) That the charge per unit for the first 400 hours has been reduced from 4d. to 3d. (5) That whereas the Company inserted in their Bill 10 per cent. as the maximum dividend, this had been reduced to 8 per cent., subject only to a sliding-scale in the event of the average price charged falling below the standard price of 2½d. per unit.

#### ELECTRIC LIGHTING NOTES.

As a considerable portion of the electricity supply area of the White-chapel District Board of Works is occupied by a Jewish population, the Board have issued particulars of the charge for light, &c., in Yiddish.

To meet increasing demands, the Halifax Corporation have decided to spend £3400 in laying new electric cables. These additions are expected to meet the necessities of the districts covered by them for many years to come.

The Shipley District Council, who have recently entered into arrangements to remove a long-standing grievance of the ratepayers by purchasing the undertaking of the local Gas Company, now propose to establish also an electric light station at a cost of £22,000. There is said to be a good demand for the light; and it is also intended to use electricity for working the tramway lines, pumping at some new sewage works, and furnishing power to the ratepayers for certain purposes. The Council intend to put down two 200-kilowatt dynamos, to give a continuous current at a pressure of from 400 to 500 volts; each dynamo being also fitted to work as a compound machine for traction purposes at from 500 to 560 volts. The distribution is to be on the three-wire continuous current system. The matter was the subject of an inquiry by Colonel Coke, one of the Inspectors of the Local Government Board, on the 3rd inst.; and there was no opposition. Mr. R. C. Quin, the Electrical Engineer to the Council, estimates that the annual income from the works will be £3088, and the expenditure (including £1553 for interest and sinking fund) £2044.

At the monthly meeting of the Sheffield City Council last Wednesday, Alderman Styling said the Electric Light Committee had found the question of leading services into consumers' premises a matter of considerable irritation. Consumers were ready to take the light, but they objected to the cost of connection with the mains. The Engineer had gone very carefully into the matter, and he found that, without making any serious sacrifice, the irritation might be done away with. The Committee therefore recommended a modification of practice which, he was sure, would be very much appreciated. In future consumers would have the service laid in to a distance of 30 feet without any special charge being made. In the cases of premises situated a greater distance away, it was thought reasonable that some charge should be made; and it was proposed that it should be the actual cost price. He wished to give a warning in regard to the capacity of their supply. A week or two ago there was a breakdown in the last-installed machine at the station. This breakdown was of a serious character; and it was just possible that they might be in some difficulty as to keeping up the supply until the alternator, which was now being erected, was completed. If any should occur, he hoped consumers would bear in mind that everything possible was being done.

We have now the result of the inquiries which have been made by the Sudbury (Suffolk) Town Council as to the probable business they are likely to do in electric lighting. They issued 1200 inquiries; and only 250 replies were received. This is a pretty clear indication of the feeling of the ratepayers on the question, and is a justification of the argument that the matter should have been submitted fairly and squarely to the ratepayers. Of the 250, 186, representing 4000 lights, were in favour of the work being carried out by the Corporation, 20 were neutral, and 49 were against. It may be remembered that it was estimated that 6000 private lamps, each consuming 16 units per annum, would have to be connected to make the installation return the modest net profit of £309. Even assuming that the 20 neutrals will become users of the current, the Corporation will only have a promised support equal to about two-thirds of the number of lights required to make the concern a paying one; and there is no certainty that the two-thirds will come up to the requisite consumption of 16 units per lamp. The Electric Light Committee consider the position very satisfactory; but we disagree. If a level-headed business man were proposing to enter into this business on his own account, he would, we venture to think, refuse to sink his capital in it with such a prospect before him. However, the members of the Corporation are not proposing to play with personal money, and so they have light-heartedly decided to proceed with the preparation of plans and specifications, and to make application to the Local Government Board for a loan.

A very grave impeachment of the Cardiff Corporation Electrical Department was made, at the last meeting of the Committee who have control of it, by Mr. Illingworth, the Mains Superintendent. The story of the many troubles at Cardiff in connection with failures has often been told in these columns; but the whole truth has never been revealed. Now we find Mr. Illingworth sending in his resignation; and his Committee were curious to learn the reasons for this step. They therefore invited



him to state them at a recent meeting; and what he then said may have a good effect. Mr. Illingworth recognizes that he has a reputation which may suffer if the lapses of the electric lighting of Cardiff continue; and he has no desire that it shall do so. This he told the Committee; and he went further and informed them of the principal grounds for his fears. An examination of the system had shown him that, in order to prevent future failures, it would be necessary to make many alterations in the distributing-stations, junction-boxes, mains, and low-tension network. The distributing-stations, he alleged, were in a far from good condition, as to equipment and cleanliness; and he felt that, unless something were done immediately, there could not be a proper distribution of electricity. He was also personally aggrieved in connection with several minor matters; and he charged the Deputy Electrical Engineer with undue interference with the work of his department. After a long examination and some discussion, Mr. Illingworth agreed to withdraw his resignation pending a general inquiry which the Committee have decided to hold. From this, may the long-suffering electricity consumers of Cardiff secure relief. If they do, Mr. Illingworth will deserve their thanks for his outspoken criticism of the electrical distribution system and other matters.

At the last meeting of the Court of Common Council of the City of London, the Streets Committee reported that, in pursuance of the resolution of the 22nd of February last, relative to the position of the generating station to be established under the City of London Electric Lighting Order, 1899, on the site at Marsh Gate Lane, Bow, they submitted a plan showing the position of the station, and recommending that it be approved, subject to the following conditions to be embodied in an agreement to be entered into by the Company: "(1) That the purchase-money to be charged against the City undertaking for the portion of the site required for the erection of the City generating station be determined *pro rata* to the cost of the whole site. (2) That the Charing Cross and Strand Electricity Supply Corporation shall not acquire any interests in adjoining land without the previous consent of the Corporation being obtained; such consent, however, not to be unreasonably withheld. (3) That the Corporation agrees to allow the Company the necessary running powers over the proposed line of railway shown on the plan submitted, subject to a nominal rental, and without prejudice in any way to the rights of the Corporation to use or alter such line of railway." The Committee also reported relative to a notice received from the Charing Cross and Strand Electricity Supply Corporation, Limited, of their intention to lay mains in the western district of the City, and recommended that the Company be permitted to lay such mains, under the direction and to the satisfaction of the Engineer and Electrical Engineer, subject to the Company complying in every respect with the provisions of the City of London Electric Lighting Order, 1899, and using the subways, where possible, on such conditions as may be arranged, or complying with the proposed Act relating to the laying of public service works in the City of London—it being understood that the Company shall give as long notice as possible of their intention to proceed with each section of the work. It may be remembered that the Corporation petitioned against the Bill of the Charing Cross and Strand Electricity Supply Corporation in Parliament. The Streets Committee submitted a report with a report from the Remembrancer thereupon, stating that the Company, during the progress of the case before a Select Committee of the House of Lords, agreed to the insertion of a clause for protecting the interests of the Corporation.

Last Wednesday, Colonel Smith, R.E., one of the Inspectors of the Local Government Board, held an inquiry at Ryde with respect to the scheme of electric lighting which it is proposed to carry out for the town, and for which the Corporation have applied for power to borrow £30,000. The Town Clerk (Mr. C. G. Vincent) gave evidence in support of the project. He said the borrowing powers of the Corporation under the Public Health Act were £127,814; and there was a margin of £87,689. They were not aware of the existence of this large sum until he investigated the accounts that morning. In cross-examination on behalf of opposing ratepayers, he admitted that up to that morning all loans had been treated as being under the district fund account. A meeting on Sept. 1, 1898, when it was decided by 48 votes to 23 to ask the Corporation to allow a company to do the work, was the last at which the ratepayers had had an opportunity of expressing an opinion. He had received a letter from the Local Government Board, asking that evidence of demand for the light should be placed before the Inspector at the inquiry. The present estimate of £30,098 for the work had never been before the Council, who had at present many other schemes for which they wanted money. About 152 people out of the 600 living in the compulsory area had agreed to take the light, if satisfactory. Mr. J. I. Barton, Chairman of the Electric Lighting Committee, said he did not expect the scheme to return a profit for about four years; but he never had a doubt as to its paying eventually. Mr. F. W. Randall, in support of the opposition, said a petition against the scheme had been signed by 973 people, representing a rateable value of £11,141, or more than half of the total, excluding voids and public institutions. They did not object to electric lighting, but they did not want to take up a more or less speculative concern. The initial expense ought to be borne by a company. He maintained that the scheme would cost more than the estimate. A large number of people had subscribed to the cost of opposing the application; but the Ryde Electric Light Company had no interest in the opposition. The Gas Company did not oppose the electric light, but only the town doing the work. He thought a company were more likely to make it pay than the town. Mr. W. H. Thirkell also opposed on the same grounds, and said the rates were from 6s. 8d. to 7s. in the pound; and they did not wish to have them increased. Mr. Shaw also opposed the scheme, and said the Corporation had only a small majority in their favour. Mr. Hutchinson characterized the opposition as instigated by those who desired to see a company in Ryde. Companies were not generally so philanthropic as to work at a loss; and the Corporation could make the thing pay as well as a company. The Board of Trade granted the Provisional Order without a transfer clause, evidently intending that the Corporation should not be able to depute their powers.

It is reported that the Clayton, Allerton, and Thornton Gas Company have made a further offer to sell their works to the Bradford Corporation. This offer reopens the negotiations on more favourable terms.

## HULL CORPORATION WATER SUPPLY.

### Starting the New Engines at the Springhead Pumping Station.

The new engines which have been constructed by the Corporation of Hull, at a cost of about £20,000, at the Springhead pumping-station, were started on the 3rd inst. by Alderman Massey, the Chairman of the Gas and Water Committee, in the presence of the Mayor (Alderman Hall, J.P.), the Deputy-Chairman (Alderman Wharram), the members of the Committee, and the officials. The two old engines, which had long done duty at the station, have been removed and been replaced by two others of the very latest construction, designed and erected by Messrs. James Simpson and Co., Limited. On the arrival of the party, they were met by the officials in charge, and the Engineer (Mr. F. J. Bancroft, B.Sc.) explained the advantages of the latest additions. The new machinery consists of two vertical inverted rotative three-crank triple-expansion surface-condensing receiver engines, each having three pumps driven direct from the piston-rod crossheads by means of rocking beams. They have been designed for a service where the continuity of the supply absolutely depends on constant and efficient working, and where it is highly essential that the engines should be capable of running for long periods with safety and reliability. The main pumps have been located so that they are accessible at all times and at any level of water in the well. The pump-heads and all parts of the engines are convenient for inspection; the whole being above the engine-house floor and in full view. Each engine is capable of raising 3500 gallons of water per minute, and the arrangement of driving the pumps is such as to enable the pump-heads and valves to be readily drawn up from the floor-level without interfering with any part of the engines. The high and intermediate pressure cylinders are jacketed with boiler steam, and the low-pressure cylinder with steam at 60 lbs. per square inch. The cut-off in the high-pressure cylinder is under the control of the governor; and arrangements are made that, should the variation in the speed of the engine rise above or fall below a certain percentage of the mean speed, on account of the main bursting on the one hand or becoming blocked on the other, the cut-off valve would be thrown out of action, completely shutting off the steam; while at the same time a valve on the condenser would be automatically opened, destroying the vacuum. The surface condensers are located above the engine-house floor, and arranged so as to permit of easy accessibility and convenience for inspection both internally and externally. The air-pumps are single-acting, of the Edwards type, driven direct. The method of driving the rocking beams, by which the pumps are worked, enables the engines to be arranged on either side of the well, and not over it; thereby securing accessibility to the pumps, while the engines themselves are removed from each other—so giving ample room for inspection, and obviating the danger of accident while working one engine when the other is under repair. The working barrels and suction-valves are fixed close to the bottom of the well, so as to command the water at the lowest levels. Each engine delivers into a separate 25-inch main, upon which proper non-return valves are fixed, so as to render each set of pumps self-contained. Considerable alterations were made in the boiler-house, from which six of the old boilers were removed, and in their place four Lancashire boilers, 27 feet long and 8 feet in diameter, have been fitted, with flues 3 ft. 2 in. diameter, cross tubes, and superheater fixed in the down-take, together with a Green's economizer. The following are the principal dimensions of the engines and pumps: Diameter of high-pressure cylinder, 17 inches; do. of intermediate-pressure cylinder, 28½ inches; do. of low-pressure cylinder, 43 inches; do. of pump-buckets, 19 inches; do. of pump-plungers, 13½ inches; stroke of engines 48 inches. The new plant has been subjected to the most exhaustive tests by the Engineer, who has presented to his Committee a report furnishing full details of the trials. The engines were specified to be capable of continuous running; and they both ran satisfactorily for a period of eighteen days without stopping—the speed ranging from 10 to as high as 30 revolutions per minute. Mr. Bancroft concludes his report as follows: "Messrs. Simpson's guarantee was for a useful horse power (called a pump horse power) to be developed when running at a total head of 140 feet from 14 lbs. of steam, and when at 200 feet head from 15 lbs. of steam. Under these conditions, the east engine used 13-32 and 13-65 lbs. respectively, and the west engine 13-81 lbs. and 13-76 lbs. respectively. From this the Committee will see that the makers are well within their guarantee—indeed, the steam consumption per indicated horse power and the high mechanical efficiency place these engines high in the list of the most economical pumping-engines yet built." The new engines have been named after the Chairman and Deputy-Chairman of the Committee, by whom they were set in motion. It is satisfactory to find that the whole of the work has been completed without accident, and the removal of the old plant, the erection of the new machinery, and the connections to the leading mains effected without inconvenience or shutting off the town supply.

After a stay of nearly an hour, the party proceeded to the Mill Dam pumping-station, the engines at which were examined. They then assembled in the Board-room, where luncheon was partaken of at the invitation of Alderman Massey, who presided. In proposing "Success to the New Engines," he took the opportunity of expressing the Committee's indebtedness to Mr. Bancroft, not only for the great interest and intelligence he had displayed in effecting the reconstruction of the works at Springhead, but also for his generous zeal for the success, development, and good order of the city's water supply. As a legislative body, what they had to look at was results. The new engines had been tested, and he felt sure they would give every satisfaction. He hoped that, in the future, those gentlemen who constituted the Committee and the Corporation would march with the times and keep ahead, so far as machinery was concerned. He assured the Contractors that if the time came for making further improvements at the works, their tender would receive most careful consideration. If the actual working results of the new engines were what was expected, it would be a matter of extreme satisfaction, for they would beat the top of the tree, not only throughout England, but throughout the world, so far as pumping-stations were concerned. Mr. Wharram responded, and contrasted the present machinery with that which was first used. Mr. Bancroft also replied to the toast. He said it was four years that day since he entered the service of the Corporation. Those years had been very busy ones; but they had been made happy by the attitude of the Committee. Every section of the Water Department had received consideration during



that time. They had laid down mains to East Hull and West Hull, and now complaints of short supply were quite exceptional. The Corporation had 200 miles of mains in use at Hull; and during the recent hot weather 11½ million gallons of water were supplied. This meant that every man, woman, and child had, on an average, 50 gallons of water to use. To put it in another way, it was equivalent to delivering a ton of water at every house in a day. Many towns had to be content with a water supply of half this quantity. They wanted the ratepayers, however, to assist the Corporation in their efforts to stop any waste. As long as Hull increased by 5000 to 6000 people every year, which was equivalent to an extra supply of a million gallons for five years, there would have to be no standing still on the part of the Corporation. If they were going to keep the works up to the requirements of the city, they would have to spend something like £10,000. Mr. Simpson, on behalf of his firm, acknowledged the appreciative remarks which had been made upon their work. The Mayor proposed the "Health of the Chairman," and said the starting of the engines was an important event in the history of Hull, and one upon which the citizens might well congratulate Alderman Massey and all connected with the Water Department. He had been struck by the manner in which the Engineers had adapted themselves to the existing building accommodation; and he thought it was another illustration of how difficulties could be overcome by those who were prepared to face them and do their best. The result of the work was highly satisfactory, both to the Contractors and to Mr. Bancroft. After a few remarks from the Chairman, in response, the proceedings closed.

## NOTES FROM SCOTLAND.

From Our Own Correspondent

Saturday.

I have to-night received, per favour of Mr. James Fleming, the Treasurer to the Glasgow Corporation Gas Department, a copy of the print of the report of the Committee on Gas Supply, and their accounts for the past year. The time is short in which to look into the document; but I note a substantial increase of business. Gas sold is greater by 185 million cubic feet than it was in the year 1898-99, in which period there was the abnormal increase of 413 million cubic feet; but last year's increase is greater than that of two years ago, which shows an unbroken normal advance. The revenue also shows a great advance—£70,000—of which over £20,000 is due to increased sales of gas, the price of which remained the same as the preceding year. This is eminently satisfactory, as is also the increased return upon coke (£18,775), and from ammoniacal liquor and tar (£32,347). In this latter connection, a most gratifying feature is the large return per ton of coal carbonized. Liquor and tar are stated at 3s. 5d. per ton, and coke will come to about 2s. per ton, which, together, with coal delivered in the works at a cost of 11s. 5d. per ton, means that about one-half the price of the coal is returned in the shape of residuals. Who is there that does not envy such a result? Coal was up £57,588 in price, upon an increase in the quantity used of 21,844 tons. A larger proportional increase may be looked for when the accounts for the current year come out. Yet the price of gas is only to be raised by 4d. per 1000 cubic feet, which restores it to what it was in 1894-95. A rise of 3d. per 1000 cubic feet in 1891-92 brought in an increased revenue of £46,576. The sales are one-third more than then; so that 4d. should bring in an increased revenue from gas of about £80,000. The extra cost of coal alone is estimated at about £140,000. There would thus remain about £60,000 to be made up from residuals. If last year they added £46,000 to the revenue, there should not be much difficulty this year in their adding £14,000 more. Unfortunately, however, that is not all that is required, because the amount necessary for payment of interest, which last year increased by over £4000, and the amount of contribution to sinking fund, which last year increased by over £1000, will both be proportionally greater. I would not contend that the Corporation are playing for a deficit; but I daresay they can afford to look with equanimity upon the possibility of one. The last deficit they had was in 1891-92; it amounted to £27,116, and was not only wiped out in the succeeding year, but a surplus of £29,539 was realized. Such is the vitality of the undertaking, that a deficit can be at once converted into a surplus, without effort. But that we need not contemplate a deficit is, I think, warranted by the experience of the past few years. For the twelve months dealt with in these accounts, the surplus is £33; in the years preceding, going backwards, the surpluses were respectively, £49, £641, £328, and £502. An undertaking which is managed so as to produce so near results is in the hands of gentlemen who understand their business. They handle a capital of nearly a million-and-a-half sterling, and a revenue of £770,000 a year; and yet, so well balanced is the working of the undertaking that the year closed with only £2108 in the bank, and £3 5s. 3d. in the hands of the Treasurer. Could management go further? The accounts before me furnish material on which an actuarial report upon the conduct of this colossal undertaking might be based. I am unequal to the task. I can only see the end attained, without being able to appreciate the means employed. The capital account, I have no doubt, is a simple document; and this year it is made plainer than ever where the money has been derived, and how it has been applied. But the items are so numerous, and the conditions so different, that time forbids my attempting anything like an analysis of the account. I will go no further than this—that the Corporation have, since 1885, transferred their indebtedness from the form of mortgages to that of Corporation loans—making, thereby, a saving of interest which, at the present time, appears to be ¾ per cent. The effect is seen in this result—that, whereas in 1874, with a capital of £1,016,592, including mortgages amounting to £650,999, the interest paid amounted to £28,556, in the past year, with a capital of £1,408,621, including the Corporation loans amounting to £766,500, the interest paid amounted to £35,581. That is to say, while the capital account has risen by £392,000, the annual charge for interest has only increased by £7000. It is universally acknowledged, I think, that municipal trading receives its highest exposition in Glasgow. I venture to say that the Corporation Gas Department stands first of all. These accounts, therefore, present to us the high-water mark of corporation commercial enterprise. As such they are welcome reading; and the pleasure received in their contemplation is heightened by the fact that year after year there is an advance in the position of the undertaking.

The accounts for the year of the Forfar Gas Corporation have, after some delay, been issued. They show that the year commenced with a balance from the revenue account for the year ending June 15, 1899, of £442; and that the amount of gas-rates for the past twelve months was £5252, or an increase of £160 on the previous year. For residual products the sum received was £930, or an increase of £225. The total revenue was £6624, or an increase of £467. The total expenditure during the year was £6084, leaving £540 of free revenue to meet annuities, the latter amounting to £436. The principal items in the expenditure were: Coals and carriage, £3043; retorts, bricks, and fire-clay goods, £118; furnishings, fittings, tools, &c., £182; meters and repairs, £53; wages, &c., £838; rates and taxes, £98; interest, £318; sinking fund, £270; redemption of £1200 loan, £100; contingent fund, £157; annuities, £442; management, £239; law charges, £5 11s.; arrears, £55. The sinking fund account stands at £1724. Under the heading of the contingent fund, the account shows that during the year £1039 was paid on account of the new gasholder, meter-house, &c., and £124 for coal waggons. The balance at the credit of the fund (standing against the works) is £259. The Auditor appends a statement to the effect that the accounts are correctly put forward and sufficiently vouched. He points out, however, that loans outstanding amount to £10,200, while the statutory borrowing powers are limited to £9000. With reference to the sinking fund, he states: "The requirements of the Act in regard to the sinking fund have not been regularly observed. In the years 1891 to 1897 inclusive, the sum set aside was reduced from the statutory amount of £270 to £150, showing a shortage at the 15th of June last of £840, with interest. The Act of 1871 provides that 'the sinking fund shall be lodged in any of the Banks in Scotland incorporated by Act of Parliament or Royal Charter, or invested in Government securities, or lent out at interest in the name, and at the discretion of, the Corporation, until the same be applied for the purposes specified;' and with reference to the contingent fund, the Corporation are directed 'to invest the moneys so set apart, when the same are not required, in such way and manner as they may deem expedient.' No separate investment of these funds has been made." The Corporation are to meet next week to discuss the accounts. I would merely point out that this is the first year of the new audit, which the Sheriff of the County (Mr. Johnston, Q.C.) appointed; and that it brings out, without any possibility of cavil, that the gas undertaking of the Corporation has been efficiently managed by Mr. Forbes Waddell, the Gas Manager, which is contrary to what some Corporation critics have endeavoured to make out. If the accounts have not been kept upon the best system, that was not the doing of the Manager; and now that the accounts are cast in a more regular form, his critics ought surely to keep silence.

The Town Council of Airdrie have appointed a Committee to re-open negotiations with the Airdrie Gas Company with a view to the transfer of the undertaking. Bailie Walker, on whose motion the Committee were appointed, said it might appear strange that such a motion should be brought forward, seeing they had gone into the subject so recently. In October last, a report upon it by Mr. A. Gillespie, of Glasgow, was laid upon the table. It was Bailie Walker's opinion that they did not give the report proper consideration. He thought the ratepayers were in favour of the transfer. So far as his knowledge and information went, there was not a burgh in which the gas undertaking had been acquired, in which it had not been a complete success in the hands of the corporation. He considered that this was a proper time for them to take over the gas-works, when the burgh was growing and prosperous. Councillor Ewart, on whose motion the subject was formerly brought before the Council, said the purchase sum mentioned in Mr. Gillespie's report took the Committee by surprise. At that time, his apprehension was that the Gas Company were not in a good position financially. In fact, it was quite a common saying that the dividend was in a bad condition. But since then he had seen the balance-sheet of Mr. Gillespie; and from it he gathered that the Gas Company were far from sinking. He thought it was a good paying concern; and he would go nearly the length of the sum mentioned by Mr. Gillespie. As they were all aware, the Gas Company were looking out for an addition to their works. If this addition went on, they would require to raise more capital; and therefore he thought this was an opportune time for investigating what price a willing buyer would give to a willing seller for the undertaking. There was general unanimity in the Council as to the desirability of having the subject reconsidered. This is a very fair opening of the movement, and is in marked contrast to the vapourings about the community having been taken undue advantage of, the gas industry played out, and the like, which are the usual introductions to "friendly conferences" on gas transfers. The Town Council are in a reasonable spirit; and if the Gas Company be equally reasonable, the transfer should be easily effected. Mr. Gillespie's valuation has not been published; but whatever it is, both sides may rely upon its being as fair a valuation as it is possible to make.

The Chief Clerk in the Dumfries Corporation Gas Office (Mr. J. Herries) recently died, after having discharged the duties of his office with great faithfulness for 22 years. Shortly before his death, he executed a will in which he left all his belongings to the Gas Commissioners. The Commissioners have renounced the bequest. In their opinion, it was quite evident that Mr. Herries was not in his common mood. The estate will now go to the sister of the deceased. The Commissioners have certainly acted rightly. Doubtless the bequest was made in a spirit of devotion to the body which Mr. Herries had acquired an affection for—an affection which, in the end, overruled his reason; and this fact being apparent, the Commissioners had no moral claim to the estate.

Within the past ten days the annual congress of the Royal Institute of Public Health was held in Aberdeen, under the presidency of the Earl of Aberdeen. Judging by the congratulatory remarks which were made in the course of the meeting (which lasted for five days), the gathering was a most successful one; but, of course, such utterances are not the standard by which to judge of the value of a meeting. I am not competent to express an opinion as to the scientific worth of the gathering. Speaking as an outsider, what occurs to me is that—as is the case with most of the great scientific bodies—a great amount of self-advertisement was indulged in. Also there were many subjects brought forward which to the lay mind appeared to be trifling. For instance, one paper was on the danger of the practice of passing the Communion Cup promiscuously round in a congregation, on account of the risk of disease being conveyed by it. If there could be said to be a general tone in the



congress, taken as a whole, it was decidedly in the direction of the creation of a Government Department of Public Health, some of the speakers advocating that the head of the Department should be endowed with Cabinet rank. In some of the papers, subjects were dealt with which are of interest to readers of the "JOURNAL." I put first one by Dr. Cowie, of Dufftown, upon the treatment of distillery ale by the biological method. Dufftown is in the Glenlivet district, where so much whisky is manufactured. The growth of the distilling business has been so great that the disposal of the spent ale has become a problem of the first magnitude. When run into rivers in the quantities now handled, the result is the destruction of the healthy water growths and the deposit of a fungus, between which effects fish life is very seriously injured. The Law Courts have been invoked, with a view to having the nuisance removed or abated; and the subject is being dealt with in the customary manner of giving time to remedial measures, to show whether or not they will be effective. Dr. Cowie, dealing with a distillery at Dufftown, which is not the one involved in the litigation, has wrought out a method other than that which is before the Court. He finds that evaporation in settling ponds leaves behind a sludge which is of so sticky a nature that it is scarcely possible to manipulate it. He has, therefore, turned to the biological method; and it is here that the interest to gas producers comes in. He constructs a series of tanks, through which the effluent flows by gravitation. The first tank is filled with coke, and the others with sand. I need not go further into the matter than to say that a crop of microbes is cultivated, and that the action of these is to, as it were, eat up the polluting substances; leaving an outflow of water which is non-injurious to either aquatic vegetation or fishes. Another method of dealing with the same matter, by irrigation, was described to the congress by Dr. Hendrick, of the University of Aberdeen, which does not interest us. There is an offer by the distillers of an award of £2000 for a successful plan of disposing of the refuse of distilleries; and Dr. Cowie seems to have brought out a method which is both successful and cheap. Should it be adopted, there will be a considerable outlet for coke. Mr. Jamieson, the City Analyst of Aberdeen, read a paper on "The Effect of Organic Matter in Water on Health," in which he referred to the danger of organic matter developing in reservoirs, and even in filter-beds, and said that the golden rule was to take water from the running stream.

On the suggestion of Councillor Forsyth, of Glasgow, the Master of Works has been instructed to take two samples of air from a lamp which has been recently erected at Alexandra Parade, with a view to dealing with gas from the sewers. One of the samples is to be of the substance which enters the lamp, and the other of the substance which issues from the lamp. They are to be sent to the Corporation Chemist for analysis; and if it be found that the lamp efficiently deals with the sewer gases, the system, it is said, may be extended.

The County Council of Ayr have recently brought into use a system of water supply for the villages of Birkip and Auchengree, as well as for the County Hospital and other places, which was adopted on the advice of Mr. Patrick Campbell Hart, C.E., of Kilmarnock and Glasgow. A "Victor" windmill is employed to raise the water from a well 100 feet

deep; and it is found to be capable of raising, with a moderate wind, 1 million gallons of water per day. There is a storage reservoir of the capacity of 30 million gallons, equal to six days' supply. The plant is working quite satisfactorily.

There are ominous rumours in Greenock as to coming taxation; increase in the rates being freely talked of in respect of most of the public boards. Taking the Police Board alone, it is stated that the slump in Gas Trust finance will cause a levy of 5d. extra per pound. Why, it may be asked, should there be such a sudden and complete reversal of the old order of things at Inchgreen? For many years in succession, until quite recently, the Gas Department yielded a surplus—some years a very handsome one—which was often used to make good nasty gaps in the ledgers of other municipal departments; and at ward meetings it was frequently a hot question with some candidates and ratepayers whether it was right to prop up this and that department with the honest profits of Inchgreen. Certain of the local orators used to say that "every herring should hang by its own tail." This controversy has been completely solved, for the present, at least, by the disappearance of the gas surplus. But why should there be such an alarming increase as 5d. in the pound? If even the rise were 3d. or 4d., the leakage in the accounts must be greater than anyone outside the Police Board has suspected. What is the cause, or what are the causes, of this disagreeable condition of Inchgreen finance? Is dear coal mainly responsible? All over the country the coal question is becoming a most serious one, and in all likelihood the rise in the price of "black diamonds" has much to do with what must be an enormously increased expenditure in the local production of gas. But in some towns the gas-works have not been so heavily handicapped by the enhanced price of coal as others, because foresight and smart business faculty have been brought to bear on the important matter of buying. Has the purchasing of coal for Inchgreen been shrewd and satisfactory? These are questions which will be asked, and will have to be answered before Hallow E'en ushers in the winter. For this financial slump in a municipal department which used to be a fail-me-never, is not the business of the Convener, or the Gas Manager, or the Provost and Magistrates alone, but of every man and woman who pays local rates. Much was said at one time in favour of oil being used instead of coal as the raw material for the production of gas. What of it now? Could it not be got to stand between the community and famine prices at the mines?

**The Deficient Water Supply in South-East London.**—At a recent meeting of the Lewisham District Board of Works, the Penge and Sydenham and Forest Hill Local Committees brought up numerous complaints as to the failure of the water supply in the portion of the district supplied by the Lambeth Water-Works Company. The Clerk (Mr. E. Wright) stated that a letter had been received from the Secretary of the Company (Mr. H. Wilkins) regretting the slackness of pressure, but not giving any satisfactory reason for it. It was decided to appeal to the Railway and Canal Commissioners, under the Metropolis Water Act, 1897.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 406.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.															
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18½-19½	+	5 7 8	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	13-14	..	5 7 2	500,000	100	June 1	6	People's Gas & 2nd Mg. of Chicago } Bonds	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	10-10½	..	6 13 4
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	260,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100-102	..	3 18 5
40,000	5	"	6	Do. New, £4 paid	4-4½	..	5 6 8	260,000	10	Apl. 11	5	San Paulo, Ltd.	11½-12½	..	6 8 0
850,000	Stk.	Feb. 23	12	Brentford Consolidated	250-260	..	4 12 4	135,000	Stk.	Mar. 14	10	Sheffield A.	24½-247	..	4 1 0
270,000	"	"	9	Do. New	182-187	..	4 16 3	209,053	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	"	5	Do. 5 p.c. Pref.	140-145	..	3 9 0	447,427	"	"	10	Do. C.	244-246	..	4 1 4
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	5,611,885	Stk.	Feb. 23	5½	South Metrop., 4 p.c. Ord.	126-129	..	4 2 7
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	225-235	..	4 17 10	1,520,000	"	July 12	3	Do. 3 p.c. Deb.	94-97	..	3 1 10
226,320	"	"	8	Do. A. Ord. Stk.	155-165	-2½	5 3 0	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
1,009,506	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	70,825	"	July 12	4	Do. 4 p.c. Deb.	117-122	..	8 5 7
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	120,000	Stk.	Mar. 14	6	Tottenham } A. 5 p.c. and } B. 3½ p.c.	103-108	..	5 11 1
50,000	10	Feb. 23	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	250,520	"	"	4½	Edmonton 4 p.c. Deb.	80-85	..	5 5 11
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	55,100	"	June 14	4	Tuscan, Ltd.	111-115	..	3 9 7
600,000	10	May 16	6	Buenos Ayres (New) Ltd.	8½-9½	..	6 9 9	182,380	10	Jan. 12	5	Do. 5 p.c. Deb. Red.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	149,900	10	July 2	5		98-102	..	4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	6 12 0								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13-14	-½	5 14 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55-57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock	270-280	..	4 16 5								
236,425	"	"	10½	Do. New do.	205-215	..	4 17 8								
288,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 8								
600,000	Stk.	May 31	9	Continental Union, Ltd.	158-163	+5	5 10 5								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	780,404	Stk.	June 28	11	Chelsea, Ord.	285-295	..	3 14 7
61,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
178,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 5	160,000	"	Mar. 29	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p.c.	110-115	..	4 11 9	175,785	"	"	4	Do. 4½ p.c. Deb.	145-150	..	3 0 0
60,000	"	"	5	Do. 6 p.c. Pref.	130-135	..	3 14 1	1,720,560	Stk.	Apl. 11	7	East London, Ord.	185-190	..	8 13 8
466,090	10	July 27	11	European, Ltd.	19-20	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	147-152	+1	2 19 3
354,060	10	"	11	Do. £7 10s. paid	14-15	..	5 10 0	890,000	"	"	3	Do. 3 p.c. Deb.	96-98	..	3 1 3
14,993,075	Stk.	Feb. 9	4½	Gas } 4 p.c. Ord.	97-99	..	4 8 10	700,000	50	June 14	7½	Grand } 10 p.c. max.	106-109	..	8 8 10
2,600,000	"	"	3½	light } 3½ p.c. max.	95-97	..	3 12 2	810,000	Stk.	Mar. 29	4	Junction } 4 p.c. Deb.	130-135	..	2 19 3
8,799,735	"	"	4	and } 4 p.c. Con. Pref.	116-119	..	3 7 8	708,000	Stk.	Feb. 23	14	Kent	300-310	..	4 10 4
8,993,975	"	June 14	3	Coke } 3 p.c. Con. Deb.	92-95	-2	3 8 2	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	..	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	134-141	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	275-285	..	3 14 8
2,900,000	Stk.	May 16	10	Imperial Continental	197-202	..	4 19 0	406,200	100	"	8	Do. 7½ p.c. max.	203-208	..	3 16 11
473,600	Stk.	Feb. 9	3½	Do. 3½ p.c. Deb. Red.	100-102	..	3 8 8	850,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	128-132	-1½	3 0 7
76,000	5	June 14	6	Malta & Medn., Ltd.	4½-5	..	6 0 0	500,000	100	Feb. 23	13½	New River, New Shares	415-420	..	8 4 3
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb.	107-110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	124-133	..	3 0 2
250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	106-118	..	4 3 4	926,300	Stk.	June 14	7½	South- } Ord.	187-192	..	3 18 1
541,920	20	May 31	3½	Monte Video, Ltd.	104-111	..	6 1 8	126,500	100	"	7½	wark } 7½ p.c. max.	182-187	..	4 0 3
667,946	Stk.	Feb. 23	9½	Newcastle & Gateshead Con.	215-220	..	4 4 1	1,019,585	"	Apl. 11	4	and } 5 p.c. Pref.	155-160	..	3 2 6
299,855	Stk.	June 28	8½	Do. 3½ p.c. Deb.	104-107	..	3 5 5	1,155,066	Stk.	June 14	10	Vauxhall } 4 p.c. A Deb.	129-134	..	2 19 9
150,000	5	May 16	8	Oriental, Ltd.	72-73	..	5 3 8	1,155,066	Stk.	June 14	10	West Middlesex	270-275	..	8 12 9
135,000	"	"	8	Do. New, £4 10s. pd.	6-6½	-½	5 10 10	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	-5	3 2 1
15,000	5	"	8	Do. do. 1879, £1 pd.	12-1½	..	4 11 5	200,000	"	Mar. 14	8	Do. 8 p.c. Deb.	99-101	..	2 19 5
							* Ex. div.								* Ex. div.

† Next dividend will be at this rate.



## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 11.

**Sulphate of Ammonia.**—In the early part of the week, there was a fair demand. But this has since slackened; and prices have eased off—the closing quotations being £10 17s. 6d. to £11 per ton. Buying has again been mainly by middlemen. Consumers still maintain a waiting attitude; and this has been rather encouraged by a certain amount of speculative offering for August at a shade under current prices. Production is, however, being absorbed; and there is practically no stock to fall back upon in the event of any exceptional demand arising. In the forward position, quotations are also easier; and sales are reported at £11 5s. per ton, f.o.b. Leith, January-March delivery.

**Nitrate of Soda** is firm at 8s. 1½d. per cwt. for ordinary, and 8s. 4½d. for fine quality, on spot.

LONDON, Aug. 11.

**Tar Products.**—The increasing demands for benzol is having an effect upon the price, and also upon the anxiety of benzol users to cover their requirements over a more extended period; and though actual advances are not very pronounced, there seems every likelihood of higher prices prevailing later on, notwithstanding the increasing production. Creosote and other oils are flat; and even lower prices are talked of than are at present being obtained. In face of its fuel value, however, it is not likely to recede far below to-day's figures. In pitch, there is little business passing, and still less being shipped. Anthracene shows no change; and prices to a considerable extent are nominal.

Prices may be taken as follows: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 8½d. to 9d., according to position; special qualities for gas, 10d.; 50's, 11d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 50s. to 80s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—This has dropped from £11 3s. 6d., or thereabouts, to £10 15s. to £10 17s. 6d., at which considerable business has been done.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—All that can be reported with regard to the trade of this district is that every description of round coal is moving away freely, with prices exceedingly strong. Though there has been some abatement of the extreme push of orders for house-fire qualities, the restriction of the output, owing to holiday stoppages during the past week, has tended to keep up a pressure for supplies; and collieries generally are still considerably in arrear with deliveries. No difficulty whatever has been experienced in establishing the advance of 1s. 8d. per ton on all new business; the only question being whether this will represent the limit of the upward move, of which there would seem to be some doubt in the event of any very severe winter; and consequent

larger demand than usual for house-fire qualities. Steam and forge coals are in active request, with supplies not plentiful, although, if anything, there is not quite the same briskness of demand for shipment. At the pit, prices average 16s. 6d. to 17s. per ton for best Wigan Arley, 15s. 6d. to 16s. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, and 12s. 6d. to 13s. for steam and forge coal, with ordinary screened steam coal 15s. 3d. delivered at Mersey ports. Any weakness in the market is confined entirely to engine classes of fuel, supplies of which become rather more plentiful; and though Lancashire collieries are still holding to their basis rates of 10s. 6d. to 11s. and 11s. 6d. per ton at the pit, according to quality, the possibility of some reduction on these figures is now being forced upon them, as supplies from outside districts continue to be pushed here at 9d. to 1s. below local quotations. In many cases consumers are simply keeping themselves going with surplus special lots which are offered from Derbyshire, Staffordshire, and Yorkshire; while the cotton trade outlook is not at all satisfactory, and there is more than a probability of diminished requirements for mill use in the immediate future. For coke there is a continued good demand; and makers of both furnace and foundry qualities are generally holding to recent rates. But the position all through is not quite so strong as it has been; and in some instances coke is now being bought through second hands at considerably under makers' prices.

**Northern Coal Trade.**—The demand has been fuller, and there has been an increase in the shipments for the last few days; the collieries having been fully working. Best Northumbrian steam coals are now quoted up to 19s. per ton f.o.b.; and even higher prices have been named for odd lots. Second-class steams are about 18s. per ton f.o.b.; and steam smalls are from 11s. 9d. to 12s. In the gas-coal trade, there is still a very limited local consumption. But the exports are heavy; and the shipments to the London Companies have been relatively good of late. One portion of the contract for the gas coal for Stockton has been allotted to the Wear-dale Coal Company; while other quantities are likely to be taken from collieries in the mid-Durham coalfield. There is no large additional contract for coal now on offer. For occasional sales, best Durham gas coal is quoted at 16s. 6d. to 17s. per ton f.o.b. In the coke trade, the demand is good; and the price is firm at 34s. to 35s. per ton f.o.b. for best Durham coke for export. For blast-furnace coke, the quotation is 29s. at the furnaces. Gas coke shows no alteration in price, or in the extent of the demand.

**Scotch Coal Trade.**—There cannot be said to be any change; the output continuing good, and the demand strong. Prices are much the same. The quotations for last week were: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 229,214 tons—an increase of 60,223 tons upon the preceding week, and of 21,921 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,200,667 tons—an increase of 1,068,099 tons upon the same period of last year.

The Northam Urban District Council decided on Thursday to increase the salary of Mr. Thornton, who is acting as Resident Engineer of the water-works in course of construction, from £200 to £300 a year.

## C. &amp; W. WALKER, LTD.,

Midland Iron-Works, Donnington, nr. Newport, Shropshire.

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**Proposed Extensions at the Tipton Gas-Works.**—Colonel C. H. Luard, one of the Local Government Board Inspectors, recently attended at the Public Offices, Tipton, for the purpose of holding an inquiry relative to the application of the District Council for sanction to borrow £2000 for gas-works purposes. Among those present were Mr. J. W. Waring (Clerk), Mr. H. O. Timmins (Manager), Mr. V. Hughes (late Manager), and Mr. T. Crew (Chairman of the Council). The Clerk stated that they required the money for the purchase of additional land adjoining the works for extensions, for a new station-meter, and for legal and incidental expenses.

**The Discontinuance of Public Lighting in the Summer Months.**—In a pay-bill of considerably over £1200—one of the largest amounts which the Bishop Auckland Town Council have had to sanction the payment of at one time—the modest sum of 8s. 1d. represents the outlay on street lighting in that town for the month of July. Commenting on this circumstance, the "Northern Echo" says: "If it were not for the fact that in these so-called summer months the nights are often of densest darkness, there would exist every reason for feeling fairly satisfied with the saving that is annually exercised by not lighting the street-lamps in the summer months. But there are dangers attending such a course; and with the police the total absence of lighted lamps is a standing grievance, handicapping them as it does in the performance of their duty. In impenetrable darkness, it is easy for the wrong-doer to evade notice; and property and person alike are endangered."

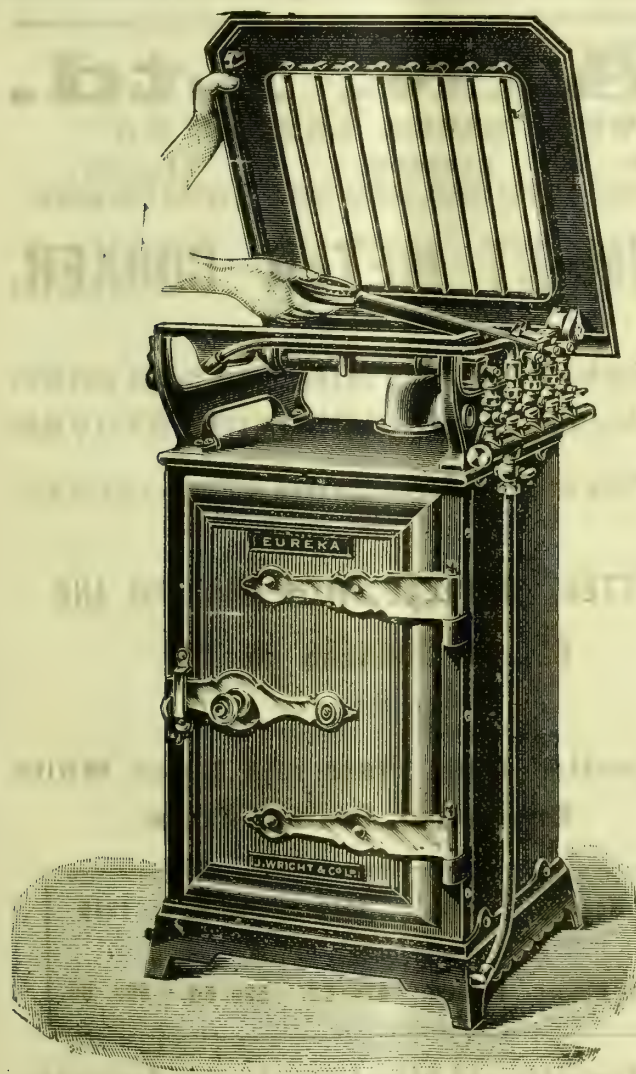
**Mr. T. Burt on the Export of Coal.**—In the course of his monthly circular to the Northumberland miners, Mr. Thomas Burt, M.P., says: "A vigorous agitation for checking or for entirely prohibiting the export of coal has been going on for a few months past. Influential newspapers have advocated the project, motions to call attention have appeared on the order-book of the House of Commons, and numerous questions have been put to Ministers suggesting legislation on the lines indicated. Any serious interference with the export of coal, would certainly injuriously affect Northumberland, South Wales, and other exporting mining districts. Probably no part of the country would be more severely hit than our own county, since we depend on foreign demand for so large a proportion of our trade. Nothing but the strongest, the most overwhelming reasons in the general interest of the nation, or of the Empire, could justify the infliction of this loss, injury, and suffering upon localities. No such overwhelming reasons have been advanced. General and permanent prohibition of the export of coal may be dismissed as utterly chimerical; but a narrowed issue, though not an unimportant one, has been raised in a practical form. The Government have introduced a Bill for prohibiting the exportation of arms. In that Bill coal is not specifically mentioned; but the questions and answers in the House of Commons show it is included. . . . If it is necessary, in the general interest, to prohibit the exportation of arms and ammunition it may conceivably be equally necessary to prohibit the export of coal. But the responsibility to determining when and where the prohibition should be exercised demands judgment and discrimination—qualities which, as we have recently seen, even Governments do not always possess and exhibit. The subject will require to be carefully watched."

**Sales of Shares.**—At a sale by auction last Thursday, at Chapel-en-le-Frith, 45 shares in the local Water Company were sold at £1 each. Messrs. Bruton, Knowles, and Co., of Gloucester, recently disposed of some original £10 shares in the Stroud Gas Company for £23 to £23 15s. each; and £5 ordinary shares in the same Company for £8 2s. 6d. to £8 9s. each.

**The Falmouth Corporation and the Gas-Works.**—Another attempt was made last week to induce the Falmouth Corporation to take action with a view to the acquisition of the gas-works. At a meeting on Thursday, Mr. C. Rusden proposed that an expert should be appointed to value the gas undertaking, which he said was a valuable concern that the Corporation ought to acquire. Two or three members, who briefly spoke on the subject, expressed the opinion that the time is inopportune for further action with regard to the gas-works, and the motion not being seconded fell through.

**The Wages of Bradford Gas-Works Employees.**—At the meeting of the Bradford Corporation Gas Committee last Friday, the chief business under consideration was an application from the men employed at the gas-works for an all-round increase of wages. It was computed that, if the demands asked for were granted, it would mean the extra payment of salaries amounting in the aggregate to £3700 per annum. Most of the workmen concerned are members of the Gas Workers and General Labourers' Union, by whose authority the application is made. The greatest increase is asked for by the meter inspectors, who demand an advance from 22s. to 24s. per week, and a further advance of 1s. per week every year until a maximum of 32s. is reached. The question was adjourned in order that a deputation representing the workmen may attend before the Committee.

**The Local Government Board and New Water-Works for Sudbury (Suffolk).**—There has been some correspondence between the Local Government Board and the Sudbury Town Council with reference to a proposal to borrow £2000 for additional water-supply works. The Board wrote that they were advised that, as a general rule, water-mains should be laid at a depth of not less than 3 feet, measuring from the top of the pipes to the surface of the ground, and that this depth should be allowed wherever possible in the present instance. Where, however, the mains proposed to be laid were to be connected at both ends with existing mains, and the depth in question could not be attained, the best cover available should be given; care being taken to avoid any depression in which deposit might take place. The Board desired to be informed whether the Town Council were prepared to comply with this suggestion. The Board also asked whether the Council had definitely decided to proceed at once with the construction of the shaft and underground storage reservoir in the event of the loan being sanctioned. At the meeting of the Council on Tuesday, the Clerk stated that he had replied that they would do all in their power to carry out the Board's suggestions as to the water-mains. He had also mentioned that, so long as the present supply of water continued, there would be no necessity for constructing a storage reservoir; but the Council desired to be in a position to build one at any time, should the supply show signs of failing.



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**New Borrowing Powers for the Hartlepool Gas and Water Company.**—At a special meeting of this Company last Thursday, the Directors were empowered to borrow £16,500 required for extensions.

**Oil-Lamp Accidents.**—In London last year, 22 persons lost their lives as the result of lamp accidents—a number which compares favourably with previous years. The death-roll from 1890 to the end of March last reaches the formidable figure of 276.

**The Costs of the Derwent Valley Water Act.**—The Town Clerk of Sheffield (Mr. H. Sayer) has reported to the Water Committee that the costs of the Sheffield Corporation in connection with the Derwent Valley Water Bills of 1899 have been taxed and allowed at £22,912; and he was instructed to apply to the Derwent Valley Water Board for repayment of this amount, in accordance with the provisions of the Act.

**Experience of a Gas Engineer's Son as a Prisoner of War.**—During the progress of the war in South Africa, the papers all over the country have contained many interesting letters from officers and men engaged in the campaign, which have done much to dispel the glamour with which it was at the outset surrounded. They have presented to us a "round unvarnished tale" of suffering and privation bravely endured in defence of the country's honour, and have furnished innumerable examples of that extraordinary pluck which has ever been, and it is to be hoped ever will be, a characteristic of the British race. An extract from one of these letters appeared in last Wednesday's "Daily News;" and it calls for notice in our columns from the fact that the writer was Mr. Douglas Colson, son of Mr. Alfred Colson, the respected Gas and Electrical Engineer of the Leicester Corporation. Mr. Douglas Colson, who is in the Royal Engineers, was taken prisoner by the Boers acting under De Wet, on the 14th of June, and he furnishes a remarkable narrative of his experiences. On the day prior to his capture, he was employed with others in making good three bridges which had been damaged by the enemy. In the evening he and eleven other electrical engineers turned in to sleep on the open veldt; but about 2.30 the following morning they were all awakened by heavy rifle fire. He jumped up, and to his astonishment found that the reconstruction train by which they had travelled had disappeared, and with it all their rifles! The bullets were flying round them like hailstones. The men were taken prisoners, and were marched off to join a convoy where they found about 700 English troops who had been captured at Roodeval. After being in the hands of the enemy till the 5th of July, they were taken to the border and liberated, by order of President Steyn; not, however, before they had been asked to sign a parole, which to a man they refused to do. While on the Ladysmith Road, they halted one day at noon for a meal; and as they were taking it (such as it was), they saw galloping over the hill towards them a mounted man, who turned out to be a British soldier with his rifle. Mr. Colson confesses that he almost cried with joy at once more seeing one of our own troopers. They were directed to a farm which was in sight, where, to their delight, they found luscious food, and coffee with sugar in it. He says it was "a meal never to be forgotten—biscuits and bully beef!" That night they reached the village of Upper Tugela, where they slept under cover for the first time for 22 nights. It is true they were in prison cells; but they were welcome enough.

**Gas and Electric Light Shareholders and Membership of Local Authorities.**—The Melton Mowbray District Council recently applied to the Leicestershire County Council for an order dispensing with the prohibition against certain members voting on any question in which the Gas and Electric Light Companies were interested, they being shareholders in these Companies. The Finance and General Purposes Committee last Wednesday recommended the Council to accede to the application, and to affix the seal of the Council to four copies of the necessary order. This was done.

**A Dutch Water Company.**—"La Dechnologie Sanitaire" recently gave some particulars of the working of the Dunes Water Company, of Leyden, in the past year. In 1899, the pumps at the station on the Rhine raised 1,060,247 cubic metres of water (1 cubic metre = 220 gallons), against 1,031,666 cubic metres in 1898—being an average of 2905 cubic metres per diem, against 2829 cubic metres in 1898. The consumption of coal was 754,066 kilos. The subsiding reservoirs with coke filter-beds and the sand filters worked perfectly. The number of consumers on Jan. 1, 1899, was 6294; and on Jan. 1, 1900, 6427—an addition of 133. Water is supplied by meter to 115 consumers and under 18 contracts. The meters fixed in works and other establishments registered a consumption of 154,589 cubic metres, which gives for the remaining consumption 905,658 cubic metres, including water for roads, fire extinction, and leakage. There are 54,406 metres of pipes in the service. For industrial and other important establishments, 651 meters are in use. The receipts last year were 111,984 florins, which allowed of a dividend of 8½ per cent.; the portion belonging to the town being 31,500 florins.

**The Proposed Acquisition of the Heckmondwike Gas-Works by the Local Authorities.**—Last Wednesday, a meeting of owners and rate-payers of Liversedge was held at the Public Hall to consider a resolution adopted by the District Council authorizing them to proceed, jointly with the Heckmondwike Council, to promote a Bill in Parliament enabling them to acquire the undertaking of the Heckmondwike Gas Company, who supply gas over the greater part of the two townships. There was only a small attendance. Mr. Kellett, the Chairman of the Liversedge Council, proposed the adoption of the resolution. It was stated that the Directors of the Company had said they were not anxious to sell the undertaking, and had refused to name any price; and the Council did not think it prudent to suggest any figure, as the matter might eventually have to go to arbitration. For the same reason they could not give any statistics to show that the undertaking could be worked profitably for the ratepayers. Thereupon Mr. Metcalf moved, and Mr. Longey seconded, the adjournment of the meeting until some information could be given. A discussion ensued, in the course of which Mr. H. Heaton and others submitted that it was not fair to ask the rate-payers to sanction such an enterprise without evidence that advantage was likely to result; while others contended that the meeting should have confidence in the Council, and give them the power they asked. Only three persons voted for the amendment, and about a dozen for the motion, which was therefore declared carried. It was stated during the discussion that the paid-up capital of the Company is £42,000.

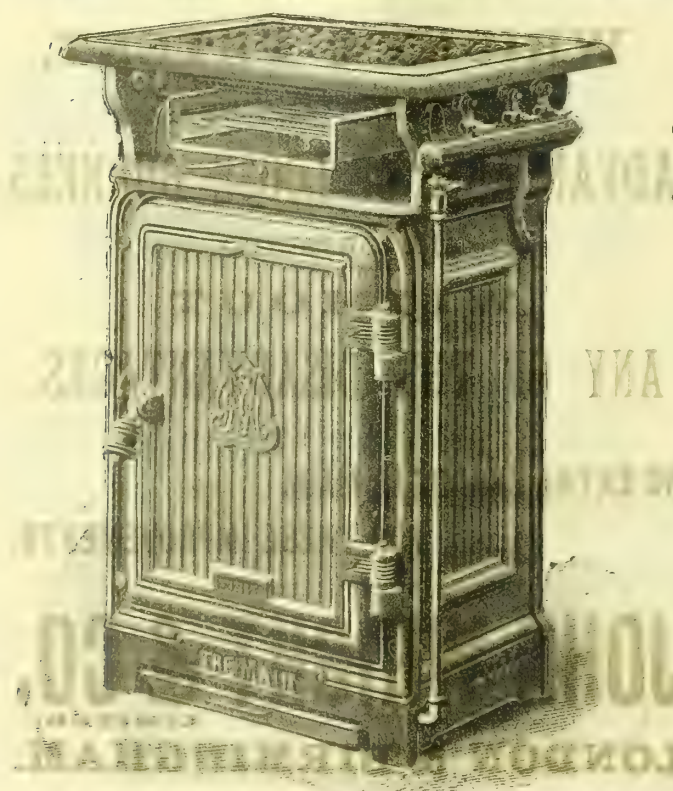
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## EDITORIAL NOTES.

## Coal Miners' Wages and the Price of Coal.

THE policy of the coalowners of working the advantage over the consumer which they have held for some months past for every penny it is worth, will, unless we are grievously mistaken, bring in due course a heavy retribution, in the dealing out of which the trade of the nation will, as a whole, suffer severely. The very serious situation in which the iron and allied trades will ere long find themselves is patent to anyone who cares to look a little beyond—or, rather, who cares to find out the true inwardness of—the existing state of the markets. Coal is very dear, wages are high; but prices in the iron and steel trades are tottering, and only need the coming shock of competition from America to fall heavily. How is the manufacturer to keep going, when the cost of production exceeds the price of the finished article? He will, in many instances, have no option but to shut down. That this will be a severe blow to the trade generally of the country needs no demonstration.

It will also have a consequent effect upon the coal market, which will break down later on, when the mischief has been done. This does not sound to the coal consumer a very terrible consummation; but there is one side to the question that deserves some consideration. That is, the effect upon the wages of the miners of the fall of coal prices from the present abnormal level, and the consequences of this effect upon the relations between the men and their employers. So long ago as November last, we drew attention to the considerable increase that had taken place all round in coal miners' wages, and showed that at the end of October the rates of pay in force were either practically as high as, or higher than, those paid in 1890-1. Since then wages have risen, and are rising, much higher still, as will be readily seen from the following particulars. At the end of October, the miners' wages in Northumberland and Durham stood at 25 and 33 $\frac{3}{4}$  per cent, respectively above the standard of 1879. They now stand at 52 $\frac{1}{2}$  and 55 per cent. higher than that standard; the previous highest rates being 31 $\frac{1}{4}$  per cent. in the one case, in 1890, and 35 per cent. in the other, in 1891. In South Wales, wages on Nov. 1 last were paid at the rate of 28 $\frac{3}{4}$  per cent. above the 1879 basis. The percentage now is 58 $\frac{3}{4}$ , or 5 per cent. higher than the record in 1891. In Scotland, the rate is now double the standard, at which it actually stood no longer ago than 1897; and wages there had never previously risen to more than 50 per cent. above the basis. Finally, the Miners' Federation have quite recently obtained from the owners a considerable modification of the agreement entered into last December, when wages were fixed at 45 per cent. above the 1888 rates, with the understanding that no further increase should be asked prior to Jan. 1, 1901. The Conciliation Board of masters and men have now agreed that a 15 per cent. advance shall be granted—5 per cent. each on Oct. 1, Jan. 1, and Feb. 1. This will make the rate of wages up to the maximum which the Board are empowered to award.

What of that? it may be asked. Miners' wages vary with the price of coal; and it is therefore only in the nature of things that, with coal at present prices, wages should be high. When coal comes down, so will wages. But will they come down with as little friction as they went up? That is the point. Miners have never known such rates before; and Conciliation Boards and sliding-scales (as it is being found in other walks of business life) are best appreciated when they are working favourably to those who are called upon to approve them. We quoted the other day the significant remarks made by Mr. B. Pickard, M.P., to the Yorkshire Miners' Association, as to the necessity and possibility of accumulating out of their higher wages a fund of half a million, "to strengthen themselves against any "evil day that may arise." Again, Mr. Sam Woods told the South Wales men the other day that "if they stuck to "their position, hoarded up their finances, and trusted their "leaders," they would be able to fight the masters over the question of Federation *versus* Sliding-Scale, which threatens the future peace of Wales. Now we find Mr. John Burns, M.P., telling the Nottinghamshire miners that he wanted them "to make the Union the fighting organization to get "for labour that charter of leisure, pleasure, and treasure it "was the duty of every workman to enjoy."

These be ominous signs that the present period of exceedingly high wages is having two results, so far as the men are concerned. They are getting a rate of pay which is quite abnormal, but which they will not at all relish

## TO CORRESPONDENTS.

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giving up. Who, indeed, would relish a reduction of 30 per cent. in his income, after getting used to spending the greater amount? At the same time, they are accumulating funds to enable them to fight for a higher *standard* of wages; and if this be the aim of their leaders (and we shrewdly suspect it to be so), there is big trouble in store for the country as a whole, and for coal consumers in particular. We repeat what we said at the commencement—that, by running up prices to a figure quite unwarranted by general trade conditions, and purely artificial, and thereby handing over an equally unwarranted and unearned increase in wages to the men, the coalowners have dealt a heavy blow at the future prosperity of the country, and have put into pickle a rod for their own backs. May our prophesies be proved false as they are gloomy; but similar forebodings appear to be—rather late in the day—entering the minds of the journals of the trade. The “Colliery Guardian” last Friday actually made so bold as to remind the coalowners that there had been times when they had found the support of their consumers useful, and that such times might again return. “The men,” said our contemporary, “know that the day will arrive when the consumer and the owner must say [in regard to the increase in wages]: ‘Thus far, no farther.’ Then will come into play those engines of war which miners all over the country have been, and are, amassing. Is it altogether wise for the coalowners to alienate from themselves the sympathy of the consumers—in other words, the British public—if, in the near future, they will have to face an unreasoning adversary in the shape of their own employees?” Without wishing to hurt the feelings of our “child-like and bland” contemporary, we would ask: How much sympathy for the coalowner is there left in the hearts of the coal consumer to be alienated? The latter will feel that consideration for him comes much too late, and too self-interestedly, to be valued highly.

#### The Re-Opening of the “Strike Factories.”

CIRCUMSTANCES are conspiring to accentuate the warning we uttered last week in regard to the re-starting of “strike factories” in different places. Reports of labour disturbances have come in from various parts of the Continent; and it is supposed that an organized attempt is in course of development, having for its object the raising of the condition of workers everywhere to that of the “most favoured” of their class. It is not a little flattering to learn that this term usually means the condition of the British Workman. Representatives of English miners, mechanics, and dock labourers have been abroad egging on the benighted foreigners to agitate for equal treatment; and an outbreak of strikes is the immediate result. Such, at least, is the substance of the reports that have reached us during the past week. It is no mystery, of course, that English coal miners’ delegates have been abroad many times of late years; and there is no difficulty in believing that their underground work has been more important than the speechifying in which they have indulged for the amusement of the authorities. Again, one would gladly hope that Continental workpeople had become practical politicians, in the sense of preferring to strike for shorter working hours or for higher wages, rather than talking Anarchy and practising murder. But all this is very doubtful. Talk about equalizing the condition of the working classes all over the world is nonsense, until it has been proved in what equality consists, which is one of the most difficult of all the problems of practical economics. At the same time, it is impossible to withhold sympathy from the man at (say) Antwerp or Berlin, who is dissatisfied because he is only paid at the rate of ninepence for work for which his British brother is paid a shilling. But is it so? We are under the impression that Continental labour, at the large centres of industry, is to the full as dear as in England. It is desirable that the facts of this matter should be known. There would then be less scope for fancy; and of the two, the latter is likely to be the more mischievous. Many studies have been directed to the solution of the old problem, “Which is the happiest land?” for the wage-earner with nothing but his bodily strength to sell; but the answer remains obscure. It seems tolerably clear that the world everywhere wants workers, more or less skilled, with their hands, and is ready to pay them a living wage for honest and good work. Never were artisans in greater demand. With all the Board Schools turning out poor clerks and indifferent school teachers, this state of things will continue. There are coal trimmers

in the Port of London making an income that would be wealth to an Italian politician or a German professor. The equalization of the conditions of labour! It is an idle dream, and must remain so till mankind agrees upon what is money’s worth.

With regard to the operations of those “mischievous bodies,” as Lord Claud Hamilton called the Railway Servants’ Union, which afflict the public services of this country, it is a good omen that at Bristol the District Secretary of the Gas Workers’ Union has received a wholesome setting-down at the hands of the Gas Company’s men. It is, of course, an essential part of these Unions’ policy to send agitators about to centres where there is industrial peace and contentment. This is called conducting a vigorous campaign; and the emissary (who is usually also a paid correspondent of the Labour Department of the Board of Trade) aims at getting a double “pull” out of the job by having something to report to the past-masters in the craft of strike manoeuvring who rule that branch of the Civil Service. At Bristol, a certain H. Brabham had this commission, and he started on the usual lines by convening a meeting on his own initiative of those servants of the Gas Company who might like to have more money for less work. After this meeting, the gentleman wrote to the Board of the Company in his self-appointed capacity of representative of their employees. But this diplomatic document remained unacknowledged by the recipients, who naturally declined to hold any communication with an outsider. Moreover, there happens to be in force in Bristol an agreement—proposed originally by the men themselves, and accepted by the Board—for submitting all questions affecting the workmen to discussion at a meeting of Directors and representative workmen. Whether Mr. Brabham was aware of the existence of this agreement or not, he went on calling his meetings and forcing on his design to get the men under his thumb in the regulation style. Such persons have a certain knack of persuasion; and experience shows that every ten years, or thereabouts, there is some chance for successfully sowing the seeds of discontent among the raw hands of a factory. At any rate, Brabham succeeded so far as to get a meeting of the Bristol men to cast a vote slightly in his favour. A ballot was, however, demanded, which resulted in leaving him in a minority of 137 to 335. This is so far satisfactory as showing that the bulk of the Bristol gas workers are not such fools as to drop the solid advantages of their position for the shadow of such compensation as the Union can offer; but it is nevertheless a warning to gas managers everywhere that no paper guarantees are competent to ward off the insidious attacks of professional agitators.

#### “Light Gas” for Southport.

THERE is fair promise that to the Corporation of Southport will fall the distinction of being first to copy the example of the South Metropolitan Gas Company, and abandon the manufacture of heavily-carburetted town’s gas. In another column will be found a report of the proceedings at the last meeting of the Town Council, at which an organic resolution submitted by the Gas Committee—“That it is desirable that the illuminating power of the gas be reduced”—was unanimously adopted. So Southport early joins the procession of those enlightened towns which have perceived the necessity for adjusting their gas supply to the most economical and advantageous conditions of its utilization for all the purposes of lighting, heating, cooking, and the production of motive power. Good luck to the Corporation in their worthy effort! According to the way of the world, the Corporation of Southport, being willing to make a move in the direction of industrial reform, is perhaps the one Municipality in the United Kingdom that is prevented by a treaty with a foreign power from doing its own will in such a matter. Southport, in short, has a partner—Birkdale. Whether this Jorkins in the firm will prove as obstinate as did the immortal original, cannot be made the subject of prophecy. But inasmuch as Birkdale is not a mere sleeping partner with Southport—quite the opposite, in fact—there is ground for hoping that it is not more blind than the head of the firm to the advantages of conducting the business on commercial lines. What Southport and Birkdale will have to do will be to lay their respective municipal heads together, and study the economics of the mutual gas supply in the light of cold, hard facts. The discussion at the recent Town Council meeting sufficiently disclosed the firmness of the grip of



the leading citizens of Southport upon these facts; and it will be no easy task to make them leave go. The standard illuminating power of Southport gas is 20 candles, the same as Liverpool. These two undertakings are the only ones in the kingdom required by Act of Parliament to supply gas of so high an illuminating power; and it is not surprising that one of them should be first to awaken to the conviction that a make of gas which might have been desirable a quarter of a century ago is now out of date.

#### Working of the Harrow and Stanmore Gas Act, 1894.

AMID all the discussion that has passed of late on the question of the way in which the sliding-scale of gas prices and dividends has realized the intention of those who favoured it in place of the older system of maximum prices with power of revision, it has been overlooked that a modified example of the latter is still operative among us. The gas supply of no more distant nor insignificant a district than that of Harrow and Stanmore was settled so recently as 1894 upon a basis in which the sliding-scale and the principle of outside supervision were artfully blended. As will be seen by the report which appears in another column, the proof of this particular kind of legislative pudding has just been taken, with the assistance of Dr. J. S. Haldane, one of the Metropolitan Gas Referees, acting as a Special Commissioner for the Board of Trade. The law and the circumstances of the case are sufficiently explained in the report, and need not be repeated here. Of course, the first thing the Referee was asked to do was to decide something lying outside the terms of the reference. Harrow is a district with a central area measured by a certain radius, which in this case starts from a hotel; and the Act says nothing about what price shall be charged beyond the radius. The Local Authority naturally wanted to repair their forgetfulness of the outsiders by getting the Referee to say something in support of an alleged "general opinion" that the charge for gas outside should be governed by the price ruling for the time being inside the radius; but he very wisely declined to fall into the trap. This little skirmish should be carefully noted by those who are concerned with the making and interpreting of these parliamentary bargains. Mr. J. L. Chapman, for the Company, is perfectly right in claiming that the settling a price for a strictly delimited central area has no reference to what may be charged outside. Whether or not this ought to be so in the case of Harrow is beside the mark. If the Harrow District Council are solicitous for the interest of the outlying gas consumers, they should have taken better care of them in 1894. It is not to be believed that these consumers really suffer from the neglect of the District Council to protect them in respect of the statutory price of gas, while there is good reason for leaving a company serving such a scattered region free to make their own bargains. The evidence taken by Dr. Haldane is interesting reading; and he appears to have been most desirous of understanding the points of the case submitted to him. In the event, the Company received permission to make the very moderate increase of 3d. per 1000 cubic feet for which they asked, commencing at the next quarter-day, and terminating at Midsummer, 1901. So far, the novel statutory provision proved to be workable; but whether it can be regarded as constituting any real protection of the public against a (supposed) extortionate Gas Company is not so obvious. There is something in the view that it is only another and a superfluous device for registering the inevitable. Certainly, nothing of the kind seems needed in the case of a Gas Company not paying full dividends.

#### The Meeting of Irish Gas Managers.

NOMENCLATURE, despite Shakespeare's oft-quoted sneer at it, plays a very important part in the affairs of the world. So the gas managers in Ireland have found in connection with the working of their Association, and so we find in the heading to these observations; for, though there is no doubt that the meeting which was held at Sligo on Tuesday last was a meeting, at the start, of the North of Ireland Association of Gas Managers, before it had gone far it was converted into one of the Irish Association of Gas Managers. This change, notwithstanding that it had met with keen opposition on former occasions, was this year made without a dissentient voice. The reasons for holding to the old name having disappeared, we need not resurrect them here; and consequently, accepting the change of name as having been made with the approval of all, we only refer to the reasons for the change. The principal of

these is that the Association has been creeping southwards, and was no longer, in fact, a North of Ireland Association. The southern infusion, it is anticipated, will be accelerated by the dropping of "North" from the appellation. We hope it may be so, and that the Association under its new name may be even more prosperous than it has been under the old. But it is the duty of everyone to recognize that the movement towards the association of gas managers in Ireland originated in the North, and that it is to northern managers—especially to the energetic action of Mr. James Whimster, of Armagh—that there has been any organization to which southern managers could have any desire to seek entrance; and, further, that the objection to the name was a very slender peg upon which to hang aloofness. We are led to expect that, now that the northern men have enlarged their fold, the southern men will flock into it. We have doubts upon the subject, but shall be glad if the experience should be such as to show them to be groundless. While we approve, and commend, the change in the name of the Association, we anticipate that, under its new name, it will be no sweeter a centre of activity than it has been hitherto.

In one respect the Sligo meeting suffered from a cause which is greatly to be regretted, although it has to be admitted that this cause grew out of the circumstances. When the programme was issued, no papers had been promised; and this, coupled with the fact that the place is distant and difficult to reach, led to the non-attendance of many. Concurrently with this resolution on the part of some to absent themselves, a desire fired the bosoms of others to make the meeting a success; and two papers were submitted which did not appear on the *agenda*—thereby making up quite a full day's work. The members who stayed away because the fare was to be meagre, lost the enjoyment of a satisfying repast; while those who contributed the abundance did so to a small gathering.

The same reasons acted detrimentally to the meeting in another way. In the absence of papers, the burden of carrying on the proceedings fell upon the shoulders of Mr. C. B. Tully, the President. There was danger of the meeting resolving itself into a "one-horse show;" and this it would have done but for the timely appearance of the papers by Mr. Percy Griffith and Mr. Reid. As to the way in which Mr. Tully braced himself to the task before him, there can be but one opinion. To describe him as an all-round man is not sufficient. He is more; he is a many-sided man. The gas-works he manages are full of wonders—some of his own invention, and others his selections from the best productions of others. But had it been, in reality, a one-horse show, Mr. Tully would have made it a worthy one. His address contains a record of high attainment, because he started low—exceedingly low—and has brought his works forward to the front rank of their kind. To be able to collaborate with Professor Lewes is beyond the power of most; yet Mr. Tully has risen to that estate, as was shown by his communication upon the water-gas plant at Sligo. The meeting will, without doubt, lead to a quickening of the interest of gas managers in the development of this ingenious adaptation of scientific principles in the production of water gas. But Mr. Tully, however his belief may be as to one thing at a time, does not believe in holding to one thing only. Having produced his water gas and carburetted it, he wishes to further improve its illuminating power, or at least to provide a ready method for the enrichment of poor gas. The idea is not new, but the application of it is rare; and Mr. Tully's apparatus, which, as usual, he thought out for himself, formed another worthy contribution to the Sligo meeting. This appliance is of interest to managers in small towns for two reasons. One of these is found in the remark of Mr. Tully that, with the apparatus placed after the governor, the enrichment takes effect over the town in from five to ten minutes. The problem of dual supply is thus solved, generally, for small places. The other reason lies in this—that coal which is frequently described as "muck" may be employed to make the gas; and then it can be enriched to the desired standard, which means a great deal in days of dear coal. But even yet Mr. Tully's list was not complete, for the members of the Association were taken to the gas-works to see in operation the "Rapid" retort-charging plant, which more than justified itself as a cheap and efficient charging apparatus.

Mr. Griffith's paper was dictated by a desire on the part of many to see the gas industry in Ireland developed so as



to keep it in line with what is going on on this side of the Channel. In too many instances, so long as the dividend comes in, there is a feeling that well should be left alone. The works are allowed to fall behind, and the undertaking may be said to be eating its own head off. The paper was welcomed as providing a means for urging owners of gas-works to move forward. The paper by Mr. W. A. Reid, of Longford, on a sulphate plant which he works, was of a kind which is suited for such a meeting, and it received a homely criticism.

#### The Cause of the Municipal Civil Servant.

ON several occasions it has been the task of the "JOURNAL" to plead the cause of municipal officers, and to advocate the erection and consolidation of a sound system of appointment, pay, and promotion for the municipal civil service of the country. There is no more important subject for the study of those public-spirited citizens who aspire to serve their generation in the way of local self-government. Men get themselves elected to some local office on all manner of pretexts, but rarely in the professed cause of fair play to the public officers. Yet usually one of the first of the Corporation Committees to which young Town Councillors are assigned is that which has to do with the government of the executive staff. It is not surprising that sometimes an ardent "ward politician" who has had slight personal experience in such matters, finds it difficult to get the proper focus for observing the duties and emoluments of public officials of much higher social position than his own. It speaks highly for the common sense and political instincts of our people that so little friction, on the whole, arises from this source. There is always, however, a latent possibility of trouble in a service where there is no recognized system of regulation in this matter. Speaking generally, and therefore in some degree inaccurately, we venture to question the existence of any such system in many of the local governing organizations, large or small, of this country. Nobody would for a moment desire that, in this respect, there should be a hard-and-fast uniformity throughout the land. What is to be desired is that every district should realize its own wants, and arrange for supplying them upon what passes at the time for a generally accepted standard of adequacy. "We have certain positions of trust and responsibility to fill—what conditions should be attached to those positions which will satisfy the right kind of officer, and warrant the community in expecting the best kind of return for cash paid and consideration given?" That seems the correct way of stating the case. It would naturally follow that members of Local Authorities should adjust their view of the subject to this presentment of it. Unfortunately, there is far too much evidence to prove that these bodies do not do business on systematic lines.

Not to cite instances too closely connected with the administration of Corporation Gas Departments—when we might be found treading on particular toes—we will give an example of how a Joint Sanitary Board in Devonshire recently set about appointing a Medical Officer of Health. The Committee nominated to deal with this business recommended that on the retirement of the actual incumbent, his successor should be appointed at a reduced salary of £150 per annum. When the matter came up for confirmation, a member of the Board suggested that it would be better to pay £200 a year: "They were dropping from £270 to £150, with the result that whoever got the position would be immediately applying for a rise." This was very evidently a man of the world. Another member thereupon stated that "they had got returns" from a number of other districts, and found that these were paying far less for the same offices. This was the "circular-of-inquiry" fiend. Eventually, the recommendation of the Committee was adopted, "subject to the approval of the Local Government Board." The last observation recalls the peculiar condition of Government supervision under which local governing bodies do their uncommercial work. They are popularly credited, in the newspapers and on political platforms, with doing the ordinary work of local government and sanitary improvement with such conspicuous ability that they must be fairly allowed to be competent to transact all sorts of other business. But people who are not carried away by the hare-brained chatter of generalizing politicians and journalists, know that this measure of efficiency, such as it is, is largely due to the silent pressure of the great Department in Whitehall.

There the authorities, who do not permit their names to appear, patiently and incessantly sift tables of mortality, and pass in review the resolutions taken by Sanitary Authorities, suggesting this course, or correcting that threatened blunder, by the light of their own highly elaborate system. Of course, this centralized system is a little cumbrous in operation; and the cultivated and advanced sanitarians of the great towns fret at its ponderous march. But what its effects in the way of preventing injustice to individuals, nobody could adequately describe. Trading departments of Corporations are under no such superior regulation, which is all the more reason for invoking that systematic study of the problem of the municipal civil service which we have so strenuously advocated for members of Local Authorities.

#### The Home Office Report on the Workmen's Compensation Act.

IN another column will be found a digest of the more important and interesting points in the Home Office report upon the working of the Workmen's Compensation and Employers' Liability Acts during 1899. The report is the first which covers a complete year's proceedings under the Act of 1897; and it is in its bearings upon the operations of that measure that it will be of most interest to our readers and the public generally. The critics of the Act (especially those who are so fond of dilating upon the supposed abnormal mass of litigation to which it has given rise) will not, we feel sure, hasten to call attention to the facts set forth in the report. For, although the returns which can be collected by the Home Office do not touch the great body of cases which come within the scope of the Act, that very fact disproves the contention of the critics that the measure is essentially of a litigious character—these returns relating chiefly to, and recording, all the cases of litigation under the Act.

How does the aforesaid criticism look in the light of the dry, uncoloured facts? There are not any official returns obtainable of the number of accidents which occur, and which come within the provisions of the Act; but, from creditable particulars supplied by the Miners' Relief Societies, it appears that, while some 70,000 miners were last year disabled for periods exceeding a fortnight, only 128 claims under the Act were brought into the County Courts. That is a proportion of one adjudication to five hundred accidents. Moreover, it cannot be said that the Home Office estimate of an annual total of 150,000 accidents causing incapacity for more than fourteen days is in any way excessive. Yet only 1347 cases (or less than 1 per cent. on that estimate) were commenced in the County Courts during 1899; and of these 348 were settled out of Court, while only 54 were subsequently carried to the Court of Appeal. There remain to be added 292 cases in the Sheriff Courts, and 18 cases removed to the Court of Session in Scotland. Truly, the "litigation" criticism, in view of these facts, looks not a little ridiculous.

But if we go more closely still into the facts, the criticism loses yet more of its substantiality. For the cases carried into the County Courts are by no means to be all reckoned as litigious, the Judge acting more frequently as an arbitrator as to the amount of the compensation than as a judge to determine disputed liability. That this is so is evident from the fact that in nearly one-third of the cases decided in the Courts last year the award took the shape of a lump sum, and of those (numbering 317) some 225 were in respect of fatal injuries. Now we know for a fact that some employers always refer to the County Court the decision as to the amount and allocation of the compensation payable on the accidental death of a workman—not because they wish to dispute their liability, but in order to have the amount legally certified, and to relieve them of the responsibility of determining the way in which the sum awarded (generally close upon £200) shall be apportioned among the dependants or invested for their benefit. Such references cannot, of course, be classified as disputed claims. In fact, the only cases which can genuinely be classified under the heading of litigation are those carried to the higher Courts; and of these the majority are in the nature of definitive actions, some at least of which will form precedents obviating the need for similar appeals in the future. That is to say, the first two or three years of the working of a measure so wide in its scope and so novel in its principles and procedures as the Compensation Act of 1897 are certain, as we have always contended, to witness a number of appeals to the Courts



for the decision of the subtle points which the legal mind can always raise in regard to provisions, the intention of which is perfectly obvious to the layman, be the wording never so slightly ambiguous. The future will certainly see a falling off in such appeals. But, even taking the 1899 figures as fairly representing the probable annual average of litigation, can one case of appeal to every three thousand accidents be held to justify the favourite gibe at the Act, and, more especially, at its authors?

One feature of the returns that is noteworthy is the considerable number of instances in which lump sums have been awarded in original settlement of claims for total or partial incapacity—that is to say, other than in commutation of previously granted weekly allowances, as to which no information is available. The Act, it will be remembered, provides (Schedule I., 13) for commutation at the option of the employer, after an allowance has been paid for at least six months; but it now appears to be held that the law allows the workman to accept a lump sum in settlement of his original claim, or to commute by agreement before the six months are completed. The danger is that a workman, under stress of momentary necessity, or through ignorance, may commute his right for a sum much less than its real value. And some insurance companies would probably not be superior to the temptation of “trying it on.”

The statistics published are of much interest and value, but are of necessity only fragmentary, as there is no provision, and it would perhaps be impossible to enact, that employers should report upon every case of accidental injury to their men; and, indeed, the collection and digestion of such reports, if obtainable, would entail the expense of a special department with a considerable staff. There is, however, one source (indicated in the report) from which much valuable and already tabulated information could be obtained, if its supply were rendered compulsory—namely, from the insurance companies. There ought to be no difficulty, and there would be much advantage, in enacting that those companies should supply the Home Office with statistics. Short of that, we must remain satisfied with the information contained in the reports as issued, supplemented by that which reaches us from unofficial sources. The authors of the Act have certainly no reason to be at all dissatisfied with its working, so far as it is revealed in the available returns.

## WATER AND SANITARY AFFAIRS.

THE allied subjects of sanitation and the public health have come out rather prominently during the past few weeks. The proceedings at the meeting of the British Medical Association recently held at Ipswich would have been singularly incomplete had they been restricted to questions concerned solely with the treatment of disease, which may be said to be the special work of the physician, and had excluded all reference to the measures which have been adopted of late years to prevent its appearance, mitigate its severity, and check its propagation. It was therefore gratifying to the labourers in this field to find that the President (Dr. W. A. Elliston) took notice, in the course of his address on the evolution of the modern physician, of the advances made in sanitary science during the past half century. Though this science may be said to date from the time of Moses, whose elaborate directions for the preservation of health most people would have been willing to acknowledge were of high value, it was not till comparatively modern times that endeavours were made to have them systematically followed, and the beneficial results of so doing generally recognized. Three hundred years ago, the mortality in London was 80 per 1000 of the population; while in the week ending the 11th inst. it was only 20·5—the figures for the four preceding weeks having been 20·1, 21, 16·1, and 14·2. North of the Tweed, in the past fifty years the average length of life has been raised to a figure between six and seven years for each person born. There cannot be much room for doubt that this lowering of the death-rate is the outcome of the gradual improvement in the conditions under which our large population lives, and to the greater facilities afforded, by the provision of a more ample supply of water, for closer attention to personal cleanliness. The chief factor in bringing about this very desirable result was the foundation of the modern science of hygiene by the late Dr. Parkes towards the close of the first half

of the century, about which time the first General Public Health Act was passed. The work done by the old Board of Health was good in its way; but reform was called for, and the appeal was responded to by the creation of the Local Government Board in 1871, and the passing, four years later, of the Public Health Act. The outcome of the study of sanitary science by Dr. Parkes has been the organization of a system of general and individual supervision which makes for a higher standard of public health; and though it would be absurd to suppose that improved sanitation will eventually stamp out disease, it may be confidently asserted that it will enable the physician to more effectually grapple with it when unhappily called upon to do so.

It is, of course, the dwellers in towns who have profited most by the greater attention to hygiene to which reference has been made above; and therefore it is not surprising to find urban populations increasing by the influx of labourers from the rural districts, and a tendency to forsake agricultural pursuits for the higher pay and the more cheerful surroundings of town life. The spread of education and the facilities for travel are in a large measure answerable for this condition of things; while another factor, according to Dr. Thresh, the Medical Officer of Health for Essex, is this improved sanitation of which we have been speaking. In his address as President of the section devoted to State Medicine at the meeting of the British Medical Association, in which he dealt with the subject of rural sanitation, he pointed out that this desertion of pastoral districts is every year rendering the feeding problem more serious. We are, with our rapidly increasing populations, consuming more and producing less; and Dr. Thresh is afraid that this will go on until we receive a rude awakening—one which, indeed, will “stagger humanity.” He is hardly surprised that the villager should take himself off, bag and baggage, and change his abode from a place where “nuisances from the improper disposal of filth abound on every side, and the water supplies too often are unsatisfactory in quality as well as in quantity,” for one where he will enjoy advantages which tend to increase health, prolong life, and make it better worth living. Nor are we. The modern rustic is not so rooted to the spot as were his ancestors; and he has no particular concern as to whether or not his departure for the town will, in however small a degree, render the country more dependent upon outside sources for her wheat supply. The problem is how this migration is to be stopped, and how the peasant is to be brought back to the soil. That is the difficulty. Dr. Thresh is of opinion that one of the chief requirements for restoring rural prosperity consists in giving increased facilities for acquiring small areas of land for sanitary purposes. He says, if this were done, the necessity for carrying out a system of sewers would be avoided in most rural districts; while in compact villages the expense would be willingly borne if land upon which the sewage could be disposed of were obtainable on fair terms. But when, in view of the carrying out of a sewage-disposal scheme, land goes up from £5 to £100 an acre, the fact acts as a deterrent, and sanitary works are neglected. He thinks that if the result of the experiments now being made in connection with the bacterial treatment of sewage should be the discovery of some simple process requiring but little land, a great advance would be rendered possible in rural sanitation. In addition to improvement in this particular, he urges the provision of decent cottages for labourers. The whole problem bristles with difficulties; but, as Dr. Thresh says, this is no reason why it should not be attacked. We are afraid, however, that the carrying out of the improvements he suggests will scarcely be sufficient to induce those who have forsaken village for town life to cheerfully relinquish the brightness of the latter for the dreary dulness of the former. Something in the way of recreation must also be provided.

While Dr. Thresh looks hopefully to modern systems of sewage treatment to assist in the solution of the problems connected with rural sanitation, Dr. A. C. Houston questions whether they can be depended upon to remove the typhoid bacillus and allied organisms. In a paper read at the same meeting, he characterized septic tanks, whatever might be their advantages from the chemical and practical standpoint, as little better than modified cesspools, from the point of view of the epidemiologist. He therefore confined his remarks entirely to bacterial filters, and declared that the mechanical separation of the micro-organisms in sewage by the use of these beds is virtually impossible—that, in fact, until positive evidence to the contrary is forthcoming,



effluents therefrom must not be regarded as safer, in their possible relation to disease, than crude sewage itself. He pointed out that he was dealing chiefly with the Crossness experiments (on which, it may be remembered, he has been engaged in association with Dr. Frank Clowes, the Chemist to the London County Council), and that it did not follow that the results obtained there have a constant value in the case of all bacterial filters. He added, however, that, from the chemical and practical point of view, the coke-beds at Crossness are highly efficient—the effluents being apparently non-putrescible. The lesson of these experiments appears to be to raise a doubt as to any bacterial process in practical operation at the present time detaining the sewage for a sufficiently long period to allow of the complete destruction of all the pathogenic germs by bacterial agencies. At the close of Dr. Houston's paper, Dr. Thresh was fain to acknowledge that the whole subject needs investigation. But who is to undertake it?

Dr. Percy F. Frankland, speaking on this matter at the congress of the Royal Institute of Public Health lately held in Aberdeen, expressed the opinion that it should be handed over to an Imperial Board of Health, formed on the model of the Massachusetts State Board of Health. He is evidently dissatisfied with the work of the Local Government Board—more, we take it, from their lack of initiative than from the incapacity of the permanent officials and staff to deal with the various questions which come before them. Undoubtedly, the Board which Dr. Frankland cites as a pattern has done some excellent work; and, much as we deprecate the multiplication of these responsible bodies, there is much force in his suggestion. It does not seem right that important scientific investigations should be carried on in this country, as they no doubt are, frequently at private expense, and upon the premises of the investigators, who receive little or no encouragement of any kind. Dr. Frankland therefore calls for the creation of an Imperial Board of Health, having at its head a Minister with Cabinet rank, under the auspices of which scientific inquiries should be systematically prosecuted by men who have shown themselves to be competent to carry on work of the kind. Such a Board would, he considers, be able to initiate and lead in matters connected with public health; while its administrative functions would be guided by the scientific thought and achievement of the day, instead of being based upon the often obsolete knowledge gained a generation before. Should this idea be carried out, and a special Board also be formed for the administration of the water undertakings, the Local Government Board would be relieved of some of its present work, which, according to report, is found to be too heavy for prompt despatch. As to how the business now concentrated would be carried on when divided, we need not speculate until one or other of the projects referred to begins to take definite shape.

**The Private Bill Legislation of the Past Session.**—During the session just closed, 272 Private or Local Bills were submitted to Parliament; and of these 231 were passed, and received the Royal assent.

**American Coal for Europe.**—According to a telegram, dated last Friday, received through Reuter's Agency, the steamers *Trevanian* and *Rathmoor* have been chartered to carry coal from Philadelphia to France; and it is stated that five more will be chartered for the same purpose.

**Gas and Electricity Works in Germany.**—On the 1st of March last, Germany possessed 652 electricity works, against 489 in 1899; while 122 were in course of erection, and 17 were expected to start in July. The number of gas-works still exceeds that of electricity works; but 900 places have the electric light against 850 illuminated exclusively by gas. Gas-engines are used for supplying the power in 29 works.

**Manchester District Institution of Gas Engineers.**—The 123rd Quarterly Meeting of the Institution will be held at Ripon next Saturday. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich), that on arriving, just before noon, the members and friends will be driven to the Crown Hotel, where luncheon will be served. After this, the small amount of business on the agenda will be transacted under the presidency of Mr. T. N. Ritson, Assoc.M.Inst.C.E., of Kendal. The party will then proceed to the gas-works of the Corporation, over which they will be conducted by the Manager (Mr. E. E. J. Anderson). In the afternoon, they will drive to Fountains Abbey, and spend a little time in the inspection of these interesting ruins. On returning to Ripon, opportunity will be afforded, by permission of the Dean, to visit the Cathedral. The Mayor (Mr. R. Wilkinson) will entertain the members to tea. Ripon will be left soon after six, and Manchester reached by about half-past eight.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 486.)

THERE WAS a fairly marked improvement in the general aspect of things in the Stock Exchange last week. There was a moderate recovery from the previous state of stagnation; but anything like an approach to activity was not to be expected at this time of the year. Prices generally inclined in the upward direction, influenced by a more comfortable feeling in regard to Chinese affairs, and by the easier condition of the Money Market—Consols leading the way in obedience to the latter factor. There was a little inclination to fall back on Friday while closing down for a holiday the next day. The settlement was light and free from difficulty. The Money Market has eased to a remarkable degree; large arrivals of gold having quite undermined previous rates. Business in Gas has been more active than in the preceding week, as, indeed, it could scarcely help being; but beyond this there was evidently a better feeling in regard to values. Not that prices have risen to a marked extent—the volume of business done giving no scope for any strongly pronounced movement; but there were signs of a good undercurrent setting in the upward direction. A number of issues were marked *ex div.*, and in almost all the attendant variation in quotations was favourable. In Gaslight issues, the ordinary was moderately dealt in at advancing figures; so that, from 98 *cum div.*, it closed at 97½ *ex div.* But the maximum was put down a point. South Metropolitan was buoyant also, advancing from 127½ *cum div.* to the same figure *ex div.*, or a difference of £2 13s. 4d. Commercial was steady at good middle figures. Very little was done in the Suburban and Provincial Companies; but Brentford, Bromley, and Crystal Palace were all higher *ex div.* The Continental group was extremely inactive, but with a firm tendency; and Imperial advanced a couple of points. Among the rest, Buenos Ayres was lower, and River Plate higher. Changes in Water were few and unimportant; but New River shows an improved dividend of 14 per cent. per annum, or, to be exact, £6 19s. 5¼d. for the half year.

The daily operations were: Gas stocks were not very active on the opening day; but prices were good. South Metropolitan rose 1; but Buenos Ayres debenture fell 1. In Water, Southwark rose 2; but West Middlesex debenture fell 1. Tuesday's dealings were quieter; and prices did not move. On Wednesday there was a shade more activity; and River Plate rose ½. Many *ex div.* advances were made. Thursday's business was about on the same level. Gaslight ordinary advanced 1, but ditto maximum fell 1. Business eased down on Friday; but prices were good. Imperial rose 2. The Exchange was closed on Saturday.

### THE WORKING OF THE EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION ACTS IN 1899.

THE Home Office have recently issued a report giving such statistical information as it has been possible to collect with regard to the working of the Employers' Liability Act, 1880, and the Workmen's Compensation Act, 1897, during last year. As the latter Act only came into force on July 1, 1898, the statistics for that year were merely fragmentary, and did not provide any real basis for a judgment as to the working of the measure. The present return, therefore, contains the first statistics of proceedings under the Act for a complete year, and is also the first return in which the statistics of cases under the Employers' Liability Act show the effect of the new legislation upon the old. The Workmen's Compensation Act, while it provides for complete returns being made to the Registrar of Friendly Societies with regard to the schemes certified by him, contains no provision for any returns as to the general working of the Act. The Home Office, however, obtain and tabulate complete returns as to the cases which come before County and Sheriff Courts, and as to those cases where memoranda recording agreements as to compensation, and awards by private arbitrators or committees, are registered in the Courts. They further obtain particulars of cases carried to appeal in the Supreme Court and the Court of Session; particulars of references made by the Courts, arbitrators, and Committees to the Medical Referees; and, in addition, statistics and general information from the Chief Registrar of Friendly Societies as to mutual schemes certified by him.

While the returns compiled from these sources contain much information of interest, they leave untouched, as the Home Office report points out, the great body of cases under the Act. In the majority of cases—compensation being settled by agreement or informal arbitration, and no memorandum being registered—no official information whatever is available. The most that can be done is to draw certain inferences as to the number and character of such cases from the statistics of the proceedings before the County Courts, and from the statistics of accidents reported. As with the 1897, so with the 1880 Act. Official information is available only with regard to those cases which are made the subject of legal proceedings. There is no direct information as to the cases—presumably much more numerous—which are settled without litigation.

The first table in the return shows the number of cases under



the Workmen's Compensation Act dealt with in England and Wales during the year 1899, by County Court Judges and arbitrators. The total number settled by these officials during the year was 999, of which 828 were decided by award of the Judge, 98 by award of an arbitrator appointed by the Judge, and 73 by acceptance of money paid into Court. There were, in addition, 348 cases brought before the County Courts which were afterwards withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the results to be definitely stated. Of the 999 cases finally settled within the cognizance of the Courts, the decision in 753 cases was for the applicant, and in 246 for the respondent. In 317 of the cases in which compensation was granted, the award was a lump sum, and in 418 a weekly payment; while of the remaining 18 decisions in favour of the applicant, 13 related to cases of applications for termination or redemption of weekly payments, 2 were cases in which only a declaration of liability was made, and 3 were cases in which the amount of compensation was not settled.

The 317 awards of lump sums comprised 225 in respect of death and 92 in respect of injury. It is a remarkable fact that in only 6 of the 225 cases of death were no dependants left by the deceased. In the remaining 219 the total compensation awarded amounted to £37,905, or an average of just over £173 per case. This is less than the average (£200) for the six months of 1898 during which the Act was in force; but the figures for that period were too small to give a trustworthy average, and, indeed, it would be well to await the statistics for one or two more years before assuming any figure to be a reliable average. As has been said, there were 92 cases in which the compensation for injury took the form of a lump sum. In 12 of these the plaintiff accepted money paid into Court; in the remaining 80 a lump sum appears to have been awarded in lieu of weekly payments, by mutual consent of the parties. The total amount of these awards was £2955, or an average of £32 odd in each case.

Of the cases of injury in which a weekly sum was awarded, 169 were cases of total and 249 of partial incapacity. The average weekly allowance in the former was 10s. 11d., in the latter 9s. 2d.—figures comparing with 11s. 4d. and 12s. 10d. respectively for the last six months of 1898. It was noticed, as a curious fact, at the time that the figures for 1898 were published, that the average award for partial was higher than that for total disablement. This result appears now to have been accidental, and not normal; the figures for 1898 being too small to furnish a true average.

The second table gives the number of cases in which memoranda were registered in the County Courts, and shows which were settled by agreement, which by committee, and which by arbitrator. The figures are 651, 89, and 23 respectively. These numbers represent only a very small proportion of the agreements under the Act, and of the decisions of committees and informal arbitrators. Apparently, it is still considered unnecessary in most cases to go to the trouble of registering memoranda—indeed, nearly one-half of all those registered were reported from two adjoining County Court districts in the North Riding Circuit, showing that it has been the regular practice to register agreements in these two districts and nowhere else. The average compensation awarded under registered agreements to dependants in cases of fatal accidents was rather less than £174, or but a few shillings more than the average awarded by adjudication in the County Courts. The average weekly payment agreed to in cases of total disability was 12s. 3d.; and in cases of temporary incapacity, 11s. 6d.

The third table gives the figures relating to proceedings under the Employers' Liability Act in as nearly as possible the same form as those in Table I.—relating to the Act of 1897. In the case of the 1880 Act, the tabulation is simpler—first, because all cases except those removed to the High Court are decided by the County Court, there being no arbitrators; and, secondly, because the damages awarded can always be stated as a lump sum. For the purposes of comparison, the cases under each Act have been arranged in six groups according to the employment in which the accident occurred; a seventh being added in the tabulation of the actions under the Employers' Liability Act for accidents in employments not covered by the 1897 Act. In the aggregate, the actions in County Courts under the Employers' Liability Act show a reduction from 681 cases in 1898 to 505 in 1899; while the damages awarded decreased from £16,853 to £10,680—a reduction of 36 per cent., as against 26 per cent. in the number of cases. From the sub-division into employments, it would appear that in mines the Workmen's Compensation Act has practically superseded the Employers' Liability Act, and in employment on railways has taken about half the cases; while in factories, quarries, buildings, and engineering works, the reduction in cases under the 1880 Act has been comparatively small, though nearly 80 per cent. of the actions brought under the 1897 Act relate to accidents incurred in these employments.

The average amount of compensation awarded in respect of fatal injuries under the Employers' Liability Act was about £115, as compared with £173 awarded under the Workmen's Compensation Act. The awards under the two Acts in respect of temporary incapacity are not comparable. The average amount of solicitors' costs was £11 14s. 6d. under the new Act, as against £21 2s. 3d. under the Act of 1880.

The fourth table, showing the number of cases dealt with in the individual Courts, does not call for much comment. In England and Wales, the Bow County Court dealt with more claims than any other—a fact not surprising, when it is borne in mind that

the Bow Court is situated in the heart of the East-end factory district, and has within its jurisdiction the Docks and other river-side industries of the Metropolis. So, in the case of Scotland, it is the factory-studded, shipping, and commercial city of Glasgow in whose Sheriff Court the greater number of cases are brought; the total under both Acts being, indeed, 50 per cent. higher than in the case of the Bow Court. There were 285 County Courts out of a total of 505 in England and Wales in which no case was brought under either Act. These would, of course, be in the agricultural districts principally.

To turn to the statistics as to appeals—of which so much is made in the Press by the enemies of the 1897 Act—we find that the number of cases carried to the Court of Appeal in England was 54, or only 4 per cent. of the actions brought before the County Courts. Of these appeals, 23 were brought by workmen—in 5 cases successfully—and 31 by employers, who were successful in as many as 12 cases. The appeals under the Employers' Liability Act numbered 21 in England and Wales. The figures for Scotland are: 51 cases under the 1880 Act, and 18 under the 1897 Act, carried to the Court of Session. The table of appeals under the Workmen's Compensation Act appended to the report is a very useful one; a brief note of the point in the Act on which the appeal arose being given where possible, while a reference is made in each case to the fullest available report of the proceedings. From this table, some idea can be formed of the provisions of the Act which have given rise to most litigation. Taking the English, Scotch, and Irish lists, there are 69 cases in which the point at issue is stated, including 11 which are noted as involving two points each. In 26 out of the 69 appeals, the question that arose was whether the workman's employment was one to which the Act applied. In 18 of these cases, its application to a factory was in dispute, in 5 its application to a building was questioned, while the 3 remaining cases had reference one to a railway and two to engineering works. In 13 instances the critical question was the meaning of the words "arising out of, and in the course of, his employment;" while, moreover, in five of these thirteen, as well as in two other cases, the meaning of the term "serious and wilful misconduct" was at issue. Six appeals turned on the question as to who are the "dependants." The remaining cases arose out of various points in the Act—three as to the meaning of "personal injury by accident," two each as to those of "average weekly earnings" and "incapacity for work," and so forth.

The number of Medical Referees appointed under the Act at the end of last year, was 321. Their office may, however, be said to be practically a sinecure; only 43 references being made to them during the whole of 1899 by Judges, arbitrators, or committees. No figures are available as to the number of appeals by workmen to the referees under the first schedule (par. 11) of the Act; but the number is believed to have been very small. The proceedings of the Chief Registrar of Friendly Societies under the Act were noticed fully in the "JOURNAL" for the 31st ult.; and no further allusion to them is here necessary.

The returns relating to the working of the Acts in Scotland are remarkable for two special features. The first is the much larger amount of litigation entered into under both Acts in Scotland as compared with England. Taking as the basis of comparison the number of cases per million of population, the figures are: In England, 46 cases under the 1897, and 17 under the 1880 Act, as against 72 and 36 cases per million of the population respectively in Scotland. This disparity, says the report, is not easily to be accounted for, as, although it is true that private arbitrations are practically unknown in Scotland, there is no reason to believe that this method of settlement has been extensively adopted in England. The compiler of the report, however, we think, fails to attach sufficient importance to the large number of cases settled in the latter country by committees elected by the employers and their men. For while it is noted that in England 89 awards by committees were registered, the remark is added—as if to imply that such method of settlement was far from general—"but these came, as already noted, from four districts only." May not the inference be that it is the process of registration, rather than the method of settlement by committee, that is confined to the districts in question?

The second special feature in the Scotch returns is the small proportion of litigated cases in which the workman was successful. Under the Workmen's Compensation Act, the workman in England obtained definite judgment in his favour in 56 per cent., and the employer in 18 per cent., of the cases before the County Courts. In Scotland, the percentages were 34 in favour of the workman, and 28 in favour of the employer. It is probable that the difference is partly due to the larger number of cases settled in favour of the workman "out of Court;" but this does not fully explain the remarkable disparity between the statistics for the two countries—a disparity equally marked, in the case of actions under the Employers' Liability Act.

As to the general conclusions to be drawn from the statistics given, the report observes truly that it would be a serious mistake to treat the cases which come before the County Courts as representing any considerable proportion of those in which compensation is claimed or paid under the Act. The great majority of claims are settled by agreement; only a small percentage being carried to formal arbitration. In the case of deaths, the claims are for considerable sums, and are therefore more frequently carried into Court. Nevertheless, out of a total of 2053 deaths from accidental injury sustained during employment in railways, factories, mines, and quarries during 1899, only 319 claims, or



about 15 per cent., were adjudicated upon in the County Courts. In regard to non-fatal injuries, no official figures are available which would give even a rough idea of the number of accidents coming within the scope of the Acts; but there are unofficial figures with regard to mines (supplied by some of the Miners' Relief Societies) from which it has been calculated with approximate accuracy that the total number of miners disabled during the year, for periods exceeding 14 days, is at least 70,000. The number of cases under both Acts, in which compensation was claimed by miners in the County Courts was only 130, equal to a percentage of 0.2, or one case for every 500 accidents. In other employments, where machinery for the automatic settlement of claims is less generally existent, the proportion of contested claims is doubtless higher; but there seems to be reason to think that the Home Office calculation, made before the Act came into force, that 150,000 accidents would annually fall within its scope, is too low rather than too high. Even at this figure, however, the proportion of litigated cases is less than 1 per cent.

### THE TECHNOLOGY OF ACETYLENE.\*

OUR recent brief reference (p. 345) to Professor Lewes's new work on "Acetylene" indicated our appreciation of the manner in which author and publishers have united in an endeavour to place before the public a volume of goodly proportions on the technology of acetylene. We said enough then to show that the publishers have done their part in the preparation of the book extremely well. The type renders reading an agreeable task; and the side notes in red ink assist reference to the text. Professor Lewes is so well known to our readers as an authority on all matters connected with the acetylene and carbide industries that it is scarcely necessary for us to commend the successful manner in which he has dealt with his subject in this work, which, as he points out in the preface, is by far the most pretentious text-book on acetylene so far published in the English language.

The first chapter on "The History of Acetylene," from its discovery in 1836 by Edmund Davy to its commercial application about 1895, is interesting. The vexed question of the priority of the discovery of the production of calcium carbide by means of the electric furnace is discussed at considerable length. One interesting contribution to the controversy is a statement that in 1886 and 1887 lads employed in works where aluminium was made in electric furnaces "used often to amuse themselves in the dinner-hour by putting water on the old crucible linings and igniting the gas which was set free." If only one of these lads had submitted the old crucible linings to a distinguished savant, as later Mr. T. L. Willson submitted his calcium carbide to Lord Kelvin, for investigation, the world would probably have had the benefits of lighting by acetylene some years before either Moissan, Willson, or Borchers announced his production of calcium carbide in the electric furnace! Professor Lewes prints the correspondence which passed between Mr. Willson and Lord Kelvin in the autumn of 1892, and finally comes to the conclusion that the world owes "commercial acetylene" to Mr. Willson and the shrewd business men who supported him.

It is now well recognized that Mr. Willson was really the first to foresee the immense commercial possibilities of acetylene obtained from calcium carbide; but it is equally clear that M. Moissan gave to the world the first explicit account of the formation of calcium carbide in the electric furnace. But to M. Moissan calcium carbide was only one of a series of products which his world-renowned researches with the electric furnace had revealed; and he investigated its properties with the same zeal and thoroughness as he bestowed on compounds of which the commercial value at present seems quite negligible. Thanks chiefly to M. Moissan's disinterested work, the manufacture of calcium carbide by means of the electric furnace can be pursued freely by anyone in almost all countries; while Willson, Bullier, and others sought only to secure patents which would have placed the control of carbide manufacture completely in their hands.

Professor Lewes clearly thinks Mr. Willson's claims to priority of the discovery of the method of producing calcium carbide in the electric furnace well substantiated, for throughout this book he refers to Mr. Willson with almost painful re-iteration as the "discoverer" of the method. He quotes at some length the evidence presented in opposition to Mr. Willson's application in 1896 for a Special Act of Parliament to antedate his English patent; but he omits to add the significant fact that the application was refused. Moreover Professor Lewes, in a list of carbide works at present running or in course of construction, fails to name any works in Great Britain except those at Foyers, which belong to the Company which acquired Willson's English patent rights. In respect of other countries, the list is a tolerably complete one; and we are surprised that works such as those at Blackburn and Cradley Heath, and those at present under construction in North Wales, are omitted from it. If the author's impartiality were not beyond question, these omissions would seem intentionally misleading.

The list of carbide works on pages 316-19 to which we have just referred happens to be one of the parts of the book where the proof-sheets appear to have escaped Professor Lewes's revision. Among numerous other errors in it (apart from the mere omission or misplacement of accents) we notice "sur la Rhone" for "sur le Rhône," "Kend" for "Lend," "Ing." for "Ind." (i.e., industrie), "Lauffen-a-M" for "Lauffen-a-N." (i.e., "Neckar"), "Société Electrochimie" for "Société electrochimique" and "Haur Gresivandan" for "Haut Grésivaudan;" while the polyglot expression "Electrochemische Works" is calculated to send a shiver through the least sensitive reader. In the Italian list we notice "Oberitalien" and "Distrikt"—words which are neither Italian nor good English; and "bei" seems out of place in the Norwegian list. English readers would also have recognized "Vienna," "Carinthia" and "Geneva" more easily if they had been so printed instead of appearing in German guise as "Wien," "Karnten" [Kärnten], and "Genf." We wonder if the works of 2000-horse power named under the heading "Russia" as "Hämeskosky Aktiebolag, Wiborg, Finland," is distinct from the 3000-horse power works given under the heading "Finland" as "Hamekoski Aktiebolag."

The second chapter is on the "Preparation of Acetylene," and is divided into five sections, of which the first four treat of methods of preparation of academical and scientific, rather than of technical, importance. The fifth section deals with the preparation by the interaction of carbides with water. A laboratory method for the preparation of "pure" acetylene is described. The purification of the gas which is evolved by dropping granules of carbide, a few at a time, into water, is effected by passing it through a wash-bottle containing a 3 per cent. solution of sodium hypochlorite, and through a tower containing moist sodium hydrate. Mr. Blagden's recent research (see "JOURNAL," Vol. LXXV., p. 1718) on the action of acetylene on sodium hypochlorite indicates that purification by means of a solution of that salt causes contamination of the gas. This is objectionable, even though the gas is subsequently passed through sodium hydrate, as Professor Lewes recommends. The illustration given of the apparatus suitable for the production of pure acetylene by this method does not tally with the accompanying description. The carbide admission tube is shown terminating considerably above the tubulure which serves as the exit for the gas from the generating flask; whereas the description quite properly states that this tube should extend below the level of the tubulure.

The third chapter is on the "Properties of Acetylene," and is naturally one of the most important in the book. The heat of formation is given as a positive instead of a negative value—thus making acetylene appear to be an exothermic instead of an endothermic compound, as Professor Lewes afterwards correctly describes it. The degree of solubility of the gas in various liquids is given from the researches of a number of authorities; but, curiously enough, the values obtained by Dr. E. Müller in the Carlsruhe laboratory (see "JOURNAL," Vol. LXXI., p. 1385) are not alluded to, though in the case of brine at least they differ appreciably from the figures recorded in this work. The most instructive series of researches on the explosive properties of gaseous and liquid acetylene, made by MM. Berthelot and Vieille, are described by liberal extracts from their original memoirs.

The fourth chapter treats of the "Chemical Reactions of Acetylene." The author's researches on the action of heat on acetylene are recorded, as are also the subsequent researches of Herren Haber and W. von Oechelhaeuser. The account given of the latter is virtually a reproduction, word for word, of large portions of the translation which appeared in the "JOURNAL" of the German memoir (see "JOURNAL," Vol. LXIX., pp. 349, 589), though we find no acknowledgment of this utilization of our columns. The continuity of the translation, however, is broken at two places by the omission by Professor Lewes of two passages in which damaging criticism is levelled against his observation of the decomposition of acetylene with luminescence, and his method of measuring temperatures. Later in the work before us, however, Professor Lewes attempts to explain the discrepancy between his own and Dr. Haber's observations on the occurrence of luminescence in the decomposition of acetylene. The compounds of acetylene with copper, silver, and other metals are discussed at great length, and voluminous extracts from the memoirs of their investigators are given. Then follows an account of Gréhan's and the other researches which go to prove that acetylene has but feeble toxic properties.

This concludes the chapter and Part I. of the book. This part is more especially devoted to the "scientific side of the preparation and properties of acetylene, while the second part deals with the technical developments of the last few years, considered from a scientific standpoint." From this and other statements in the preface, we understand that the second part is more particularly intended to enlighten and help the practical man engaged in the construction of generators or other acetylene plant. Certainly few men of this stamp would be greatly tempted to study closely the discursive disquisitions on the early history of acetylene and the academical researches of innumerable investigators. A summary of the matter in Part I., occupying not more than one-tenth the number of pages would have been more acceptable to the practical man, and if accompanied by references to the author's authorities would have equally well met the wants of nearly all others who are likely to use the work.

Chapter V., with which the second or more essentially practical

\* "Acetylene, A Handbook for the Student and Manufacturer." By Vivian B. Lewes, F.I.C., &c., Professor of Chemistry, Royal Naval College, Greenwich, Chief Superintending Gas Examiner to the Corporation of the City of London, &c., &c. With 228 Illustrations. Westminster, Archibald Constable and Co., Limited; 1900.



part of the book commences, treats of the electric furnace. Almost immediately, however, the practical generator maker, or other reader, would find himself in difficulties in attempting to follow the author's remarks on the formation of carbides. The production of carbides by heating "the oxides of the alkaline earths" (*sic*!) with potassium is explained in the following lucid terms (p. 174): "All (*i.e.*, Wöhler, Travers, and Maquenne) produced carbides by making a mixture of the oxides of which the carbide was required with another metal having an affinity for oxygen, which, if the fusing point of the mass is attained, takes the oxygen from the oxide and sets it free in a condition favourable for its combination with carbon."

Really Professor Lewes must have underrated the intelligence of his readers to place before them such statements as, "oxides of earths," "carbide of oxides" and "oxygen which takes the oxygen from the oxide and sets it (oxygen?) free." Incidentally, it may be observed that oxygen, whenever set free, is usually "in a condition favourable for its combination with carbon." The practical man may pass on, after he has assimilated such explanatory remarks, to the descriptions of a large number of electric furnaces, illustrations of nearly all of which are given. Strangely enough, there is no illustration of the furnaces used at the important works at Froges, near Grenoble, though later in the book, the author refers to the good quality of their output in these terms: "One of the purest carbides analyzed by the author was a run carbide from Froges" (p. 314). Readers of the work could better dispense with the figures of some of the obsolete and worthless furnaces than with a figure of the Froges type of furnace.

Chapter VI. is headed "The Manufacture, Properties, and Impurities of Calcium Carbide." We wonder what the practical man, who ought not to be expected to fill up the lacunæ in the author's sentences from his own scientific knowledge, will make of this passage, which occurs near the commencement of the chapter: "Some carbide makers lay great stress on the absence of sulphates from the lime; but, in the absence of aluminium, the presence of sulphates in small quantities is of no importance, as, unless aluminium sulphide is formed in the carbide, it will not find its way into the acetylene as sulphuretted hydrogen in any large quantity." The "it" which we have italicized doubtless is meant to refer to sulphur; but there is absolutely nothing in the sentence, or the context, to indicate this to the average "student and manufacturer" for whose assistance the work is intended. The amounts of ash, sulphur, and carbon in a number of samples of coke are stated shortly afterwards; but no indication of the origin of the samples is given, and as in a subsequent table of analyses of coke ash, samples of English origin are conspicuous by their absence, we wonder if this part of the book has any direct practical value to English manufacturers. In any case, it would have been more satisfactory to have had a statement of the origin of each sample of coke of which an analysis is given.

In the first line on p. 279, we find in connection with the use of briquettes of charcoal and lime, another "it" which appears to have no relation to anything before or after it; and we are quite at a loss in this instance even to guess the author's meaning. On p. 307 we are told that the smallest trace of carbon monoxide free in the air produces intense headache. If this were true, the workers in the Inner Circle railway tunnels of the Metropolis would be chronic sufferers; whereas in fact they enjoy the best of health. We see on p. 311 that the author informs his readers that the best method of utilizing the dust and smalls produced in breaking up the ingots of carbide is one devised by himself, and we are glad to be able to add that the seeming egotism is quite pardonable, as his method is both ingenious and very good. It consists in receiving the dust from the sieves in dehydrated tar, with which it forms a pasty mass, from which briquettes are moulded. The briquettes are heated to a temperature at which the volatile components of the tar distil off; and they are then sold for the generation of acetylene, of which they yield about 4 cubic feet per pound. We notice that at a works which is fortunate enough to secure coke at 12s. 6d. per ton (at the present time so low a price seems past hoping for) and lime at 12s. per ton, and water power at a rental of £2 per horse power per annum (1000-horse power being rented), Professor Lewes estimates the cost of one ton of packed carbide to be £8, which we believe agrees with earlier trustworthy estimates of the lowest probable cost of production. The various processes which have been proposed for the production of carbide without the aid of the electric furnace are considered; but Professor Lewes quite rightly regards them as unpromising.

The seventh chapter is on "The Generation of Acetylene;" and a large number of generators are described by the aid of illustrations. The majority of these were exhibited at the Acetylene Exhibition at the Imperial Institute in 1898, and were critically discussed in our columns at the time. We notice that Professor Lewes no longer divides acetylene generators into three classes, as he was formerly wont to do, but speaks only of the two main types which are distinguished by whether it is the carbide or the water which is in excess during the operation. It is, of course, convenient to make subdivisions of the generators of each of these primary types; and Professor Lewes follows this plan in the work before us. He speaks of an installation of acetylene lighting at the Wolverton station of the Great Eastern railway. Evidently there is a misprint here. Wolverton, as nearly all our readers will remember, is an important station and

works on the London and North-Western Company's system, while it is Wolferton which is a small station on the Great Eastern Railway. When discussing the heat evolved in different types of generators, Professor Lewes makes long quotations from a paper by Dr. Caro, of Berlin, of which we gave an abstract translation (see "JOURNAL," Vol. LXXI., p. 1380). Our translation is not referred to in connection with these quotations; but, nevertheless, they are almost absolutely identical in wording, and it is impossible that any two translators would not have displayed some differences in the style of their compositions or choice of words in rendering such long passages into English. A few pages later Professor Lewes gives a list of acetylene supply works at present in operation or under construction. This list is identical with that given in the "JOURNAL" for Dec. 5 last (p. 1374), with the exception that the statistics with regard to one town are slightly varied. The list as it is given by Professor Lewes could not have been derived from any source but our columns; but no acknowledgment is made by him of his indebtedness to us. Throughout the book the "JOURNAL" columns have been freely drawn upon, *without acknowledgment*, while other technical and scientific periodicals are named when quotations are made from them.

The eighth chapter deals with the "Impurities of Commercial Acetylene" and the purification of the gas. Here also we find extensive extracts from Dr. Caro's writings (see "JOURNAL" Vol. LXXIV., p. 940); but in this case we are glad to say the translation given is not ours, which was evidently too much summarized for the author's taste. There appears to be no great amount of original matter in this chapter, which is followed by the important one in which the "Generation of Light and Power from Acetylene" is dealt with. Here we are pleased to note that Professor Lewes at once disposes of the contention of acetylene enthusiasts that the gas is "fifteen times as valuable in illuminating power, volume for volume, as London coal gas." Numerous types of acetylene burners are described, and then we find some comments on the statutory illuminating power of coal gas. That this expresses the amount of illumination to be obtained under ordinary circumstances from the gas, was, the author says, the belief of most people up to a few years ago. "This assumption, however," he continues, "is far from correct, and has given rise to a chaotic bemuddlement in the theory and practice of illumination." The forcible, if none too elegant, expression "chaotic bemuddlement" might be applied aptly to the notions of many would-be legislators on the illuminating power of London gas. Professor Lewes afterwards expresses the opinion that a screened acetylene-jet flame would make an excellent international photometrical unit.

Chapter X. is on "The Utilization of Diluted Acetylene." The most valuable part of it is that which treats of the use of mixtures of oil gas or coal gas and acetylene for railway carriage lighting. The experiments made by Messrs. Pintsch and by Herr Borch on the explosiveness of such mixtures are recorded fully, and the results are tabulated.

Chapter XI. is on the analysis of the raw materials, and of carbide and acetylene.

We then come to Part III. of the work, which comprises three sections. The first gives in full the legal enactments of various countries with regard to carbide and acetylene. These should prove useful for reference to manufacturers, dealers, and exporters. The second section is a list of English patents granted for acetylene generators and lamps, with abstracts of the specifications. It occupies 147 pages. Professor Lewes earlier in the work states that "at the present time, in England alone, some 300 forms of acetylene generators have been patented. About 60 of these have been actually made, and half that number have attained to the dignity of being on sale." In view of this comment, we wonder why he considered it necessary to encumber his textbook with abstracts of all these patent specifications, especially when abstracts can be found in our columns and in those of some other readily accessible periodicals, by those who really find it necessary to make a search. A list merely of the numbers, titles, and patentees' names would have served every useful purpose; and the book would have been the better for the saving in pages. The third section of Part III. is an appendix of useful data. An index of 30 pages concludes this voluminous work, which we should have read with greater pleasure had its bulk been reduced by the omission of many tedious extracts from the writings of other authorities. Professor Lewes is fully competent to work the matter contained in these extracts into a homogeneous and harmonious whole with his own valuable contributions; and we are decidedly of opinion that the book would have been much improved had he followed this course.

**The Institution of Gas Engineers and the International Gas Congress.**—We hear that several members, who, in answer to the first circular issued by the Council of the Institution of Gas Engineers, signified their intention of joining the party attending the International Gas Congress in Paris, have not yet returned their application forms. It will greatly assist the Secretary if they will do so without delay. There may also possibly be other members who, at the time of sending in their reply to the first circular, could not see their way clear to visit Paris but who could now, under altered circumstances, accompany the party. If there are any such members, they should at once place themselves in communication with the Secretary.



## PERSONAL.

Mr. R. HESKETH JONES has been elected a Director of the Bournemouth Gas and Water Company.

Mr. T. B. PEARSON, Secretary of the Pontypool Gas and Water Company, has been appointed Manager, in succession to the late Colonel Hair, and will fill the combined positions.

Mr. F. W. TORPEY, who has relinquished the position of Manager of the Whitwick and Coalville Gas Company, took up yesterday his duties as Manager of the St. Ives (Hunts) Gas-Works.

Mr. S. J. SYMONDS, assistant at the Hertford Gas-Works, has been appointed, out of 60 applicants, Manager and Secretary of the Farnham Gas Company, in succession to Mr. WILLIAM WELLS, who has resigned after 42 years' service.

Alderman LLOYD HIGGINBOTTOM, of Manchester, has consented to accept the Lord Mayoralty. He has been Deputy-Chairman of the Corporation Gas Committee, and is doing good service as Chairman of the Electricity Committee.

Mr. HARRY WIMHURST, son of Mr. H. Wimbhurst, of Sleaford, who for some time has been engaged with the Elland-cum-Greetland Gas Company, has secured the appointment of Manager and Secretary of the Irthlingborough (Northamptonshire) Gas Company.

The American University of Harriman (Tenn.) has granted the degree of Doctor of Philosophy (Ph.D.), *pro meritorius*, to Mr. J. T. WESTCOTT, M.E., Manager of the Economical Gas Apparatus Construction Company, Limited. The qualifications were chiefly mathematics and engineering.

Acting upon medical advice, Alderman HUGH BELL, of Middlesbrough, has resigned his position as Chairman of the Corporation Gas Committee; having been recommended to curtail his public engagements. Mr. Bell, who was appointed to the chairmanship of the Committee in 1885, is to be asked to reconsider his decision.

Mr. W. H. G. PADFIELD, B.A., has been offered and accepted the Examinership in Mathematics at the Punjab University, in addition to his present appointment. Out of a total of eight scholarships for civil engineering and electricity, available for the whole of India, six of these were won by pupils prepared by him at La Martinère College, Lucknow.

## NOTES.

## Action of Iron on Water.

Writing on this subject in the "Chemical News," Mr. W. French, of the Bury Grammar School, calls attention to the fact, which seems to him astonishing, that modern standard textbooks on chemistry do not mention the fact of the readiness with which iron decomposes water at ordinary temperatures, with evolution of hydrogen gas. He says that in the elementary work at the school, when studying the effect of water on metals, it is always a source of much interest to observe from day to day the continued effect of water on the commoner metals. In the case of iron, when a test-tube of filings is covered with water, "red-rust" first occurs on the surface, and then beneath this rust appears the greenish-black oxide in a flocculent form, and finally bubbles of hydrogen. By suitably arranging an apparatus, a volume of gas may be collected in two weeks, using iron filings, or in a few hours if *ferrum reductum* (B.P.) is used, sufficient to demonstrate its properties. The same is true if zinc dust is employed. He finds that distilled water, recently boiled and cooled, shows an evolution of hydrogen sooner than common water; and no trace of red rust is observed if air is excluded.

## The Flow of Marble.

According to a paper by Professor Frank D. Adams, of Manchester, contributed to the Royal Society, rocks are as unstable under severe physical stress as metals and gases have long been known to be. Very little, therefore, remains on the earth of the old rigid materials and elements which were supposed to be permanent in form or substance. In Professor Adams's experiments, solid marble was made to flow like wax under the pressure of a hydraulic intensifying press, or like iron under the rolls. In both cases the motion is facilitated by the application of heat. It is unnecessary to describe the experiments in detail; but they showed that limestone or marble can be permanently deformed by pressure under certain conditions. The movement is identical with that produced in metals by squeezing or hammering. There is, therefore, a flow of marble just as there is a flow of metals, under suitable conditions of pressure. The movement is also identical with that seen in glacial ice. In these experiments the presence of water was not observed to exert any influence. It is believed, from the result of other experiments now being carried out, but not yet completed, that similar movements can, to a certain extent at least, be induced in granite and other harder crystalline rocks. The result of movements of this character are visible all over the world in the distorted crystalline strata which have attracted the attention and speculation of the earliest geologists; but this is the first time that rocks have actually been caused to flow artificially by human agency, and the result is all the more striking. The marble was not broken up in the process of

squeezing; samples that had altered in shape under the strain being found actually stronger than those unstressed. It would be curious to try the same experiment on coal.

## The Flow of Hot Water in Pipes.

An interesting experiment has been carried out by Mr. H. T. Yaryan, in connection with the hot-water heating central station at Toledo, United States. It appeared that when this undertaking was started, it was found necessary to know the relative friction of hot water in pipes as compared with cold; and there were no available data in regard to this point, which could be used in calculating the size of mains required for the supply of a given number of houses. Consequently the question was determined experimentally. A run of 450 feet of 1-inch pipe was laid down, with numerous bends, and was connected with a meter. With a constant pressure of 10 lbs., it was found that the delivery at the end of the pipe in five minutes was 6.2 cubic feet at 34° Fahr., rising to 7.9 cubic feet at 212° Fahr. As it required an average of 15 gallons per minute to be delivered to each house, and the friction of cold water in pipes was known, the data thus obtained enabled the engineer to calculate the size of mains necessary to give good service to each house, and always maintain a sufficient difference in pressure between feed and return mains to ensure rapid circulation. It transpired that in this case, the extreme length of distributing mains being three-fourths of a mile from the station, the water returns to the station with a drop of 35° Fahr. in the coldest weather. The general suitability of the method of distributing heat adopted in this example has been denied; but in certain circumstances it appears to be as successful as it certainly is convenient.

## The Occlusion of Hydrogen by Metals.

In the course of his address to the American Association for the Advancement of Science, Professor J. L. Howe discussed the phenomenon exhibited by several of the eighth group of metals (and particularly by palladium), of condensing hydrogen and other gases upon their surface. The discovery that platinum black and platinum sponge, when held in a stream of hydrogen, ignite the gas, owing to the absorption of the hydrogen by the platinum, was made by Döbereiner in 1823. Little attention, however, had been paid to the similar action of palladium upon combustible gases, until Graham in 1868 presented to the Royal Society his paper on the occlusion of hydrogen by metals. His interpretation of the phenomena is that hydrogen is a metal, and forms an alloy with the metal which occludes it; but this view was received with considerable dissent. The recent determinations of the specific gravity of liquid hydrogen by Dewar show a figure only of about one-ninth of the density of occluded hydrogen, so that the question of the nature of the hydrogen condensed by the palladium and platinum remains unsettled. The other metals of the group in the periodic system possess this property to some considerable degree, but much less than is the case with palladium and platinum. One of the earliest papers of Dewar was on the motion of a palladium plate, during the formation of Graham's hydrogenium. This paper was contributed to the Royal Society of Edinburgh in 1869. Nothing more seems to be known concerning the nature or causes of the phenomenon in question; and no modern papers relating to it are included in the proceedings of learned societies of any country. Professor Howe was content to touch upon the fact in passing, without attempting to explain it.

## The Problem of Tin.

One of the indispensable supplies for gas-works is tin, in several forms; and this metal has exactly doubled in price in two years. It is remarked in a special article on the "Problem of Tin," published in "Engineering," that tin actually presents an economical aspect difficult to reconcile with the usual platitudes about the interaction between supply and demand. For several years past, there has been an excess of market deliveries over supplies; the amount of the dip into stocks being 17,512 tons in three years. The only comfort is that the balance on the wrong side shows a decrease each year. But that is a very negative sort of consolation; the main fact which the unfortunate consumer of tin has to grasp being that his demands still keep well ahead of production, notwithstanding the heavy advance in the price. There is no tin famine to account for this shortage of market supplies, and much of the metal comes from small producers. Yet the anomalous feature of the situation is unrelieved, and the mining industry has utterly failed to respond to the stimulus afforded by an extra £70 per ton profit on the raw metal. The average annual supplies for the three years ending June, 1898, reached 62,360 tons, although the price never exceeded £70 10s. per ton. For the last two years, the annual average works out at 62,431 tons, though the price has touched £150 per ton. Even if it might be supposed that the big producers would not be disinclined to nurse so good a market, the small producers might be expected to weigh in as much as they could while the prices ruled so stiff; but this does not appear to have been done. It is reported, however, that New South Wales is making great efforts to take advantage of the present opportunity, and supplies sufficient to satisfy the market may flow in just as the best prices begin to slacken. Then the price of tin may fall by £30 or £40 per ton; but meanwhile consumers have to buy it at an exorbitant rate.



## TECHNICAL RECORD.

### THE INTERNATIONAL GAS CONGRESS IN PARIS.

#### LIST OF PAPERS TO BE READ.

We are now enabled to give a complete list of the papers to be read at the forthcoming International Gas Congress, of which mention was briefly made in the "JOURNAL" last week. The names of the authors and the titles of their communications appear in the order of the programme of questions proposed some time back for discussion. Some of these papers have already been printed for circulation among those who intend to be present at the congress, while the other communications, not received in time, will only appear after the meetings have been held. The list is as follows:—

- "Inclined Retorts." By Mr. C. E. Brackenbury, of London.
- "Mechanical Means of Dealing with Coke in the Works of the Paris Gas Company." Report by M. Louvel, of the Paris Gas Company.
- "Coal-Handling Plant." By Mr. F. D. Marshall, of Copenhagen.
- "Notes on a Retort-Bench with Independent Producers at a Distance." By M. G. Eichelbrenner, of Paris.
- "On the Measurement of High Temperatures." By Mr. Alten S. Miller, of New York.
- "Thermic Reactions during the Carbonization of Coal. Registering of High Temperatures. Details of Experiments." Report by M. Euchène, of the Paris Gas Company.
- "On the Absorption of Hydrocyanic Acid by Illuminating Gas, as an Introduction to the Question: What Progress has been made in the Manufacture of Gas in respect of the Production, by Liquid Process, of Yellow Prussiate of Potassium?" By Dr. A. Smits, of Amsterdam.
- "Production and Manufacture of Cyanides in Gas-Works." By Dr. J. Bueb, of Dessau.
- "Carburetted Water Gas: Its Use in Coal-Gas Works." By M. Henri Sospizio, of Trieste.
- "Means to be Adopted for Avoiding Naphthalene Obstructions." By Dr. J. Bueb.
- "In What Way the Normal Loss of Gas in Distribution may be Reduced to the Greatest Extent." By Mr. P. H. Gibbons, of Philadelphia.
- "Gas-Engines and their Gas Supply." M. Aimé Witz, of Lille.
- "Reduction in the Cost of Distribution by the Adoption of High Pressures." By Mr. F. H. Shelton, of Philadelphia.
- "Concerning Consumers' Meters." Opening of a Discussion on Wet and Dry Meters. By M. Bigeard, of Angers.
- "Advantages and Disadvantages of Dry Meters." By M. G. Asselbergs, of Bergen-op-Zoom.
- "Results obtained in Holland with Prepayment Meters." By M. P. Bolsius, of Bois-le-Duc.
- "Report on the Utility of Standardizing the Pitch of Screws for Gas-Fittings." By M. J. Bengel, of Paris.
- "The Photometry of Incandescent Gas." By Dr. H. Bunte, of Carlsruhe.
- "Draft of Conditions and Rules to be observed in the Photometry of Incandescent Gas-Mantles." By MM. Stœcklin, Rieder, and Co., of Mulhouse.
- "Heating and Cooking by Gas." Report by M. A. Lévy, of the Paris Gas Company.
- "Statistics of Swiss Gas-Works. Diagrams and Plans of the Gas Consumption and Town of Zurich, 1890-1899. Plan of the Gas-Works of Winterthur and Geneva." By La Société Technique Suisse des Directeurs de Gaz et Eaux.
- "Notes on the Public Lighting Arrangements of Guayaquil." By M. Charles Guichard, of Paris.
- "Comparison between the Usual Illuminants by means of Diagrams." By M. Ad. Bouvier, of Lyons.
- "Automatic Lighting and Extinguishing of Gas in High Street-Lamps." By M. F. Koenig, of Berlin.
- "Examination of the Competitive Illuminants of Gas." By M. A. Lecomte, of Paris.
- "La Lumière Globe." By M. Ernst Salzenberg, of Crefeld.
- "Means of Interesting Stokers in Retort-House Work." By M. I. Hedde, of Paris.
- "The History, Character, and Results of the Educational Fund Instituted by the American Gaslight Association for the Technical Instruction of Gas Workers." By Mr. Alfred E. Forstall, of New York.

It will be seen from the above that a large amount of ground is covered by the subjects chosen, and many of the papers offer considerable opportunities for the exchange of international ideas, which may be not only of passing interest, but also of some permanent use generally to the gas industry.

### NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

#### Annual Meeting at Sligo.

The Annual Meeting of the above-named Association was held in the Town Hall, Sligo, last Tuesday—Mr. C. B. TULLY, Engineer and Secretary of the Sligo Gas Company, the President for the year, in the chair. There was a fairly large attendance.

#### THE REPORT OF THE COMMITTEE.

The HON. SECRETARY (Mr. J. Whimster, of Armagh) submitted the report of the Committee. It opened with an expression of regret at the loss by death of two of the extraordinary members—Mr. J. Bain, of Glasgow, and Mr. C. S. Spear, of Dublin—to whose memory a fitting tribute was paid for their geniality and hospitality. Reference was made to the difficulty experienced in getting papers for the meeting; but the Committee hoped that the inspection of plant for which arrangements had been made would prove as interesting and instructive as literary contributions. After the programme was issued, however, two papers were promised. The Committee trusted the proposal to change the name of the Association would elicit a frank expression of opinion from the members. The Association now possesses 64 ordinary, 24 extraordinary, and 2 honorary members; making a total of 90. The accounts accompanying the report showed that the income for the year was £60 16s. 11d.; and that the balance in hand at the close was £33 7s. 5d. The subscription on behalf of the widow and family of the late Mr. P. J. Salmon amounted to £13 3s. Details were appended to the financial statement.

The report and accounts were adopted.

#### PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

#### INAUGURAL ADDRESS.

In addressing to you a few remarks on the position and prospects of our Association, and the business with which it is most intimately concerned, I conceive it to be my first duty to return you my sincere thanks for the honour you conferred on me in electing me President of your Association for the year which has now drawn to a close. My next duty is to welcome you as representatives of a most important industry to the most important and promising centre of trade in the West of Ireland, the town of Sligo; for I need not point out to you that the railway and shipping accommodation of Sligo are such as necessarily place it in a favourable position for trade and traffic. In this connection, I cannot help referring with regret to the lamented death of the late Mr. C. S. Spear, who was our genial host at our annual conference in Dublin last year, and whose unexpected death we all deplore sincerely. We also miss another old friend of the Association in the late Mr. John Bain, who was so well known to us all.

With regard to our Association, it is satisfactory to be able to announce that there has been a considerable increase in the list of members during the year; and I think we may look forward to a still greater increase in the near future. This is eminently satisfactory; for it is only by intelligent co-operation and combination, and comparing notes, so to speak, between those whose circumstances and surroundings are obviously different in different localities, that a clear conception can be formed of the lines along which general progress lies. I may say here that the remarks and suggestions I have to make are intended chiefly for the smaller gas-works, such as we have in the provincial towns of Ireland.

One of the most serious questions with which all of us have had to deal during the past year is the advance in the price of coal. I think, however, that the seriousness of this matter has been considerably over-estimated. In the first place, we have a partial set-off in the increased price of coke and other marketable residuals. Again, in accordance with the adage that "Necessity is the Mother of Invention," there is a material benefit to be derived from the efforts we are obliged to make to meet the extra cost; and I am sure, by putting our energies to work and adopting some of the modern ideas of gas manufacture and distribution, we can all do something to counteract the excessive cost of coals. For my own part, I have endeavoured with fair success to do this—(1) By perfecting the retort settings. (2) By the adoption of machinery for charging the retorts. (3) By the introduction of a carburetting plant for enriching the gas and obviating the necessity for using cannel coal for this purpose.

I was surprised to find, during my travels last summer, two towns, at least, in Ireland where iron retorts were, and are still, in use—one town with a population of over 4000 inhabitants. Surely it is time that these were superseded by clay retorts. The saying, "Money is Made in the Retort-House," is more applicable than ever; and capital spent on good settings will very soon repay itself. Expensive systems of regeneration are unnecessary; but a cheap form of shallow generator, with a secondary air supply, which could be adapted to the smallest works, will give very satisfactory results. Most makers of retorts supply working drawings on application; and any intelligent man accustomed to the work would find no more difficulty in building a generator furnace and setting than the direct-



fired setting. Of the many advantages to be derived from the adoption of this system, one of the most important is that the hot coke can be drawn directly into the furnace after clinking, and a great saving of heat thus obtained.

It is impossible to get additional men during the heavy season to do the same amount of work, and with as good results, as the constant, regular men; and we have invariably had to work during the winter season with raw hands, with the result that the make per mouthpiece falls off, and the consumption of coke per ton of coal increases. To overcome this difficulty, I have adopted Messrs. Biggs, Wall, and Co.'s "Rapid" charging-machine; and from what I have seen of its working, I expect to get at least 50 per cent. more coal carbonized per mouthpiece during the winter, which will result in a corresponding increase in coke sold per ton. Besides, we shall not be depending upon skilled shovel chargers, and shall have a larger scope for the selection of men. I am not so anxious to economize wages as to obtain good results in manufacture.

It had been the practice in Sligo for some few years to enrich the gas during lighting hours up to 16 to 16½ candles with cannel, and to send out gas during the day of about 15 candles. This arrangement was uncertain, and sometimes unsatisfactory; so last summer a small carburettor was fixed at the station governor, and cannel dispensed with. The first day's trial proved the value of this arrangement; the apparatus being switched on half-an-hour before sunset and worked until 11 p.m. The gas during that time was enriched up to 18 to 18½ candles, costing 2s. 6d. per day, and replacing 1 ton of cannel. The apparatus is working with such satisfactory and certain results that I should be very sorry to dispense with it. The anxiety as to the illuminating power of the gas in the retort-house is a thing of the past.

Too much importance cannot be attached to the washing of the gas and the thorough removal of the ammonia. I am sorry to say many works I know make no attempt to remove this impurity, with the result that their meters and fittings are destroyed in a very short time. At a meter-works some few months ago, I happened to notice a dry meter smothered with tar; and I naturally asked where it came from. I was informed Ireland; and my informant told me that they got a great number from Ireland in that condition, and they only lasted a very few years. Now this is a state of things that should not exist, and could be remedied at a very small expenditure.

An exhauster driven by a gas-engine, with a small pump attached, for circulating the ammoniacal liquor for washing the gas, could be adopted with advantage and profit at most small gas-works. Any capital expended in this direction will repay itself in a very short time.

I did not intend to go into the details of the purification of gas, &c., but I am aware that at many works the purifying plant is hopelessly small. The system I adopt is to use lime in the first of the series of purifiers, and oxide in the remainder. The gas entering the first purifier contains both carbonic acid and sulphuretted hydrogen, and these gases at first combine with the lime; but the lime having more affinity for carbonic acid than sulphuretted hydrogen, the sulphuretted hydrogen is gradually being replaced and driven forward to the oxide purifiers, thus enabling the lime to be completely converted into carbonate, which can be tested by simply bubbling the gas through lime water for a minute. If carbonic acid is present, the lime water will become cloudy. Fortunately, none of us are worried with the removal of other sulphur compounds.

As water gas is at present making great headway on the Continent and in this country, no doubt in the near future it will form a very important addition to our business. Some time ago I went into the subject, and decided, with Professor Lewes's consent, to construct one of his methane hydrogen water-gas generators, capable of making 50,000 cubic feet per day. It is possible with this plant to make methane hydrogen water gas, carburetted water gas, or straight water gas at will. It is intended mixing this gas with the coal gas at the outlet of the hydraulic main, with a view to picking up any light hydrocarbon, and passing it on to the gasholders, and enriching it up to 18 candles or so at the station governor, by means of a carburettor using benzol or light naphtha. My reasons for adopting Professor Lewes's plant were owing to the similarity of the gas to ordinary coal gas, and to the fact that it contains only half the quantity of carbon monoxide; and the fact of the methane hydrogen water gas being a particularly good diluent for acetylene, also holds good for benzol or naphtha. It can be started at an hour's notice; and will enable us to fill up the holders at any time, and obviate the necessity for curtailing the supply or lighting up beds of retorts. We can also use up our coke when the demand is bad, and so maintain a steady price. At present, petroleum is being used in the plant; but at an early date it is proposed to erect a small tar plant to distil our own tar (and any obtained from the neighbouring works) for light naphtha, oils, and pitch—the naphtha being used for carburetted, the oils for the water gas, and the pitch being sold, for which there is a good demand at high prices. I have been engaged for some time experimenting with peat for various purposes; and from results so far obtained, I am confident that a generator could be designed to utilize this abundant source of carbon, instead of importing coal for the purpose.

Unaccounted-for gas has been always a fruitful source of annoyance to all of us. This may be caused by leaky mains,

decayed services, neglect to water meters, and public lighting. When I took charge in Sligo, the unaccounted-for gas was 60 per cent. The gas was shut off during the daytime, with the result that the lamplighters saved themselves the trouble of turning off the lamps. Consequently the mains got full of air, and the services laid, and the gas-fitting done, were not tested; so, naturally, leakage increased.

As we are not afflicted with expensive wood pavement or asphalt, but only common macadam, I decided that the cheapest and most certain and satisfactory mode of curing the leakage was to open up the mains and services. Contracts were let for stripping the mains and filling in and ramming the trench, at 1s. 3d. per perch (7 yards); and for laying, leading, and caulking 3-inch to 6-inch pipes, 2s. 6d. per perch. The mains were found to be broken in several places, especially over sewers, and many joints were found uncaulked and leaking at the bottoms. Most of the services were decayed and leaking; and in several cases as many as three services were found in one house. I maintain that this is the cheapest and only satisfactory method of remedying a serious case of leakage. Having reduced the leakage, the next step is to try and sell the gas thus saved; and I believe you all have as much scope as myself, and I am satisfied that there is still a large undeveloped field in Sligo.

My experience of the adoption of the slot meter in Sligo is most satisfactory. Out of a total of 770 meters in use, we have 150 slot meters, 64 of which have cookers attached. The average consumption is 11,300 cubic feet for all—9000 feet for lighting only, and 13,000 feet where a cooker is attached. The average amount received per meter is £2 10s. 10d. On looking up these figures, I was more than pleased to find that the consumption of gas during the two summer quarters, with cookers attached, is about 25 per cent. in excess of the winter consumption, which has led me to the conclusion that we should push the cooker with the slot meter. The average cost of fitting a slot-meter installation, including service and cooker, is £6, and without cooker £4 7s.

Since the reduction in the price of the Welsbach burner and mantle, we have decided to supply them free of charge to slot-meter consumers in lieu of the governor burner, and expect to have a very great increase of consumers on this account. The meters are at present rated at 15 feet for a penny, and a minimum consumption of 6448 cubic feet per annum arranged, divided over twelve months. Then, 25 per cent. rebate is allowed on all gas consumed over the minimum consumption assumed to be stove gas. This arrangement gets over the difficulty of different rating of meters, &c.

In England, the gas consumed per thousand of the population amounts to about 4½ million cubic feet. In Ireland, it is on the average only about half-a-million, and in some towns as low as a quarter-of-a-million. In Sligo, however, it amounts to 2½ million cubic feet. It is thus clear that there is in this country plenty of scope for energy and enterprise in the development of the industry. Blame for our comparative backwardness in this respect lies more with the directors of companies than with the managers. In many instances they have not increased the capital with which they started 40 or 50 years ago; and it is therefore impossible for them to develop their business in accordance with modern requirements. Some companies have built up large reserve funds, but have not turned the money to account. I am convinced from experience that the money invested by such companies in (say) 3½ per cent. Consols, would, if employed in the development and extension of their own business, yield at least 15 per cent. By reducing the selling price of gas used for cooking, heating, and motive power, and by supplying consumers with all kinds of fittings—engines, stoves, and in fact anything that consumes gas—on an easy hire-purchase system, the output could, I am confident, be easily doubled, and consumers would be induced to fit up their premises in a far better style, and with more satisfactory results. The extra gas thus demanded could be produced by most small companies without any addition to the standing expenses—salaries, rents, rates, taxes, &c.—while the loss from leakage would remain also unincreased. The additional gas used by these means would be chiefly consumed in the daytime, leaving the retorts available for lighting purposes at night. This would level-up the load and obviate the necessity for extra holder room.

Considering that, in addition to lighting, gas is now so extensively used as a motive power, it must be conceded that the manufacture and distribution of gas constitute an industry of great and growing importance. And with a view to the development of manufacturing industries in Ireland, it is essential that the existing and necessary industries should be encouraged as much as possible by supplying them on the most moderate terms practicable with gas for power and manufacturing purposes, considering that gas now plays such an important part in almost all manufacturing operations. It is in this way that gas companies may help to utilize to advantage the many natural industrial resources of a country which, in the past, has been scandalously neglected in this respect.

A vote of thanks was accorded to the President.

#### THE NAME OF THE ASSOCIATION.

Mr. F. EUSTACE (Tullamore) moved "That the name of the Association be changed from the present name to that of the Irish Association of Gas Managers." He said he thought it



would be a great benefit to the Association to alter the name as proposed, because it would be a means of increasing the membership. There were, he was sure, many southern managers who would be willing to join the Association if they saw that it was a national one. He believed his suggestion would meet with their approbation.

Mr. S. B. LANGLANDS (Coleraine) said he had much pleasure in seconding the proposal. In the present state of matters, he thought the limitation had a weakening effect, because quite a number of gas managers in Ireland would, he knew, join them if a bigger name were given to the Association. Then, again, they might take it that any person aspiring to the office of President, which was being so worthily filled by Mr. Tully that day, would feel it a greater honour to preside over a general than over a provincial Association. Further, why should not the brotherhood of gas managership in Ireland be fostered? Why should they not join hands? In increased numbers they would have greater strength. He hoped there would be unanimity in the movement. He might mention that a letter had been received from a manager in the North of Ireland, in which he said that but for the limitation he would have joined the Association and been one of the working members long ago.

There was no counter-proposal, and the motion was carried unanimously.

The PRESIDENT hoped this movement would open up a new future for the Association. He himself was quite confident that it would.

#### NEW MEMBERS.

The following were elected members of the Association:—

*Ordinary Members.*—Airth, G., Dundalk; Bradley, John, Athlone; Brown, Frank, Tuam; Byron, R. H., Nenagh; Cronin, John, Middleton (Co. Cork); Davis, J., Naas; Dickson, John H., Ballycastle (Co. Antrim); Donegan, L., Drogheda; Lusted, J. A., Ennis; Lyne, J., Wexford; Lyne, J. J., Enniscorthy; Parsons, H., Mullingar; Tooms, D. W., Carrick-on-Suir; Young, L. G., Athy.

*Extra-Ordinary Members.*—Duff, C. N., Glasgow; Magill, Edwin, Glasgow; Marsh, T., Manchester; Scrivener, S. A., Dublin; Wall, J. W. R., London.

The PRESIDENT said he must remark that this was a very satisfactory commencement to the new Association—or rather to the old Association under a new name.

#### ELECTION OF OFFICE-BEARERS.

Mr. EUSTACE said he had great pleasure in proposing that Mr. W. A. Reid, of Longford, be elected President for the ensuing year.

Mr. LANGLANDS seconded the proposition, and it was agreed to.

Mr. T. WHIMSTER (Omagh) moved, and Mr. A. MACKENZIE (Edinburgh) seconded, that Mr. S. B. Langlands be elected Vice-President. This was agreed to.

Mr. F. J. Clarke, of Ballinasloe, Mr. P. Conray, of Galway, and Mr. T. Whimster, of Omagh, were elected members of Committee, on the motion of Mr. W. A. Reid, seconded by Mr. S. A. SCRIVENER.

Mr. LANGLANDS said he did not think the post of Secretary should be put to the meeting at all, because he regarded Mr. Whimster as one of the fixtures of the Association, and he thought they should hold him to be permanent Secretary.

The PRESIDENT thought it was unnecessary to put any motion on the subject to the meeting. They certainly recognized Mr. Whimster as one of the fixtures of the Association.

The appointment was agreed to.

Mr. P. HURLL (Glasgow) jocularly remarked that he thought the appointment should be *ad vitam aut culpam*.

#### PLACE OF NEXT MEETING.

The HON. SECRETARY said he thought that, with reference to their place of meeting for next year, though they were very glad to see so many present, it had been inconvenient for several to attend in Sligo. He felt that they would have had a larger gathering if Sligo had been more accessible; and he considered that they ought to go to some place which would be more convenient for the members. He questioned if Longford would be easier to get to than Sligo; and although they were in Dublin last year, yet, seeing that the name of the Association had been changed, with a view to inviting members from all parts of the country, he had pleasure in proposing that they visit Dublin again next year, under the new name of the Association.

Mr. SCRIVENER said, as a Dubliner, he had much pleasure in seconding the proposition.

The motion was agreed to.

#### PROFESSOR LEWES'S METHANE HYDROGEN WATER-GAS PLANT.

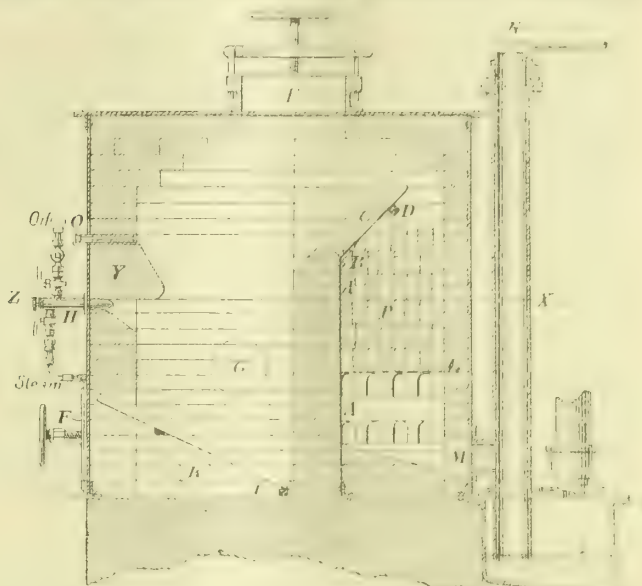
The PRESIDENT submitted an explanation of Professor Lewes's methane hydrogen water-gas plant, as he had fitted it up. He said he had had the plant working for two days, and the results were satisfactory. He was sorry that he could not show it in operation, because his men had been called off to other work. He then proceeded to read a paper descriptive of the plant, and said he would be pleased to show it to anyone who wished to see it.

The generator case is to be a cylinder made of stout boiler plate, with the top fitted to the angle-iron rim by screw-nuts,

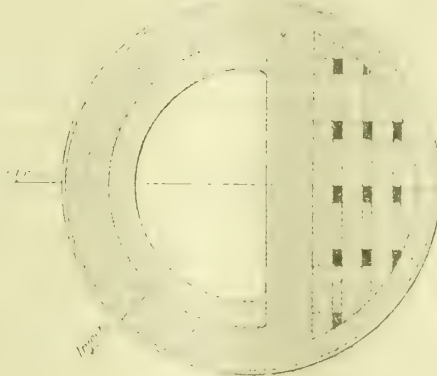
and the bottom riveted to angle-iron. The early generators I made were oval; but this allowed too much play on the sides. A is a partition of stout plate, riveted to the sides and bottom 4 feet from one side, divides the generator into two parts to a height of 3 ft. 6 in. from the bottom, and carries at the top a strong angle-iron B, to act as a support to the  $\frac{1}{2}$ -inch fire-clay slabs C, which are further supported by an iron rod D, bolted to the sides of the generator. These supports are necessary, as the slabs must be movable to allow the building-in of the superheater. On the furnace side of this partition, there is a 9-inch fire-brick lining, which extends round the furnace. At the top of the generator is the charging-door E; while at F is the clearing-door. The bottom of the furnace is formed of fire-bars of large section, supported at an angle, as shown; while at the side, just above the level of the bars, it is well to have a removable plate or manhole G, in case of big clinkers that cannot be cleared from the bars.

About 3 feet from the floor are fitted the oil or tar injectors H, recessed in a groove which runs round the lining of the generator. (If the projection is not made too sharp, it does not fuse away; and if there is trouble, a water-ring can always be substituted.)

#### LEWES'S METHANE HYDROGEN WATER-GAS GENERATOR.



SECTIONAL ELEVATION.



SECTION THROUGH X Z.

The injectors can be of any of the well-known forms, with oil fed at a fixed rate by gravity from above, and "slathered" into the fuel by superheated steam at the highest pressure obtainable. For good working, a small high-pressure boiler, giving an initial pressure of 100 lbs., and not falling below 60 lbs. in the run, is best. Besides the steam-tubes leading to the injectors, there is a steam-pipe I below the lowest point of the fire bars, running across the whole breadth of the generator, and pierced with very small holes on the outer side. These are to supply the steam necessary to wash up in the fuel, towards the end of the run, the gases from the heavier hydrocarbons, which sink in the fuel instead of rising. The air-blast K enters below the bars from one side. A Roots blower is better than a fan, as it gives an absolute pressure. It should be large as compared with the work it has to do, as a good deal of economy is derived from a very rapid, and what a few years ago would have been considered an excessive, "blow," as the more complete the combustion—i.e., the less carbon monoxide—the less fuel is used to gain a given temperature.

The form of the generator, although awkward, is of importance, as when using a tar or heavy oil, there is a lot of carbon liberated from it; and I find that if the gases have to pass



through the top layer of but little heated coke, it acts as a filter, and does away with a good deal of the risk of choking in the superheater. The deposited carbon also is brought down by the coke to the zone of combustion, and is utilized; while the coke itself is dried and heated before being burnt. The superheater has the top part built in with a chequer work of fire-brick, which can rest on a grating at L; while the lower part is built up of pig iron or old furnace bars, which during the run decompose any surplus steam to hydrogen, and are again reduced to iron in the next blow. The floor of the superheater must slope down to the exit M; so that if, as the result of improper temperatures, any tar condenses, it will run down to the hydraulic seal.

In working the generator, the fuel is put in until full up to the top of the charging-shoot, all openings are closed gas-tight, and the "sniff-valve" N is opened. This valve consists of a heavy iron cap working on the faced top of the blow-off pipe, to which it is hinged, as shown. It works very well in practice; and the importance of doing away with valves for the hot gases cannot be overrated. The fuel being lighted, the blast is turned on, and is kept blowing until the fuel shows red through the sight-hole O, consisting of an iron pipe with easily removable cap glazed with mica, which has to be taken off and cleaned from time to time, as a little tar vapour condenses on it. When the fuel shows red at the sight-hole, the air-blast must be cut off (there must be a valve between the blower and the generator, as close to the generator as possible), the sniff-valve closed, and the oil and high-pressure steam turned on to the three injectors; the exhaust being started to give a level gauge at the generator. The minimum quantity of steam must be used; and after the injectors have been going a minute, the steam is turned on below, and the run continued until the temperature seen at the sight-hole is reduced from a bright to a dull red. The oil and steam to the injectors are then stopped; but the steam at the bottom is continued for a minute, to wash all hydrocarbon vapours out of the fuel and superheater. When the steam is cut off, the sniff-valve is opened, and the blast turned on full until the temperature again shows bright red.

Pipes must lead from the generator and other parts of the apparatus to a series of gauge glasses fixed on the same board, so that the man in charge can regulate the speed of the exhaust. There should be a manhole into the superheater at the side P; and in making the generator, it should be so constructed that every part is easily accessible. In case of a failure in the carbide supply, this generator works equally well with "solar distillate" or other gas-making oil.

#### Discussion.

Mr. T. G. MARSH (Manchester) said he had not had an opportunity of examining this water-gas plant; but he had, on several occasions, seen a description of it, before it came into use. Water-gas plants that were in use now took up considerably more space than the generator in this plant would appear to do. The plants which he had seen on the other side of the Channel were so large that there would be considerable difficulty in putting them into many of the Irish gas-works, in consequence of the price of the generators. The generator in this plant appeared to him to lend itself more particularly to medium-sized works. With the generators he saw on the other side of the Channel, a very great amount of care had to be exercised, because, if the operator in charge of the machine was at all careless in the time of his passage of air and his passage of steam, the result would be that a very serious defect would be encountered. For instance, if he continued to run steam too long through the generator, the coke became sodden; and they would find, in addition to getting the carbonic oxide sent forward, that they would send forward a large percentage of carbonic acid. They all knew that, if they sent carbonic acid forward, they had to take it out again; and consequently there was a considerable expenditure required for purifying material. Further, the extra quantity of carbonic acid sent forward required to be enriched by the oil; and therefore they would have to incur an extra cost for oil as well as for purifying material. The apparatus before them looked to him to be much simpler. It was very compact. It had the generator and the superheater all in one. As to how the carburettor acted in the same generator, he was not in a position to say. This was a matter which could only be found out by a series of tests, which, he felt confident, no one was more competent to make than their President, Mr. Tully, who he knew had given a considerable amount of time to the chemical aspects of the subject. The advantage of this gas of Professor Lewes's was that there was nothing like the quantity of carbon monoxide that there was in water gas as used generally. As he had said, one of the difficulties with water gas was the quantity of carbonic acid sent forward, through no want of care. Mr. J. W. Helps, of Croydon, applied to him some time ago in regard to this matter, and said he found that though the man attending to his generators had very little work—all he had to do being to look after some valves, and close one for seven, and open the other for three minutes—he had to watch the clock. This seemed to be looked upon as no work at all; but Mr. Helps said that if he had to do it he would think it very hard labour, and that the only possible man they could get to undertake it would be a man without any thought or mind at all—that, in fact, it was a most arduous job. In a few instances, they had an electric bell. Mr. Helps

told him that if they made a run a minute too long, the carbonic acid increased by 9 or 10 per cent., which was, of course, disastrous. He suggested that some mechanical means might be arranged; and there would be very little difficulty about that. He (Mr. Marsh) was fixing up there now a simple arrangement by which they could check the man, and see if he kept the time required—in fact, make his life a little bit more miserable than it was at present. In addition to this, he had made a machine which he had just patented, and which was rather a peculiar one. It was an automatic analyst. It was a machine which would make a diagram, in the same way that a pressure register did, and show the proportion of carbonic acid there was in the gas, as it was made and as it was sent forward, so that the manager could himself see the diagram in the morning, and ascertain the proportion of carbonic acid which had been sent out during the night. This, of course, was a thing which was more applicable to medium and large-sized works than to small ones. With the apparatus in question, they would not have nearly the amount of trouble they had at present. In the matter of the price of coal, he was entirely at one with the President that the ill had its remedy; and though the high price they had been charged for coal now might appear to them to be likely to reduce their profits, he was satisfied in his own mind that it was one of the great benefits they had that occasionally their raw material went up in price, for the simple reason that if they got a thing too cheap, they became wasteful of it, and did not seek to save it. In regard to coal as it was used in gas-works now, and as it was employed some twenty years ago, they were selling 10 per cent. more gas per ton than they made then. The result was that, with the high price of coal, those who used it would apply the resources of science, and do everything they possibly could to save the coal. The price would then go down; and, when this happened, they would have much greater profits. He believed an advantage would come to them in this way. The price of coke would be most materially enhanced on account of the high price of the coal with which it competed. But, in addition to this, water gas had been introduced very largely, not so much for the purpose of competing with coal gas (because water gas was not very much cheaper than coal gas, when they had to use oil, which had also gone up in price), as to enable them to meet sudden contingencies. These water-gas plants would use up a large proportion of coke; and when this occurred, a scarcity of coke would be experienced—not an artificial scarcity, but a real one.

Mr. G. W. NORMAN (Dublin) said he would like to ask the President, for the information of gas managers in smaller towns than his own, about the general cost of the plant. He wished to know whether it would be useful for smaller works, and whether they could go in for it at once.

Mr. S. B. LANGLANDS (Coleraine) asked if Mr. Marsh could tell them whether the apparatus he spoke of for telling the overplus of carbonic acid was a chemical appliance.

Mr. MARSH said he did not know that there was any particular secret about the machine, because it simply carried out mechanically the old process which the ordinary analyst did, and marked it on a diagram. Of course, he had had a great many troubles in connection with it, as they had in most things—the idea, for instance, in connection with automatic meters, which he first brought out. But he thought he had got this thing right, and that in a few months' time they would have illustrations of it pretty generally.

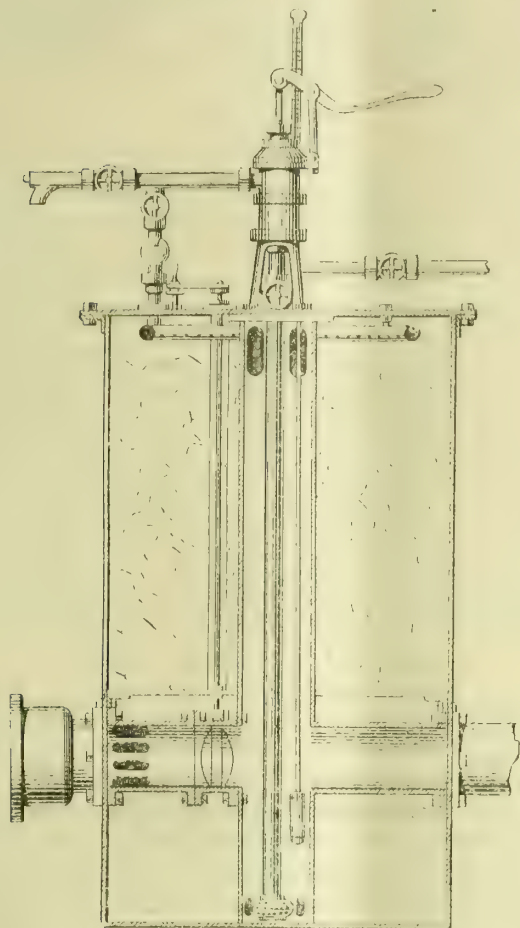
The PRESIDENT said, in reply to a remark by Mr. Marsh, that, of course, it was possible to carburet the gas in the apparatus, by introducing the oil into the superheater at the top; but he did not intend to do so. He meant to carburet the gas as it left the works for the town, through an independent carburettor. As to carbon monoxide, they would see that Professor Lewes's carburetted water gas contained 15 per cent., as against 33 per cent. in ordinary carburetted water gas; and it came very close to ordinary coal gas—being only 5 per cent. more. It was this fact that induced him to adopt Professor Lewes's process. Mr. Norman asked the cost of the plant. He thought that an apparatus such as he had could be fitted up complete, with blower and gas-engine, for from £200 to £250. That was a plant capable of making 50,000 cubic feet of gas per day.

#### ENRICHMENT OF GAS WITH BENZOL OR OTHER LIGHT HYDROCARBONS.

The PRESIDENT introduced this subject. Referring to the accompanying diagram, he said that some time last winter he looked into the question of the enrichment of gas with benzol, and he set about designing and constructing the apparatus before the members, which had been working since February last. In the period from the 8th of February to the 8th of July, 9,166,000 cubic feet of gas were made, of which 4,583,000 cubic feet, or about 50 per cent., of the whole, was passed through the apparatus in the hours between 30 minutes before sunset and 11 p.m. The enriching medium he used was crude naphtha—the first runnings—of about 8·928 sp. gr. They had used 106 gallons of naphtha, at 10d. per gallon. The total cost of enrichment was £4 7s. 6d., and the cost per 1000 cubic feet worked out at 0·23d. Coke baffling was used in the apparatus. The gas he supplied ordinarily was of about 15-candle power, and this enriched it up to about 18½ candles. He found that the gas passed through the town in from five to ten minutes. The



naphtha vapours were taken off at the ordinary temperatures, and they had not time to deposit, and did not deposit, in the town mains; neither had they affected the meters. The appliance was exceedingly simple.



TULLY'S NAPHTHA ENRICHER AT THE SLIGO GAS-WORKS.

[The President had a small glass experimental apparatus on the table, with one light burning unenriched gas, and another enriched gas. The effect of the enrichment was quite apparent.]

In answer to a question, the PRESIDENT said the cost of the apparatus would be, perhaps, from £50 to £70, according to size. He must say that he would be very sorry now to be without it. He had it fitted after the governor.

#### WELCOME BY THE SLIGO GAS COMPANY.

At this stage of the proceedings,

The PRESIDENT said it gave him very great pleasure to introduce to the members the Chairman of the Sligo Gaslight and Coke Company—Mr. Gorman—who desired, on behalf of the Company, to extend to the Association a welcome to the town.

Mr. R. GORMAN said he was exceedingly pleased to come there and see the happy faces round the table. He was glad the Association were meeting in Sligo, because, being so far west, they were delighted to see a stranger. As to the working of the Gas Company, he and his brother Directors had been charmed by the way in which Mr. Tully had conducted the business during the ten or twelve years he had been Manager. Mr. Tully had reduced the loss by leakage from 60 to about 10 per cent. There was something in that. It seemed to him, reading Mr. Tully's address, that all gas managers should endeavour to do likewise. One thing he would advise, and that was that they should endeavour to bring somebody to their towns to lecture upon gas-stoves. Under Mr. Tully's advice, the Directors did this; and he thought it was their greatest help. It assisted them to the extent of at least 2 per cent. In small towns, they never had the chance of hearing lectures upon these things. He thought that if coal cost 7s. or 8s. per ton to carry, there was great advantage in employing gas. The use of gas-stoves, he thought, was the greatest lever they had in making the balance-sheet come out right.

Mr. PERCY GRIFFITH read the following paper:—

#### IMPRESSIONS OF SMALL GAS-WORKS IN IRELAND.

My only excuse for presenting the following notes on Irish gas-works to a body of Irish gas engineers is that I have undertaken this very formidable task at the urgent behest of your President; and I can only hope and believe that such an excuse may serve to mitigate the severity of your criticism, as well as to justify your giving me a patient hearing. My reluctance to attempt a paper on this subject was the greater because of the comparatively few opportunities I have had for making a special

study of Irish gas-works generally, as distinguished from English works. If, therefore, my knowledge of them should appear somewhat superficial to Irish engineers, or my conclusions in any way unwarranted, I must ask you to give me freely such correction as may appear to be necessary in the course of the discussion.

It will be best in the first place to explain that last summer I made an extended tour, chiefly in the western provinces, for the purpose of reporting upon the value and prospects of a number of small works, which, owing to various causes, but principally the want of capital for extensions, were in a more or less stagnant condition, as well as for the purpose of inspecting various small towns where there appeared to be good openings for the establishment of new works. I need hardly say that my tour proved extremely interesting and instructive, more especially as I had the company of your President most of the time.

I propose to divide my paper under sundry heads for convenience of reference and discussion; and as the time at my disposal has been extremely limited, I will confine my remarks within the shortest possible compass.

#### OWNERSHIP OF UNDERTAKINGS.

I was throughout my tour very much struck by the number of works in the hands of individuals, as well as by the absence of that competition between local authorities and companies, which is, at the present time, so important a factor in English gas undertakings. The first point is, in my opinion, a serious disadvantage in many respects, and one not easily accounted for, unless it be due to a want of enterprise on the part of engineers and capitalists generally. The results are, however, very obvious and decidedly antagonistic to that progress which you, as gas engineers, have very much at heart. The private owner, having but a limited supply of capital, and being naturally averse to investing the whole of it in one undertaking, has neither the means nor the desire to extend and develop his works and mains except so far as can be done from time to time with surplus profits—that is, with whatever balance remains after paying himself a fair minimum interest on his invested capital.

Under such conditions, it is obvious that any development on modern lines—such as, for example, the hiring of stoves, fittings, and slot meters—is utterly impossible; and, consequently, in those works owned by individuals a restricted supply and high charges are the rule rather than the exception.

The non-interference of local authorities with the supply of gas to their constituents has no doubt been accounted for in the past by the absence of local representation on those bodies as it is understood in England; but no doubt the recent creation of county and urban district councils will very shortly make a difference in this respect. At the same time, I think few engineers or managers will look forward with satisfaction to a time when local authorities shall consider the ownership of gas-works within the ordinary scope of their duties, and make a general practice of buying them up at the lowest possible figure. In my opinion, this policy, whatever its advantages may be, would not conduce to that peaceful advance of scientific improvement which alone can secure the best quality of illuminant at the lowest possible price.

#### CAPITAL.

As far as my observation has carried me, this may be considered the vital point in connection with the gas industry in Ireland. Whether I am correct or not, you will be able to decide more definitely and reliably than I can. In nearly every case I investigated, whether gas-works were already in existence or not, the difficulty appeared to be the same—viz., how to raise sufficient capital either to construct or to extend the necessary works and mains, and this notwithstanding the fact that every existing undertaking was paying a very fair percentage of dividend or interest on capital invested. That there is an absence of capital in Ireland has been most positively denied by very competent authorities; and I must therefore abandon any attempt to explain what is, to my mind, the most serious bar to progress in the industry we are all so deeply interested in.

Even in the case of small limited companies, I found it quite a common practice to utilize surplus profits (when made) for the necessary extensions of plant or mains, rather than to raise additional capital for the purpose—a practice which, although improving the security for the original capital from year to year, and maintaining a low proportion of capital, must be fatal to that expansion of the business by which alone it can be rendered prosperous and secure. The rates of charge prevailing among the small works, and the absence of any engine, stove, or meter business, may, I think, be taken as more or less direct results of this system.

#### ACCOUNTS.

The practice above referred to naturally produces a form of accounts which is very puzzling to one unaccustomed to it. Of course, it does not follow that this is necessarily misleading to Irish accountants or Irish shareholders; but it must at least be granted that balance-sheets based on this system do not give an accurate representation either of the actual capital value or the net maintainable profit of the undertakings to which they refer. Consequently calculations for ascertaining value are extremely complex, and largely depend for accuracy upon information not to be found in the balance-sheet at all in many cases.



No doubt the peculiar and very various forms in which gas accounts are kept in Ireland arises partly from the absence of any common form, such as is provided in the Gas-Works Clauses Acts; and I will therefore turn for a moment to the question of

#### PARLIAMENTARY POWERS.

To an English engineer, the absence of any statutory powers, except among the largest works, appears very remarkable, and bears ample testimony alike to the reasonableness of the road authorities in regard to main laying and repairing, and to the honesty of the consumers in accepting (and, presumably, meeting) a liability not enforceable by parliamentary authority. In my opinion, however, it would materially assist the development of the gas industry in Ireland if parliamentary powers were more generally obtained. In the first place, the adoption of the General Acts would secure uniformity as regards account keeping and general financial management, as well as the quality and supply of gas. The general stability afforded by parliamentary sanction and support would also strengthen the financial position of any particular undertaking, and render the raising of capital more easy than it now is. Further, the restrictions in respect to the price of gas would certainly prompt owners and managers to adopt the most improved systems of manufacture in order to reduce the cost to a minimum. And, finally, the annual returns as to capital, loans, gas made and sold, profits, price charged, &c., required of all authorized gas undertakings, would, I think, prove of inestimable value to all gas engineers.

While dealing with this subject, I must, however, refer to the extravagant cost incurred in obtaining parliamentary powers under the present system, which requires promoters, opposition, and witnesses alike to travel to London and back in order to secure a hearing. It can hardly be expected that parliamentary powers will be generally sought by the smaller gas undertakings while the trouble and expense are as excessive—and, apparently, unnecessarily so—as they now are; and it is earnestly to be hoped that Parliament may soon see its way to bestow upon Ireland the privileges in this respect recently conferred upon Scotland—viz., that of having the details of all Private Bills settled in the Capital City.

#### CONDITION OF WORKS AND MAINS.

The general condition of the smaller works will no doubt be better known to you than it is to me; but I think I may fairly deal with what I myself saw, and leave you to judge how far this state of affairs is general throughout the country.

*Buildings.*—With regard to buildings, I may say at once that they were generally of the most substantial character, and in a remarkable state of preservation, even when obviously old and neglected. The natural supply of limestone, and the practice of making all walls about 2 feet thick, no doubt accounts for this.

*Land.*—The works I visited were nearly all very favourably situated as regards land, having ample space for extensions, both on the existing sites and adjacent thereto. The system of land tenure is, of course, different to that common in England, and is usually based upon a very long, sometimes interminable, lease at a nominal annual rent. It is not within the province of this paper to deal with this subject, as it varies but little from the English freehold tenure. The price of land is, however, generally extremely low; and there is less difficulty in getting convenient sites than is the case in England.

*Retort-Settings.*—These are almost universally of the ordinary type; regenerators are extremely rare. Machinery for drawing and charging is also entirely absent from the smaller works; and, in fact, the general design of settings, retorts, and fittings is often of the most antiquated type. Retorts of cast iron, as small as 13 in. by 13 in. by 7 ft. long, in arches containing one, two, or three retorts each, are not uncommon; and in some cases, the whole of the coke made is consumed in the furnaces. It is obvious that where such conditions prevail, an exorbitant charge per 1000 cubic feet is necessary to secure any return for the capital invested. The gas made per ton of coal is also, of course, much below what it should be; and the capacity of the retort benches, too, is small proportionate to their original cost.

*Condensing, Washing, and Scrubbing and Purifying Plant.*—The general plant of the works I visited was in many cases extremely inefficient, and suggested that a test of the gas would have revealed a very undesirable state of affairs. Very rarely was any attempt made to collect or utilize the ammoniacal liquor, although tar was generally sold, in small quantities relatively to the coal carbonized, at a good price. Exhausters and washers were also rarely met with; and the working results will, therefore, be readily imagined without further data.

*Storage.*—The gasholders were invariably small and in want of repair, and the tanks leaky—in fact, at one works the holder was erected in a pond formed by filling an old stone quarry with water; the guiding columns being erected on separate piers built on the floor of the quarry. The holder itself was therefore practically inaccessible except by boat or raft.

*Mains.*—Mains were perhaps the most deficient part of the various works, being small, leaky, and never carried as far as would have been warranted by the demand. In some cases, public lamps were supplied by small service-pipes extending several hundreds of yards, where a little canvassing would have secured consumers *en route*, and have justified the laying of a proper main.

*Generally.*—Of course, the foregoing remarks must not be taken as necessarily involving all the small works in Ireland, or even all those which I inspected; neither do I mean to imply that where such conditions as I have indicated prevail, the fault lies with the managers. The general difficulty appears to be in raising the necessary capital for properly extending and developing the works; and it is small cause for wonder that, in such circumstances, capable managers are difficult to procure, and more difficult to keep.

#### PRICE OF GAS.

I have already referred to this point, and need hardly repeat that, under the conditions which I have described, a low rate of charge is obviously impossible if any dividend or interest is to be made on the capital invested. Rates of 5s., 6s., and 7s. per 1000 cubic feet are not at all uncommon, and special rates for cooking-stove or engine supplies are by no means general—in fact, it was evident that many of the works would have been totally incapable of meeting any such additional demand for gas as these supplies would have created; and as in these cases it would certainly have paid to reduce the price of gas, apart from any reduction in the cost of manufacture, it is clear that incapacity to meet the increased demand which such a lowering of rates would have produced, was the real reason for the maintenance of the high charges. I may, however, say, with every confidence, that in no case investigated by me was the charge made for gas warranted. In other words, a trifling capital outlay would invariably have produced such a reduction in the cost of manufacture, and such an increase in the capacity of the works, that a lowering of the charge would have been eminently feasible without any sacrifice of profits or dividends—in fact, these would, I am confident, have been increased rather than diminished by such a progressive policy.

#### STOVES, FITTINGS, AND SLOT METERS.

It need hardly be said that the modern practice of hiring stoves and fittings, and of doing so by means of a fixed scale of prepayment based on the consumption of gas, has not yet reached any of the smaller Irish works. The comparatively heavy capital charges involved in this system are quite sufficient to account for this as matters now stand; but it is earnestly to be desired that some means may be found to overcome the difficulty, alike in the interests of the smaller consumers and those of the gas industry generally. The advantages of this system have now been fully proved in England, both in large towns and rural districts; and granted the necessary capital, there is no reason whatever why it should not prove equally successful in Ireland.

#### RESIDUAL PRODUCTS.

*Tar.*—The manufacture of tar for sale appears to be very much neglected in the works I visited—and that in spite of the fact that there was generally a good demand for it.

*Liquor.*—As previously stated, the liquor was in most cases thrown away; and one could not help remarking that there seemed little difficulty in turning it into the nearest ditch or water-course—a state of affairs which is now very rare in England. It is probable that the newly constituted local councils will shortly begin to interfere with this in the interests of those relying on such sources for their domestic water supply, in which case it will be necessary to pay a little more attention to this very valuable product than has been given it up to the present. In an agricultural country such as Ireland, it would seem that sulphate of ammonia would fetch a very good price; and I believe it does so, although I have not the actual figures before me. The only difficulty appears to be in the case of the very small works where separate sulphate plants would hardly pay; and for these, I would suggest the erection of small concentrating stills at the works themselves, in order to reduce the bulk of the liquor for carriage to the nearest sulphate works. Such works could then be erected very profitably at convenient centres within easy reach of the smaller gas-works on the one hand, and shipping ports for export of the finished product on the other.

*Coke.*—As regards coke, I need only call attention to the desirability of increasing the amount available for sale per ton of coal carbonized to the utmost, as in every case a good price could be obtained locally. Moreover, with the recent development of water-gas plants in the larger cities, there is likely to be an opening for coke at a paying price there, which has, of course, not existed before.

#### OPENINGS FOR NEW WORKS.

In conclusion, I may add a few remarks upon the scope that exists in Ireland for the erection of gas-works in the small towns hitherto neglected. I have, as previously stated, visited a number of such places, and, by personal inquiry, have satisfied myself that a gas supply would be cordially welcomed, and immediately adopted, by the principal shopkeepers. In most Irish towns, there are either convents, workhouses, gaols, or court-houses, as well as other local public buildings and offices, that would become large consumers of gas; and every gas manager will appreciate the value of the "large consumer" to a small undertaking. The only thing needed is apparently that so often referred to in this paper—viz., the necessary capital, coupled, of course, with such enterprise, energy, and engineering skill as are necessary in every manufacturing concern of a similar nature. The last mentioned is also peculiarly necessary at the present



time, when gas making is being elevated into a fine art, and the chemical processes involved are every day being more closely investigated and more and more scientifically carried out.

Let me, before closing, once more apologize if I have seemed to depreciate the gas industry as practised in Ireland too severely, or more than is warranted by the facts. It will be sufficient for my purpose if I have drawn the attention of your Association to the splendid opening that your country affords for the development of your own particular business among the smaller towns; and I hope that the suggestions I have thrown out will not seem too presumptuous coming from an English Engineer with so much less experience of Irish gas-works than you have yourselves. Should this be the case, I can undertake to accept your criticisms with a perfectly open mind, being confident that the time taken in studying this important subject will not have been in any sense wasted.

#### Discussion.

Mr. S. B. LANGLANDS (Coleraine) said that in Mr. Griffith's paper they had an excellent lever with which to move gas companies and corporations to a new order of things. It seemed to him that Mr. Griffith had a thorough grasp of the difficulties gas managers had to contend with; and he thought the Association should accord their best thanks to the author for his valuable communication. If at any time they wished to bring before their companies or corporations any questions as to extension, reduction in price, or anything of the sort, he was convinced that they had in the paper the very best means for moving them.

Mr. S. A. SCRIVENER (Dublin) thought that they certainly had before them one of the best and most important papers which had been read to the Association for some years. More than this, they had at Sligo one of the best examples of what could be done when suggestions such as those contained in the paper were followed up. The President had spoken of a 60 per cent. leakage, and what he had done to reduce it; he had also told them something about the difficulties he had had to contend with. In no walk in life could they earn money without spending it. This was particularly true in the gas business; because if they tried to make gas upon the lines on which it was made thirty or forty years ago, they would be clean out of it. In view of the newer competitors they had, in the shape of electric light and others which had sprung up, they required to produce more gas, and to have more lights burning. The President had done this. He had been doing what they should all do—seeking to provide gas for various purposes, and at a price which would enable the people to avail themselves of its advantages. He had succeeded in making much more gas, with practically very little addition in the way of charges. His management of the gas-works in Sligo had been a great success.

Mr. W. A. REID (Longford) read the following paper:—

#### SULPHATE MAKING AT LONGFORD.

Having mentioned to some of my brother managers that I had a small sulphate plant working, and was making a very fair profit from it, they persuaded me to give a paper on the subject, and it was with great reluctance that I consented to do so. But as the paper is chiefly for the benefit of managers of small works, it may be the means of encouraging them to follow in my footsteps. I will state, first, that my reason for thinking of a sulphate plant at all was that we were told that our liquor was finding its way to the River Shannon and causing a nuisance, and that we ought to find some other way of disposing of it. My Directors were hard to convince that it would be a profitable business to incur the expense of erecting a house and sulphate plant; but by producing figures to show that it would be a profitable transaction, they at last gave their consent to procure tenders for the work, which were received from three firms. After going carefully into the matter, it was decided to give the contract to Messrs. R. & J. Dempster, at a cost of £136.

The apparatus for sulphate manufacture differ in many ways; but the plant decided upon was adopted on account of its simplicity, and is known as the direct-firing system, with open fishing saturator. The plant consists of a shell boiler still 9 ft. by 3 ft., fitted with safety-valve, and saturator 2 ft. 6 in. by 2 ft. 6 in. by 2 ft. The condenser is a brick-built cement-rendered tank 12 ft. by 6 ft.; the pipes being submerged in water. The purifier is 4 feet square and 2 feet deep, filled with bog ore (natural oxide of iron) for the removal of the sulphuretted hydrogen. The waste liquor from the still is allowed to run into a pit and filter away in the earth, causing no nuisance whatever. The purifier is built of brickwork, without a cover; the gases after leaving it escaping into the atmosphere. When everything was complete, and the plant put to work, I found it was impossible to get salts in the saturator; the saturator always filling, thereby compelling me to resort to the evaporating pan.

Having tried several plans, such as shifting the catch-box nearer the saturator and covering all the pipes with a thick coating of straw, and firing stronger (so strong that sometimes the still would boil over, and make it very unpleasant to remain in the house), I at last arrived at the conclusion that the heat of the boiler was not sufficient. I decided therefore to connect a pipe from the steam-boiler and attach it to a larger dry-steam

coil in the still, which had the desired effect, and my troubles were at an end.

When working, instead of the saturator filling with condensed steam, I have now to add water to it when fishing; and instead of the boil taking 24 hours, it is done in less than 8 hours. I can also get a splendid heat in the saturator, so that the salts come out as white as snow; and I must say the plant is in every way giving great satisfaction. I am much handicapped on account of the very high price of acid—£2 2s. 6d. per ton in Dublin, to which must be added railway carriage, 19s. 6d. per ton from Dublin to Longford, and 5s. per ton from the railway to the works.

My scrubbing plant is not sufficient to enable me to work up the liquor as I should wish, having no washer, and having to depend solely on the scrubber, which is 16 ft. by 4 ft. 6 in. well filled with boards. The liquor is kept pumping backwards and forwards through the scrubber until it is nearly 5° Twaddel; and under these conditions, it is impossible to remove all traces of ammonia from the gas. If a washer were working, the profits from the sale of sulphate would be greatly increased.

When first I tried to introduce the sulphate locally, I could not get the farmers to appreciate the value of this important manure, and they would not give as much as £10 a ton for it when they could get other chemical manures at less than half the amount. But by perseverance, I got one farmer to realize its great value and give it a trial on his meadow. Before six weeks he was the proudest man in the district, and had his neighbours to see his meadow—it being so much better than the others, which had been treated differently. From that time forward, I had very little trouble in disposing of what sulphate we made at home, which you can understand was more profitable to us than bagging and paying carriage on it.

The manufacture of sulphate on small works costs nothing for extra labour; and the fuel used for firing is breeze, which is practically of no value. The profit for the year was £27; being almost 10d. per ton of coal carbonized. This is a small return in comparison with larger works having efficient washing plant; but I consider it is better to have even this small sum to our credit than let the liquor run to waste, and perhaps get us into trouble. The working of the sulphate plant is so simple and satisfactory that I wonder it is not more generally adopted by small works in this country.

#### Discussion.

The PRESIDENT said he thought they ought to feel obliged to Mr. Reid for having come forward with his paper, although it was at the last moment, and for giving them his experience in the manufacture of sulphate of ammonia in his works. He was sure Mr. Reid showed a great deal of pluck in going in for this business. It was a thing, he thought, which could be very profitably adopted by many more who had not already touched it. In his paper, Mr. Griffiths said something about concentrating the liquor about the works. He himself had looked into this matter, and he thought it would be far better for Mr. Reid to do this, or manufacture liquid ammonia, than to import sulphuric acid into Longford. He could produce pure liquor ammonia of 90 sp. gr., which would be equal to 25 per cent. of ammonia. This would be even in a more concentrated form than sulphate; and he would get rid of the high carriage charges on his stuff of which he had spoken. No doubt he would find a ready market for liquor ammonia, purified with lime; and a very much simpler apparatus than the one he had at present would produce pure liquor ammonia. It could be packed in iron or tinned iron drums, and sent to Dublin or elsewhere, where there was a very good market for it. He thought they should look to inland towns to manufacture pure or crude liquor ammonia. In the event of its not being in demand, works for the manufacture of sulphate could be put up. He thought the members should express their obligation to Mr. Reid for giving them his paper.

The HON. SECRETARY said he introduced the manufacture of sulphate of ammonia into his works; but he did not go in for any of the patent systems such as, he understood, Mr. Reid had—in fact, he did not know whether they were in vogue when he started his. He began on the old conventional lines. He procured an old boiler, cut out the flue, plated up the ends, and put in a steam-coil, supplied from a boiler, with a steam-trap on the outlet. Perhaps he did not get as good results from this plant as he would have done from a patent apparatus; and certainly there was one thing he must admit—he was not able to use breeze. He felt, when he was putting on his sulphate plant, that he was stinting himself of coke. He had to use coke in the apparatus; and when he ordered the sulphate plant on, there was trouble in the coke yard, because they got short of coke for their customers. He was consequently sometimes forced to delay putting on the sulphate plant on account of the want of coke for fuel. Mr. Reid said something about the plant giving him perfectly white sulphate. He wondered how this could be—whether it was anything in connection with the plant, or whether it was the acid that was used. He himself, using pyrites acid, very dark in colour, found that the only way he could get white sulphate was by a little manipulation—by putting either a little tar into the still or a little tar or naphtha into the saturator. If he did this, he got perfectly white sulphate; but if he proceeded in the ordinary way, simply putting ammoniacal liquor into the still, and nothing into the



saturator but vitriol and water—which, of course, they required to keep up the level of the liquid, in order to seal the curtain—he obtained a brown or a grey sulphate. But by adding a little tar or a little naphtha, he got it white. Of course, sometimes they liked to see it white; but it was not very material—the price was the same, whether it was white or grey. He thought that every works of any size should have a sulphate plant. As to what the President said about the manufacture of liquor ammonia, he had sometimes thought of this; but he could not see how it was to be done. Sulphate was, perhaps, the best, because if they made strong liquor ammonia, they would have it in a form that was not very stable. It was easily evaporated; and he could not think that it would be very profitable. In the form of sulphate, it was stable; and they could either sell it or carry it about without any trouble. He would like to know, if Mr. Reid could tell them, how he could make the sulphate white without any additional tar or naphtha.

Mr. REID, in reply, said that one of the chief reasons for his mentioning that he obtained white sulphate was that a great many managers were in the habit of getting very dark sulphate; and he saw a paper not long ago, in which a manager said he secured white sulphate by simply keeping the saturator warm—that before that he never could get enough heat in the saturator to make the sulphate white. It was since then that he himself had got it white—as white as the driven snow. He thought that the plan Mr. Whimster mentioned, of putting a little tar into the apparatus, only worked for a time. It then went back again. But the whole secret of getting white sulphate was to keep the saturator as hot as possible.

The PRESIDENT said that Mr. Whimster had spoken about working an antiquated arrangement. It was a somewhat antiquated arrangement he himself adopted eight years ago; but he must say that if he had to start again to-day, it would be the same. He could charge it in the morning, turn the key in the door, and leave it till the following morning. The fireman had instructions as to the turning on of the steam the following morning. The apparatus was then re-charged, a process which took about half-an-hour. They could make white sulphate. They took out the arsenic and other impurities in a settling pond. He was convinced that, for works the size of his, the arrangement he had was sufficient. He was satisfied with it. He worked with a closed still, which was a very old arrangement.

Mr. REID asked if the President was ever troubled with the acid and liquor becoming crystallized in the saturator.

The PRESIDENT: No. Continuing, he said that, with regard to white salts, and the using of tar in the still, his experience was that they always got sufficient tar in the substance to whiten the salts in the liquor.

#### VOTES OF THANKS.

Mr. S. A. SCRIVENER (Dublin) proposed a vote of thanks to the Mayor and Corporation of Sligo for the use of the rooms in the Town Hall.

Mr. T. LLEWELLYN (Newbridge) seconded, and the motion was agreed to.

Mr. F. J. CLARKE (Ballinasloe) moved that they give their heartiest thanks to the Chairman and Directors of the Sligo Gas Company for their kind and handsome reception of the Association.

The HON. SECRETARY seconded, and the motion was agreed to.

#### VISIT TO THE GAS-WORKS.

At the conclusion of the meeting in the Town Hall, the members visited the gas-works, where they saw several evidences of the ingenuity and general capacity of Mr. Tully as a Gas Manager. By the gate there stands a wire-rope guided gas-holder. In the governor-house, there is the naphtha enricher which Mr. Tully submitted to the meeting. Another building contained the plant for the manufacture of carburetted water gas, which Mr. Tully described. In connection with this, it may be stated that the entire structure, including the shaping and riveting of the plates of which the outside shell of the cylinder is constructed, was the workmanship of Mr. Tully and his men, which, in itself, was a feat of engineering. The retort-house contains settings of sixes, and one setting of threes. In it is fitted the "Rapid" charging plant of Messrs. Biggs, Wall, and Co., of London. The apparatus was shown at work, manipulated by men who had been sent by the patentees. There being a crowd in the place, it was evident that the plant was not worked to its fullest capacity—in fact, Mr. Tully stated that his own men, in ordinary working, did better, which was held to be a proof of the statement of the patentees that the plant is eminently suitable for use by inexperienced men. The members were entertained to light refreshments by the Sligo Gas Company.

In the afternoon, they enjoyed a most charming drive round Lough Gill, through striking scenery—wood, rock, and water—a distance of 24 English miles. Dinner was served in the Abbey Hotel, at Dromahair, at the head of the Lough. The excursion was favoured with a beautifully sunny afternoon. Sligo was reached on the return journey at 9 o'clock in the evening. On alighting, the party were again entertained in the Town Hall Buildings by the Sligo Gas Company, and a smoking concert was organized, which brought out a great deal of fine talent; and at 1 o'clock on the morning of Wednesday, the curtain was rung down upon one of the most enjoyable of all the meetings of the North of Ireland Association of Gas Managers.

#### THE COMBUSTION OF SULPHURETTED HYDROGEN TO SULPHUROUS ACID.

In the notice which appears in another part of the "JOURNAL" of the recently-issued report of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), reference is made to the method of combustion of sulphuretted hydrogen to sulphurous acid, with subsequent neutralization of the latter by limestone in a tower fed with a flush of water on the top (the soluble product, bisulphite of calcium, flowing away afterwards to the drains), mentioned by the Chief Inspector and some of his colleagues in previous reports. As many inquiries were made last year concerning the method in question, Mr. Carpenter gives some precautions which have been found necessary in working, and sets forth the conditions necessary for success. They are as follows:—

1.—There must be command of draught at the furnace—i.e., the suction at the condenser outlet must be adequate to supply this at all times, else sublimation of sulphur, with attendant evils, occurs. It seems to me quite possible that air might be supplied to the furnace under slight pressure, equal to that of the gases from the saturator.

2.—Adequate and complete cooling of the gases before the furnace, and also afterwards. If the gases enter the limestone tower above 100° Fahr., containing as they will excess of oxygen with sulphurous acid, the formation of calcium sulphate is promoted. This compound (gypsum) is but sparingly soluble; it forms a protective crust on the surface of the limestone, protecting the latter from its function of further action on passing sulphurous acid, and throwing consequently too great stress on the condensing efficiency of the upper layers of limestone in the tower, and causing low percentage condensation. At the same time, it should be clearly pointed out what are the difficulties accompanying condensation of water from a hot gaseous mixture containing this in the form of vapour in presence of sulphurous acid. On leaving the furnace at high temperature, cast iron is clearly the best material for cooling pipes. A point arrives, however, when temperature is so much lowered that water in condensing dissolves some sulphurous acid, and perhaps a little is oxidized to sulphuric acid, and corrosion of the iron takes place, especially at the chaplets of the pipes, which are of wrought iron; and voltaic action is induced by the dissimilarity of metals. Here is the point at which lead should be introduced, and continued to the base of the tower; taking care that there should be sufficient surface of lead (in itself a bad conductor and radiator) to ensure the delivery of the gas at the tower at the temperature not exceeding that named, and preferably lower. Such problems as this are of every-day occurrence with the chemical engineer, but seem of much complexity to engineers in gas-works practice.

3.—Cast iron does not seem the best material for use in the construction of the tower. Wood planks tongued and grooved have proved themselves to last well, even in summer heat; and brick and cement built towers have also well stood the test of time.

4.—The supply of water must be adequate, and it is best arranged if there are two forms of distribution—one constant, the other intermittent. If only intermittent, the intervals may be of too great length between flush and flush; for it must be borne in mind that limestone is not a porous body, and holds no reserve of condensing power within itself like coke. If, however, hard chalk is used, the intermittent flush only, at not too great intervals, is admissible.

**The Nernst Lamp.**—The "Electrical Review" of New York calls attention to the fact that very little is now heard about the above-named lamp. It is remarked that the hopes which were raised to a high point by the announcement of Dr. Nernst's invention have seemingly withered, and outside of the Paris Exhibition, there does not appear to be a single installation of the new lamp in existence.

**Wood Gas for Public Lighting.**—Some few years ago, a process for making gas from wood was introduced in Petersburg, South Australia; and a trial of the gas produced thereby was made in the Institute and the Town Hall. It is reported to have given so much satisfaction that it is now proposed to extend it to the streets. According to the "Adelaide Advertiser," any kind of wood is applicable; and the gas resulting from its treatment by the process referred to, which is stated to be "brilliant, of good power, and not glaring," can, it is claimed, be produced at 5s. per 1000 cubic feet. Patent rights have been secured for the invention in South Australia, Victoria, New South Wales, Tasmania, and New Zealand.

**The Puech System of Water Filtration.**—According to the "Revue Industrielle," M. Puech has recently devised a method of filtration for large quantities of water. The filter consists of three rectangular basins placed in juxtaposition, and separated by cemented brick walls. These basins contain three layers of gravel of different degrees of fineness. The first layer consists of pieces about  $\frac{1}{2}$  inch diameter; the second of rather smaller pieces; and the third, of pieces about 0.3 inch in size. The water first passes through the coarse gravel, then through the other layers in succession. Very impure water thus filtered issues perfectly clear. The discharge per square metre (1.2 square yards) of filtering surface per 24 hours is 6600 gallons.



## REGISTER OF PATENTS.

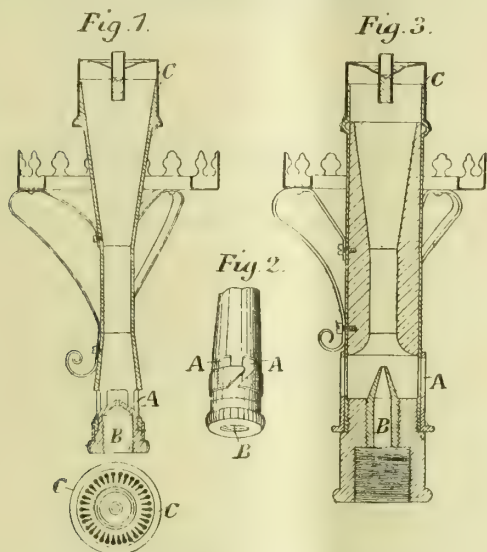
**Incandescence Gas-Burners.**—Duncan, J. H. H., of Coleman Street, E.C., the New Sunlight Incandescent Company, Limited, and Barnett, H. T., of Teddington. No. 14,995; July 20, 1899.

This invention relates to incandescence gas-burners of the kind especially adapted for use without a chimney, and with an ejector having the form of two cones united at their summits, as described in De Mare's patent No. 10,497 of 1894.

Fig. 1 shows a vertical section of the burner and a plan of the removable head or top; fig. 2, an isometrical view of the air regulating-ring; and fig. 3, a vertical section of so much as is needful to illustrate a modified construction of the burner.

In fig. 1, the burner-tube is shown to consist of two hollow truncated conical portions united at their smaller ends to an intermediate portion of uniform diameter throughout its length. The lower conical part has an inlet for air at its lower end through openings A, formed in a prolongation externally of uniform diameter throughout its length. The proportionate lengths of the upper, middle, and lower portions of the tube are varied to suit the gas used, as may also the apical angles of the cones, of which the internal surfaces of the conical portions form parts. The burner-tube is represented with its several parts of the relative proportions found suitable when using ordinary illuminating gas.

There is a split ring adapted to be moved so as to constrict the effective area available for the admission of air through the openings A, but which cannot close them so fully as to cause the production of a luminous



or partly luminous flame. Screwed into the base of the burner-tube is a gas-nipple B. This air regulating-ring is intended to be used to vary the admission of air to such an extent as may be necessitated by variation in the constitution or pressure, or both, of the gas to be burnt, or by difference in the size of the mantle employed; so that the size of the flame can be increased (by reducing the air supply) to incandesce properly a large or badly fitting mantle, or reduced by a larger admission of air in order to obtain a maximum brilliance with a closely fitting or perfectly shaped mantle, or with a richer gas or a gas under lower pressure than that usually met with. The oblique splitting of the ring, as shown in fig. 2, prevents the air admission-holes from ever being completely closed, even when the width of the ring is not less than the height of the air-holes. The head or top C of the burner is detachable, and is provided with an annular series of holes approximately pear shape.

The modification illustrated in fig. 3 adheres more closely in its form and details to the original burner of De Mare, with the addition of the straight portion between the two cones, which forms the subject of this invention.

Burners according to this invention may, say the patentees, be constructed "with various forms of caps or tops, and may be advantageously used with various kinds of gas—including coal gas, water gas, and mixtures of these, acetylene, oil gas, &c. The more carbonaceous the gas, and the more explosive its character, the smaller should be the holes in the cap of the burner. The richer the gas, and the greater the proportion of air necessary to complete its combustion, the smaller should be the diameter of the intermediate straight part of the burner-tube as compared with the largest diameter of the upper conical part, and the higher should be the pressure at which gas should be supplied through the nipple C.

**Incandescence Bodies for Lighting Purposes.**—Nordmann, R., of Christiania, Norway. No. 18,800; Sept. 18, 1899.

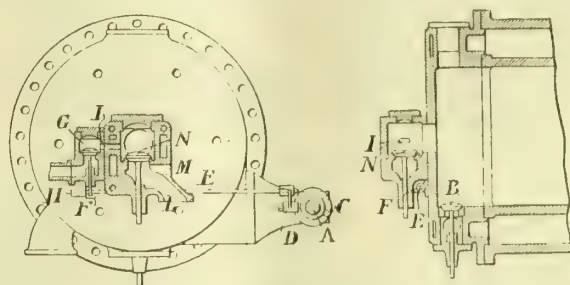
According to this invention (in the words of the patentee) "the incandescence body, made of suitable material for the purpose, is prepared for use by subjecting it to intense heat alone, without a direct flame, instead of, as heretofore, subjecting it to the action of gas, a blow-pipe flame, or the like." After the material has been impregnated with ingredients proper for subsequent incandescence and dried, it is suspended on a peg, cone, or the like, made of a material capable of withstanding heat, and of a diameter corresponding approximately to that of the burner upon which it is to be subsequently used. While thus suspended, it is placed in a furnace—preferably a muffle-furnace—in such a way that it does not come into contact with any direct flames. After this, the furnace is closed; and by means of external firing, the material is heated to a temperature of about 1500° C. "Thus, by the action of the continuous and gradually increasing heat of the furnace, the material of which the incandescence body is composed is charred and oxydized, and the oxide is toughened to a sufficient extent to render it suitable for use. After being thus heated for several hours, and the furnace having been allowed to cool, the said body is removed."

Before being subjected to the heat of the furnace, the material is, of course, considerably wider than the peg or cone; but through the action of the heat, it assumes the shape of the peg or cone, and "an incandescence body of the best possible form is produced." By this system of producing incandescence bodies, it is claimed that incandescence bodies are "not only prepared with the greatest ease and safety of any desired form or shape, but their symmetry, durability, and illuminating power are increased."

**Internal Combustion Engines.**—Thwaite, B. H., of Westminster, and Mensforth, H., of Bradford. No. 17,654; Aug. 31, 1899.

This invention is especially applicable to motors where the gas used is of low calorific value—such as blast-furnace gas.

Near the end of the exhaust stroke of an engine working on the "Otto" cycle, the patentees propose to introduce a current of air under moderate pressure, which flushes out the products of combustion from the cylinder, and occupies the combustion chamber, forming, with such additional air as is drawn in during the charging stroke, the air necessary to support the combustion of the next charge. For the purpose of introducing the air, there are a special valve and an inlet to the combustion chamber of the cylinder; the valve being operated by a cam, by which it is opened at the proper time, admitting air at moderate pressure so as to scour out the exhaust gases—the air remaining in the cylinder, and forming part of the succeeding charge.



The illustrations are sections (on planes at right angles to each other) showing the ordinary air-admission valve and the additional air-valve according to this invention, applied at the end of a gas-motor cylinder.

A is the ordinary valve-shaft, which revolves at half the speed of the crank-shaft, and has on it the usual cams (not shown) for opening the exhaust-valve B and the gas-valve. Besides these cams, there is fixed on the shaft A another cam C, the face of which acts on a roller D mounted on the arm of a rocking-shaft E, which has another arm F under the stem of a valve G. Under this valve is an inlet from a pipe H communicating with a supply of air, under moderate pressure—just above that of the contents of the cylinder in the last portion of the exhaust stroke. When the engine is worked by low calorific value gases, the pipe H communicates with the discharge of a pump or other compressor (such as a flexible bag) worked by the engine. Above the valve G there is a lateral inlet I into the combustion chamber of the cylinder. Besides the air sent into the cylinder on opening the valve G, air also enters, during the suction stroke, by the inlet L, and gas enters by the inlet M; the mixture passing the ordinary inlet-valve N. This mixture, with the air admitted by the valve G, forms the combustible charge.

**Gas-Lighters.**—Juhasz, F., of Berlin. No. 24,120; Dec. 4, 1899.

This invention relates to a device for lighting gas-lamps based on the well-known principle that, with an igniting ball impregnated with platinum metallic salts (platinum black or spongy platinum), if lighting gases pass over it, it is caused to glow, and thereby ultimately ignites the gas with which it comes in contact. The igniting pellet is arranged at the top of a bell (adapted to act as a collecting vessel), concentrically surrounded by a hood; and the pellet is held over the cylinder of the gas-flame by a handle, "in such a way that the escaping gas encounters the igniting pellet, and causes it to glow so that an automatic ignition of the gas is produced."

**Dry Gas-Meters.**—Engelke, W., and Meyer, F., of Hamburg. No. 250; Jan. 4, 1900.

This invention has reference to dry meters, in which collapsible bellows-like gas-containers are constructed to always contain equal volumes of gas, and are connected with a multiple-way cock or valve in such a manner that it can be operated by the movement of the containers through the intervention of suitable lever, link, and toothed-wheel gearings.

A dry gas-meter constructed according to this invention is illustrated in the engraving—transverse and longitudinal sections of a complete meter, a separate view of one of the collapsible gas-containers, and a detail elevation showing how the body of the container is built up at the corners.

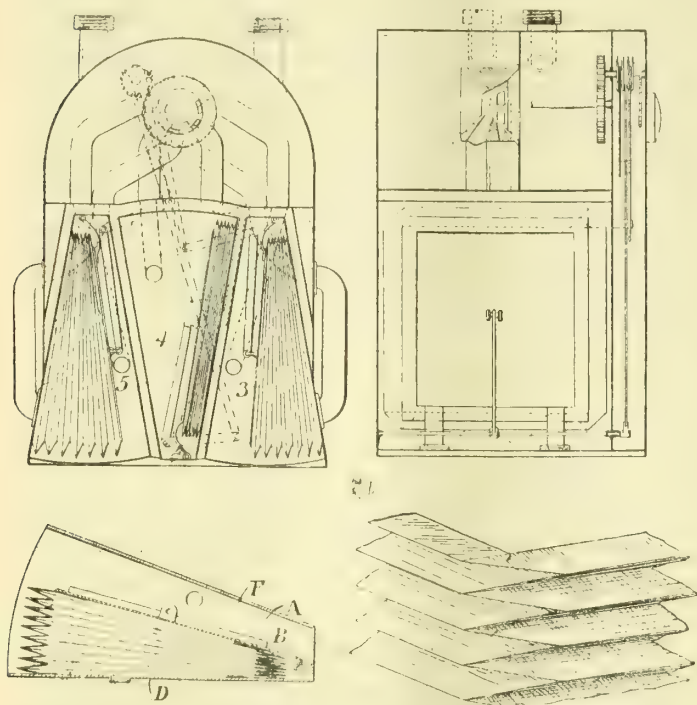
The upper portion of the meter-casing is divided into two chambers or compartments, into one of which the gas supply discharges, and from the other a gas delivery proceeds. The multiple valve or cock already referred to is between the chambers, and is the only means of communication between the gas supply and the gas delivery. The plug of the cock (which is a three-way one) is conical, and fits, on the one hand, into the socket or seating in the cock body, and on the other is connected by a stalk journaled at one end in the meter-casing. On this stalk a toothed wheel is fixed to gear in with another wheel on a secondary axis on which discs are mounted. To these discs rods actuated by levers from the motion of the containers are at one end connected.

To attain an easy movement of the bellows-like containers in the chambers A, they are formed as shown, and made of sheet metal of trapeziform section. A collapsible bellows-like gas-container in each chamber is attached to one of its faces at one end—viz., at D—and to a sheet metal cheek or flap B at the other end; the flap being hinged at one end. The gas inlet and outlet to the container is on the side D. The body of each gas-container is made of a material (such as paper, linen, or



jute) rendered gas-tight and impervious to ammonia. It is gusseted like the bellows body of a photographic camera.

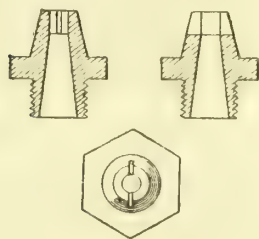
As an example of the working of a meter constructed according to this invention, supposing the gas to be entering the bellows in chamber 5 to inflate it, as the inflation takes place the plug of the valve is rotated through an angle of 60°, which will have the effect of opening the communications of the bellows in the chambers 4 and 3, and also of opening the communication between the chamber 5 and the valve. The entering



of the gas into the chamber 5 will cause the bellows in this chamber to close, and the gas contained in the bellows will be forced out gradually through the opening, which had formerly served as an entrance, to the gas delivery—the gas on being delivered passing through openings in the plug. On the discs being further rotated by the second bellows in the chamber 4 being filled, the chamber-openings are uncovered for the entrance of the gas; while for the exit the bellows-opening and two of the chamber-openings are uncovered. On the movement of the third bellows in chamber 3, a chamber-opening and two bellows-openings are again opened for the entrance of the gas, and the other bellows-opening and two chamber-openings for the exit—the cycle of operations being so that when one bellows is full, the next in order is two-thirds empty, and the next in order one-third empty.

**Jet-Holes for Bunsen Burners.**—Bachmeyer, A., of Westminster. No. 9565; May 24, 1900.

It has been found, says the patentee, that when a plain cylindrical jet-hole is employed as the outlet for the stream of gas that has to enter the mixing-tube of a burner of the bunsen kind, the mixture of gas with the air drawn in by it is "rarely so complete as to produce the highly heating flame which such burners are intended to give." His invention, therefore, relates to the formation of the jet-hole in such a manner as "to cause thorough mixture of the gas and air, and thereby to produce an intensely heating flame." In the illustration is shown such a jet-hole for supplying gas to the mixing-tube—sections at right angles to each other, and a plan.



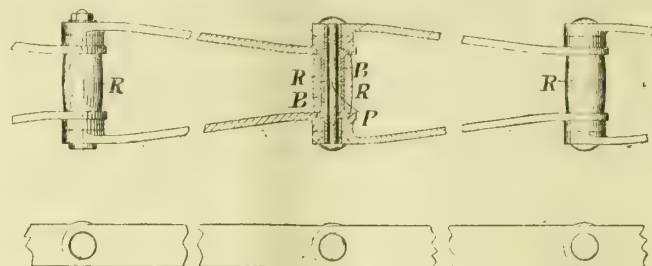
The hole, as usually made, consists of a part tapering to a smaller diameter upwards, and a cylindrical upper part. A fine transverse saw-cut is run down from the point to the junction of the cylindrical with the tapering part of the hole—thus producing two lateral slits. As probably some of the gas, by lateral expansion, issues by these slits at a pressure differing from that of the gas issuing parallel to the axis, there may be produced (the inventor remarks) "eddies or other movements in the jet which promote its mixture with the air drawn by it into the mixing-tube."

**Conveyor, Elevator, and other Chains.**—Hunt, C., of Birmingham. No. 9769; May 28, 1900.

This invention refers particularly to the construction of the various parts forming the links of conveyor chains "so as to cheapen their construction, and render them stronger and lighter, with facilities for the renewal of those portions upon which the major portion of the wear is concentrated."

The side-links are made from stamped, forged, or cast metal—such, for instance, as tough steel or iron—with preferably the external boss at one end pierced through with a square hole, the other end having an internal boss pierced through with a round hole. There is also a recess at the inner side of the one end of each link, into which the collar of the renewable journal-pieces B sink and fit when driven home into the links. The links may be formed with flanges or provision for receiving buckets for elevators or troughs for conveyors. The journal-piece is generally a simple casting—malleable cast iron or steel—or it may be a forging. In either case, it is made separate from the links with a square neck, which fits into the hole in the links with such a fit that it requires to be driven home so as not to turn round. When the parts of the chain are

assembled (as shown), a pin P is passed through all the parts and riveted at each end. In this invention, the patentee makes no claim to the



use of the roller R, as this mode of construction on solid links was secured to him by his previous patent No. 29,817 of 1896.

#### APPLICATIONS FOR LETTERS PATENT.

- 13,646.—BOWER, G., "Volumetric gas-governors." July 30.
- 13,647.—BOWER, A. S., "Production of acetylene." July 30.
- 13,665.—GROUVELLE, J., and ARQUEMBOURG, H., "Blower or exhauster." July 30.
- 13,674.—THOMAS, W. A., "Gas supply regulator or governor." July 31.
- 13,682.—BEAL, W., "Supporting a smoke consumer from a gas-globe." July 31.
- 13,734.—MURINICK, A., "Incandescent burner mechanism for street lighting." July 31.
- 13,742.—BAUER, F., and RUMPLER, A., "Acetylene gas producers." July 31.
- 13,814.—JOHNSON, J. Y., "Manufacture of gas and coke." A communication from The Deutsche Continental Gas Gesellschaft and J. Bueb. Aug. 1.
- 13,899.—LYTLE, H. H., "Gas-burners." Aug. 2.
- 13,926.—KEITH, J., "Gas or air compressors or pumps." Aug. 3.
- 13,947.—BIRCH, G., "Holders for incandescent gas-mantles." Aug. 3.
- 13,958.—RIEHL, J. B., "Internal combustion engines." Aug. 3.
- 13,996.—GIRARDVILLE, P. N. L., "Production of acetylene gas." Aug. 3.
- 14,026.—KEITH, J., "Gas or air compressors or pumps." Aug. 4.
- 14,034.—MEISSNER, C., "Production of acetylene gas." Aug. 4.
- 14,066.—DIEST, G. DE, "Acetylene generators." Aug. 4.
- 14,138.—HENNING, C., "Production of acetylene gas." Aug. 7.
- 14,160.—SMITH, E. F., "Acetylene gas generator." Aug. 7.
- 14,188.—STROUDLEY, F. W., "Gas or other engines." Aug. 8.
- 14,193.—POTTER, W. G., "Gas-lamps." Aug. 8.
- 14,207.—DESJACQUES, G., "Carburetters." Aug. 8.
- 14,271.—GUT, J., "Fluid meters and the like." Aug. 9.
- 14,343.—DUDGEON, A. J., "Gas-engines." A communication from the Société Anonyme John Cockerill and H. Savage. Aug. 10.
- 14,360.—LESPINASSE, C., "Production of acetylene gas." Aug. 10.
- 14,412.—MARCUS, H., "Conveying material." Aug. 11.
- 14,426.—JOHNSTON, J. P., "Manufacture of gas." Aug. 11.

**Importation of Coal into Russia.**—The Board of Trade have received information, through the Foreign Office, to the effect that the authorization given to Russian railway companies by the Government, to import foreign coal free of duty at all the frontiers of the Empire up to the 1st of September next, has now been extended until July 1, 1901. It is stated that this extension is due to the comparative scarcity and consequent high price of coal in Russia.

**The Leamington Town Council and the Gas-Works.**—At the meeting of the Leamington Town Council on Monday last week, the Town Clerk (Mr. H. C. Passman) said he had received a letter with reference to the purchase of the gas-works. At their last meeting, he had no report to make, in consequence of the Directors of the Gas Company not having met. The letter he held in his hand had been received since the last meeting of the Town Council; and if it was the wish of the Corporation he would read it. After some remarks, it was decided to refer the letter to the General Purposes Committee. The nature of the communication was not divulged; but, in a letter to a local paper, Mr. Heath Stubbs has given an indication of it. He says: "I have learned from the best authority (and quite outside the Town Council) that the Gas Company will not be advised to take any step to relieve the Corporation from the statutory obligation of taking over the gas-works. I consider I am justified in letting the ratepayers know this at once, because if any attempt is to be made to prevent the transfer of the works, it must originate with the ratepayers, and be supported by a large majority of the shareholders in the Company, and should take the form of a memorial to the Directors of the Company and to the Council."

**Leeds Water Affairs.**—The question of the water supply of the city was considered by the Water Committee of the Leeds Corporation at a meeting last Friday. A short time ago the Committee made inquiries, and ascertained that there was great waste of water in the city, and an appeal was issued to the public with the object of checking the waste. Figures submitted to the Committee on Friday by the Engineer (Mr. Hewson) showed that the consumption of water at present was 16½ million gallons per day, as compared with 18 million gallons per day a fortnight ago. It will therefore be seen that the appeal has not been without effect. The Committee are still prosecuting their inquiries with regard to the prevention of waste. The recent heavy rainfall has added greatly to the amount of water in store in the reservoirs, which is now equal to a supply for the city for 93 days. At the corresponding period of last year, the quantity in the reservoir was equal to 62½ days' supply. A contract for a new 30-inch main to be laid from Eccup, by way of Arthington and Lindley Wood, to Swinsty reservoir, was adopted. The cost will amount to nearly £100,000. At present there are three mains, which are capable of conveying 18 million gallons per day to the Eccup reservoir. When the new main has been completed, the quantity of water flowing into the Eccup reservoir will be increased to 24 million gallons per day.



## MISCELLANEOUS NEWS.

### THE GAS POLICY OF THE MANCHESTER CORPORATION.

#### A Graphic Statement.

Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, has issued a memorandum to the members dealing with the finances of the department, and bearing particularly on the practice of making large contributions out of the profits of the undertaking in relief of the city rates. The memorandum, which reviews the history of the concern since it passed into the hands of the Corporation, 57 years ago, is as follows:—

The gas-works of the city of Manchester were transferred by the Commissioners of Police to the Corporation in 1843 for the sum of £198,817. Since then there has been expended on the works £2,827,124; making a total of £3,025,941. During these 57 years, the gross profit made out of the gas undertaking has been £5,227,086; so that, if the Gas Committee during this period had been permitted to use their own profits for their own benefit, the whole of the gas-works would have now been paid for without having to borrow any money at all, and the ratepayers of to-day would have had a balance in hand of £2,201,145.

Instead of this the ratepayers have no balance, but owe £1,026,456, and have to pay nearly £40,000 a year for interest upon borrowed capital, which never need have been borrowed. What has been done with this profit of £5,227,086? The sum of £2,398,471 has been paid over for city improvements and in relief of the rates; £1,017,191 has been paid in the shape of sinking fund; £752,808 has been used to write down the value of the works as depreciation; and £1,058,616 has been paid for interest on borrowed capital. So that over a million of money has been given away when it ought to have been in the gas consumers' pockets. This brings up the total amount to £5,227,086.

Members of the Gas Committee will see this is not a question of the price of gas, but a question of policy; and surely the short but startling facts just enumerated amply justify me, as Chairman of the Committee, in bringing the matter more fully before the City Council, as I propose to do by resolution.

### THE FIRST STEP TO "LOW-GRADE" GAS AT SOUTHPORT.

#### Following in the Wake of the South Metropolitan Company.

The Gas Committee of the Southport Corporation can claim the honour of being the first to follow in the wake of the South Metropolitan Gas Company in connection with the question of the supply of gas of low illuminating quality. The Committee have made a move, the Council have endorsed it, and we hope that it will bear good fruit. The matter was introduced to the attention of the Council last Tuesday by Mr. Trounson, in the absence of the Chairman of the Gas Committee. The resolution which summed up the feeling of the Committee on the subject was contained in the minutes. It was simply this: "That it is desirable that the illuminating power of the gas be reduced." Mr. Trounson remarked, in moving the adoption of the minutes, that the question of the reduction of the illuminating power of gas had been exercising the minds not only of the Gas Committee of Southport, but of other gas supplying bodies throughout the country; and it was considered that the time for action in this direction had arrived. The matter had been recently before Parliament; and objection was raised to having the illuminating power reduced from 16 to 14 candles. The result had been to bring out evidence of the highest possible scientific and practical experts; and though the opinion of these experts was heard, the proposed reduction was agreed to by Parliament. There were many reasons why the illuminating power of gas should be reduced. The great use of incandescent mantles made the present quality absolutely unnecessary and wasteful. Fourteen-candle gas would, properly used, give as much light as 20 or 21 candle gas. It was rather a remarkable thing that with one exception—that of Liverpool—Southport was the only town compelled by Act of Parliament to give 20-candle power gas. There was not the slightest doubt that the proposed reduction would result in a very considerable lowering of the price; and the public would get a very uniform quality of gas. In this matter, they would have to deal with Birkdale. But the District Council was composed of men equally as astute as themselves; and they would look at the question from a business standpoint. The motion was seconded by Mr. Irving.

Several members spoke on the subject. Mr. Karr doubted whether a reduced illuminating power would be suitable in the houses of the working class, where they had no incandescent lighting. It might answer in the streets. He moved the deletion of the minute. Alderman Booth seconded the amendment, because it was not stated to what extent the illuminating power was going to be reduced. Working people could not afford incandescent mantles. They cost 7d. or 8d. each; and this was something to a working man every few weeks or so. It might be a saving to the Corporation; but the people would have to pay for it all the same. Alderman Fisher said he had a theory that it was in the interest of the working man that they should reduce the illuminating power of gas. The bulk of the people thought that the burners commonly in use were not calculated to bring out so high a candle power as 20; and if the working man obtained gas at 2s. 6d. instead of 3s., it would be to his advantage. It was not a question of incandescent light. The Local Government Board had, he understood, suggested that they should apply for a reduction in the quality of their gas; and because they thought it time to consider the matter more fully, this resolution was put on the minutes. Alderman Threlfall said he understood that the cost of producing the extra quality of gas was very much greater than that of the ordinary gas. He wished to know if gas of 2 or 3 candle less power would serve as well as higher power gas for cooking-stoves. Several members replied that it would answer better. It was hoped by Alderman Rimmer that the Council would pass the resolution. He said that more gas was consumed now than some time ago; and the introduction of incandescent burners was an important feature. In reducing the lighting power, Mr. Karr and Alderman Booth

thought they were going to do something detrimental to the working classes. In his own opinion, they were going to do something of great benefit to the working classes; and it would come out in this way—that instead of a working man burning two or three lights in a room, which were not very beneficial to his health and that of his family, he would learn to use one light, and with the incandescent light would get more illuminating power with a gas of 2 or 3 candle power less than before. If they had occasionally to renew the mantles, the cost was trifling compared with the cost of burning two or three lights. He did not think the reduction would be altogether a benefit to the Gas Committee or to the town, because less gas would be consumed. But it would be better for the general health of the town. Mr. Travis pointed out that the condition of the gas supply was very much changed from what it was at the time when the 20-candle limit was fixed by the Southport Improvement Act. The proportion of gas sold at that time for purposes other than lighting was practically nil; to-day it formed a very large proportion of the gas delivered by the gas-works. The Mayor (Alderman Griffiths): About one-third. Mr. Travis said there was no doubt about it that for purposes other than lighting, lower candle power gas at a lower price would be very acceptable to the users of it. He, however, objected to the form of the resolution, because he thought it would enable the Committee to reduce the illuminating power before they obtained parliamentary power to do so. The Town Clerk said they had simply an abstract resolution before them. If the Council endorsed it, further steps would have to be taken. The Mayor remarked that if there was to be a reduction of quality, it could only be by arrangement with their neighbours in Birkdale; but if that body were not favourable to the change, he did not see how it could go any further. Mr. Irving also spoke in support; but Alderman Hatch was in favour of the amendment. On an appeal, however, by Alderman Booth, Mr. Karr withdrew the amendment, which in the discussion had received so little support.

Replying upon the discussion, Mr. Trounson observed that an ordinary burner consumed 5 cubic feet of gas, and gave an average illuminating power of 20 candles. An incandescent burner used 4 feet of gas, and gave a 50-candle power light. The Committee were only following the Germans in this matter; and the sooner they took a leaf out of the German book, the better it would be for the gas consumers. A return of the German Continental Gas Company with regard to the growth of their burners last year showed that the increase of incandescent lights (including the supply to the working class population) was 91·64; ordinary burners, 7·95; and argands, 0·41. With reference to mantles, no doubt the question had become revolutionized recently because the greatest mantle firms had reduced their prices by 50 per cent., and in Germany the gas suppliers could buy them from 1d. to 2d. each. Personally, he did not see why mantles could not be put on the Southport market as in Berlin, Munich, or in any other place.

The minutes were adopted.

### WARRINGTON CORPORATION GAS DEPARTMENT.

#### The Annual Report of the Engineer.

The Gas Engineer of the Warrington Corporation Gas Department (Mr. W. S. Haddock) has issued his annual report. Referring to the increased cost of coal and cannel, he says the average price for the present year is nearly 50 per cent. in advance of last year's prices. The increased receipts from residual products, owing to better prices and the large increase in the output of gas, have enabled them to carry on the works with profit. In the contracts entered into for next year's supply of coal and cannel, the prices are again advanced 50 per cent. upon this year's price, or rather over double the price paid for last year's supply. He thinks it probable that, by postponing the renewals and repairs of buildings and plant where not absolutely necessary, together with the increased receipts from residuals, the works will be carried on in the coming year without loss. An early reduction in the price of gas was promised last year; but owing to the present inflated prices for raw material, it is not advisable to make any alteration at present. The increased make of gas is 32,034,300 cubic feet, equal to 10·6 per cent., upon last year's production. From statistics supplied by Mr. Haddock, it appears that the largest make of gas in one week was 10,240,000 cubic feet—viz., the week ending Dec. 9. The largest consumption was in the week ending Dec. 24, when it amounted to 10,491,700 cubic feet—some 250,000 cubic feet more than the largest make for the same period. The smallest make and the smallest consumption was in June. The average illuminating power of the gas is given at 18·41 candles. The wages cost per 1000 cubic feet of gas made was 9·985d. against 9·742d. for the previous year. The average price of coal and cannel was 10s. 5½d. per ton, against 7s. 1½d. for the preceding year. The expenditure amounted to £51,327, as compared with £36,010; and the receipts to £67,938, against £58,391.

### A QUESTION AS TO GAS STORAGE AT MIDDLESBROUGH.

#### Lay Opinions v. Expert Advice.

There was a protracted discussion at the Meeting of the Middlesbrough Town Council last Tuesday on the subject of the gas storage accommodation at the gas-works. The situation was described at length to the Gas Committee the previous day in a communication by Alderman Hugh Bell (accompanied by a letter resigning his position as Chairman). The only absolutely trustworthy holder, he said, was No. 4, containing about 1 million cubic feet. This was inadequate, considering the winter production exceeded 2½ millions a day. They had been able to carry on the works from two circumstances—(1) the fact that the water-gas plant enabled them at a pinch to make gas with sufficient rapidity to keep up the supply; and (2) they had been able to rely to some extent on No. 5 holder, of which one lift was at their disposal. The position for the coming winter would be improved so far as the new retorts would assist in production, against which was to be placed the increased demand. Mr. Corbet Woodall, their Consulting Engineer, had expressed himself strongly on the necessity for additional storage. He concurred with him in urging that a new holder be erected before any attempt to improve



No. 5 was made. Mr. Woodall attended the meeting; but a motion was finally carried, deciding not to erect a new holder until Mr. Woodall had reported on what was needed to put No. 5 into order.

At the Council meeting, Dr. Hedley moved, as an amendment, that the Committee proceed at once to erect a new holder, leaving No. 5 untouched for the present. He regretted the majority had voted against the opinion of their Consulting Engineer. They were getting to the starvation point; and they had Mr. Woodall's opinion that it was dangerous to act in the manner they had done. Mr. Ward seconded the amendment. Although, he remarked, they had not Mr. Woodall's report on the No. 5 tank, they had it from him that it was the foundation that was at fault. Alderman Jones described the vote against Mr. Woodall's advice as an indication they desired no longer to retain his services. Mr. Woodall, he said, had told them he must resign. No. 5 holder might be improved; but the work would take six or eight months, or even twelve; and they could not do without it next winter. Even then they would never be sure there would be no further sinkage. The speakers who followed held divided views on the question. The discussion was terminated by Mr. Roberts, who said the department possessed 1,100,000 cubic feet of storage in No. 1 holder, and 700,000 or 800,000 cubic feet in No. 5—nearly 2,000,000 cubic feet. Taking this into consideration, as well as the water-gas plant, and the electric lighting plant (which would make some difference in the demand for gas for two years at least), he felt there was no reason for haste.

In the end, 15 members voted for the Gas Committee's minutes being adopted, and only 9 for proceeding with a new holder.

### MACCLESFIELD CORPORATION GAS COMMITTEE AND THE PRICE OF GAS.

#### No Increase to be Made.

At a recent Meeting of the Gas Committee of the Macclesfield Corporation, Mr. Shaw moved that the price of gas be increased from 2s. to 2s. 8d. per 1000 cubic feet. He said he did so in view of the present price of coal, and the large decrease in profit which might be expected in the ensuing twelve months. It had been ascertained from the Gas Engineer (Mr. Ernest L. Newbigging) that the profit was likely to be quite £2000 less than in the past financial year, owing to the enhanced price of coal. Seeing that this was the case, and that the rates would suffer in consequence, he thought there should at least be a small addition to the price of gas. He (Mr. Shaw) and those supporting him were not quite convinced that this was the best thing to do; but in order to bring the matter before the Council, and for other reasons named, he submitted the motion. Mr. F. W. Isherwood said that for the sake of discussion, and in view of the information possessed by members of the Committee and given by the Engineer, he would second the motion. The Engineer had brought before them a list of 52 towns where gas had been raised recently from 2d. to 10d. per 1000 cubic feet; and largely on that account he (Mr. Isherwood) thought the price should be raised in Macclesfield. An amendment was proposed by Mr. Whitmore that the gas remain at its present price until the end of the financial year (March 31, 1901) when the matter could be reconsidered. He thought the figure was sufficiently high now. They had 6000 tons of coal at the old rate, and the benefit of this should be given to the consumers. He also considered that if they increased the charge, the consumption of gas would go down materially. After some discussion, the amendment was carried.

### SHEFFIELD UNITED GASLIGHT COMPANY.

#### The Half-Yearly Report and Accounts.

At the 91st Ordinary General Meeting of the above-named Company on the 11th prox., the accounts presented will show that the Company's business continues to progress satisfactorily. The quantity of gas sold in the six months ending the 30th of June was 1,294,856,000 cubic feet; being an increase of 59,387,000 cubic feet, or 4.8 per cent. on the corresponding period of 1899. The revenue from the sale of gas amounted to £111,974; stove and meter rentals, to £6861; residuals produced £63,369; and the total receipts were £184,335. The expenditure on the manufacture of gas was £108,517 (coals costing £63,649, as compared with £50,495); on distribution, £10,674; and on management, £5118—the total expenses amounting to £134,461. The balance carried to the profit and loss account was therefore £49,874; and the amount available for distribution is £71,948. The half-year's profit will allow of the payment of the usual dividends on the various classes of stock, and leave a balance of £6905, which, added to the amount brought forward, makes £28,851 to the good. The Company's coal contracts, which expired on the 30th of June, have been renewed at a considerable advance on last year's prices. Towards meeting this extra expenditure, and also the additions made to the workmen's wages, the Directors have found it necessary to increase the charge for gas by 4d. per 1000 cubic feet from the 1st ult. The portions of the accounts relating to the manufacturing operations of the Company show that 103,910 tons of silstone coal and 26,536 tons of cannel were carbonized in the past half year; the estimated quantities of residuals produced being: Coke and breeze, 78,211 tons; tar, 8162 tons; ammoniacal liquor, 3,729,800 gallons.

### TOTTENHAM AND EDMONTON GAS COMPANY.

#### The Half-Yearly Report and Accounts.

At the Meeting of the above-named Company next Saturday, the Directors will report that the increase in the quantity of gas sold in the six months ending the 30th of June last, as compared with the corresponding period of 1899, was 34,478,800 cubic feet, or equal to 13.62 per cent. The Company's coal contracts terminated in March last; and consequently a considerable portion of the quantity used in the past half year was bought at the high rate then ruling, and since maintained. The result has been an increase in the cost of 3s. 7½d. per ton, and a

total additional expenditure for materials used in manufacture of £6161 4s. 10d. During the whole of the year on which the Company have now entered, the coal used will have to be paid for at the higher rate; involving an addition of £19,792 to the expenses. The Directors have abstained thus far from raising the price of gas; and they have decided—following the policy they have repeatedly avowed, of considering the interests of consumers equally with those of shareholders—to continue the present rates till Christmas. It will, however, be necessary to make some increase from the end of the year; but the consumers are assured that the amount will be as small as circumstances will admit. A tender for building new offices in High Road, Tottenham, has recently been accepted.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £43,024; the rental of meters, fittings, and stoves, to £3606; and the sale of residual products, to £6043—the total receipts being £52,749. The expenditure on the manufacture of gas was £33,025 (coal costing £11,677, oil for enrichment of carburetted water gas £8165, and coke used in making this gas £2369); on distribution, £6333; and on management, £2060—the total expenses being £45,029. The balance carried to the profit and loss account is £7720; and the sum available for distribution is £8549. To this has been added £302 from the reserve fund; making a total of £8851. This enables the Directors to recommend the payment of a dividend at the rate of 6 per cent. per annum on the "A" consolidated stock, and of 4½ per cent. per annum on the "B" stock. Under the supervision of Mr. A. E. Broadberry, the Engineer and Manager, 13,032 tons of coal, 196 tons of cannel, and 547,485 gallons of enriching oil were used in the production of 307,554,000 cubic feet of gas, of which 287,535,000 cubic feet were sold, and 292,735,000 cubic feet were accounted for. The estimated quantities of residual products were: Coke, 7936 tons 16 cwt. (of which 2097 tons 16 cwt. were used in the manufacture of coal gas, and 3344 tons 12 cwt. in producing carburetted water gas); breeze, 2024½ chaldrons, of which 1408½ chaldrons were used; tar, 218,124 gallons; and ammoniacal liquor, 3674 butts. The sulphate of ammonia made was 121 tons 1 cwt.; and 142 tons 7 cwt. were sold—the difference coming out of stock.

### CROYDON COMMERCIAL GAS AND COKE COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice calling the meeting; and the report and accounts—summarized in last week's issue—were taken as read.

The CHAIRMAN, in moving the adoption of the report, said the first thing he had the great pleasure to refer to was the very satisfactory—and, he might say, rather extraordinary—increase of 16.98 per cent. in the consumption of gas over the corresponding period of last year. This was a maximum increase that had never before been reached in the history of the Company. The previous highest was nearly 16 per cent. in 1874; but since then they had had nothing so high. This great increase of 16.98 per cent. had, of course, arisen partly from the growth in the building trade in and around Croydon, and more especially from the prepayment system of gas supply, which had been taken up very largely indeed during the half year. The adoption of gas cooking-stoves was also greatly on the increase. They had had several lectures on the subject; and these had proved most beneficial, and had been the means of letting out a large number of stoves—both cooking and heating. Regarding the accounts, the capital received during the half year had amounted to £22,018 19s. 6d. from the sale of £5000 of "B" stock, £2500 of 5 per cent. debenture stock, and a call of £2 per share on the ordinary "C" shares, or Carshalton capital. This had given them a premium of £9518 19s. 6d.—showing that the Company were still appreciated by investors who wished to put their money into a safe concern. The capital expenditure had amounted to £11,184. They had purchased four new tanks for conveying oil, instead of paying for the hire of tanks, as they found it would be much cheaper to have their own. Then on water-gas plant (which he mentioned at the last meeting it was intended to extend), they had spent £930; on a new purifier-roof, £145; on new pipes, £152; and on wages for the foundation of the purifiers, £268. New mains and service-pipes and work connected with the distribution came to £4612. On new meters the outlay was £459; new gas-stoves had cost them no less than £3687; and for new house fittings £309 had been spent. Coming to the revenue account, he said that in the sale of gas to private consumers in the Croydon district there had been an increase of £5859; in the Carshalton district £1010; and in public lighting and under contracts £843—making a total of £7712 increase. In the rental of meters, they had obtained £127 more; and in the rental of gas-stoves £268 more. Respecting residual products, an additional £4750 had been received for coke; it having made 2.89d. more per cwt. than in the corresponding period. For breeze there had not been such an active demand; and they had not realized so much for it by £31. In regard to tar, they had rather a big stock at the beginning of the half year; but it was now going out much better than it had been doing. They received an additional £538 on this product, or 0.17d. per gallon, which was rather comforting. Sulphate of ammonia had increased by £86, which was 20s. 2d. per ton more than for the corresponding period. This bye-product had been rather stagnant in price for some considerable time. Altogether the total realized for residuals had been £5405 more. As to the expenditure on revenue, £7189 more had been spent on coal and oil; but they had carbonized 3445 tons of coal more, and used 72,580 gallons more oil. But this was a natural increase due to the increase in the sale of gas. Purification had cost £331 more; repairs of mains, &c., £266 more; gas-stoves £226 more; and lighting and repair of public lamps £82 more. Rates and taxes were £404 more. This had partly arisen through the increase of 4d. in the income-tax for the past three months. The item of superannuations was a little more, but they would be less, as since the last meeting the Company had lost a very old servant, Mr. Kemp, and Mr. Waller, who for many years was assistant to the manager at the works. Altogether they had a balance on revenue account of £5508 more than in the corresponding period. As the shareholders were aware, the



Directors had given notice of an increase in the price of gas from Oct. 1 next of 2d. per 1000 cubic feet. He knew that it was thought by some that they ought not to have done so; but he considered those who were on the Board were better able to judge of whether or not they should increase the price than those who were outside, and criticized the Directors without knowing all the facts of the case. He could assure the proprietors that the Board had not done this without grave consideration, and without very great reluctance; and from the few figures which he would give, it would be seen that what they had decided to do was perfectly right. Unfortunately, they had to make fresh contracts for coal and oil as from June 30, and, of course, like other companies, at a much higher price. Altogether the increases added 9d. per 1000 cubic feet to the cost of making gas, or about £24,000 per annum. With the excellent half year they had had, however, and having some coal in store, which took them on for a little time, the Directors resolved not to make the change until Oct. 1. He thought the consumers should take this into consideration, and not think harshly of the Directors. Since 1894, they could have paid the shareholders, under the sliding-scale, 1½ per cent. more than they had done; but they had given the consumers the benefit of it. He therefore thought the consumers should not be unmindful of this mercy. The Board had taken into account the balance of £9466, which would be carried forward, after paying the dividends on this occasion; and the 2d. would bring in about £1670 on the quarter, towards making up the £12,000 which they would have to pay in the six months in consequence of the increase in the price of coal and oil. The amounts mentioned did not make up the deficiency; but the Board looked to the natural increase that undoubtedly would come to make it up. They sincerely trusted the increase in price would be only temporary. He believed it was the opinion of many who were better able to judge than he was that the increase in the price of coal would not last much longer; but this the Directors knew was certain, that for twelve months from last June they were bound by their contract for coal to the price they had made. Therefore any reduction would not now affect them, unless they were fortunate enough to get the contractors, as they did once before, to cancel the old contract, and give them a new one. But they could scarcely hope to realize that. Comparing the proposed increase of 2d. with the advances of other companies, he said that one journal in the town had quoted a certain worthy Chairman, and had held him up as a pattern to other chairmen of gas companies. But the gentleman referred to had, in the case of his own Company, put up the price 3d. at Lady-day, and 4d. at Midsummer. Then the Crystal Palace Company (which was another of Mr. Livesey's Companies) raised the price 2d. in March and 2d. in June—making it 2s. 10d., the same as it would be in Croydon with the increase in October. Then the West Ham Company had increased their price by 4d.; the Redhill Company, by 4d.; the Richmond Company, 4d.; the Sutton Company, 6d.; the Mitcham and Wimbledon Company, 7d.; the Caterham Company, 4d.; and the Dorking Company, 4d. Thus, in their own case, he considered the Directors had been very moderate; and he believed when the consumers had thoroughly taken into account the increase in the price of coal and oil, they too would think the Directors had been very lenient in only raising the price by 2d. It was true that they had large insurance and reserve funds; but he for one was loth to touch such funds for this purpose, unless it was merely a spasmodic increase in the price of material. They might, however, have to do so slightly for the next half-yearly dividend; but he hoped not. After paying the dividends at the rates they had done for a considerable time now, they had a balance of £9466 to carry forward. He thought they ought to congratulate themselves upon being in such a happy position.

Mr. T. RIGBY seconded the motion.

Mr. H. D. ELLIS thought the Directors might be proud as well as happy in having such admirable accounts as they had on this occasion to submit to the proprietors; and, personally, he was grateful to the Board for the attention they had given to the business to produce such results. The pith of the matter dealt with in the Chairman's speech was the rise in the price of the gas. He felt confident that every reasonable shareholder—in fact, all the shareholders—would thoroughly approve of the action of the Board in resolving to increase the price 2d. For his own part, he was only astonished at their moderation. Everybody who knew him (Mr. Ellis) was aware that he had been an out-and-out advocate of cheap gas. He had always endeavoured, in all companies with which he had been connected, to preach the wisdom of selling gas as cheaply as possible. But there was a point at which they could go no lower, and must raise the price. It was absolutely quixotic to try to sell gas cheaper and cheaper when they had a certain loss facing them in the future. He ventured at a meeting the previous week to say something on this point; and he was much scolded in print for his words. But he was so hardened that he came up smiling again; and he stuck to his opinion still. With such an advance in the price of material, he would venture to say most respectfully that, as time went on, if the Board saw (as he hoped they would not see) that 2d. was not sufficient to enable them to tide over the enormous rise in the price of coal, they would have the unanimous support of the shareholders if they did not shrink from taking such further measures as might seem prudent. It was all very well for writers in local newspapers who were not thoroughly acquainted with gas affairs to talk of large reserve funds. Perhaps they did not know that reserve funds were not applicable to the matter; and such funds must not be lightly frittered away.

The ENGINEER (Mr. J. W. Helps), in reply to a question, stated that the unaccounted for gas was only between 2½ and 3 per cent.

The motion was unanimously agreed to.

Mr. CORBET WOODALL moved the declaration of dividends at the rate of 14 per cent. per annum on the "A" stock, 11 per cent. on the "B" stock, and 9 per cent. on the "C" and Carshalton capital. He said he would not have made any observations upon this motion, had it not been for the remarks of Mr. Ellis. He could not help feeling a little at issue with Mr. Ellis in some of the observations he made. To him (Mr. Woodall) it was a matter of most sincere regret that they had had to raise the price of gas at all. When he said "to him," he spoke of himself as one of the Board of Directors. They were all very sorry indeed that such a course had been necessary; but at the same time, they knew that it was necessary, having to face an increase of something like £25,000 in the coming year, and amounting, as had been said, to about 9d. per 1000 cubic feet of gas sold. It was perfectly impossible to meet this out of

the ordinary revenue in the past half year. The increase in the gas revenue, large as it was, had been entirely absorbed by the increase in the cost of the raw material; and the increased balance had come from the greater value of residuals. His (Mr. Woodall's) feeling was that the shareholders should be, and he was quite sure they were, willing to share with the consumers the loss attending a condition of things such as they were experiencing now. The Directors had accumulated a certain amount of reserve fund; and out of that, if necessary, they would return something to the consumers, in order to make the increase in price as low as they possibly could. They had put the money by out of what might have been divided to a large extent. But they had put it by so as to have the wherewithal to meet a case of this sort; and no doubt, to an extent, it would be used for that purpose, should it be necessary. A very good reason for raising the price of gas now, although they had such an admirable balance-sheet, was that it might prevent a larger rise at a later date.

Mr. SAMUEL SPENCER seconded the motion, which was agreed to.

Mr. BAYNES moved a vote of thanks to the Chairman and Directors; and Mr. ELLIS seconded it—the latter gentleman remarking that he entirely agreed that the object of the reserve was to make good the dividends in bad years.

The motion was heartily endorsed.

The CHAIRMAN, having responded, proposed, in graceful terms, a similar complimentary vote to the Secretary and the Engineer and their respective staffs.

Mr. W. CASH, F.C.A., seconded the motion, which was also warmly approved.

Suitable responses having been made by Mr. RUSSELL and Mr. HELPS, the proceedings terminated.

### BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Bell Hotel, Bromley—Mr. ALEX. DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) having read the notice calling the meeting, the report and accounts, of which an epitome appeared in the "JOURNAL" for the 7th inst., were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought a satisfactory feature of the half-year's working was that they had been called upon to make 8 million cubic feet of gas in excess of the quantity produced in the previous six months, and 13 millions over and above the quantity made in the corresponding period of last year. It was always desirable that they should beat their best records; and this increase was a very welcome proof of the Company's inherent power of growth, notwithstanding certain other systems of lighting. Yet it was unfortunate that, in the very half year in which they had had this large increase (which, had it continued, would have brought them in a sum of profit at the old price which would have enabled the Directors at no distant date to approach the consumers with proposals for lowering the price), they found themselves confronted with a sudden and very substantial advance in the cost of coal; so that, in place of the other prospect, they were actually driven, much against their will, to increase the price of gas. Such were the experiences of commerce! Various causes had operated to bring about this great rise in the price of coal. It was divulging no secret to say that, towards the close of last quarter, many of the Durham, and some of the Yorkshire, collieries, had so fully contracted their sales for the twelve months in advance, that they simply answered inquiries for coals by saying: "We really have no coal to offer you." And it was no exaggeration to say that there was practically no coal in store at that time at the pit mouth or elsewhere. The great demand had not only depleted but exhausted stocks. The iron trade, with which the fortunes of the coal trade were so closely allied, was in unwonted activity at high prices; skilled labour was everywhere in demand; and, indeed, the trade of the whole country was immersed in an activity and prosperity which had seldom been previously known. In such circumstances, it was not surprising that the coalowners should seek to share in the general improvement; but no one was prepared for a rise of nearly 300 per cent. in the price of coal in about two years. It was not an easy matter to unravel the mystery of how this had come about. Its very suddenness and the extent of it were astounding. No doubt the advent last February of foreign buyers of gas coal, in enormously increased quantities, was very prejudicial to the home customer. When in the North with their Engineer (Mr. W. Woodward) some months ago, trying to pick up the best possible bargains, he learnt that agents from two foreign countries (which were named to them) had been over, and announced that they were buyers of largely increased quantities of coal. One was desirous of buying from our fields the usual year's supply for a large Continental gas-works, and to discontinue using Belgian or German coal. The agents were informed they could have the coal; but the price would be 16s. 6d. per ton, instead of 8s. 6d. They took only a few days to consider the matter, and then accepted these onerous terms without much further discussion. These prices, having been made, were then adopted by the coalowners as ruling the home market also. Without some kind of mutual understanding among the coalowners, without the prevalence of a great demand, and the entire absence of stocks, such a price could not have held for any time. But as it was, so great was the demand that a sale below the price mentioned, and in the case of the best qualities at something higher, was simply declined. The Chairman proceeded to refer to the suggested export duty on coal, and to other matters associated with the subject—particularly referring to the absence of miners from their work, and its effect upon the output of coal. He said he alluded to this topic at such length in the hope that the consumers would recognize that the rise in the price of gas had resulted from causes over which they had just as much control as the gas companies—if either of them had any—and that it was not the gas companies but others who were profiting. It should also be remembered by the consumers that only 10,000 cubic feet of gas could be produced from a ton of coal; and, therefore, a rise of 10s. per ton meant an additional cost of 1s. per 1000 cubic feet. Part of the gas made was supplied under contracts which could not be disturbed, as, for instance, the contract for public lighting, which was upon terms that could not be disturbed for a



few years. The town in this case had the advantage, and quite fairly so. But this rather increased than lessened the trouble of the Directors. The Company, however, would get some benefit from the sales of coke as a set-off. He ventured to hope that those present would see from what he had said that the Board fully realized their responsibilities at this juncture both to the shareholders and to the consumers; and he trusted that time would show their arrangements had guarded both interests. In the first instance, they had fully determined to have a winter stock of coal, whether the coalowners had one or not, and to run no risks. The Directors also decided that, whatever the price, quality should be maintained. Hence they had bought coal which would enable them to do as heretofore, though they necessarily had to pay the full price for it. Referring to criticisms in the Press respecting the difference in the charges to ordinary and prepayment consumers, he explained the reasons for the additional charge of 8d. per 1000 cubic feet in the case of the latter. Turning to the accounts, he said the large advance in the consumption of gas gave an increase in the rental of £2002 as compared with the June half of last year, and from the sale of coke they had derived an additional £1567. Tar and sulphate had also yielded better results; and with other small advantages, their net rental increase was £3800. On the other hand, the charges for coal had increased by £1940; for repairs of works and in the amount written off for depreciation, by £252; for repairs of mains and services (this work had been in the half year of an exceptional character, and the expenditure was not likely to be recurrent in the same proportion), by £315; for wages, by £167; and in other items, by some £346. Regarding the matters in dispute between themselves and a neighbouring Company, they had, he said, advanced a stage.\* Judgment had been recorded, and in terms against which the Directors were strongly advised by Counsel to appeal. In accordance with the rule, they had paid the taxed costs in the first Court to the plaintiff Company; and they had also drawn a cheque for their own Solicitor's charges in the matter, and thus cleared their accounts of these items. After providing for the payment of the dividend at the same rate as heretofore, there would remain a balance of £2571 to be carried over to the next accounts. He thought the proprietors would agree with him that this was a very satisfactory result, having regard to the short period that had intervened since they were dividing their profits to the fullest extent they possibly could. In conclusion, he mentioned that during last half year the Board bought coals at an advanced price; but, having used part of them, they had in stock at Midsummer some of the later deliveries under last year's contracts. So the benefit of the lower prices under last year's contracts would, *pro tanto*, pass to the present year's trading.

Mr. B. H. LATTER seconded the motion, which, after a few questions had been answered, was unanimously carried.

A dividend at the rate of 12 per cent. per annum upon the original 10 per cent. capital, and of 9 per cent. upon the ordinary 7 per cent. capital (both subject to income-tax), was declared.

The thanks of the shareholders were accorded to the Chairman and Directors and officials; and, in responding, the Chairman made special allusion to the anxious times they and their Engineer had experienced during the half year.

### HORNSEY GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Friday, at the Offices, No. 63, Chancery Lane—Mr. JOHN DREW, the Chairman of the Board, in the chair.

The report and accounts were taken as read. These showed that comparing the sale of gas in the half year ending June 30, 1899, with the same half year in 1900, there was an increase of 22½ million cubic feet, or 16½ per cent. The revenue yielded a profit of £8300; and the price of gas was 3s. per 1000 cubic feet. The initial sliding-scale figure is 3s. 9d. per 1000 cubic feet; and this would permit of an increase of 2½ per cent. per annum dividend on both classes of shares. The report stated that a quotation for the 7 per cent. consolidated stock of £72,500 had been granted by the Stock Exchange; and the regret of the Directors was expressed at the loss of an old and valued colleague, for many years Chairman of the Board—Mr. William Peter Bodkin.

Mr. DREW spoke of the satisfactory position of the Company, and moved that the report and accounts be received and adopted.

Sir HARRY POLAND seconded the motion; and it was carried unanimously.

Resolutions moved by the CHAIRMAN, and seconded by Mr. E. T. E. BESLEY, Q.C., and by Mr. JOHN MILES, were likewise adopted for payment of a dividend on the preference stock and of dividends at the rate of 12 and 9 per cent. on the 10 per cent. and consolidated stocks respectively.

Thanks were then voted to the Directors and to the officers and staff, and the proceedings terminated.

### AN INQUIRY AS TO THE PRICE OF GAS AT HARROW.

#### A Curious Provision and its First Application.

In the Harrow and Stanmore Gas Act of 1894, the following provisions are applied to the selling price of gas: From the quarter-day next after the passing of the Act, the standard price is fixed at 4s. per 1000 cubic feet for gas supplied within a radius of one mile from the King's Head Hotel in Harrow. For every penny upon this price, up or down, the original capital is to have 5s. per cent. allowance; and the 7 per cent. capital 3s. 6d. per cent. It is provided that, as from the same period, the price to be charged by the Company within this radius shall not exceed 4s. 3d. per 1000 cubic feet until the Company shall have for the first time paid a dividend on their "A" capital of 9½ per cent., and on the "C" capital, old and new, of £6 9s. 6d. per cent. per annum, "unless the cost to the Company per ton of coals delivered at their works shall, in the opinion of a competent and impartial Referee, having a practical knowledge and experience in the manufacture and supply of gas (who shall be appointed by the Board of Trade upon application by the Company, or by the Harrow Local Board), justify an advance beyond the said price of 4s. 3d. per 1000 cubic feet; and such advance of price, and the date of its com-

mencement and the period of its duration, shall be determined by the said Referee." The first inquiry under this provision has recently been held; the Company having applied for permission to raise the price of gas 3d. per 1000 cubic feet from Midsummer last in the one mile radius from the King's Head Hotel. The Referee appointed by the Board of Trade was Dr. J. S. Haldane.

The Company were represented by their Engineer (Mr. J. L. Chapman), and the opposition of the Harrow District Council was conducted by Mr. R. H. Fisher. The Referee opened the proceedings by reading his credentials; and then Mr. Fisher desired to know how the matter stood with reference to the district outside the prescribed area. He said it was generally held that if the Company did not get consent to raise the price in the prescribed area, they could not do so in the outside area, and so it would affect a great number of people who were not then represented. Mr. Chapman maintained that the matter did not apply to the outside district; the Company could charge what they liked there. The Act of Parliament was read by the Referee, who said the question was not before him; and it was therefore unnecessary for him to express an opinion, which would be of no value, as it was a legal question.

The preliminaries having been disposed of, Mr. Chapman stated the case for the Company. He said that in 1894, when they obtained their Act of Parliament, the contract price of coal was 15s. 11d. per ton; now it was 22s. 11½d. per ton—a rise of 43 per cent., or 7s. 0½d. per ton. These were the prices for coal delivered at the Harrow Metropolitan Station; and after that there was a further cost of 2s. per ton for cartage. The average quantity of gas sold for each ton of coal carbonized was 9500 cubic feet; and the increase of 7s. 0½d. per ton of coal therefore gave an increase of 8-84d. per 1000 cubic feet of gas. Against this, there had been an advance in the price of coke since 1894 of 2s. 3d. per ton. The average sale of coke, deducting the quantity used in the furnaces, was 10 cwt. per ton of coal carbonized, which showed an increase of 1-44d. per 1000 cubic feet of gas sold. Tar had also increased 0-68d. in price per 1000 cubic feet of gas sold; while the price of sulphate of ammonia had remained practically stationary. After making allowance for all these increased returns for residuals, the net additional cost of coal to the Company per 1000 cubic feet of gas sold was shown to be 6-72d. In the autumn of 1893, a coal strike had affected the pits from which the Company drew their supply, and seaborne coal had to be purchased at high prices. Part of these high-priced contracts remained in operation during the early part of 1894, increasing the cost of coal over that year by 17d. per ton or 1-79d. per 1000 cubic feet of gas sold. By deducting this from the 6-72d., the net increase in the cost of production was found to be 4-93d. per 1000 cubic feet. The rise in coal from 1896 to the present year was 6s. 11½d., which equalled 6-15d. per 1000 cubic feet of gas sold. With the price of gas at 4s. 3d. per 1000 feet, the Company, under their sliding scale, were empowered to pay 9½ per cent. dividend on the "A" shares, and £6 9s. 6d. per cent. on the "B" guaranteed shares; whereas the dividends paid up to the end of December, 1897, were 7 per cent. on the "A" shares and 6 per cent. on the guaranteed shares. For 1899, the dividends paid were 8 per cent. on the "A" and 6 per cent. on the guaranteed shares. The present coal contract was for the next twelve months. They did not now use much water gas, for the price of oil had gone up so that it did not pay. He had, however, made a contract for oil at 5½d. per gallon from September to March.

Mr. Fisher asked if the present prices of gas at Harrow—viz., 4s. 3d. and 4s. 6d.—were not high? Mr. Chapman: Yes. Mr. Fisher: Very high? Mr. Chapman: No, not compared with many other places, which were even higher. He added that it must be borne in mind that they had no water to carry their coal. Last year the Gaslight and Coke Company got their coal for 11s. per ton; while at Harrow it cost 18s. The Gaslight and Coke Company charged 3s. 6d. per 1000 cubic feet; the Harrow Company asked for 4s. 6d. In reply to a question, Mr. Chapman said they only asked for a rise for twelve months. Mr. Fisher pointed out the great leakage the Harrow Company showed year by year. Mr. Chapman explained that they had 52 miles of mains to look after; and other Companies adjoining had even a larger percentage.

Mr. Fisher then went into figures to show that the relative position of the Company to-day was even better than in 1894, when they obtained their Act. If 4s. 3d. was sufficient then, as the Act presupposed it was, for it fixed the standard at 4s., then 4s. 3d. should be sufficient now. The Company was considered by many to be over-capitalized.

The Referee asked Mr. Chapman to explain why coals cost more at Harrow than in London. Mr. Chapman said the large London Gas Companies had the great advantage of sea-borne coal. The Harrow Company had nothing but the railway. They had looked into the question of the canal; but it was too far away, and would cost more than the railway. Mr. Fisher pointed out that a new railway was being constructed quite close to the works. Asked as to the amount of capital per 1000 feet of gas sold, Mr. Chapman replied that at Harrow it was 29s. 1d.; while in the case of the Gaslight and Coke Company it was 12s. 6d., and in the case of the South Metropolitan Company 8s. 10d. Some £2000 had been spent in slot meters. The Referee asked the reasons for so large a capital. Mr. Chapman replied that they had bought up two Companies—one costing £18,000, the other £10,000—and their district being a large one, they were constantly laying new mains to meet the wishes of local authorities and private consumers, which mains were unremunerative at present. Other companies had raised the price, having the power to do so without making application to the Board of Trade. He should hardly think there was another company in the kingdom in the same position. It was quite unprecedented for a company to have to get consent to raise the price. Mr. Fisher quoted the charges of other companies in Middlesex; and out of thirteen companies, only three were charging more than Harrow.

A consumer of gas under the slot meter system (Mr. Short) said he was supposed to get 17 cubic feet for a penny. If the Company were empowered to raise the price, he would only get something like 13 feet. Why, he asked, should the Harrow Company charge 4s. 6d., when London only charged 3s.? Let the shareholders drop their dividend a bit; 6 per cent. would be very good interest. They were grabbing everything. He uttered his protest against any rise. Mr. Chapman replied that a good many other companies had not raised the price of gas, but then they had large reserve funds. Harrow had none. He pointed out that his figures showed that, after deducting the increased price for residuals, the cost per 1000 cubic feet of gas was 5d. more; but the Company were only asking for 3d. They did not go for the highest dividends; and if it had not

\* See "JOURNAL," Vol. LXXIV., p. 434.



been for the rise in the price of coals, they would have very soon reduced the price of gas. As to slot meters, the effect of the reduction would be 16 feet for a penny, instead of 17 feet.

Mr. Fisher asked the Referee, in the event of his deciding to sanction any increase, not to sanction the 3d. asked for, but something less, and not to allow the rise for twelve months, as in six months' time the Company might have a railway running into their works. Mr. Chapman remarked that Mr. Fisher was turning prophet. The Referee observed that he should go down to the works and see for himself; and he would send his decision as early as possible.

Dr. Haldane has made his award, in the course of which he says: "I am of opinion that the present cost to the Company per ton of coals delivered at their works justifies an advance beyond the sum of 4s. 3d. per 1000 cubic feet, the price of gas delivered by the Company within a radius of one mile from the King's Head Hotel, Harrow. I therefore authorize the advance in price from 4s. 3d. to 4s. 6d. per 1000 cubic feet of gas; this advance to commence at next quarter day from the present date, and to terminate at Midsummer quarter day, 1901."

### COALOWNERS, GAS COMPANIES, AND THE COAL QUESTION.

The correspondence on the above subject in "The Times," to which reference has been made in the last two numbers of the "JOURNAL," was continued on the 14th inst. by "Another Coalowner," who wrote as follows in reply to Mr. Livesey, whose letter was given in our issue for that date (p. 425):—

Mr. Livesey is an acknowledged authority on questions connected with the making and supply of coal gas; but I gather from his letter of the 7th inst. that he is less intimately acquainted with colliery matters. Will you allow me to assure him that to work and continue to work a colliery at a loss is by no means an uncommon occurrence? In my own case, for five years past I have not made one penny profit, but, on the contrary, have annually lost from 1d. to 1s. 2d. per ton of coal raised. I feel sure that Mr. Livesey will readily understand that coalowners under such circumstances might reasonably feel a little sore when they see chairmen of gas companies gloating with well-satisfied complacency over the fact that, owing to the cheapness of coal, the shareholders receive their statutory dividend of 12½ per cent.

No doubt gas consumers and coal users will not be as well satisfied with coal at a reasonable price as when it was unreasonably cheap; but unsatisfied desires of this kind are not limited to coal. I own to them myself in relation to the iron and timber I use and to the labour I employ, the cost of which has increased and is increasing. My cost, not including any interest or capital charges, has increased 2s. 4d. per ton in the last five years, due to the advance in wages and prices of stores—the increase in selling price being 1s. 11d. in the same period.

I have no qualification for the rôle of prophet; but in relation to the probability of prices coming down there are some facts and circumstances which may be of interest to your readers. The fallacy of a comparison between 1873-4 and now is apparent to colliery owners. In 1873-4 there was a great reserve of unopened coal which could be got at at reasonable cost; and numbers of collieries were opened and many more were able to increase their output in a way which ere long far more than met the demand, which was vastly less than it is at present. Coalowners, as a rule, had little or no idea of acting together in relation to the sale of the produce of their pits; and foolish and unreasoning competition led to the cutting of prices and increased that deep depression in the industry which a wise and reasonable co-operation in relation to prices would have gone far to mitigate. The fact—for it is a fact—that increased output lessens cost obtained a too prominent position in the eyes of colliery engineers and managers, until the owners had the unpleasant experience forced upon them that what was saved in cost was more than lost in reduction of price.

As matters stand now, the circumstances are widely different. There is little or no coal in districts I am acquainted with which can be opened by fresh sinkings save at enormous cost. Collieries which in 1873-4 had ample coal within reasonable distance from the pits are now two and even three miles in; and others which were then working are now practically exhausted. I am quite aware that the national output has increased. But while in 1873-4 supply quickly overtook demand, it appears now that supply does not even keep pace with demand; and I venture to think that reduction in price will only be effected by a very materially lessened demand. As to the probabilities of the latter, I can only be guided by the facts before me. I find the great railway companies, if offered the option of a six or a twelve months' contract, generally choose the latter at equal prices. Shipowners contract for the usual long periods, and merchants and works are not only ready but eager to contract for a year at present prices. On the other hand, colliery owners are refusing to contract for greater quantities than in past years. An advance of 1s. 8d. per ton in house coal has just come into force; and the demand seems stronger than ever—not because merchants want to stock for the winter, since the practice of summer and winter prices has been long abandoned in this district. I am not acquainted with iron-works, but I am told that further advances in the price of iron are expected; and I think it will be found that the iron and steel industry is by no means the important factor in coal consumption it was some thirty years ago, having regard, of course, to the tonnage of coal raised.

Colliery owners have learnt a lesson from past misfortune. They have found, and are finding more and more, the necessity of acting together in matters relating to coal sales, not only in districts, but district with district. United action has been a plant of slow growth; but it has come to stay, and is a factor which has to be reckoned with.

Mr. B. Pickard replied to Mr. Livesey in "The Times" on Friday, as follows: I see from Mr. Livesey's remarks that he has been advising the general public not to buy coal, because the price of coal, as he assumes, will be lower directly. It is not for me to prophesy what the price of coal may be next winter. At the same time, I very much desire to prophesy of this fact—that coal, if not higher, will not be lower to the consuming public in London or in any other large city. I should like to ask Mr. Livesey a plain question or two. First, is it true that his

Company have been buying up all the coal possible at the highest values recently, and the contracts will run until next June? Secondly, is it true all this was done with the full knowledge that, in his judgment, the prices would not recede before the end of June, 1901? If this be true, what is the commentary to be applied to the advice to the general public not to buy coal now, but to wait in the hope that values will recede immediately? All I can say is that, looking at the trade of the country and the present demand for coal both at home and abroad, he would be an unwise man to advise another man to refuse to buy coal if by that means he could save perhaps 1s. or 1s. 6d. a ton?"

Speaking at the annual meeting of Messrs. Henry Briggs, Son, and Co., Limited, last Wednesday, Mr. A. Currer Briggs gave expression to his views on the coal question. He said the reason coal had gone up in price was that other industries had been prosperous, and coal had been required in greater quantities. Another fact was that the supply was below the demand. He did not think the present price of coal would continue for very long after it had reached a point seriously endangering the national industries. Nor was it to be hoped that the high rates would last. It would be a great detriment to everyone in the country if the price of coal were to continue at such a figure as would threaten with extinction any other national industry. He had noticed remedies suggested for the present high price of coal—such as prohibiting exportation. It was an absurd misapprehension that exportation was the cause of the high rate. He mentioned that it had been stated that a gentleman had become alarmed because he had seen four or five cargoes of coal being discharged at Dunkirk, and had jumped to the conclusion that the French were storing up coal to use against this country. Coal had been sent to Dunkirk for thirty years. The Paris Gas Company formerly procured almost all their coal from this country; and if the gentleman in question had gone there two or three years ago, he would have seen English coal being discharged. He did not think the prohibition of the exportation of coal would take place. No Government would dare to do it. If they did, they would not only have to deal with the coalowners, but with the miners, 200,000 of whom would be thrown out of work by such a step. He could claim for Yorkshire coalowners that they had been singularly moderate as compared with coalowners in other parts of the country; and he would undertake to say that in this part of the world coal was cheaper than in any other portion of the kingdom. It was not unfair that they should take advantage of the times when they were able to increase the price, and when the demand almost forced them to do so. "The faster it goes up," concluded Mr. Briggs, "the faster it will go down, and less time will it remain at the extravagant figure."

### THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

In the "JOURNAL" last week, we briefly noticed the issue of the report for the past year of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter). We are now able to give some extracts from the report.

The number of works registered under the Acts in England, Ireland, and Wales is 1055. Of these, 88 only are works decomposing salt, and so scheduled as alkali works, while the remainder (967) carry on processes which are scheduled under the Acts of 1881 and 1892. These numbers show a net increase of two alkali and one other works since 1898. There are also 127 works registered in Scotland; bringing the total number of registered works to 1182. Concerning these, a separate report is presented to Her Majesty's Secretary for Scotland. The inspectors under the Acts paid 5011 visits to works, and carried out 5585 tests. There were four prosecutions for "failure to use the best practicable means for preventing escape of noxious gases, or for rendering them harmless and inoffensive when discharged;" and a penalty of £20 and costs was imposed in each case. One was in connection with the manufacture of tar, and another with that of sulphate of ammonia. Mr. Carpenter says that in the former case "very full warning was given; but protracted and deliberate neglect to re-erect and replace previously existing appliances could only be adequately met by the commencement of proceedings." The district inspector, we are told, "exercised much forbearance." In the latter case, the Chief Inspector acquits the proprietors of the works of intention to evade the requirements of the Act; but the warnings given as to the limited capacity of the plant were disregarded, and there was laxity in the management, as the plant was not stopped on the day the escape was discovered. The duty was a very painful one for Mr. Carpenter to have to carry out; and he expressed his pleasure in stating that the relations of confidence between the inspector and the firm have been in no way impaired. He says it cannot be too strongly urged that unless this feeling of mutual confidence exists and is cultivated, inspection becomes much less efficient in protecting the interests of the public.

Passing the sections of the report dealing with alkali and alkali waste and wet copper works, Mr. Carpenter comes to chlorine. No serious escapes of this gas reached him, nor did the district inspectors have much of their time occupied in dealing with them. He refers to the explosion at the Kurtz works of the United Alkali Company at St. Helens, on the 12th of May, which destroyed a large holder at the adjacent Corporation gas-works, as "the event that marks out the year 1899 as one which can never be forgotten in the Leblanc industry." At the time of his visit to the scene, he was informed of what was noticed concerning a barometer in the laboratory of the Hardshaw Brook Chemical Works; and he obtained, through Mr. E. G. Ballard, the Inspector for the district, the following particulars from the Chemist at the works:—

On May 12, 1899, at 10.20 a.m., a terrific explosion occurred at the Kurtz Chlorate of Potash Works. A barometer hanging in the laboratory at the Hardshaw Brook Chemical Works, about a quarter-of-a-mile from the scene of the explosion, suddenly rose, and immediately fell to a point indicated by some scum on the surface of the mercury being left behind in the barometer tube on the mercury rising again to its normal height. This point was at 22½ inches from the surface of the mercury in the cup (corrected), indicating the vacuum created in the atmosphere after the explosion. The first effect of the explosion was a pressure which drove the mercury up above the normal height 2½ inches, until it was arrested by the closed end of the tube. It might have gone higher had the tube been



longer. It then fell to 22·6 inches, and left the mark on the barometer-tube mentioned. All the windows at the Hardshaw Brook Chemical Works were blown inwards; but at a greater distance from the scene of the explosion the windows were blown outwards. A closed room at a distance from the explosion would act as a cushion to any outward pressure; but the subsequent vacuum created outside caused the air in the rooms to expand and drive the windows outwards.

In the next sections of the report, Mr. Carpenter deals successively with sulphuric acid works (and, in this connection, devotes some space to new processes for the manufacture of sulphuric acid without vitriol chambers), chemical manure works, and works for the manufacture of sulphate and muriate of ammonia and the treatment of gas liquor. It is the last section which most concerns our readers. During the past year, many inquiries reached the Chief Inspector in regard to the method, referred to in previous reports, of combustion of the sulphuretted hydrogen to sulphurous acid, with subsequent neutralization of the latter by limestone in a tower fed with a flush of water on the top—the soluble product, bisulphite of calcium, subsequently flowing away to the drains; and he opens this part of his report by stating what precautions have been found necessary in working, and what conditions are absolutely essential for success. He then goes on to say that he thought it would be interesting to make a historical retrospect into the value of residuals in coal gas manufacture, going back to the year 1850 or thereabouts; and he cites as noteworthy the fact that there are still in active work members of the gas profession whose recollection goes back to that period. In many works it was undoubtedly the case that ammoniacal liquor was run into watercourses and drains, or where this could not be done, was evaporated in the ash-pans of retort fires. Rather more than fifty years ago, a return, to the order of Mr. Joseph Hume, on the gas undertakings of the United Kingdom was presented to the House of Commons, and was analyzed in early numbers of the "JOURNAL." Mr. Carpenter gives the following figures extracted therefrom:—

Raw Material.	Cost of Raw Material per Ton.		Value of Residuals. Per Cent. of Cost of Raw Material.	
	s.	d.	s.	d.
Cannel—				
Scotch	12	5 10	24	4
Wigan	9	4½	15	6
Caking Coal—				
Cheshire	10	7	12	0
Cumberland	9	8	13	7
Staffordshire	8	4	20	0
Derbyshire	6	6	13	6
Somersetshire	10	0	13	0
Lancashire	—	—	8	11
South Wales	7	10	17	0
Yorkshire	5	4	12	4½
Newcastle	5	6	19	6

Mr. J. H. Cox, the Secretary and Manager of the Sunderland Gas Company, who, it may be remembered, celebrated last year the jubilee of his connection with the Company, supplied Mr. Carpenter with the following interesting information bearing upon this subject:—

	1849.	1899.
Coals	3s. per ton	12s. per ton.
Coke	2s. 6d. per ton	10s. 6d. per ton.
Tar	2d. per gallon, sold to builders of wooden ships.	1½d. per gallon, sold to tar distillers.
Ammoniacal liquor	3s. per 1000 gallons, sold to chemical works in the neighbourhood.	40s. per 1000 gallons, calculated from present price of sulphate.
Proportion of cost of coals received from residuals	65 per cent.	70 per cent.
Gas made	20 million cubic feet.	927 million cubic feet.

Referring to the foregoing particulars, Mr. Cox wrote as follows: "When 2d. per gallon for tar was paid in 1849, the production was small and the demand fairly good. When the production of tar increased, without any corresponding increase in the demand, prices came down until the discovery of benzene and aniline dyes,\* when the demand was such that we received 2½d. to 3d. per gallon. This was again followed by a depression in prices, and at one time it was difficult to obtain ½d. per gallon." The figures in the last line of Mr. Cox's table show at a glance the extent to which the Sunderland gas undertaking has grown during his connection with it.

The next portion of Mr. Carpenter's report is of such exceptional interest that we reproduce it practically as it stands:—

It seems desirable that I should give some attention here to the results of an examination made this year into the most recent of the processes for desulphurizing gas liquor developed at the works of the Halifax Corporation, and with which the name of Mr. Holgate, the Engineer of the works, is so closely associated. As little mention has been made of such processes in previous reports (my own remarks as District Inspector of No. 4 district in 1894,† on the Halifax process being almost the only reference that I can find) it will be also desirable to preface the results of this particular process with a short account of what has been previously done in this field.

When consulting, for an entirely different purpose—viz., the dealing with residuals from gas-works in the earlier part of the century—the "Historical Sketch of the Origin and Progress of Gas Lighting" by William Matthews (2nd Ed., 1832), kindly lent me by Mr. Warner, Engineer and Manager of the South Shields Gas Company, I came across a fact, known, I think, to but

very few, that Mr. C. F. Claus was anticipated as early as 1817 in his process for gas purification in closed vessels by means of ammonia gas.\* From p. 85, of this work I extract the following:—

One of the first of these plans, which is remarkable, was that devised by Mr. D. Wilson, of Dublin, who, in 1817, took out a patent for purifying coal gas by means of the chemical action of ammoniacal gas.† . . . As this combination of the sulphuretted hydrogen with the ammoniacal gas rendered the mixture soluble, it was dissolved in its passage through the water, and the carburetted hydrogen gas was rendered pure before it entered the gasometer to pass to the burners. Though this method proved efficacious for its purposes to a certain extent, it appears to have been attended with some inconveniences or difficulties, and was therefore never much introduced into practice.

Attention was directed subsequently to the desulphurization of gas liquor by various means, chiefly by heat; the compounds of ammonia with sulphuretted hydrogen and carbonic acid were split up, the latter going off in gaseous form, the ammonia being almost entirely retained in the liquor, which, when cooled, was fed on to the scrubbers and washers in place of fresh water, for removing the above-named impurities from a further portion of crude coal gas awaiting purification—the processes, of course, being continuous. While many labourers were in the field, the process in its ultimate form, in the year 1882, when such processes first came under the purview of the Alkali Act as "gas-liquor works"—that is to say, any works in which gas liquor is used in any manufacturing process—was known as the Hills process, though as co-workers in this connection the names of Mr. Richard Laming and Mr. George Livesey should not be forgotten.

Shortly after this, the processes with which the name of Mr. C. F. Claus is so intimately associated proceeded to development on a working scale. The recovery of sulphur from sulphuretted hydrogen, or from gases containing it, in proportions exceeding 15 per cent. by volume, has been a most valuable aid to various chemical industries. It at once proved an almost indispensable adjunct to the Hills process, as other means of satisfactorily dealing with the foul gases evolved had proved themselves by experience to be unsatisfactory. Mr. Claus's main process, however, was for the purification of crude coal gas by adding to the crude main a quantity of ammonia gas eight times the weight or volume of the ammonia carried naturally by that gas, and arising from the distillation of the coal in the retorts. Experimental plant was erected at the Birmingham Corporation Gas-Works at Windsor Street, which I myself saw in operation early in 1886. It had then been some time in use, and an additional tower had been erected to remove the organic sulphur compounds (often called bisulphide of carbon) from the crude gas usually removed as calcium sulphocarbonate by means of fowl lime purifiers. In the Claus apparatus, ammonium polysulphide, prepared by dissolving sulphur in ammonium sulphide, was the re-agent employed for combining with, and removing, organic sulphur. It subsequently transpired that this was the re-invention of a process bearing the name of the late Dr. Leigh, Medical Officer of Health for Manchester, which was experimented upon at the works of the Gaslight and Coke Company, at Bromley, and mentioned by Dr. Ballard in his report to the Board on Effluvia Nuisances in 1878.

It was not, however, till January, 1889, that a plant designed to purify 2½ million cubic feet of gas per diem started operations at the works of the Belfast Corporation. The process worked intermittently till February, 1895, when it was finally abandoned, and has not since been revived elsewhere. Mr. Stelfox, the Gas Engineer to the Belfast Corporation, contributed a most complete history of its working to the Gas Institute in 1897.‡ Of the paper it has been said: "We do not recall, in the whole range of technical literature, so candid a narrative." It is clear from this history that (1) the expectations of those interested were too sanguine, as regular and complete purification to the limits laid down for gas supply could not be effected, provision of dry lime purifiers being necessary as a final process; and (2) that the design and construction of the plant were not adapted to secure a successful solution of the problems facing the inventor or the engineer responsible. The importance of chemical engineering as a separate branch of applied science here received only too full an illustration.

Mr. Holgate's process started work in 1894, as already described; and at the Incorporated Institution of Gas Engineers in 1895 the record of a half-year's work was presented \$—2 million cubic feet of gas being treated, on an average, per day. Since that time, additional scrubbers and washers have been erected; so that it is easily possible to get an 85 to 90 per cent. purification of the gas, and beyond 90 or 95 per cent. Mr. Holgate does not consider it would be wise to attempt to force the process. The remaining impurities can be removed more cheaply by dry purifiers. The conditions having changed through development in the course of the last four years, the figures I give of an examination of samples of unpurified and purified liquor in 1899 are not strictly comparable with those given by Mr. Holgate in 1895. I, however, present both results. [See opposite page.]

Attention should also be called to the improvements suggested first by Mr. W. Young, of Peebles, and patented by him in 1885, in the preparation of caustic ammonia, either in liquid or gaseous form, for the removal of impurities from coal gas. These are based on appreciation of the fact that at atmospheric pressure only a small range of temperature exists between the dissociation-point of carbonate and sulphide of ammonium and the boiling-point of water; and as the solvent power of water for ammonia at those temperatures at ordinary atmospheric pressure is small, the process of preparation of a crude caustic ammonia solution has to be conducted slowly in large vessels and with only weak gas liquors, else too great loss of gaseous ammonia ensues, unless an acid ammonia catch such as Mr. Holgate's is employed. If, however, the process is conducted while under considerable pressure (30 to 50 lbs. in excess of atmospheric), a greater quantity of caustic ammonia can be held in solution by the water, while the dissociation of the carbonate and sulphide of ammonium is not materially affected. Stronger crude gas liquor can, therefore, be safely employed.

These points are well worthy of further study and application by those interested in the development of such processes. The future of such processes must lie more within the domain of the engineer than of the chemist. What can be done chemically has been ascertained, but what will it cost to do? Will the capital cost, beyond a certain percentage purification, exceed that of the old method of dry purifiers of lime and oxide of iron, and at what point does that relation establish itself? If it does exceed it, will it still be possible by the economies in working, which are undoubted, to counterbalance this drawback? It appears to be established that the reaction in removal of impurities takes place more quickly, and in less space, when ammonia is used in the form of gas, in the proportions employed in the Claus process, than of liquor, but with the disadvantage of special plant

\* Reference was made to the fact in the notice of the life-work of Mr. Matthews which appeared in the "JOURNAL" on the 20th of February last (p. 465).—Ed. J.G.L.

† "This patent is dated March 1, 1817, and the specification and drawings will be found in the 'Repertory of Arts,' Vol. XXXII., p. 11. Mr. J. F. Ledsam, of Birmingham, has recently obtained a patent for purifying coal gas by a similar process; and he states that his plan effects his purposes most completely, and is practised to a considerable extent at the Birmingham and Staffordshire Gas-Works."

‡ "JOURNAL," Vol. LXIX., pp. 1475-82. § *Ibid.*, Vol. LXV., pp. 1133-6.

\* Perkin's process being developed in 1856-7; Hofman's discovery of benzene in coal tar, and his pupil Mansfield's process for its extraction therefrom, preceding it in 1845 and 1847 respectively.

† Vide "Thirty-first Annual Report of the Chief Inspector under the Alkali, &c., Works Regulation Acts," p. 57.



Purified and Unpurified Gas Liquor, 1899.

Liquor.	Degrees Twaddel.	Chloride, calculated as HCl, per Cent.	SULPHUR.		AMMONIA.				CARBONIC ACID.		SULPHURETTED HYDROGEN.		Total Acids (B + C) ; H.E.	Difference of Acids (B + C - A) H.E.	Difference of Acids (B + C - A, NH <sub>3</sub> H.E. = 100.)	Per Cent. of Total Acids as H <sub>2</sub> S.
			As Thiosulphate. Sulphur Grammes per Cent.	As Sulphide. Sulphur Grammes per Cent.	Total, per cent.	Fixed, per Cent.	Free.		Per Cent.	B.  H.E.	Per Cent.	C.  H.E.				
							Per Cent.	A.  H.E.								
Gas . . .	5	0·654	·0691	·4016	1·9890	·6545	1·3345	78·50	1·348	61·25	·4267	25·10	86·35	+ 7·85	+10·00	29 06
Purified . .	2½	0·650	·0435	·1971	1·7468	·6375	1·1093	65·25	·5214	23·70	·2094	12·32	36·02	-29 23	-44·79	34 20

Note.—Percentage of impurities removed by distillation 58·8, comparing with Mr. Holgate's final right-hand column. More liquor was passing through the heater of the desulphurizing plant when these samples were taken than on the occasion when Mr. Holgate took his samples for the analysis given in his table below.

From Mr. Holgate's Paper read before the Incorporated Institution of Gas Engineers, 1895.

BEFORE PURIFICATION.					AFTER PURIFICATION.					IMPURITIES REMOVED, PER CENT.				
Density. (° Twad.)	NH <sub>3</sub> .	CO <sub>2</sub> .	H <sub>2</sub> S.	Total.	Density. (° Twad.)	NH <sub>3</sub> .	CO <sub>2</sub> .	H <sub>2</sub> S.	Total.	Density. (° Twad.)	NH <sub>3</sub> .	CO <sub>2</sub> .	H <sub>2</sub> S.	Total.
3'5 . .	1'343	..	..	1'760	1'50. .	0'986	..	..	0'528	2'00. .	26'5	..	..	70'0
4'0 . .	1'327	..	..	1'554	1'75. .	1'053	..	..	0'546	2'25. .	20'6	..	..	65'0
4'0 . .	1'360	2'18	0'50	2'680	2'00. .	1'130	0'99	0'08	1'070	2'00. .	16'9	54'5	84'0	60'0

and process being needed for its formation. Possibly a combination of the two processes might prove to present the greatest advantages. It is, however, certain that great advance in knowledge has been gained, by the experience of the last ten years, towards attaining the ideal of purification of gas in closed vessels, and placing it on a commercial and practical basis.

The subject is one that closely affects the work of the Inspectors. It is of not unfrequent occurrence for members of the staff to receive telegrams and urgent letters complaining bitterly of nuisance from the manufacture of sulphate of ammonia at gas-works, when, on inquiry, it turns out that the sulphate plant was idle on the day or days on which complaint was made, but that lime purifiers were being emptied. Over this nuisance, the Alkali Acts have no control; but it is not always easy to persuade sufferers from a nuisance that the Inspectors are not neglecting their duties.

Coming to the portion of the report dealing with the recovery and production of ammonia, the Chief Inspector is again able, through the courtesy of manufacturers, to continue the tables given for several years past on the produce of ammonia from all sources in the United Kingdom. These figures represent, in terms of sulphate of ammonia, the amount of ammonia and its salts produced in 1899; and they relate merely to production—not to what is marketable as sulphate:—

	1899. Tons.	1898. Tons.	1897. Tons.
Gas-works . . . . .	136,529	129,590	132,724
Iron-works . . . . .	17,963	17,935	17,779
Shale-works . . . . .	38,780	37,264	37,153
Producer gas, coke, and carbonizing works . .	10,624	11,568	10,624
Total . . . . .	198,280	196,357	198,280

Mr. Carpenter remarks that, in comparing the production in different departments during the last three years, an average figure seems to have been reached in one case (where, indeed, it was hoped for in 1899)—viz., in iron-works; that is to say, blast-furnace works where coal is used. In all other branches contributing to this important manufacture, it is gratifying to note substantial increases. He did not anticipate so great an increase in what is still the most important ammonia-producing industry—viz., gas-works. The drop in 1898 has been more than recovered; last year's produce showing a satisfactory increase over that of 1897. Mr. Carpenter points out that this indicates a very marked increase in the use of gas, when it is borne in mind how much the gas production of the country has been increasingly supplemented by admixture in various proportions of water gas made from coke and steam, in which operation no appreciable amount of ammonia is produced.

In leaving the consideration of this branch of his subject, the Chief Inspector directs attention to two notable circumstances affecting the water-gas industry—viz., the issue of the report of the Departmental Committee, which has been fully dealt with in our columns, and the publication of one on the Dellwik-Fleischer process by Professor Lunge,\* confirming the earlier careful investigations of Professor Lewes and Dr. Bunte into the extraordinary fuel-efficiency of this process as compared with that of any other in which the product of the "blow" preliminary to the introduction of steam to the incandescent coke is carbonic oxide. Mr. Carpenter expresses his opinion of this process as follows: "It gives a method of obtaining, at very low cost, a concentrated gaseous fuel of fully twice the calorific power of producer gas, burning with a smokeless flame, and of very high flame temperature; so that problems of high-temperature chemistry, not otherwise approachable, become possible of trial. The industrial uses of such a gas stand quite apart from carburetted water-gas manufacture—a process that has been so perfected within the last fifteen years that, considered as a heat-engine, 81 per cent. of ultimate efficiency is attained; the energy of the blast gases issuing from the generator during the blow being utilized for subsequently gasifying the enriching oil in the presence of the heated water gas concurrently produced. Such a revolution must make its influence felt on the gas industry sooner or later, and in more ways than one." While recognizing that his report is not the place for dwelling upon any of the technical features or interesting chemical points arising out of the new process, the Chief Inspector considers that it is permissible, if there is such a future for it as is anticipated, to again direct attention, as he has done on previous occasions, to the need of precautionary measures and

appliances being adopted to protect the workmen employed, in case of emergency.

Here, for the present, we must leave Mr. Carpenter's interesting report, which is twice the length of that in which he recorded the result of his labours in the year 1898.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The half-yearly meeting of the Airedale Gas Company was held on Monday last week. The report of the Secretary (Mr. E. Thornton) showed that during the six months the receipts from the sale of gas had amounted to about the same sum as in the previous half year; but from the residual products above £200 more had been received than in the corresponding half of last year. The report also referred to the excessive increase in the cost of coal. The report was adopted; and the maximum dividends of 5 and 3½ per cent. were declared.

Presiding at the half-yearly meeting of the Aldershot Gas and Water Company, Mr. A. F. Wilson referred with gratification to the increase in the Company's business in the six months ending June 30, as compared with the corresponding period of the past year. The coal consumption had been considerably more; 8863 tons 14 cwt. having been consumed, against 7107 tons 12 cwt. The quantity of gas made had risen from 71,076,000 to 81,465,000 cubic feet; representing a rise of 14·61 per cent. This was a very large increase for any company to realize during the course of a half year; and it compared well with the most progressive of the London Gas Companies—the South Metropolitan—whose increase had been only 12 per cent. Referring to the coal question, he said they had spent £7492 in the past half year, and they would have to expend from £4000 to £6000 more for the same quantity in the current six months. As this required making up, they had had to raise the price of gas 3d. per 1000 cubic feet. The extension of the works necessitated an expenditure of money; and the Directors contemplated making another application to Parliament for further powers in the near future. As to the water supply, it was thoroughly satisfactory. The report of the Directors, noticed last week, was adopted.

The Directors of the Bridport Gas Company will report, at the meeting of shareholders to-day, that the sales of gas were higher by 1,098,200 cubic feet, or nearly 7 per cent., last year as compared with those for 1899. The revenue from gas amounted to £3144; from meter and stove hire, &c., to £135; and from residuals, to £976—the total receipts being £4305, against £3816. The expenditure on the manufacture of gas was £2458; on distribution, £201; and the other items on this side of the account made up a total of £3305, as compared with £2851. The amount carried to the profit and loss account is close upon £1000, against £965. The amount available for distribution was £1469, which enabled the Directors to recommend a dividend of 8 per cent. on the ordinary shares (free of income-tax), and 5 per cent. on the preference shares (less tax). This would absorb £982, and leave a balance of £487 to be carried forward. Reference is made to the necessity for an increase of 5d. per 1000 cubic feet in the price of gas, owing to the enhanced cost of coal, and to the completion of the new show-rooms and offices, noticed last week.

The half-yearly report of the Bristol Gas Company was noticed last week; and it was submitted to the shareholders last Thursday by Alderman J. W. S. Dix. In his remarks, he expressed the opinion that the account was a very gratifying one. He need not tell the shareholders that the Directors had not been free from anxiety and difficulty as to coal. The remarkable position of the coal market might be explainable to some, but it was inexplicable to others; but as it existed they had to consider it. He thought the Company would be able to surmount the difficulties in front of them; and he hoped to meet the shareholders under the same favourable circumstances at the next meeting. The sale of gas had increased by 10 per cent., which was satisfactory; and he saw no reason why it should not continue advancing in the future. If they went on as they were at present, he did not think they need have any fear as to the extinction of the Company. He had as great faith in the concern as he ever had, believing there was a great future before it. Their day increase was great, and this was also a very satisfactory feature.

\* See "JOURNAL," Vol. LXXIV., pp. 819, 1191.



There had been a considerable increase in the number of stoves for cooking purposes; and they had now 11,600 in use. The increase last year was 1700; 250 had been sent out during the past fortnight; and they had 365 on order to deliver. The report was adopted; and a dividend at the rate of 5 per cent. was declared. An extraordinary meeting was afterwards held; and resolutions of a formal nature were passed as to the further issue of stock. Mr. Weston Stevens proposed a vote of thanks to the Chairman, and mentioned that, notwithstanding the high price of coal, the Directors had not followed the example of other companies and raised the price of gas. The resolution having been carried, the Chairman said he could make no promise as to the future; but the Board would continue to do the best they could for the consumers.

At the recent half-yearly meeting of the Colchester Gas Company—Mr. Charles Coleman in the chair—the accounts to June 30 showed that there was a balance in hand on the revenue account of £2428; while on the profit and loss account there was one of £12,462. It was decided that a dividend at the rate of 10 per cent. on the old, and 7 per cent. on the new shares, free of income-tax, should be declared.

The Eastbourne Gas Company report a profit for the half year of £7967, which, added to £11,647 (the balance brought forward after payment of the dividend in February last), and £89 received for interest, makes a total of £19,703 to the credit of the profit and loss account. The Directors recommend a dividend for the six months at the rate of 14½ per cent. per annum upon the £20,000 original capital and also upon £12,490 raised on the "C" shares, and at the rate of 11½ per cent. upon the £77,000 paid-up capital raised on "B" shares, which will absorb £6783, and leave £12,920 to be carried forward to the next account.

The annual report of the Faversham Gas Company, read at the annual meeting last Wednesday, furnished evidence of an improvement in the sale of residuals and gas; the latter showing an increase of £362, and the residuals a rise of £579. Against this had to be set the greater cost of manufacture. The net profit, after placing £300 to the suspense account for the renewal of the retort-house and retorts, and allowing for income-tax and interest, was £2493, which, with £1470 brought forward, made a total of £3963. Out of this, a dividend of 9 per cent. was recommended. The report further stated that during the year a site for a new gasholder had been acquired, and the holder and a good wharf were in course of construction. Water-gas plant was also in course of construction, and would shortly be available for use. The report and accounts were adopted. The Chairman (Mr. W. E. Rigden) referred to the deep regret felt by the Directors at the death of their late Manager, Mr. R. Darney, which was notified in our columns last week.

The balance-sheet of the Heckmondwike Gas Company for the past six months shows a profit of £1696, to which is added the balance from the previous half year; making £6209. After deducting interest on loans and dividends paid last March, a disposable balance of £4916 is left; and this will allow the full maximum dividends to be paid, and carry £3157 to the next half-year's account. The Directors report an increased consumption over last year of 6½ million feet, notwithstanding the adoption of electricity for lighting purposes at several of the local places of business.

In their report for the year ended June, the Directors of the Liverpool United Gaslight Company state that the total revenue was £594,171, and the expenditure £472,280; leaving a surplus of £121,891, which has been transferred to the credit of profit and loss. After deducting the amount taken for payment of the dividend declared last February, and the interest on the debenture stock, there remains a balance of £56,832, out of which the Directors recommend that a dividend for the half year ending June 30 last be declared of 5 per cent. on the ordinary consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock. The Directors record, with deep regret, the loss during the half year of the valuable services of their late colleague, Sir Thomas Earle, Bart., recently deceased. The vacancy thus caused at the Board has been filled by the appointment of Mr. Alfred Tyer.

The annual meeting of the Maidstone Gas Company was held last Thursday, under the presidency of Mr. George Marsham. The report submitted showed a balance of £13,893; and a dividend of 11 per cent. per annum, less income-tax, for the year ended June 30, was recommended. In moving the adoption of the report, the Chairman alluded to the decision of the Board to erect another holder at a cost of £16,000, which would be met by the issue of new capital, chiefly debentures. The increase in the quantity of gas made during the year worked out at 7.8 per cent. Coal had cost them £19,908, against £16,296 for the preceding year; and it was expected that during the next twelve months the cost would be increased to somewhere about £33,000. The report was adopted.

The half-yearly meeting of the Malton Gas Company was held on the 8th inst. Mr. H. W. Pearson presided, and, in moving the adoption of the report and accounts, said the most marked feature of the past six months was the heavy increase in the price of coal, which had gone up fully 50 per cent. They had had, in consequence, to raise the price of gas. But while coal had gone up 50 per cent., they had not put up the price of gas more than 9 per cent. The report was adopted. Mr. Robert Metcalfe moved the payment of a dividend of 5½ per cent. for the half year, and pointed out that it was out of the actual earnings of the period covered by the report, while £1700 was also being carried forward. This was agreed to.

The report of the Directors of the Mirfield Gas Company states that the profit for the past six months amounted to £2617; and there is, with the balance from the previous half year, £4352 available for distribution. The Directors recommend the payment of a dividend of 10 per cent. on the old shares and 7 per cent. on the new shares; leaving £1852 to be carried forward.

At the half-yearly meeting of the Pontefract Gas Company last Friday, payment of the usual maximum dividends of 10 per cent. on the original shares and 7 per cent. on the new ordinary shares was resolved on. The Chairman (Mr. Joseph Taylor) stated that coal during the half year had cost £300 more than usual; and under the new contracts the increase would probably be £1100, which would be only partially recouped by the 3d. per 1000 feet added to the price of gas.

In the report which the Directors of the Reading Gas Company will present at the half-yearly general meeting to-day, they state that, owing to the continued increase in the business, it has become necessary to erect additional plant; and to provide for this they recommend the share-

holders to authorize them to raise, as required, such part or the whole of the unused capital as may be necessary for the purpose. The yearly contracts for coal have been entered into at such an advanced price that the Directors have been reluctantly compelled to give notice that, from the date of recording the meter-indices for the Midsummer quarter, and until further notice, the price of gas will be increased to all consumers 2d. per 1000 cubic feet. Owing, however, to the enhanced value of residuals, and to their having acquired a large stock of coal at the old contract prices, they hope to be able during the current half year to meet the increase in the cost of manufacture by means of this small advance. The accounts accompanying the report show that the revenue from the sale of gas in the six months ending June 30 amounted to £26,093; of residual products, to £10,264; and the total receipts were £36,393. The outlay on the manufacture of gas was £24,730; on distribution, £2566; and on management, £1368—the total expenditure being £30,973. The balance carried to the revenue account was £5420; and the amount available for distribution, £19,578. The Directors recommend the declaration of the full dividends on all the stocks and shares.

At the meeting of the Scarborough Gas Company last Saturday, the Directors presented accounts which showed that the revenue in the six months ending June 30 amounted to £21,403, and the expenditure to £15,614; leaving a balance of £5789 to go to the profit and loss account. The net revenue, including £1665 brought forward, but after deducting all interest charges for the half year, was £6662. After providing for dividends on the preference stock, the Directors recommended the payment of maximum dividends upon the ordinary stock of the Company, less income-tax. The payment of these absorbed £6337; leaving a balance of £325. Inasmuch as the outlay on the carburetted water-gas installation has now ceased, the Directors have extinguished the suspense account by appropriating thereto £325, the balance from the profit and loss account, and £1799 from the reserve fund. Contracts for sulphate of ammonia and Claus sulphur-recovery plants have been concluded, and the work of construction and erection is in progress, under the supervision of the Engineer and Secretary (Mr. J. Holliday). The replacement of flat-flame burners by a system of incandescent lighting in certain thoroughfares in the borough indicated by the Corporation, was carried out during the past half year.

The accounts accompanying the report which will be presented at the half-yearly meeting of the Weymouth Gas Company next Thursday show that the revenue in the six months ending June 30 amounted to £8938, and the expenditure to £6584; leaving a balance of £2354 to go to the profit and loss account. The sum available for distribution is £4297; and the Directors recommend the payment of a dividend for the half year at the rate of 5 per cent. per annum, less income-tax. In their two last reports, the Directors adverted to the fact that coal was then more costly; and they stated that it would become still more so. The accounts for the past half year confirm this statement, and show that the figure paid has been much higher than hitherto. For the next two half years, at least, the cost will be still further advanced; the Directors having entered into a new contract under which the price of the coal at the pit will be about doubled. The Company will, however, for a time benefit from an unexpired contract, so that the full force of the further increased cost will not be immediately felt. It has not yet been necessary to raise the price of gas; and the Directors assure the consumers that they will not take this step until the increased cost of production absolutely compels an advance. Apart from the coal question, the condition and prospects of the Company are good. Under the management of Mr. James Lowe, there has been a satisfactory expansion in the output of gas; the increased consumption during the half year being 6.9 per cent. on that of the corresponding period of the year 1899. The number of consumers is still increasing, and this season more than the usual quantity of cooking-stoves have been sent out.

It was reported to the shareholders of the Yeadon and Guiseley Gas Company last Wednesday that, during the past half year, the increase in business had been equal to 10½ per cent. There was also an increase of 101 in the number of slot meters, with an average increased consumption of 800 cubic feet per meter. The contracts for coal for the ensuing year meant an additional expense of £2250; and owing to this great increase (more than 5s. per ton), the price of gas had had to be raised from 2s. 8½d. to 3s. per 1000 cubic feet net. This, however, would not bring in more than half the sum named; and there must of necessity be a considerable deficit during the next two half years. The profits for the six months amounted to £1359, which would pay the maximum dividends of 10 and 7 per cent., and leave a balance of £87. The report was adopted.

#### Water Companies.

On Thursday, the 9th inst., Mr. J. Baird, the venerable Chairman of the Directors, presided over the half-yearly meeting of the Brompton, Chatham, Gillingham, &c., Water Company. The report showed that during the six months covered by it 397 houses and other supplies of water, estimated to yield an additional rental of £317, had been connected with the Company's mains. The capital expenditure now stands at £136,084, of which £10,123 was added during the above-named period. There was an increase of £482 in the water-rental as compared with the corresponding period of last year. The balance available, after charging the interest on the temporary loan from the bankers and placing £500 to the credit of the reserve fund, was £4416; and the Directors recommended payment of the maximum dividends at the rate of 10 per cent. per annum on the "A" shares and of 7 per cent. per annum on the new "B" shares. The report was adopted.

The Directors of the East Worcestershire Water Company report that during the past half year 92 additional services were laid on; making the total 5449 exclusive of Droitwich and Rednal. The average daily consumption of water was 653,047 gallons. The new works at Washingstocks are progressing. Since the last meeting, a *pro rata* allotment of shares, at a premium of £2 10s. per share, was offered to the shareholders; and of the 617 shares authorized 447 have been allotted, and the remainder will be dealt with as and when required. The premiums received—£1117 10s.—have been placed to the credit of a reserve fund apart from the fund reserved for the depreciation of plant. As to the half-year's accounts, the cost of coal has been again larger in proportion to the quantity of water pumped; and it has not been possible to place fresh contracts except at increased prices. The revenue account shows a profit of £1804, to which has to be added £1459 brought forward from the previous



account; making a disposable balance of £3263. It is proposed to pay a dividend at the rate of 4 per cent. per annum; to add to the depreciation reserve fund £1000; and to carry forward £989.

At the ordinary general meeting of the Frimley and Farnborough Water Company, the Directors reported a net balance of £1524; and they recommended a dividend for the past half year at the rate of 5 per cent. per annum. This was agreed to.

In the six months ending June 30, the revenue of the Woking Water and Gas Company amounted to £4496, and the expenditure to £2264; leaving a balance of £2232 to go to the profit and loss account. The amount available for distribution is £2226; and at the ordinary general meeting next Tuesday, the Directors will recommend the payment of a dividend at the rate of 4½ per cent. per annum for the past half year, less income-tax, which will absorb £1919, and leave £307 to be carried forward. The Directors report that the supply to the district has been satisfactorily maintained. Negotiations are practically completed for the acquisition of the site on the Thames for the new works authorized by the Company's Act of 1899; and their construction will be proceeded with at an early date. The Engineers (Messrs. J. Quick and Son) report that the works, plant, and mains are all in good order.

At the annual meeting of the Wrexham Water Company, the report presented stated that £6643 had been expended in carrying out various works for improving the supply. The receipts showed an increase of £621 as compared with the preceding year. After payment of the usual charges, the full dividends upon the preference shares and stock, and an interim dividend at 6½ per cent. per annum upon the consolidated stock, and £4 11s. per cent. per annum on the ordinary shares, there remained a balance of £5431. The Directors accordingly recommended the payment for the half year of the full preference dividends, and a dividend at the rate of 7 per cent. per annum on the consolidated stock, and £4 18s. per cent. on the ordinary shares, all free of income-tax. The report was adopted.

### ELECTRIC LIGHTING NOTES.

The Lighting Committee of the Leeds Corporation have decided to recommend the Council to abolish the charge for electricity meters as from Oct. 1 next.

At Blackburn, last Friday, a Local Government Board inquiry was held into an application by the Corporation to borrow £190,000 for electricity extension purposes, including lighting and power. The present project will carry the Corporation on for four or five years, when they will still have land available at their proposed new works for an even more extensive scheme.

New machinery, which has been erected at a cost of £5000, at the Taunton Corporation electric lighting works, was formally set in motion last Wednesday. Many kind things were said on the occasion about the Chairman of the Committee (Alderman Potter), who has worked hard to secure the success of the concern. Both he and Mrs. Potter were presented with handsome gifts as an acknowledgment.

At the meeting of the Dublin Corporation yesterday week, the Lord Mayor moved the adoption of a report of the Electric Lighting Committee recommending application for a supplemental loan of £10,400, to cover the cost of additional works under the loan of £24,000 sanctioned by the Council and the Local Government Board for new electrical cables. The motion having been seconded, Mr. Beattie said he thought the matter should be considered more fully. The Lord Mayor significantly remarked that this was one of the cases in which the least said the soonest mended. The report was adopted.

The Yeading District Council are still discussing the electric lighting question, and have had a conference with Mr. W. C. C. Hawtayne. At the close of the conference, the Council resolved to take a *plebiscite* of the householders in the compulsory area of supply, for the purpose of ascertaining the number of lights likely to be taken up at a charge of 5d. per unit; and after this to submit the whole of the facts to a ratepayers' meeting. The period of grace allowed by the Board of Trade before proceeding to consider the revocation of the Council's Provisional Order expires in about two months; so that there is not much time remaining in which the Council can take action.

There is trouble in the Sudbury (Suffolk) Town Council; and the electric lighting scheme is at the bottom of it. The mysterious manner in which this project is being hustled through has brought about what is apparently an irregularity. Alderman Bell, who has consistently battled for full and free discussion of the question by the ratepayers (and which has been refused) last Tuesday called the attention of his colleagues to the fact that the report on electric lighting which was adopted at a recent meeting of the Council was presented before it had been submitted to the General Purposes Committee by the Sub-Committee who prepared it; and this was not according to standing orders. The Town Clerk (Mr. W. B. Ransom) stated that he considered a resolution passed by a majority of the Council meant the suspension of the standing order. Mr. Ransom should be explicit, and say definitely whether it does or whether it does not. This method of procedure is not exactly the way they do things, say, in the House of Commons. But, of course, the Sudbury Town Council is not the House of Commons; and therefore anything may do for them—in Mr. Ransom's opinion. Alderman Bell should look into the matter, and, if there has been any irregularity, insist upon the report being dealt with in a proper way. He pointed out that there are several questions in the report that might advantageously have been discussed. He also stated that he considered the circular that had been sent round to the ratepayers a farce, and asserted that he knew a lot of respectable people who threw it on the fire. The replies did not in any way represent the voice of the town. After this, the Mayor (Mr. F. Wheeler) adopted a very injured tone; and regarded Alderman Bell's strictures as a reflection on himself, and actually offered to resign. Very gladly, when he saw an opportunity, he pointed out that there was no motion before the meeting, and turned to the next business.

The Finance Committee of the Leigh (Lancs.) Town Council have raised the salary of Mr. J. Foster, the Gas, Electricity, and Water Engineer, by £100 per annum.

### PUBLIC HEALTH CONGRESS IN ABERDEEN.

#### The President's Address—Organic Matter in Water—The Treatment of Sewage—Suggested Imperial Board of Health.

The Annual Congress of the Royal Institute of Public Health was held in Aberdeen from the 2nd to the 7th inst., under the presidency of the Earl of Aberdeen. The delegates present included representatives from nearly all the municipalities in the kingdom. A goodly number of subjects were brought before them for consideration, but only a few were of special interest to our readers.

The President devoted his address to a review of the progress of sanitation as represented by legislation. Though the first enactments bearing upon this matter were passed at the end of the eighteenth century, it was not until 1846 that Parliament, doubtless as the result of the panic caused by outbreaks of cholera and other epidemics, considered it "highly expedient, for the purpose of preserving the health of divers of Her Majesty's subjects, that better provision should be made for the removal of certain nuisances likely to promote or increase disease." An Act was passed applying to the United Kingdom, and the central authority was the Privy Council, who were empowered to issue orders at any time to prevent the spreading of contagious or epidemic disease. Following this, which was the first Nuisances Removal Act, came the amending Acts of 1848 and 1849, by which the Central Board of Health in Great Britain and the Commissioners of Health in Ireland were enabled to issue directions and regulations, and to institute and carry on prosecutions for violation or neglect of regulations. This arrangement continued until the passing of the Nuisances Removal (Scotland) Act of 1856, when the above Acts were repealed so far as they related to Scotland, and the Board of Supervision, which had been constituted as a Poor Law Board in 1845, became the central authority instead of the General Board of Health. It was soon found that this Act could not be looked upon as final; and in 1867 a new and more comprehensive measure was introduced. This, the Public Health Act of 1867, re-enacted the provisions contained in the Act of 1856, with regard to nuisances, unwholesome food, common lodging-houses, and the sections relating to epidemic disease, but in addition contained sections adding considerably to the power of the Board of Supervision, and conferring more on local authorities with regard to offensive trades, hospitals, houses let in lodgings, vaccination, drainage, and water supply. The Public Health Act of 1867 was not long in force when it became evident that, in order to carry out sanitary improvements, an increased maximum rate of assessment was required. This and other amendments were subsequently made, and yet another step was taken by the passing of the Public Health (Amendment) Act of 1882, which introduced a further improvement into the sanitary system. These were the chief Public Health Acts proper down to the year 1897, when the existing Act was passed; but meanwhile the administrative machinery had undergone a great change by the passing of the Local Government (Scotland) Act, 1889. The next great step in public health legislation was the passing of the Local Government (Scotland) Act, 1894; its main feature, from a sanitary point of view, being the establishment of the Local Government Board for Scotland, in substitution for the Board of Supervision. The Acts already mentioned might be said to be the Sanitary Acts in the direct line; but there existed also a number of Acts relating to, or affecting, the public health, applicable to the United Kingdom, which might be called collateral Acts—i.e., the Rivers Pollution Acts, the Factory and Workshop Acts, the Food and Drugs Acts, the Contagious Diseases (Animals) Acts, and the Housing of the Working Classes Acts. With the repeal of the old Public Health Acts and the passing of the new legislation, a link was severed which bound them to the old days of parochial sanitary administration, when the Parochial Board was the local authority for public health purposes, and the sanitary inspector the chief, and often the only, executive officer. The Local Government Act of 1889 changed the administrative machinery; but this was not the only Act which gave an impetus to sanitary progress. The Infectious Diseases (Notification) Act, 1889, passed at the same time, was another step in the right direction; and although only a permissive Act, it was rapidly adopted by the rural local authorities—the small boroughs showing less eagerness in this movement towards sanitary reform. Reviewing the whole position, the President thought there was no justification for complacency, but rather reason for its exclusion. The contemplation of what had been accomplished, however, often in spite of prejudice and many obstacles, might assuredly give ground for encouragement and confidence as to future progress and attainment resulting from careful and persevering effort in dealing with the problems still confronting us.

In the course of the proceedings, Mr. T. Jamieson, the City Analyst of Aberdeen, read a paper on the "Effect of Organic Matter in Water on Health." He said that hitherto the danger of decomposed organic matter had not been sufficiently recognized; the result being that many waters which were reported as safe were probably dangerous, and, on the other hand, those which were condemned were probably quite safe. This was a serious statement, but it was based on the experience of a quarter-of-a-century, during which he had analyzed many hundred samples of waters over the North of Scotland. He had come to believe that in the presence of organic matter there was a capability of germs so to alter their character under their new environments as to give rise to a disease that would be identified with a specific germ. Eminent bacteriological authorities were quoted to show that, although such a feature was not yet generally accepted, it appeared to be dawning upon bacteriologists to take into account the fact that bacteria are simple vegetable organisms, and the wonderful adaptation in Nature enabling them to assume different forms under altered conditions, made this transformation both possible and probable. Having shown the fallacy of dividing these bacteria into parasitic and non-parasitic classes, he pointed out that we have to regard all bacteria as similar in character, but only gradational in power. It followed that their effectiveness on the animal body depended upon the relative degree of the resistance of that body. Instances were given of typhoid and diphtheria occurring under conditions that seemed altogether to preclude the conveyance of the specific germs; and this seemed to go far to support the suggestion that the gradational character of bacteria might go



so far under certain conditions as to be the cause of diseases that one usually considered to be absolutely limited to the action of a certain germ. The general conclusion was that putrefying organic matter taken into the system predisposed the human body, especially the weak and the young, to the action of non-specific microbes, and in such a way as to give rise eventually to a specific disease that would be accompanied by the presence of what was regarded as the specific microbe. Mr. Jamieson insisted that water should not be allowed to lie in a quiescent state in reservoirs, cisterns, dams, or filter-beds, which sooner or later became filthy, and, without the presence of any specific germ, gave rise to a low state of health in strong people, and actual illness in the young or weak. Finally, he instanced what took place in Aberdeen several years ago, when the water was found to be in a bad state. On following up the matter closely, it was ascertained that the contamination actually existed in the filter-beds which were supposed to be purifying the water. The golden rule, he said, was to take water from the running stream.

Professor Percy F. Frankland, of Mason College, Birmingham, delivered on the 6th inst. an instructive address on "Recent Developments in the Purification of Sewage." He commenced by explaining that there were three methods of dealing with sewage. There was, first, its disposal by discharge into rivers, estuaries, or the sea. This method was by far the easiest, but public opinion had led to a considerable diminution in this mode of disposal. The second consisted in the separation of more or less impurity by precipitation, mechanically or chemically. The third was by the destruction of impurity by resolving it into simple and inoffensive material. He described the methods employed at Birmingham, and went on to furnish a detailed account of his experiments in connection with the disposal of Manchester sewage. He proceeded to give details of the results produced experimentally in the case of filtration, from the days of the Rivers Pollution Commission, which dealt with the question in 1868, and those obtained since the discovery of the action of bacteria on sewage. The experiments at Manchester, he said, altogether exceeded their expectations as to the possibility of purifying the sewage from manufactories, particularly by the use of a system of multiple contact. He deplored the apathy of corporations who built libraries and undertook public works, but refused to consider the advisability of clearing away pollution because science could not make the sewage profitable. To expect science to show how money could at all times of the year be made out of town sewage was, in our climate, as unreasonable as to ask her to devise a means of lighting a town with electricity by utilizing the waste heat which escaped from the bodies of the inhabitants. All the great developments in the purification of sewage—chemical precipitation, irrigation, intermittent filtration, and the bacterial treatment, including septic solution—were essentially British, although we were deeply indebted to America for the extraordinary diligence with which some of its men of science had conducted a truly monumental series of experiments demonstrating the great possibilities of intermittent filtration. While, therefore, we might be justly proud of the great fertility of resource which had been exhibited in this country in dealing with the sewage problem, it was a matter for humiliation that there was in the whole British

Empire no organization whose duty it was to carry out extended experimental inquiries on sanitary subjects on the scale, and with the thoroughness, adopted by the Massachusetts Board of Health. All scientific investigation in this country was carried on under extraordinary difficulties, and with little or no encouragement of any kind—frequently at private expense, and even on the private premises of the investigators, in hours or even odd moments snatched from a life of arduous duties of a routine character by means of which the daily bread was earned. His hearers all knew how much was gained in efficiency through combination, which was the watchword of the hour in the commercial world; and there could be no doubt that a similar increase in efficiency and in unexampled advance would result from combination in scientific inquiry. He considered that the Government ought to give to science in this country the position of influence and authority which it already occupies in almost every other civilized land, and that the objects of that section of science which the congress represented should be furthered by the creation of a great Imperial Board of Health, under the auspices of which scientific inquiries of the highest value should be systematically prosecuted in all directions.

In the course of a paper on the Public Health of Scotland, Mr. George Mackay, the Sanitary Inspector for the county of Perth, gave an elaborate account of the improvements which had taken place in the public health of Scotland during the 22 years ending 1898, as compared with the immediately preceding similar period. The practical application of the provisions of the long list of legislative enactments passed during these periods, and other operations incidental to sanitation, had involved the outlay of millions of money. It was difficult to specify the benefits conferred upon the community by this expenditure, but generally it might be said that the death-rates had been largely reduced, and such epidemics as formerly occurred were now unknown. Within the last fifty years, the average length of life had been raised to a figure between six and seven years for each person born; and there had been a gradual reduction in the death-rate all round. But the principal towns showed a greater improvement relatively than was seen throughout the country generally, with the exception of mainland rural districts, where there was an even greater improvement in the zymotic group. He came to the conclusion that the largest proportion of deaths in the country were not only preventable, but that much greater efforts ought to be made to ensure ultimate success. Although the country was much better equipped now, both in knowledge and appliances, to combat an epidemic, a great deal required to be done before it could be said that the death-rate was as low as it might be. In order that preventable diseases might be thoroughly combated, he suggested, among other things, that all populous places should have a properly organized public health service; that every sanitary inspector should have a certificate, and should have a proper salary; that plans of new buildings should be submitted for approval to the sanitary authorities; that all new buildings should be inspected, and their drainage tested, before they were occupied; that the supervision of public health in all burghs with a population under 10,000 should be vested in the hands of County Councils; and that a Minister of Public Health should be appointed who should have Cabinet rank.

### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 462.

Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
<b>GAS COMPANIES.</b>															
590,000	10	Apl. 11	104	Alliance & Dublin 10 p.c.	194-194½	..	5 7 8	60,000	5	Feb. 28	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	74	Do. 7 p.c.	18-14	..	5 7 2	600,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2
800,000	100	July 2	5	Australasian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	104-104½	+	6 10 3
200,000	5	May 16	6	Bombay, Ltd.	4-4½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100-102	..	3 18 5
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	10	Apl. 11	8	San Paulo, Ltd.	114-124	..	6 8 0
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255*	+1	4 14 1	135,000	Stk.	Mar. 14	10	Sheffield A.	245-247	..	4 1 0
270,000	"	"	9	Do. New	177-182*	+	4 18 11	209,053	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	June 14	4	Do. 5 p.c. Pref.	140-145*	+2½	3 9 0	447,427	"	"	10	Do. C.	244-246	..	4 1 4
169,975	"	"	5	Do. 4 p.c. Deb.	116-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p.c. Ord.	125-128*	+1½	4 3 3
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	225-235	..	4 17 10	1,520,000	"	July 12	3	Do. 3 p.c. Deb.	94-97	..	3 1 10
286,320	"	"	5½	Do. A. Ord. Stk.	155-165	..	5 3 0	890,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
1,009,500	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	70,825	"	July 12	4	Do. 4 p.c. Deb.	117-122	..	5 5 7
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	120,000	Stk.	Mar. 14	6	Tottenham A. 5 p.c. and B. 3½ p.c.	103-108	..	5 11 1
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26*	+1	4 12 4	250,520	"	"	4½	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
79,000	10	"	9	Do. 7 p.c.	19-21*	+1	4 5 8	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	82-94	..	6 9 9	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	98-100	-1	4 0 0								
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	6 12 0								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	18-14	..	5 14 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55-67	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock	270-280	..	4 16 5								
236,425	"	"	10½	Do. New do.	205-215	..	4 17 8								
288,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	168-163	..	5 10 5								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0								
51,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	780,404	Stk.	June 28	11	Chelsea, Ord.	287-292	..	3 15 4
178,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 6	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	107-112*	+2½	4 13 9	160,000	"	"	4½	Do. 4½ p.c. Pref. 7½	143-148	..	3 0 10
60,000	"	"	5	Do. 5 p.c. Pref.	130-135*	+2½	3 14 1	175,785	"	Mar. 29	4½	Do. 4½ p.c. Deb.	145-150	..	3 0 0
486,090	10	July 27	11	European, Ltd.	19-20	..	5 10 0	1,720,560	Stk.	Apl. 11	7	East London, Ord.	185-190	..	3 13 8
854,060	10	"	11	Do. £7 10s. paid.	14-15	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	147-152	..	2 19 3
14,993,075	Stk.	Aug. 15	4½	Gas- 4 p.c. Ord.	96-98*	+1½	4 9 9	890,000	"	"	3	Do. 8 p.c. Deb.	96-98	..	3 1 3
2,600,000	"	"	8½	light 3½ p.c. max.	92-94*	-1	3 14 6	700,000	50	June 14	7½	Grand 10 p.c. max.	106-109	..	3 8 10
8,799,735	"	"	4	and 4 p.c. Con. Pref.	114-117*	..	3 8 5	810,000	Stk.	Mar. 29	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	92-95	..	3 8 2	708,000	Stk.	Feb. 23	14	Kent	300-310	..	4 10 4
70,000	10	May 31	8	Hongkong & China, Ltd.	134-144	..	5 10 4	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	..	3 6 8
2,800,000	Stk.	May 16	10	Imperial Continental	199-204	+2	4 18 0	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	275-285	..	3 13 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	99-101*	+1	3 9 4	406,200	100	"	8	Do. 7½ p.c. max.	203-208	..	3 16 11
75,000	5	June 14	6	Malta & Medn., Ltd.	44-5	..	6 0 0	850,000	Stk.	Mar. 29	1	Do. 4 p.c. Deb.	128-132	..	3 0 7
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb.	107-110	..	4 10 11	500,000	100	Aug. 15	14	New River, New Shares	408-413*	..	3 7 10
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	106-108	..	4 3 4	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	128-133	..	3 0 2
541,920	20	May 31	3½	Monte Video, Ltd.	104-114	..	6 1 8	902,300	Stk.	June 14	7½	South- wark 7½ p.c. max.	182-187	..	4 0 3
667,946	Stk.	Feb. 23	9½	Newcastle & Gateshead Con.	215-220	..	4 4 1	126,500	100	"	7½	and 5 p.c. Pref.	155-160	..	3 2 6
299,855	Stk.	June 28	9½	Do. 3½ p.c. Deb.	104-107	..	3 5 5	489,200	Stk.	"	5	Vauxhall 4 p.c. A. Deb.	129-134	..	2 19 9
150,000	5	May 16	8	Oriental, Ltd.	73-74	..	5 3 8	1,155,066	Stk.	June 14	10	West Middlesex	270-275	..	3 12 9
185,000	6	"	8	Do. New, £4 10s. pd.	6-6½	..	5 10 10	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 1
15,000	6	"	8	Do. do. 1879, £1 pd.	14-14½	..	4 11 6			Mar. 14	8	Do. 8 p.c. Deb.	98-100	-1	3 0 0

\* Ex div.



**CARDIFF CORPORATION WATER-WORKS.****Preparations for the Future.**

An important report, prepared by Mr. C. H. Priestley, the Water-Works Engineer, has been submitted to the Cardiff Water-Works Committee with reference to the probable requirements of the town and district during the next ten years. The present population of the district is 220,000; and the quantity of water consumed, calculated at 25 gallons per head, was 5,500,000 gallons per day. Taking the prospective increase of population at 3 per cent. per annum, he estimated a population of 295,661 in 1910, and a consumption, at 30 gallons per head, of 8,809,830 gallons per day. The quantity of water available from the Taff Fawr source, with the reservoir there and at Llanishen, is about 7 to 7½ million gallons per day. With care and efficient inspection for waste, he considers the Taff Fawr works, together with the Llanishen storage, might be relied upon to provide sufficient water for the district for the next eight or nine years. In case of drought, however, it might be necessary to supplement the supply from local sources. He recommends the Committee not to delay commencing to construct the No. 3 reservoir, Taff Fawr, longer than 1902, or the spring time of 1903 at furthest; so that it may be ready for use in 1908 or 1909. With this new reservoir the total available supply from Taff Fawr sources would be 10½ million gallons per day. The Consulting Engineer, Mr. J. A. B. Williams, had in 1893 estimated the cost of constructing reservoir No. 3 at £217,179; but having regard to the rise in the prices of iron, coal, and materials generally, he (Mr. Priestley) thought the cost would now amount to 15 to 20 per cent. above this estimate. The report, which ran to great length, was ordered to be printed and copies circulated among the members.

**GLASGOW CORPORATION WATER SUPPLY.****Description of the New Works.**

Mr. J. M. Gale, M.Inst.C.E., Water Engineer to the Corporation of Glasgow, has prepared a statement regarding the operations during the past year upon the works for the augmentation of the water supply of the city, from which the following particulars are extracted:—

In addition to the four existing lines of 36-inch mains from the Mugdock reservoir to the city, two others of the same size are laid down from the Craigmaddie reservoir, which are intended to take up the supply to the higher levels of the city—one of which has been used since Dec. 14, 1895, to supply the higher ground at Springburn. The sum expended upon these works is £114,200. An extension of the two mains to the city was begun towards the latter end of 1896; the cost being about £27,000. The Craigmaddie reservoir has a water surface of 88 acres, and contains when full 717 million gallons; being a supply to the city at the rate of 50 million gallons per day for 14 days, in addition to the 10 days' supply, at the same rate, contained in the Mugdock reservoir.

The inlet and outlet works have been so arranged that either or both of the reservoirs can be used to supply the six 36-inch mains. The works were completed, and the new reservoir begun to be filled on June 11, 1896; the opening ceremony being performed by the late Mr. Alexander Osborne, Chairman of the Water Committee. Water was drawn from this reservoir for supplying the city on Jan. 1, 1897, and has been continuously taken from it since then. The total sum expended up to now amounts to £300,000. The length of the new aqueduct from Loch Katrine will be about 23½ miles, of which 22½ miles are completed and 1½ miles under construction. It will be 1½ miles shorter than the old one. It is 12 feet wide and 9 feet high where it is not lined with concrete; but only 10 feet wide where it is lined. The bottom is laid with concrete throughout the whole length, and it has a fall towards Glasgow of 1 in 5500. It consists of a succession of tunnels, which for the greater part were driven from the two ends without shafts; the drills being worked by compressed air, at a pressure of about 60lbs. per square inch. It will discharge 70 million gallons of water per day, which, added to the discharge of the old aqueduct of 40 millions, will bring up the total supply to the service reservoirs to 110 million gallons per day. Allowing for stoppages in the flow for examination and repairs, however, only 100 millions can be calculated upon as available for the city. The syphon pipes across the valleys of the Endrick and Blane will consist of four lines of 48-inch cast-iron pipes, two of which are at present laid.

Commencing at the south end of the aqueduct, the contracts lie in the following order: The Mugdock tunnel runs parallel with the old Mugdock tunnel at a distance of 22 yards between the centres. It is 1½ miles long, and is in great part through trap rock. The total cost has been £45,513. The Blane Valley contract extends from the north end of the Mugdock tunnel to the south side of the Endrick Valley, a distance of 5½ miles. The works include about ¾ of a mile of a double line of 48-inch pipes across the Blane Water, a tunnel 1½ and another 1½ miles long, and junctions with the old aqueduct at both ends of the contract. The total cost has been £174,690. The Endrick Valley is 2½ miles wide, and the aqueduct crosses it by cast-iron pipes 48 inches in diameter, of which there will ultimately be four lines, but only two are laid at present. The works include a steel girder bridge over the River Endrick, another over the Forth and Clyde Railway, and a third over the public road to Aberfoyle. These contracts cost £63,500. The Black Rig contract extends from the north end of the Endrick piping to the south end of the Kelty contract at Lossnaugh, a distance of 3 miles 1 furlong. The chief feature of this contract is a tunnel, 2½ miles long, through some beds of soft red sandstone, which have given considerable trouble. The tunnel has been lined with concrete throughout its entire length. There are junction chambers at both ends, which connect with the old aqueduct. The total cost has been £97,762. The length of the Kelty and Duchray contracts is 6½ miles, and the principal works consist of a tunnel 2½ miles long, another 1 mile 1 furlong long, another 1 mile long, and three short aqueduct bridges of masonry. The works connected with both contracts have been carried out at an approximate cost of £195,000. The Loch Chon contract extends from the north end of the Duchray contract, in the valley of Loch Ard, to the top of Loch Chon, a distance of 3½ miles.

# JOSEPH AIRD

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At the north end of the contract, a connection, similar to those already referred to, has been made with the old aqueduct. The contract has been carried out at a cost of £104,490. The contract for the Loch Katrine tunnel includes the driving of a tunnel through the ridge which separates Loch Chon from Loch Katrine, and of constructing an inlet basin at the loch similar to the inlet basin at the old tunnel, and the necessary alterations upon the old basin to adapt it to the future raising of the water-level of the loch. The tunnel is nearly 1 mile 3 furlongs in length, and was successfully driven through on June 14, 1898. The sum expended to date is £29,300.

The outlet works at the lower end of Loch Katrine include the building of a new masonry dam, by means of which the water in the loch will be raised 5 feet above its present top-water level, which will bring its storage capacity from 5623 to 9849 million gallons, which is estimated to yield to the city a supply of 65 million gallons per day. This contract was let in June, 1897, for £8185. By means of the new outlet works, the level of the water in the loch was raised 1 ft. 6 in. above its old top-water level in January last, and has been kept at this raised level whenever wet weather and consequent floods permitted. The additional 18 inches in depth of water will, it is hoped, be sufficient to meet the demands of a summer similar to that of last year (which was characterized by a long period of dry weather) when, towards the end of September, the level of the available water in the loch had been drawn down to the lowest since the Loch Katrine works were completed. The sum expended to date is £9500. A section of the works for which parliamentary authority has been obtained is the raising of Loch Arklet 25 feet and the forming of a tunnel to lead the water of that loch into Loch Katrine. These works will increase the supply to the city to 75 million gallons per day. When additional water is wanted, it must come from the adjoining valley of Loch Voil and Loch Doine.

### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There were several incidents of interest before the Town Council of Glasgow on Thursday. First in point of order was a notice by Bailie Fife, of a motion—"That it be remitted to the Parliamentary Bills Committee to draft a Bill for next session of Parliament to give the Corporation power to purchase or lease lands containing coal or other minerals, or to purchase or lease existing coal mines, and to work the same in the interest of the city; further, to acquire for these purposes special borrowing powers to the amount of £500,000." Whatever may become of the motion—and I should be surprised if it were to result in anything being done—there is no doubt that the dear coal for the gas undertaking is at the bottom of the proposal. The motion will be discussed in September.

Mr. O'Hare gave notice of a motion to the effect that application should be made to Parliament for authority to establish a superannuation fund in connection with the Gas Department, to be applicable to, and com-

pulsory upon, all permanent officials and workmen of the Department, with the exception of the General Manager and the Treasurer, and for powers to take over and appropriate for the purpose any monies handed to the Corporation by the old Gas Companies for benevolent purposes. This, I understand, is the beginning of the formal steps which are necessary for the establishment of the Friendly Society which the Gas Committee have resolved upon. There may be difference of opinion upon the details, when they are divulged; but they will first have to be discussed in Committee.

Mr. Wilson Buchanan asked the Sub-Convener of the Gas Committee under what statute the Corporation had power to charge an increased rate for gas for a period some three-and-a-half months prior to the passing, by the Corporation, of the Gas Committee's minutes recommending the increase. It was explained by the Lord Provost that the minutes of the Gas Committee had not been approved of. They would have been before the Council that day; but at the express desire of the Convener (ex-Bailie Mitchell), consideration of them had been delayed till the next meeting of the Council. The question was, however, quite a competent one. Mr. Buchanan put the question to the Clerk (Mr. J. Bowers), who replied that it had been the practice, during the 31 years since the Corporation took over the gas undertaking, that any increase or decrease in the price of gas was made retrospective to the beginning of the financial year. The gas accounts were closed at the 31st of May; and it was only after that date that the accounts were made up. It was, therefore, quite clear that the price of gas for the year could not be fixed until about the month of August. He thought the practice was founded upon necessity, and was quite within the statutory rights of the Corporation. Mr. Buchanan asked if the Corporation had statutory powers to make such a charge retrospective. The Lord Provost closed the incident with a violent rap with his gavel, and the testy remark that Mr. Buchanan had got his answer; and if he was not satisfied, he could give notice of motion. Upon this subject the Clerk was right, if there is no enactment regarding the fixing of the price. I know one instance in which the Act of Parliament distinctly says that the price of gas must be fixed for a period ensuing; and in that case, any change—at least, to a higher price—is never made retrospective. Where there is no express provision, expediency certainly dictates that the changes should be made applicable to the current financial year. The matter is, indeed, about as broad as it is long; because, if this increase were not made to date as from May, but from now, it would just have to be continued for three or four months longer than it will be necessary to continue it. If the rise be delayed, so will be the reduction; if it be accelerated, so will the reduction. It is a commonsense problem, and should be treated as such, which has been done here.

Not everyone is favoured on retiring from a post as Mr. A. Waddell has been in leaving Broughty Ferry for Dunfermline. The Burgh Commissioners on Monday night suspended the standing orders, and presented Mr. Waddell with a cheque for £50, to show their appreciation of his services. Mr. Christie, the Convener of the Works Committee, said that during Mr. Waddell's management the gas-works had been modernized; and they could now choose any one of three different





methods of enrichment of their gas. Mr. Waddell had been the means of enabling them to reduce the price of gas, while all over the country it was found necessary to raise it. The resolution to make the presentation was agreed to unanimously, which is one of the best tributes to Mr. Waddell's abilities. Provost Gray, in making the presentation, said that Mr. Waddell had saved the community a large sum of money.

At the same meeting, the estimates for the current year were adopted. The income is calculated at £8530, and the expenditure at £8408; leaving a surplus of £122. Mr. Christie, in moving adoption of the estimates, said that coal was now costing them 5s. 6d. per ton more than last year. They had estimated for a consumption of 5 million cubic feet of gas more than last year. As explaining this, he might mention that, since their exhibition in May last, they had sold considerably over 100 gas cookers and heaters. They expected to realize a good deal more for coke. They had, in the meantime, stopped the oil system of enrichment, and no coke would be required for fuel; and they would also have more coke from the additional quantity of coal carbonized. They would have no difficulty in getting about 15s. per ton for coke, as compared with 9s. 6d. or 10s. last year. As matter of fact, they had some contracts fixed already at £1 per ton. It was not unreasonable therefore, he thought, to estimate for an increase of £804 upon that item. They expected that their expenditure upon coal would be £3600, as compared with £2756; but with the process of enrichment which they had adopted, they could use an inferior quality of coal with as satisfactory results. They spent £1032 last year upon gas oil; and they estimated that, with the new system, £417 would be all that would be required this year. Such a state of matters reflected great credit on their Manager, and on themselves for their enterprise and commercial spirit. The mere fact that four years ago they were paying £175 to the sinking fund, and were now paying £824 a year to the fund, showed that they were financing the undertaking on an absolutely safe basis. He moved that they reduce the price of gas by 5d., making it 2s. 6d. per 1000 cubic feet. This was unanimously agreed to. It is certainly a unique experience to have a reduction in the price of gas this year; and a reduction to the amount of 5d. almost makes the thought arise that it is too much. But the Commissioners went into the subject and were satisfied, so outsiders need have no compunction. How the new Manager, to be appointed, will look upon the matter, is scarcely in doubt. He has got a task set him which it will be difficult to work up to. Had Mr. Waddell remained, he would have been able to realize his own ideals; with another it may be different. One must make allowances in these matters. Doing that, it is sufficient to command one's admiration at Mr. Waddell's resourceful spirit to think that he can this year, upon a small output such as there is at Broughty Ferry, sell gas of 24-candle power at 2s. 6d. per 1000 cubic feet.

For the vacant post of Manager of the Broughty Ferry Corporation gas undertaking, there were twenty-three applications; and out of these, the Burgh Commissioners on Thursday selected the following as a short list: Mr. S. B. Langlands, of Coleraine; Mr. T. Lighbody, of Renfrew; Mr. W. Whyte, of Renton; Mr. J. W. Murray, of Glasgow; and Mr. F. Waddell, of Forfar.

The accounts of the Forfar Gas Corporation were before that body on

Wednesday, with the report upon them by the Auditor, as given last week in my "Notes." Provost M'Dougall said that their accounts had been audited by a chartered accountant, and he thought they could congratulate themselves that, notwithstanding all that had been said about the gas accounts (and said by himself), they had come out very well indeed in connection with the audit. They knew that the Auditor had taken very great pains indeed in going to the bottom of all the accounts; and they ought to be very glad that he had certified them so heartily. There was a note or two regarding certain items; but they understood these items very well, and there was nothing worth remarking about them. These things would be put in proper order; and he thought that the accounts for the past year, and the estimates for the current year, were very satisfactory, and showed great economy and great credit to themselves as gas manufacturers, and to their Manager. Bailie Adamson said, with regard to the Auditor's note that they had exceeded their borrowing powers by £1200, that he, before the extensions were gone on with, called attention to the probability of their exceeding their borrowing powers; but the Clerk pointed out the great expense there would be in obtaining a Provisional Order giving them authority to borrow. He thought that the Clerk was entitled to their very best thanks for the way in which he had arranged the matter. The accounts were adopted, as were also the estimates for the current year, and the continuance of the price of gas at 3s. 9d. per 1000 cubic feet. Bailie Hanick, the Convener of the Gas Committee, in submitting these, said it was calculated that coal would cost them about £570 more this year. But they had a surplus of about £230; and they estimated that gas rates and residuals would show an increase. Owing to the improved conditions of working since the erection of the new gasholder, a large sum would be saved in furnishings and wages. The estimate was a safe one. Now is the triumph of Mr. Forbes Waddell, the Manager; now does his enlightened policy receive tardy vindication. The affairs of the Corporation were all along on a sound basis. The only thing which was out of gear was the Commissioners themselves. Mr. Waddell has succeeded in living down the altogether unmerited cold-shoulder treatment he has received; and if it be his fate to remain at Forfar, his course should now be of the smoothest. There is a point about the comment of the Auditor which is certainly worthy of notice. I suppose that everyone will admit that an independent audit of the accounts of public bodies is desirable. On the other hand, experience, I think, points to its being sometimes carried beyond the bounds of reason. A parish council gives a treat to the paupers under their charge, at the New Year, and the auditor, holding that this is not the purpose of the Poor Law Act, disallows the outlay, and the consequence is that it falls upon the individual members. This is harsh. In the case of Forfar, it is apparent that the Auditor, if he had had the power, would have compelled the Gas Corporation to have covered their borrowing by authority, no matter what the cost should have been. That, certainly, is the only safe policy. But, to go back to first principles, a municipality is only a combination of individuals for the common advantage; and if they see fit to undertake, for the common good, a little risk of loss, the affair is their own. In this case, £1200 may be written off in two years,

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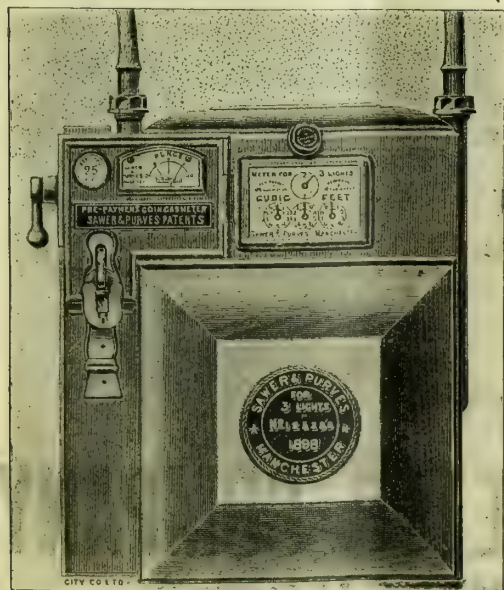
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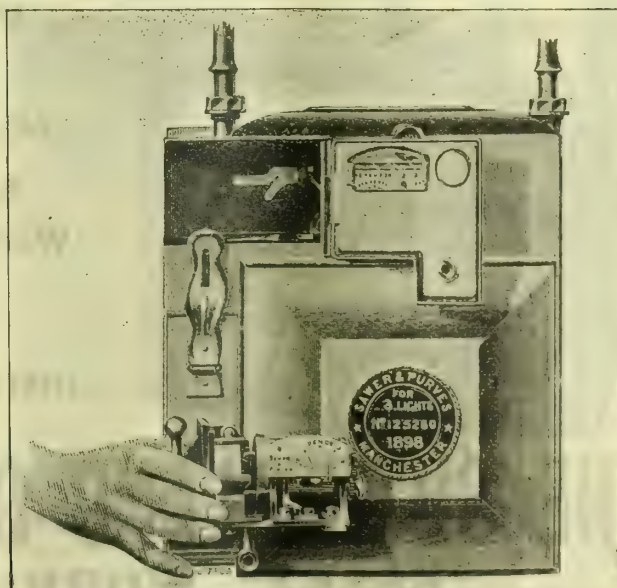
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and the undertaking will then be within statutory protection for all it has borrowed. It is only where there is opposition from within that the policy which has been pursued at Forfar could become questionable. On this occasion, there was, singularly, no opposition from within; and therefore the Corporation were undoubtedly right, although they did not adhere rigidly to form.

The members of the Greenock Gas Trust met privately last Tuesday, and talked over matters with more or less troubled faces; and, as the result of such inquiry as has been held, it has been ascertained, it is said, that this year the accounts are £2000 to the bad, and that a considerable increase in the price of gas will now be experienced by every consumer. The householders of Greenock, the great majority of whom are customers of the Gas Trust, would not grumble with any specified vehemence if the increase could be proved to be the result of the boom in coal, and nothing else. They would resign themselves to the inevitable. But what will be said if it be found that a proportion at least of the extra expenditure is the direct result of mismanagement? Is it really the case that some of last year's contracts for coal, bargained for at a much lower rate than is possible to-day, have not been implemented, and that, as a result, the Gas Trust has had to use coal at the dear instead of at the much more reasonable rate? Statements to this effect were made at the meeting on Tuesday, and the question is asked of the Convener of the Gas Committee (Mr. T. Mitchell) if he is in a position to show that they are untrue. It is urged that the whole question of gas management in Greenock must be brought to the light, and that a prolonged campaign of secrecy will not do. It may be possible to show that the management at Inchgreen has been shrewd and businesslike; but if it be found that the coalowners have been allowed to play "ducks and drakes" with the interests of the public, it may be anticipated that there will be much loud and bitter talk at the ensuing elections.

Mr. G. Keillor, jun., of Peterhead, has just been made the recipient of a most gratifying increase of £25 a year to his salary, as from the 15th of May last. The increase is, as expressed in the minutes of the Gas Committee, "in view of the additional work devolving on the Manager in the management and working of the new chemical plant, and in recognition of the success which had followed his operations during the past year." In speaking to the recommendation, Mr. Ritchie said they were all agreed that Mr. Keillor was deserving of the increase. He had been with them 18 months, and had been paid a low salary. They would have been pleased had he continued to work on the old lines; but by his ability and genius, he had saved them a large sum of money in the improvements he had effected. Mr. Keillor did not ask for the increase; it was a spontaneous offer on the part of the Committee, who thought it proper that such an increase should be given, in order that the temptation to leave Peterhead might be less. That is the true reason of the increase; and it is the best illustration of the estimation in which this enterprising young Manager is held by his Committee.

On the evening of Saturday last, it was discovered that a retaining wall about 40 feet high, between the gas-works at Milngavie and the River Allander, had given way and fallen into the river. A small gas-holder, containing 14,000 cubic feet of gas, in consequence of the want of

support, canted to one side, and the gas escaped. There is now only one gasholder on the works, the capacity of which is 20,000 cubic feet. The accident is attributed to the excessive rains of the week before.

The Johnstone Burgh Commissioners have retained the price of gas at 3s. 1½d. per 1000 cubic feet. They have been able to do this by reason of their having a surplus upon last year's working of £130, and a balance in hand, from previous years, of £1563, which they propose to utilize.

The Brechin Gaslight Company have paid a dividend at the rate of 25s. per share for the past year, which is 2s. 6d. per share less than for the year preceding. The price of gas has been advanced by 6d.; making it 5s. per 1000 cubic feet. During the past year, the consumption of gas showed an advance of about a million and a quarter cubic feet over the preceding year; this being largely owing to an increased demand for gas-cookers, and to an abnormal increase in the number of prepayment meters in use.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 18.

**Sulphate of Ammonia.**—There has again been a quiet market; and prices have barely been maintained—the closing quotations being £10 17s. 6d. to £10 18s. 9d. per ton, delivered f.o.b. at the ports. Direct orders have been scarce—consumers hanging on to the idea that prices must decline further. The bulk of the supply available has again been taken for covering purposes. Scotland has been the weakest factor; production there being sustained through the summer months, while elsewhere it is at its minimum. In the forward position, the divergent views of buyers and sellers have precluded much business. While makers look for a premium on spot prices of 5s. to 7s. 6d. per ton, according to position, consumers' views are scarcely above the level of prices for prompt delivery.

**Nitrate of Soda** is firm at 8s. 1½d. per cwt. for ordinary, and 8s. 4½d. for refined, quality on spot.

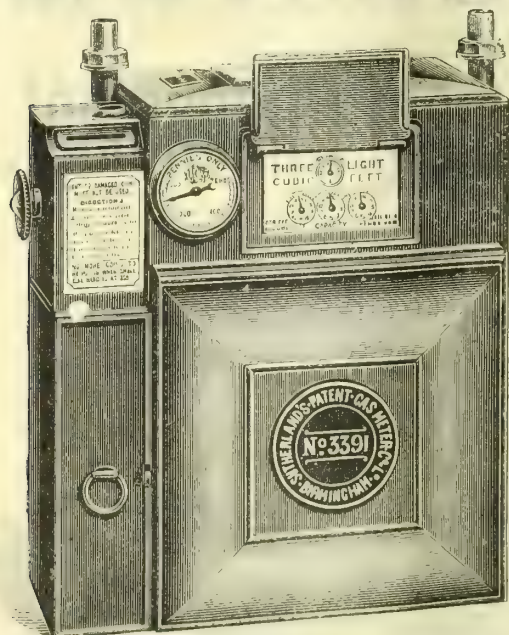
LONDON, Aug. 18.

**Tar Products.**—There is a fairly steady tone about tar products in general; but creosote continues sick, and extremely low prices are quoted from Scotland. Benzols are steady, and fair business passing; but there is not much doing in pitch, which is nominally about last week's price.

Prices may be taken as follows: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 9d. to 9½d., according to position; special qualities for gas, 10½d.; 50's, 11d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 50s. to 80s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia** remains about last week's figures—viz., £10 15s. 3d. to £10 17s. 6d.

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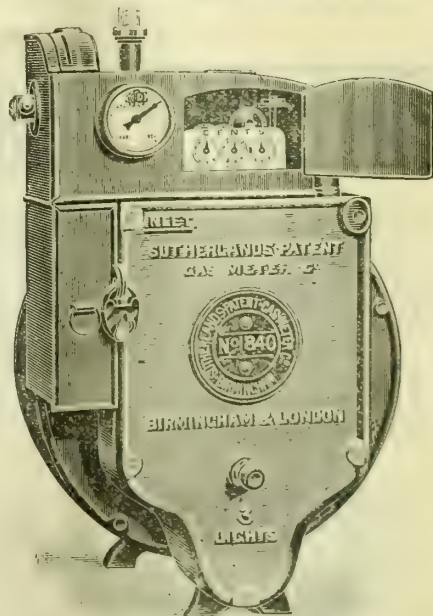
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COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—An exceeding pressure for all descriptions of round coal continues the most pronounced feature of the coal trade throughout this district. Household consumers, having evidently not yet recovered from the general fright as to higher prices, and notwithstanding the advance of 1s. 8d. per ton at the commencement of the month, are still ordering largely in excess of their present requirements; the obvious intention being to get in during the summer what stocks they possibly can to provide for winter necessities, and against any possible further upward move in prices. The result is that not only are collieries still unable to put anything into stock, but they are not raising sufficient quantities to meet the demand, and are mostly very much in arrear with their deliveries. It would not be surprising, supposing the pressure for extra supplies continues, if the advance in wages which commences in October should then be made the pretext for some further rise in prices. Indeed, this is being generally talked of; some colliery representatives expressing the opinion that best Wigan Arley may possibly touch 20s. per ton at the pit. Another feature in the market, which is also contributing towards checking any accumulation of stocks at collieries, is the special conditions in the gas coal contracts which were enforced this season. Under these conditions, the gas companies were bound to take 40 per cent. of their full contract quantities during the summer months; and it was pointed out by the manager of one of the largest gas companies recently, that they had now in stock three times the quantity of gas coal they usually held at this time of the year. The object of colliery proprietors is, of course, to compel the gas companies to stock the coal themselves, instead of its being put down in stock at the pits, and also to relieve them of the pressure during the winter, when there is a large inquiry for household purposes. Many of the gas companies have been objecting to take in these large stocks just now, as they are found very inconvenient to deal with; but the reply of the coalowners is that if they do not take the stocks now, they will not be supplied with more than 60 per cent. of the contract quantity during the winter months. For steam and forge coals, the inland demand continues exceedingly good; while for shipment there is also a large inquiry, which is in excess of the supplies collieries are just now able to send to the ports. The general result is that prices for all descriptions of round coal are exceedingly strong, on the basis of full list rates. These average 16s. 6d. to 17s. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, and 12s. 6d. to 13s. for steam and forge coal, with ordinary steam coal 15s. 3d. delivered at the Mersey ports. Supplies of slack, as might naturally be expected, continue plentiful on the market, owing to the exceptional quantity of round coal now being screened; but, notwithstanding, surplus lots are being sent in freely from other districts at much below local quotations, Lancashire collieries are determined to hold on to their full list basis, and at a recent meeting it was decided that it was inexpedient to make any concession, as the general opinion was that the present surplus of slack on the market would only be temporary. Best slack is

still quoted at 11s. to 11s. 6d. per ton, and common sorts at 10s. 6d. at the Lancashire collieries. The position with regard to coke is not quite so strong. During the past week or two, there has been some underselling by merchants who have been able to place quantities they had previously bought; and now lower quotations are also coming upon the market from some of the coke makers. This, however, is chiefly in the lower qualities suitable for furnace purposes. Quotations remain without any very material change, and range from about 23s. 6d. to 24s. for furnace coke, and 31s. to 32s. for foundry qualities at the ovens.

**Northern Coal Trade.**—There is considerable activity in the coal trade, and the range of prices is rather higher. But the production at the collieries is full; and there is rather a lack of ready steamers to take cargo, so that there is no rush in the demand. In the Northumbrian coal trade, the demand is steady; and best Northumbrian steam coals are quoted at 19s. to 19s. 6d. per ton f.o.b., though very little is sold at figures like these—most of it being on contract at lower prices. Second-class steam coals are quoted at 18s. 6d. per ton; and steam smalls average about 12s. In gas coal, there is a steady and increasing demand, both for shipment and for local consumption; so that the output at the collieries is well taken up. The price of gas coal for occasional cargoes is put as about 17s. per ton f.o.b.; but for forward delivery, it is believed that much lower prices are being taken. Shipments of gas coals to the Thames are now growing heavier; and the fine weather has allowed good passages to be made. Coke is very firm, both for export and for home consumption, the price being 34s. to 35s. per ton f.o.b. for export qualities, and about 29s. per ton at the blast furnaces for good furnace kinds. There is little or no alteration in gas coke this week, though the margin for export should soon increase. Prices are unaltered.

**Scotch Coal Trade.**—There is a firmer tone in the coal market as the holidays of the workmen expire. The demand is greater, and prices are rising, for all sorts, with the likelihood that they will go up further. The quotations are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. 3d. to 17s. 3d., and splint 16s. to 16s. 6d. The shipments for the week were 228,149 tons—a decrease of 1065 tons upon the previous week, but an increase of 42,594 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,417,746 tons—an increase of 1,132,234 tons upon the corresponding period of last year.

**Alcester Water-Works and the District Council.**—The Directors of the Alcester Water Company being agreeable to the consideration of the question of the transfer of their works to the District Council, the latter body have appointed a Committee to meet the Board to discuss terms and conditions.

**A Water Scheme for Dursley.**—The Local Government Board have sanctioned the borrowing, by the Local Authority of Dursley, of £4650 for carrying out a water supply scheme. Repayment is spread over a period of 30 years, at 3½ per cent. interest. The work will be proceeded with at once.

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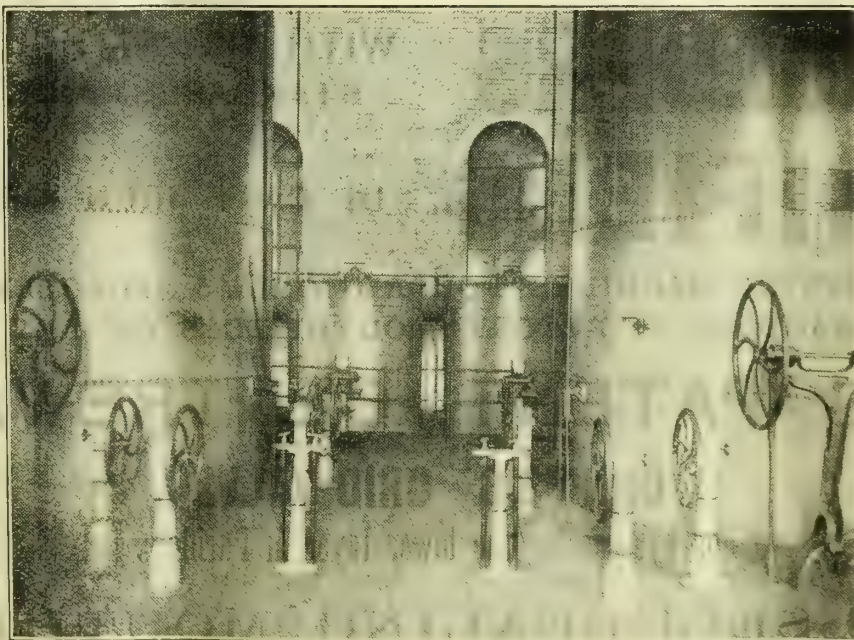
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**Water-Main Extensions at Harrogate.**—The Harrogate Town Council yesterday week agreed to make application for sanction to borrow £5000, to meet the cost of probable extensions of water-mains during the ensuing twelve months. There was an application from Scriven to supply them—which the Council are compelled to do—and which will cost about £2570.

**Barnet District Gas and Water Company.**—In the report which the Directors of this Company will present at the half-yearly general meeting next Friday, they state that the balance on the profit and loss account amounts to £16,460, out of which they will recommend the declaration of a dividend, less income-tax, for the six months ending June 30, at the rate of 9 per cent. per annum on the "A" and "C" stocks, of 8 per cent. per annum on the "B" stock; and of £6 6s. per cent. per annum on the "D" capital gas and water stocks. The business of the Company continues to progress.

**The Loan for the Purchase of the Gainsborough Gas-Works.**—At a meeting of Gainsborough District Council last week, the question of the loan for purchasing the gas undertaking was considered. It was decided to accept £50,000 from the Clerical, Medical, and General Life Assurance Company at 3½ per cent. interest, repayable over a period of thirty years. The offer of Mr. Woodall, of Scarborough, of £15,000 at 3½ per cent., was also accepted. It was stated that the Clerk had had great difficulty in placing this loan, which was as yet incomplete, but they were negotiating for the balance.

**Suicide by Gas.**—Last Tuesday, at Manchester, an inquest was held with reference to the death of Thomas Martin (age 24), a tinplate worker, who lived at his parents' house in Edensor Street, Beswick. He was found dead in bed on Sunday morning. The burner had been taken off the gas-bracket in the room, which was full of gas through the escape, and death had evidently been caused by inhalation of the gas. It was stated that the man two months ago removed the burner; but the fact was discovered before there was any serious result. He had been heard to say that he wished he was out of the world; and then he would not have to work. A verdict of "Suicide while insane" was returned.

**Benefiting One Corporation Department at the Expense of Another.**—The notable discovery has been made by the Bradford Corporation Water-Works Committee, that their great undertaking can at last be made to show a balance on the right side by the simple device of charging other Corporation departments for the water used by them. "This," says the "Bradford Observer," "may remind gas consumers of a still more important cross-charge by one department against another, which does not appear in the annual accounts. Gas consumers pay for the lighting of the streets, even before they begin further to contribute some profit in relief of the rates. They do not feel the burden; and perhaps the streets are better lighted than they would be if the actual cost appeared clearly in the estimates. But these unstated and invisible expenditures by one Corporation department at the expense of another seem hardly just to either party. Perhaps the Gas Committee may follow the Water Committee's example, if coal—but let us not mention it."

**The New Reservoir for the Tees Valley Water Board.**—A protest has been forwarded from a public meeting of Middlesbrough rate-payers to the Tees Valley Water Board against the decision of the Board in letting the contract for £385,000 for the work in connection with the Grassholm reservoir without obtaining tenders by open competition. At the meeting of the Board on Monday last week, the General Manager (Mr. D. D. Wilson) was instructed to draw up a suitable reply.

**Meter Testing in Birmingham.**—At a meeting of the Magistrates of Birmingham last Tuesday, the Chairman of the Gas-Meter Testing Committee (Mr. Maurice Pollack) submitted the annual report. It stated that the net profit of the department for the past year was £277, as against £290 for the previous year; the total receipts having been £760. During the year, 22,566 meters were tested, as against 3146 in the previous year; 232 being rejected as incorrect within the meaning of the Sales of Gas Act.

**The Severn Commissioners and the Value of Compensation Water.**—At the annual meeting of the Severn Commissioners on Monday last week, a report was submitted by the Engineer (Mr. E. D. Marten) in regard to some careful investigations that he has been making into the question of the extent to which the impounding and the abstraction of the waters of the River Vyrnwy for the supply of Liverpool, affect the Severn, of which the Vyrnwy is one of the principal tributaries. He said he found that the contention of promoters of such schemes, that while they abstracted flood waters which were detrimental to riparian owners' interests, they increased the volume of the stream in dry times by means of the compensation waters, making their operations beneficial to all parties, was altogether delusive—at least so far as the Severn was concerned. From the reports as to the daily height of the Lake Vyrnwy for the past ten years, it was shown conclusively that no flood waters of detrimental magnitude had ever been caught by Lake Vyrnwy, since it always happened that in the case of a bank full flood at Worcester, Lake Vyrnwy had been full and overflowing for many days previously; thus affording no storage whatever. He was of opinion that it actually accelerates the discharge of floods, as the waters coming down from the surrounding hills were discharged on to the smooth surface of the lake, instead of into the tortuous ditches of a flat valley, as was formerly the case. While flood water escaped, useful freshets which would otherwise pass down the river were caught and lost to the river altogether at times when they were badly wanted. The amount of daily compensation water was 10 million gallons, with an addition of 40 million gallons a day on four consecutive days in eight months from March to October inclusive. Whereas this amount of water was supposed to reduce the height of the lake 9 or 10 inches, there were times when the quantity of water in the lake had risen during the discharge, showing that larger quantities of water were entering the lake, and would have passed down the river, than was given in compensation. He recommended that, when any future proposal was made to abstract water from the Severn watershed, provision should be made that the compensation water should be discharged at such periods as may be most in accordance with the requirements of the river rather than at fixed dates as now. The report was adopted.

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## EDITORIAL NOTES.

## The Papers for the International Gas Congress

THE list of papers promised for the forthcoming International Gas Congress in Paris, which we gave in last week's "JOURNAL," is calculated to whet professional expectation to the keenest edge. Its composition does infinite credit to those who are responsible for the selection; and we have not the smallest doubt that the communications will prove worthy of the authors and of the occasion. We do not suppose that the promise of such papers will act as an additional attraction to those British gas engineers who had not decided to attend the Congress; for those who meant to go would do so in any case, and a polyglot technical programme must be more curious than interesting. The eminence of the "platform" provided by the Congress is certainly reflected in the names of the authors and the titles of the promised papers. The first thing one would naturally expect of such a programme is that it should manifest the nature of the topics which chiefly occupy the minds of technicians at this epoch; and it is gratifying to be able to commend the list of papers as fully satisfying this initial requirement. It is for the authors to meet the consequential demand, that the substance of their communications should constitute a worthy record of the state of knowledge of the subjects treated, for the time being.

Glancing over the programme, one cannot fail to be impressed with the great importance and high interest of every one of the subjects to be treated, without exception. To say that the list does not cover the whole ground of gas manufacture and distribution would be no criticism; for there must be selection and limitation. It is more to the point to observe that there is nothing petty in the matters that will occupy the time and engage the attention of the Congress. To commence with coal carbonization, the mechanical side of stoking and retort-house work generally is to be treated by Mr. C. E. Brackenbury, of London, by M. Louvel, of Paris, and by Mr. F. D. Marshall, of Copenhagen. The physical science of the retort-house has aspects which will be discussed by M. Eichelbrenner, of Paris, by Mr. Alten S. Miller, of New York, and by M. Euchène, of Paris. It is very interesting to note that the subject of the relations of carburetted water gas and coal gas manufacture will be dealt with by M. Sospizio, of Trieste, whose fiscal and industrial conditions must compel him to view this matter in a special way. Various questions of gas chemistry are, of course, to the fore; and it will be satisfactory to have Dr. Bueb on this platform. M. Witz, on the gas-engine, is again conspicuously the man for the place. Half the brilliancy of the programme, too, would certainly have been missed if the name of Dr. Bunte had not shone there.

It is unnecessary to particularize; suffice it to say that if only a majority of the papers fulfil the promise of their titles, the reported transactions will be a mine of the latest information relating to the chief subjects of gas engineering studies. Physics, Chemistry, Mechanics, Domestic Economy, Industrial Economics, General Technics, Statistics—all are included in the *agenda*; and all are in the hands of exponents whose reputation is world-wide. And, what is even of greater importance, most of the subjects of papers are those upon which the last word of science has by no means been said. They deal with actualities, not with the dry bones of text-book certainties. It is therefore not too much to expect that the gas industry everywhere will get a set of fresh data from this Congress. Whether the attendance at the meeting itself is large or small is of no material importance. It has been said that the ideal University teaching of the future will be the Professor talking in his study, undisturbed by the accidents of the lecture theatre, while telephones repeat his words in a hundred class-rooms, and the phonograph records them for purposes of reference. Until this desirable state of things is realized, the Press must act as the transmitting and recording medium between the congress-hall and the multitude without. We shall, of course, take care that the transactions of the International Gas Congress are properly Englished and put upon record, and, if necessary, discussed in detail in due course.

## The Question of Storing Gas Coal.

THE wise man sees the signs of the times, interprets them aright, and reaps his advantage from his perspicacity.



Some such reflection as this, in all its "copy-book" sententiousness, occurs to one who reads the speech of Sir Edward Lawrence at the annual meeting of the Liverpool United Gaslight Company. For Sir Edward, like all other Chairmen of Gas Companies in these times of higher prices, had to expound to his auditory, in the plainest language, the reasons for a rise in the price of Liverpool gas of 3d. per 1000 cubic feet. In doing this, he was compelled to show that "two and two make four," which is dull work. In truth, there is no stupidity or obtuseness like that of the British Public, when it is asked to pay a little more than usual for something which it is unwilling to go without. From professors at technical colleges down to readers of papers at Co-operative Congresses, one and all declare themselves incapable of comprehending why gas, railway excursion fares, or bread should be dearer because coal and flour cost more money. Nothing less obvious than the truths of our copy-book headings is competent to impress this order of the British intellect. Great is the power of platitude, and worthy of all respect. Amid the stolidities of Sir Edward Lawrence's speech, however, there peeped out a gleam of suggestion which is worth all the rest to those who really can see a hole in a ladder. He stated that the Liverpool Directors had come to the conclusion that it is desirable in their case to store coal more extensively. They have accordingly rented some land adjoining their works at Linacre; and they hope during the course of the next few months to be able to accumulate a good store of coal there, so that they may not be at the mercy of the contractors during the coming winter, and also that the Engineer may have more peace in this regard than he has enjoyed during the past one or two winters.

This course of action is to be commended to the notice of gas manufacturers. Taken in conjunction with Mr. Livesey's confidences respecting the quantity of coal which contractors have been able to pour into gas-works this summer, it really seems to indicate that the next best thing to gas companies having coal mines of their own, or having works at the pit's mouth, is a practically unlimited capacity for stocking coal. The great thing evidently is to take as much coal as can be had, at the time. The colliery proprietors have been dumbly inviting their customers to do this. Being debarred themselves, by sufficiently obvious considerations and influences, from accumulating visible stocks, they have simply sent on the coal to be dealt with "at the other end." It is idle for a gas company with inadequate storage room for coal to try and correct this shortcoming by arranging for nicely-calculated monthly deliveries. To do this is to play into the hands of every enemy of stable industry and regular employment. Small gas companies, of course, will always be able to effect more or less trustworthy arrangements of the kind; but for those immense deliveries which are of real consequence in, and influence upon, the trade, it looks as if the purchasers will have to reconsider their arrangements, somewhat in the Liverpool sense.

In these days of mechanical coal handling, one of the familiar objections to stocking coal has dwindled to insignificance. It costs very little now to put coal into store and get it out again. There are other considerations, of course, to be taken into account—the interest on the money locked up, the rent of the land occupied by it, the capital charges on the buildings, railways, and handling appliances, the deterioration in the value of the stored coal. We do not believe that all these put together would outweigh the advantages of having a coal mine at hand, ready to supply or to receive any quantity of this first necessary of a gas undertaking's existence. The old idea that massive buildings are needed for the storage of coal is exploded. Coal will keep quite well in heaps. Most of the room usually occupied, to very bad economical advantage, for keeping coke out of the market, might be more profitably used for storing coal. It is, however, unnecessary to labour the point. Indeed, some might say very plausibly that the managers of gas undertakings usually know their own business, and should be capable of being trusted to decide when and how to stock coal. But this is precisely a matter upon which gas managers need all the outside help they can get. In regard to such questions as that of the policy of stocking coal or coke, the actual manager is often helpless in the hands of his directors or committee, who occasionally entertain very eccentric notions in this regard, as the coke-mountains of Beckton and Birmingham once

testified. Such resolutions as that of the Liverpool Directors throw great light upon these problems; and it is for this reason that we characterize the reference to it as the most important feature of Sir Edward Lawrence's address to the shareholders.

#### American Coal in London and Europe.

ONE swallow, we know, does not make a summer, nor does one cargo of Philadelphian coal in the River Thames make a wholesale and permanent invasion of the English coal market by American mineral. But, as in the one case so in the other, its advent is of significance. So, in fact, it has been recognized to be by the Daily Press; for at the latter end of last week it was impossible to open any newspaper without receiving the information that the steamer *Queenswood*, with a cargo of something less than 4000 tons of Philadelphian gas coal, had arrived in the Victoria Dock, and that her cargo was being unloaded for lighterage to the works of the South Metropolitan Gas Company. Indeed, some of those papers with ill-balanced judgments that have been talking so much of such little value about the coal difficulty of late have attached an altogether exaggerated amount of importance to this incident; for, as has been pointed out in these columns more than once, it is impossible for American coal to be profitably put on the English market in any but the most abnormal of times, such as the present. That is evident from a consideration of the freight difficulty. The *Queenswood's* cargo, it is stated, was carried at a rate of 16s. per ton, which is under rather than over the usual freight charge from the States to this country. The freight from the Tyne to the Thames is, on an average, about 3s. 6d.; and it is obvious that it will never be possible for the two figures quoted to come within measurable distance of being equal, especially bearing in mind the difficulty which any additional coal vessels that might be sent eastward across the Atlantic would experience in finding cargo for the return journey westward.

It is further obvious that a difference of, say, 12s. per ton in freight could not be counterbalanced by a correspondingly lower f.o.b. price in any ordinary years, when Durham gas coal is shipped at about 6s. to 7s. a ton. Indeed, if report be correct, the shipping (f.o.b.) price of the recently unloaded cargo was 12s. per ton, which is only about 5s. less than the highest prices marked at the present time for Durham coal. This leaves, even under the existing abnormal conditions, a balance of 7s. to 8s. a ton against the American coal. As, however, Mr. Livesey has purchased the cargo in question on the strength of an estimated make per ton of 15,000 cubic feet of gas, the experiment—for such it is—was well worth the making just now. We have no doubt that, in accordance with his accustomed generosity to the industry, Mr. Livesey will in due time let us know the result. What, of course, has to be determined is not only the quantity of gas produced and its illuminating power, but also the value of the residual products.

Whatever the outcome of the experiment, the advent of American coal in London serves as a useful reminder to the English coalowners that there is a limit to their monopoly. At reasonable prices, of course, their coal must always command the Home market, and, within stricter limits, the Continental markets also. But, with the possibility of American intervention present in their minds when coal in this country rises considerably above the normal level, the colliery proprietors here must recognize that, now that the American coalfields are being rapidly developed (and their output is the heaviest of any nation), a bound has been marked beyond which it will not be possible for them to go far for any considerable length of time. It is, however, rather from the competition of American with British coal in neutral markets that we look for appreciable relief of the present situation, and a safeguard against any future rises. Our readers need no telling that the scarcity of coal in the Home markets during the past twelve months has been in no small measure due to the increased export of our coal to other countries. If, therefore, as we have before pointed out, the demand of those other nations can be met by shipments from America, every ton so supplied releases a ton of English coal for sale at home. And that very desirable consummation is now being brought about to a steadily growing extent. Italy has received numerous cargoes of American coal; and a Newport collier has delivered over 3000 tons at Cronstadt—the first cargo of U.S.A. coals placed in Russia; France is about to receive seven cargoes from Philadelphia, and the representative of some American collieries, who appeared on



the Coal Exchange last Friday, reported having concluded a contract for the delivery of 100,000 tons at Havre.

What with the competition of American goods with our iron and steel manufactures—as to which we have something to say elsewhere—and of American coal with British in the Home and Continental markets, we shall soon have to celebrate another Relief—the Relief of the Coal Consumer.

#### The Troubles of the Coal Consumer.

THE Fates have in the past twelve months fought and prevailed against the coal consumer. Like Mr. Squeers, when Bolder's father was two pound ten short, he has had his disappointments to contend with. The great activity in trade generally and the metal trades in particular had already stiffened the coal market to a degree discomfiting to the purchaser, when, last October, the outbreak of the Boer War—with the consequent increased demand for steam coal and further stimulation of the industries concerned in the manufacture of munitions of war—gave a decided fillip to the price of coal. Then came a very sharp snap of cold weather in January and February, which caused buyers to acutely realize the fact that the supply of coal was temporarily inadequate to the demand. Concurrently, the strike of Bohemian miners, coupled with labour troubles in France, created a very heavy demand upon the English collieries for coal for export. More recently, when there seemed some hope of an easing off of prices, the outbreak of trouble in the Far East caused a run upon the steam coal market for our own and other navies; the Admiralty alone having during the past month bought 400,000 tons at top prices. Now, upon all this comes the miserable, yet important, struggle on the Taff Vale Railway (over the eternal question of Trade Union "recognition"), with the true inwardness of which we deal elsewhere. We are now principally concerned with its effect on the coal market.

The Taff Vale Railway is the main outlet by which the coal from the South Wales valleys—the Rhondda, Aberdare, and Merthyr in particular—reaches Cardiff; and the paralysis of traffic on the railway means a very serious diminution in the quantity of coal available for use. It is true that the Company are gradually succeeding in re-establishing their services by the aid of their clerical staff and men drafted in from outside. But, inasmuch as the miners' leader, "Mabon," has announced that the colliers will not put out coal for transit on the Taff Vale line so long as the trouble lasts—and the men appear only too pleased at the thought of a holiday—while the tippers at Cardiff are refusing to deal with any coal that may be got down, the prospect of any considerable quantity being shipped while the struggle continues appears to be slight. The number of colliers rendered, or likely to be rendered, idle is variously computed at from 20,000 to 40,000; and the output would be thereby affected to the extent of 100,000 to 200,000 tons per week—the larger figure rather than the smaller one being probably nearer the mark.

Apart from the seriousness of such an event, regarded from the naval authorities' point of view—and it is from South Wales that the Admiralty draw the bulk of their requirements—the effect upon the coal trade throughout the kingdom must necessarily be considerable. Indeed, the reports from all quarters show that the market, which is at present in a very sensitive condition—owners clutching at every excuse to maintain or increase prices, and the astute among the buyers doing hand-to-mouth business in hopes of a fall—has already been affected by the strike in South Wales; and the reaction which is coming in the trade has been thereby further delayed. Everyone concerned in the price of coal will, therefore, watch with some anxiety the course of events in the Principality.

We have spoken of a coming reaction in the coal trade; and, unless Fate continues to pursue the unfortunate buyer and the unforeseen occurs, there can be no doubt that, if the dislocation of the Welsh trade be soon remedied, an easier state of affairs will shortly set in. There has been, it is true, an altogether unprecedented demand for and delivery of coal during the past few weeks. But reasons therefor are to be found which give ground for the opinion we have expressed. In the first place, the householder has been driven into a panic by the vapourings of the Press, with the result that nearly everybody has been rushing to buy in August what, in ordinary years, would be purchased some time between now and November. In the second place, in accordance with the revised conditions under which many gas coal contracts were renewed this year,

much heavier quantities have been delivered to the gas-works in some parts of the country during the summer months than usual, which, of course, means proportionately lighter deliveries in the winter. Both causes have tended to make the coal market harden of late; their corollary results will tend to a softer market in the months to come.

Similar views to the foregoing as to the prospects for the approaching winter were expressed by Sir Benjamin Hingley last Wednesday at a meeting of the Iron Trades Consultative Council in Birmingham. Sir Benjamin, himself a colliery proprietor, declared that he had no hesitation in saying that "many of the coalmasters had gone to great extremes," and had thereby inflicted injury upon the iron trades and the country generally—the point we were at some pains to emphasize last week. He added that the cry about "a coal famine" was all nonsense. "It was a manufactured cry"—resounded, we would add, by an ignorant section of the Press—"and the probability was that, if we had a mild autumn and winter, there would be a plethora of coal instead of a scarcity, and the stocks now being accumulated would be sufficient to carry them through." His advice to ironmasters was to hold on, and not to give "way." Whether the ironmasters will be able to follow Sir Benjamin's advice may be doubted; for there are other factors beside the price of coal which will act upon the price of iron in the future. But we hope consumers will take heed of his words as to the coal prospect, and not continue to play into the colliery owners' hands. We note, as an ominous sign, that some buyers at least have not recovered their courage; a report being current to the effect that 20,000 tons of household coal have just been sold for delivery over next year in regular monthly quantities, at the almost unprecedented price of 20s. per ton f.o.b. the Tyne. Truly, there be fools abroad; we hope not many such.

#### The Railwaymen's Strike in South Wales.

It used to be remarked of the best prophets of the ancient world, that they hated their powers, and only exercised them with great reluctance. This was on account of there being more ill than good luck in most of the human affairs upon which they were habitually consulted; and they grieved, as men, over the sorrows which their gift enabled them to foresee. They would much rather have been as other men, heedless of a future which they were powerless to control. So with the modern journalist, who has succeeded to the most enduring fragment of the prophetic mantle that has come down to these times. It is the business of the journalist to impart to his readers the passing impressions that he obtains from his incessant watch upon the trend of events. Of course, these impressions are not always trustworthy; for the observer is only a prophet in the sense in which sailors and shepherds are weather-wise—he does not know more than others, but is constrained by circumstances to notice more. When, a fortnight since, we wrote in these columns of the imminent reopening of the strike factories, the words were only too truly prophetic. At the present moment, the largest employers of organized labour in England are face to face once more with the evil of disaffection, actuated and made venomous by that very worst form of Trade Unionism which is powerless for good but only too capable of mischief. The meaning of the happily futile Great Eastern outbreak is being demonstrated in South Wales. Foiled in one case, the Executive of the Amalgamated Society of Railway Servants have thought to win the battle for "recognition" against the Taff Vale Railway Company. This is a complete dropping of the mask. The abrupt shifting of the scene of conflict from Stratford to South Wales betrays the character of this particular Union. It is a fighting Society, pure and simple, and as such thoroughly deserves the description applied to it by Lord Claud Hamilton. On the one point of "the vexed question of the right of a third party to intervene," as a Western newspaper puts it, the Union have so acted as to cause "great public inconvenience, heavy loss to shopkeepers and tradespeople, the enforced idleness of many thousands of miners, serious delays in the exportation of coal, and greatly enhanced prices for a commodity already exceptionally dear." The Railway Company have not the smallest intention to yield. They know full well that "recognition of the Union" would be fatal; and the management realizes that the issue may as well be fought out now as at any future time.

Of course, the Union will be beaten if the employers



continue resolute. There are already signs of approaching discomfiture, in the "official" communications to local newspapers respecting the success of the picketing, the anxiety of the Board of Trade to interfere, the certainty of the strike spreading to other railways, the offer of financial support from other Unions, and so forth. These are the customary expedients of discomfited strike leaders. The Railway Company make no "official" announcements; but they are attending to their ordinary business. It is much to be regretted that even the smallest local newspapers should report this familiar strike lying. In their very laudable search for news, however, it is not always possible to discriminate in regard to veracity. This Taff Railway strike proves once more how radically incompatible the accepted idea of Trade Unionism is with the working of systems of what we have called "organized" labour. The term is not a good one, because it has already been appropriated by professional Trade Unionists to distinguish society men from other workpeople. What we mean by it is the class of labour which is not exactly skilled, and is yet far from unskilled—the labour, in short, which is combined and co-ordinated to serve one general purpose, as the working of a railway, the supply of towns' gas, and similar undertakings which are as much public services as they are industrial concerns. Professional labour agitators have seized upon the modified amount and kind of skill necessary for properly carrying on the work of such organizations, as furnishing the fulcrum from which they can apply the lever of their society organization to upset the whole scheme of operations whenever it suits them to do so. They flattered the gas stokers of 1889 that they were indispensable, by reason of their "skill;" and they are flattering the signalmen and plate-layers in the same way now. This disturbing element must be exposed, repelled, and foiled at all costs. That is the long and the short of the whole matter. No man can serve two masters; and those employers only are sure of having the single service of their employees when there is no "recognized" third party between them.

#### A Year's Tale of Lamp Accidents.

WE have been keeping a watch over the attitude of the London County Council in regard to the petroleum trade; and have noted with much satisfaction the termination of the parliamentary session without any further statutory interference with this important industry. Of course, the London County Council continue in the same mind with regard to the "deadly flash-point" as of yore. Trust this body for sticking to any point which harasses a great trade, and is not directly under the influence of the labour vote. The Portable Photometer and the Flash-Point are in this category. The annual report of the Chief Officer of the Public Control Department of the Council (Mr. A. Spencer), dealing, among a number of other matters, with their administration of the Petroleum Acts, admits that the use of petroleum and its various distillates in manufacturing processes is continually increasing. Somehow, the world insists upon using more petroleum, in different ways, every day. It is a remarkable testimony to the influence of fiscal systems in moulding trade developments, that petroleum processes are nowhere so plentiful as in this country, where there is practically free trade in the commodity. The Chief Officer mentions, more in sorrow than in anger, that since July, 1898, when the Select Committee of the House of Commons issued their report, "the Government" have taken no steps to give legislative effect to any "of the recommendations of the Committee." Individual members, it is stated, have introduced Bills for raising the flash-point; but their efforts have not been successful. It is a pity the Committee did not mention the expressed intention of Mr. Ure, one of the shale-oil country members, to make this a "Party Question."

Some interesting information is given respecting petroleum stove and lamp accidents. We always regard petroleum stoves as poor substitutes for the gas-stove. They are very largely used; and it is not surprising that 56 accidents with them occurred in the London area last year, including four cases which involved the loss of four lives. "Of the fatal cases, three were caused by the up-setting of the stove and the subsequent outflow and ignition of oil. In the fourth case, the oil ignited during the replenishing of the stove with oil whilst the wicks were alight." No question of the flash-point here! Of lamp accidents there were 203 for the year, of which 22

had fatal results. The reporter admits that these numbers show a considerable diminution as compared with the preceding five years. It is officially stated to be difficult to assign a definite reason for this decrease; "but it is noticeable that a much larger quantity of Russian oil has been imported into London during the past year than in previous years; and there is no doubt that a large percentage of this has been of high flashing-point." Thus the official gloze. It might have occurred to the reporter that the enormously increased use of gas by the prepayment meter system may have had something to do with it, by absolutely reducing the number of oil-lamps in the hands of the most careless classes. Besides, what really is the flash-point of most of the Russian oil sold in this country?

The list of fatal lamp accidents is very curious reading indeed. From the character of most of the entries, it would not strike an unprejudiced observer that any alteration of the flash-point of the oil would make much difference in such a connection. Take the following specimen. It relates to the death of two persons, Daniel Moriarty and James Mills, in Lambeth, and was the only double fatality for the year. The cause was a "lighted lamp" "alleged to have been thrown by Mrs. Moriarty at her husband. The lamp was smashed, and the burning oil scattered over her husband and James Mills." After this, it is mere embroidery of the tale to be informed that the oil had a flash-point of 78° Fahr., and the lamp a porcelain receiver. The only pertinent question is whether any make of lamp or brand of oil could be safely licensed by the County Council for use in this particular fashion. It seems to be the portability of oil-lamps, rather than any other quality, that renders them so conspicuous in those "short and simple annals of the poor," collected by the inspectors of the London County Council.

## WATER AND SANITARY AFFAIRS.

WHATEVER may be the financial result of the enterprise of our neighbours across the Channel in carrying out the stupendous undertaking which is now attracting so many visitors to Paris, it will have served a very good purpose by affording facilities for the gathering together of men of various nationalities engaged in similar work, and enabling them to fraternize with each other, and compare notes on questions of general interest. It was therefore in a high degree judicious on the part of the organizers of the International Health Congress to decide to hold it this year in the French capital; and surprise will not be aroused by the statement that something like two thousand members and delegates were present at the opening meeting, at which M. Waldeck-Rousseau and the principal Government and Municipal officials of the Department of the Seine and the City of Paris were present. The sittings extended over a week; and the subjects brought forward were grouped in eight sections. Professor Brouardel was the President. Naturally, questions of water supply and sanitation came in for a large share of attention; and it may be confidently expected that improvement in each of these branches of the public service will be the result. The two subjects are so closely allied—they are so intimately bound up with each other—that they may be almost regarded as one; for, without a good supply of water, sanitation is impossible. The chief factors in the provision of a town with water are that the source shall be unimpeachable, and that the precious fluid shall not be contaminated when it reaches the consumer. These two points were brought under the notice of the Congress by M. Félix Launay, who, as the responsible Engineer for the sanitary works of the Seine, was specially qualified for the task. He emphasized the importance of protecting sources of water supply by securing as large an area as possible round them, and expressed the opinion that this should always be insisted upon. He also urged that the purity of rivers, especially when used for the supply of towns, should be secured by the exclusion of factory waters and the contents of sewers.

The pressing need for the constitution of some body for the special purpose of studying questions of water supply and sanitation, to which Dr. Percy Frankland directed attention at the recent Public Health Congress in Aberdeen, as noticed last week, seems to have been recognized by the international gathering in Paris. As the result of inquiry by a Special Commission, a demand has been made for the



organization of such a body at the cost of the State; and a measure is to be laid before the Chambers to carry out the idea. We learn from our contemporary the "Builder" that it is proposed that when the deaths in a district exceed 22 per 1000, the fact must be brought under the notice of the administrators of the Department by the communal authorities, and an inquiry instituted into the sanitary condition of the district. We presume that what is meant is the prevalence of a death-rate in excess of the above-named figure, as a temporary rise might be purely accidental. Reverting to M. Launay's paper, he alluded to the opinion held by some experts that it is impossible to reach perfection in providing great towns with water by the ordinary methods, and that it will either have to be manufactured artificially or purified by chemical processes. In considering the problem from the latter standpoint, he thought it should be settled whether or not it would be advisable that the pathogenic microbes only should be destroyed. He suggested that it would be better to endeavour to procure the purest possible source of supply, and then protect it from every kind of contamination. It seems to us that this is the right course to pursue. The matter gave rise to a full discussion, and eventually the Congress expressed a desire that the Government should institute, and bring into operation, legislative measures for the protection of streams from pollution by the refuse waters from towns and factories, and for the preservation of the purity of waters employed for domestic supply. In the event of the water being suspected, or being liable to contamination, sterilization in bulk was advised.

Next to the provision of a pure water supply, fresh air is absolutely necessary if anything approaching perfect sanitation is to be reached; and to this branch of the general question much attention was given. It was introduced by MM. Lacau and Masson, of Paris. How to keep out of a dwelling-house the foul air, and to admit as much as possible of the fresh, was the subject discussed; and upon it views were put forward which are not generally accepted in England. Here we are rather believers in keeping sewer gases out of our houses by means of the disconnecting trap; whereas our friends across the Channel do not appear to be satisfied with this system. We have come to regard sewer air as a vehicle for the propagation of disease; and consequently we have endeavoured, by means of a trap, to exclude it from our dwellings. French sanitarians, however, consider this theory to be incompatible with present knowledge, and they claim that security can be obtained by means which are not accompanied by the inconveniences attending our system. They advocate the abolition of the trap, and the ventilation of the house drains by the prolongation of rain and other pipes provided with free orifices. These, it is contended, will cause such a circulation of air that the noxious microbes will be burnt up by the oxygen as they are generated. The use of the trap was, of course, stoutly defended by delegates from England. However just may be the conclusions of the French authors on theoretical grounds, a fact cited by one speaker told very much against them. During the epidemic of typhoid fever at Maidstone three years ago, the danger of connecting the drain-pipes in a dwelling-house with the sewer, as recommended, was painfully exemplified; and the conclusion was forced upon the observer that if sewer air was not the direct vehicle for the propagation of disease, the breathing of impure air was a predisposing cause of it, especially when it took place during sleep. We must confess to a belief in the value of the trap.

**Next Year's Examinations in Gas Manufacture.**—As inquiries have lately reached us in regard to the above, we may intimate to those of our readers who are interested in the matter that the Programme of Technological Examinations of the City and Guilds of London Institute for the session 1900-1901, which contains full information in regard to all the examinations conducted by the Institute, has just been issued, and may be obtained from Messrs. Whittaker and Co., Paternoster Square, for 1s. 4d., post free. An indication of the questions to be set next year will be found in another part of the "JOURNAL."

**Aniline Dyes in Germany.**—The "Board of Trade Journal" contains some interesting facts taken from a recent Foreign Office report respecting aniline dyes made in Germany. Since the discovery was made in 1868 that the important dye-stuff madder—alizarine—could be produced in an easy and cheaper manner from the carburetted hydrogen of coal tar, the use of dye-stuffs obtained by distilling this product has grown to such a degree that in Germany about five times as many artificial colours are made as in all other countries combined. According to the last census, on June 14, 1895, there existed 25 factories for the manufacture of aniline and aniline colours, and 48 factories (with seven branches) for other coal-tar products.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 540.)

BUSINESS in the Stock Exchange last week was extremely limited, even more so, perhaps, than was inevitable at this time of year.

And the general tendency was not favourable, for there was nothing very cheering in the aspect of affairs either at home or abroad. All is uncertainty in China, things are much the same as usual in South Africa, while labour troubles at home are being industriously fomented—the only point where industry seems to come in. It is no wonder then that prices show a falling off as the result of the week's operations; but the fall is nowhere severe. The Money Market opened easy, and remained so for some days, when rates began to stiffen, and the market closed harder. Business in the Gas Market was, on the whole, very quiet indeed. On one day, it quickened-up fairly, and gave some promise of better activity; but it soon relapsed into its previous state of quiescence. Transactions were very colourless, and devoid of character; and movements in price were both few in number and slight in degree. They were, however, with only one exception, in the upward direction. In Gaslight issues, the ordinary was dealt in steadily at 97-98; prices never ranging outside the limits of those figures. The secured issues were very moderately dealt in at steady prices; the debenture even making a fractional advance. South Metropolitan came in for little notice. But the tendency was good; and the quotation made a similar fractional advance. Commercial were quite unaltered; the old stock alone changing hands, and at middle figures. Hardly any business was marked in the Suburban and Provincial group; and the only change was a slight advance in Alliance new. Among the Continental companies, business was exceptionally light; but there was a firm tendency, especially in Imperial, which advanced a point. Nothing noteworthy occurred in connection with the remoter undertakings beyond a fall in River Plate debentures. Business in the Water Companies was on the usual scale; but several quotations were moderately advanced. Kent, however, went the other way.

The daily operations were: Extremely limited business in Gas marked the opening day, and nothing moved. In Water, Southwark rose 1; but Lambeth fell  $2\frac{1}{2}$ . Tuesday was, if possible, quieter still; but Imperial gained 1, and Gaslight debenture and South Metropolitan  $\frac{1}{2}$  each. Kent Water fell 5. Wednesday was quite active, with business in Gaslight issues. Alliance new rose  $\frac{1}{2}$ ; but River Plate debenture fell 1. Thursday, Friday, and Saturday were quiet and featureless; and Gas quotations were not changed. In Water, Lambeth rose 2 on Thursday. On Friday, Southwark and West Middlesex advanced 2 each; and Chelsea, Grand Junction, and Lambeth 1 each.

### AMERICAN ENGINEERING COMPETITION.

IN the "JOURNAL" for the 29th of May last, some extracts were given from a series of eight articles on the above subject which had then appeared in "The Times," contributed by a very able Special Correspondent of that paper who has been making a tour of inquiry and inspection in the States. Since then a further like number of contributions from the same correspondent have appeared at irregular intervals; and in view of the importance of the subject, particularly to all users of iron, steel, machinery, and coal, and generally to the commercial prosperity of the nation, we propose to put before our readers a few notes of the points that we have marked as specially interesting while reading the articles.

If it should be asked: What direct concern has the gas industry with the question of American Engineering Competition, that it should be so prominently brought to notice? we would say this: Firstly, the consumer or user of any commodity—in this instance of iron and steel work, tools, engines, and machinery—must always ultimately benefit from competition between producers of that commodity, both in respect to the price he has to pay and to the quality that he gets for his money. The stimulus to enterprise, ingenuity, and inventiveness afforded by competition is everywhere obvious; while the present prices of iron and steel goods will soon tumble down when America takes the field in real earnest. We shall not hear much about fifty-shilling coal then. This is the direct interest of the gas world in the question of competition between English and American handiwork. In the second place, it is of no small benefit to the manager of any business or works in the old country to ponder over the methods which the younger nation has found it wise and necessary to adopt in order, first, to supply home demands, and then to compete on favourable terms with the holders of the world's markets. And, finally, it is well that such managers should understand that the dominion of the Trade Union is combatable, and need not be accepted as a matter of painful necessity. This is, unfortunately, not always the view taken by the management of gas undertakings.

In the first communication we have now to notice, the correspondent deals with a side of the question of American competition with British engineers which has attracted no little attention in recent times—namely, that of the importation of American locomotives into this country. There are two very



conspicuous differences between the characteristics of locomotive construction as practised on the two sides of the Atlantic. One is in the amount of general finish given to the locomotive. The English-made engines are more costly in that respect. They "are fit," as an American engineer once said, "to hang on a lady's watch chain, if they were only a little smaller." . . . They appear substantial, compact, and convey the impression of being 'well groomed.' American engines are impressive from their height and size generally; but they seem, to English eyes, ungainly and ill-knit. Those, however, who know their power and immense capacity for hauling loads, cannot but respect them. If there is no sacrifice made to appearance, in the shape of bright work and polished brass, the working parts are excellent fits, and"—here we come to the second difference between English and American policies of construction—"are interchangeable with similar parts on other engines, being made with special tools of precision." It is the constant complaint of English locomotive builders that every different buyer will have a different type of engine. There must always be a special specification, according to fad, so that no standardization of parts is possible—an increase of cost being the inevitable result.

A further consequence is, also, an inability to successfully compete with American locomotives in neutral markets. "New countries—our Colonies, for instance—have railways more approximating to the earlier roads of America than to the solid constructions of our own land. It has been more than whispered that, in the past, British makers have shown what might be described as obstinacy rather than pertinacity. They have been apt to . . . tell their customers exactly what they proposed to supply, rather than to consult their wishes. 'If you want anything else, you had better go elsewhere.' Foreign customers have taken this advice." The result has been that, while the value of our foreign trade in locomotives has not advanced during ten years, that of America has increased three-fold, in spite of a home demand that has lately been surprising in its magnitude. American works are, therefore, naturally on a much vaster scale than our own; the Baldwin Locomotive Works of Philadelphia turning out more than three locomotives a day. So that when the abnormal home demand slackens off, it is obvious that we shall have all our work cut out to hold the neutral markets we at present command.

A feature of American methods noticed by the writer of the articles before us in the case of more than one large concern—the Baldwin works just referred to among them—is the practice of continuous working, night and day. By this means, of course, the ratio of fixed expenses—rent, interest on capital, and so forth—to total cost of the article produced is practically halved. It is true that under exceptional circumstances—for instance, in times of great pressure of naval construction work for the Government—such a course has been adopted in this country; but why, it is asked, is the proceeding the exception, and not the rule? Well, it is said that if two separate shifts are engaged on one and the same job, it is not possible to apportion blame for badly executed or scamped work; or again that there would be friction between the foremen supervising the work, the one differing from the other perhaps in methods of executing a job. This may be so; but then how explain the success in the States of a plan which would so fail in this country? To find the answer, we must put our finger on the point that seems to us most instructive in the whole of these articles—the difference between the spirit animating the workshops of the two countries. We shall have some considerable quotations to make later on from the letters in which the correspondent deals specifically with the labour question as bearing upon his subject; but we may note here one or two points illustrative of the different conditions with which the English and American engineering employers have to contend, and of the different treatment which the latter is able to give his men in consequence of the dissimilarity of those conditions.

With the hampering restrictions from which the struggle of 1898 has by no means wholly freed the engineering masters in this country, our readers are sufficiently familiar—some of them only too painfully so—for them to appreciate the difference in the atmosphere of the workshops in the two countries from the mere indication of that existing in the shops in the States. The American mechanic prefers to be paid by piece-work; and he is described as being animated by a strong desire to turn out work quickly and cheaply. In the Baldwin Locomotive Works, the men "carry on in their own time"—that is, they keep their machines going very often in their dinner hour—and need so little keeping to their work, that one foreman is deemed sufficient to supervise 1800 men. "The Times" correspondent spoke to some of the men about the practice of working their machines while eating their dinners. "The answer of one was typical. He said it fidgetted him so that he had 'dyspepsia trouble' if his machine was not running while he was looking at it. Allowance here must be made for the American characteristic of conveying an idea by means of an exaggeration, a kind of native humour much practised. Another American once said to me he wondered how the British workman could keep awake with machine tools running at the rate usual in England."

Preference for the piece-work system brings about a further result. There is no opposition to labour-saving machinery; in fact, most of the ideas for economizing labour come from the men themselves. The manager of the works in question told

the writer that "it is a common thing for a man working on a machine tool to suggest improvements which will hasten work, offering to do the job at a lower piece-work rate if the alteration is made. The man, by increased output, will make more money during the week; but the firm will pay less (per unit) for the work produced. In fact, they will halve the profit and both be better off." To reward and to promote such a spirit, the firm find it pays them to adopt the policy of letting the man, in such a case, earn as high wages as he can, in consequence of his ingenuity, for so long as he continues on the same job. "We consider he has a vested right in the improvement." "The Times" correspondent rightly lays stress on the wisdom of such a policy. "If a man is allowed to benefit by a suggestion only for a few weeks, or, may be, months, he feels aggrieved when he is put back to a piece-rate which brings him the original sum per week, or perhaps a trifle more; and one may be fairly certain he will not go far out of his way to initiate another advance. Some British employers—or, perhaps, rather their foremen—are much to blame in this respect." To apply the lesson most nearly: Does the engineer of every gas-works in this country take care that the man with originality and initiative is always adequately rewarded for suggestions of improvements in working which are of real value and profit to the concern? We take leave to doubt it. We have known engineers, and others, to positively resent the presumption of a subordinate in perceiving what they had failed to discover. In such cases, the undertaking is doomed to be a laggard in the race for supreme efficiency and success.

The Baldwin works are especially happy in that "there are no Trade Union restrictions there as to the number of machines a man may look after. He takes charge of just as many as he can get entrusted to him." That is, indeed, a striking difference between the conditions there and here—a difference which must tell powerfully in favour of our competitors when we have to meet them in neutral markets. It will, however, we fear, be a long day before the British Trade Unionist will be brought to see that the near-sighted policy which throws such hampering obstacles in the path to success of the firm employing him, is equally detrimental to his own prospects. If America is able, through the greater reasonableness of her workmen, to cripple our engineering trades in the course of the next few years (and she means trying), what a fool the Trade Unionist will feel when he sits hungry outside the closed shop—closed because his American brother knew better than he which side the bread was buttered!

We have said that America means trying to cripple our engineering trades. The means by which some at least of her manufacturers propose to effect this purpose, so soon as their production (which is rapidly growing) outstrips the home demand, is to sell cheaply, even below cost, abroad, trusting to their protective tariff to enable them to keep up prices at home, and make in the home market profits sufficient to cover the whole business. Whether the American farmer will altogether relish paying a high price for his plough, in order that his English brother shall be supplied with the article at less than cost, is not certain; but the effect which such a policy would have on the engineering trades of this country is obvious.

It may, however, be doubted whether American manufacturers really contemplate, or, rather, will need to resort to, such a policy on a wholesale scale; for credible reasons can be adduced for thinking that they will be able to compete with English-made goods in neutral markets on terms which would leave them a margin of profit. Some of these reasons have already been indicated; a better return of work for wages paid being not the least among them. Others include a bolder venturing of capital in substituting new machinery for that which, though not by any means worn out, is not the most efficient. For instance, in 1889 the Boston Street Railway Company purchased nine engines of 1000-horse power each for actuating electric generators; the dynamos being driven by belt-gearing. When this machinery had only been in use five years, it was discarded, at a cost of £100,000, in favour of direct-driving engines. This was certainly a bold proceeding, yet the saving effected has not only justified the outlay, but has shown a very substantial additional profit. In the matter of labour-saving machinery, let us say, does the average gas engineer display equal courage? "It is a great source of strength to the American manufacturer that he will adopt other people's ideas readily if he finds them better than his own." Does the gas industry as a whole possess this source of strength?

Another of the reasons which incline one to look upon American manufacturers of machinery as formidable rivals to ourselves in a fair field without favour to either competitor, is that the American engineer is not above personally attending to the commercial side of the business—the selling as well as the making of the machine; whereas "in England it is too often the case that the very smallest amount of technical knowledge—a bare knowledge of the names of things—is deemed sufficient equipment for the man who has to sell machinery." In contrast, we are told that "the head of a large English engineering firm, himself a mechanical engineer of high attainments, makes a point of taking the representatives of American machine-tool makers into his shops. He says, 'I never do so without getting some ideas that are valuable, or hints which are suggestive.' One can easily understand that 'commercial travellers' of this class get orders and make large incomes."



We have marked in these very able and instructive articles numerous other points concerning industrial and commercial methods of considerable interest both to employers and to consumers, but must refrain from further quotation now, or we shall run to undue length. In another article we propose to consider the two communications in which "The Times" correspondent deals somewhat fully with the influence of the labour question upon the possibility of American competition inflicting serious damage upon the engineering industries of this country. Much of the matter he brings forward is unhappily more or less familiar to those acquainted with the history and methods of Trade Unionism in this country; but in view of the need that exists for arousing public opinion to the dangers to the national welfare that lie in those methods, and for bringing home to the leaders of the men the ill-service that a persistence in the policy still adhered to by many of them will certainly in the future do to the very persons it is intended to benefit, too wide publicity cannot be given to the able re-statement of the follies perpetrated by the Unions, and the insistence upon the influence thereof on our industrial future, which are to be found in the articles we have before us.

(To be continued.)

### PERSONAL.

Mr. T. H. HAZELL has been appointed Secretary of the Newport (Mon.) Gas Company, in succession to the late Mr. Edward Marfleet.

Mr. ALFRED ALLHUSEN, of Gateshead, and Mr. CHARLES W. MITCHELL, of Newcastle, have been elected to the directorate of the Newcastle and Gateshead Gas Company, in the places of Dr. Adamson and the late Mr. John Lucas.

We are pleased to find that Mr. A. E. BROADBERRY, the Engineer of the Tottenham and Edmonton Gas Company, has so far recovered from the accident which befel him in May last, that he is able to attend to his ordinary duties; but he is still distressed a little by pain in the back. This discomfort we are sure his friends all hope will soon pass away.

Mr. THOMAS H. DUXBURY, Deputy Gas Engineer to the Corporation of Bradford, has been appointed Engineer to the South Shields Gas Company—a position for which applications were invited in the "JOURNAL" a few weeks ago. Mr. Duxbury has been at Bradford about two years and a half; having previously been Assistant-Manager at the Bradford Road Gas-Works of the Manchester Corporation. He was trained under his father, Mr. Thos. Duxbury, of Manchester.

Mr. JOHN BIRCH PADDON has resigned, for reasons of health, the chairmanship of the Colney Hatch Gas Company, and is succeeded by Mr. JOHN MILES. Mr. LITTLER, Q.C., has been elected Deputy-Chairman; and Mr. A. M. PADDON, M.Inst.C.E., will fill the seat upon the Board vacated by his father. Mr. Paddon has been elected Chairman of the Brighton and Hove General Gas Company, in succession to Mr. F. E. WEBB, who has been compelled to retire through failure of sight, and takes the position of Deputy-Chairman.

Mr. JOHN AYRIS, M.Inst.C.E., who for 30 years was the Manager of the Lowestoft Water and Gas Company, and of the Yarmouth Water Company, and who recently retired from that position, has been presented by the combined staffs at Lowestoft and Yarmouth with a memento of their esteem. The gift consisted of a Bacchanalian vase (an ornate specimen of the silver-smith's art), an exact replica in miniature of the famous specimen of Greek ceramic art which once stood in Hadrian's Villa, at Tivoli, but which is now at Warwick Castle.

The meeting of the Tottenham and Edmonton Gas Company was held at an earlier hour than usual last Saturday, to enable the respected Chairman, Mr. CORBET WOODALL, to be present, and address the proprietors as usual. The reason the customary hour was inconvenient was that in the evening, Mr. Woodall was leaving home on a visit to the States, from whence he proposes to journey to the Straits Settlements to fulfil a professional engagement. At the close of the meeting on Saturday, several of Mr. Woodall's friends took the opportunity of heartily shaking hands, and wishing him *bon voyage*, and a safe return. To these sentiments we add the hope that he will come back greatly invigorated by a well-earned relief from constant work.

### OBITUARY.

The death is announced of Mr. J. HOWSE, Manager of the Great Marlow Gas-Works.

We regret to hear of the death, on the 21st ult., of Heer A. BREUNISSEN TROOST, who for upwards of forty years was the Manager of the Municipal Gas-Works at Sneek, Holland. He was one of the founders of the Association of Dutch Gas Managers, and several times occupied the presidential chair. In October last his fellow-members of the Association held a festival at Sneek in honour of the completion of the fortieth year of his management of the town's gas-works, which were built to his plans. Extensions at many other Dutch gas-works were also planned by him, and he was the architect of a large number of public and private buildings in Sneek and the vicinity.

### NOTES.

#### Rendering Wood Uninflammable.

A good deal more woodwork might be conveniently employed, if only for temporary purposes, in gas-works and similar industrial establishments, but for the fear of fire. There are several processes, in more or less successful use, for rendering wood not so inflammable. But what is wanted about a works is some ready and inexpensive process which will answer the immediate purpose in a reasonable degree. Mr. H. C. Standage, writing in "Engineering," recommends impregnating the wood as completely as possible with a solution of glue or gelatine. To impregnate wood with anything is a process that requires plant similar to that used in creosoting; and it is not clear how far Mr. Standage would carry the gelatine impregnation he speaks of. He is confident, however, from experience, that glue or gelatine will neither catch nor communicate flame. To render the surface of the wood repellant of water also, it would need to be bichromated—that is, a small proportion of bichromate of potash mixed with the glue solution. A similar "paint" which also gave good results is a solution of soap. When this is impregnated into any inflammable material, and the material afterwards steeped in a metallic salt, such as sulphate of iron, copper, or lead, a metallic "setote" is formed in the fibre of the material which will resist ignition. Apparently it is only because there is no patenting a process of this kind that nobody takes the trouble to apply it in ordinary works or building practice.

#### Curious Dam Construction.

A novel method of constructing a high dam for an impounding reservoir has been adopted on the South Fork of the South Platte River, about 48 miles south of Denver (Col.). Owing, it is to be presumed, to local considerations, the dam is being built of loose granite blasted from the neighbouring hills, faced with steel plating resting on concrete. At the bottom of the ravine across which it is thrown, the dam is only 25 feet long; but at the full height of 210 feet it is 500 feet long. The thickness at the bottom is 600 feet. The face of the dam is to consist of a riveted sheet of  $\frac{3}{8}$ -inch steel plates placed on a slope of 2 to 1. This plating rests on vertical beams of 6-inch rolled iron, anchored into the embankment. At the ends of the dam the plating is finished off with 5-inch angle-irons riveted to it, and also bolted directly to the living rock on each side. The plating is thoroughly asphalted. Immediately behind it is a layer of cement mortar 12 inches thick. At the ends of the dam this layer is returned 3 feet, and rammed against the rock. In it  $\frac{3}{8}$ -inch twisted steel rods are embedded 2 inches apart. Behind the layer of mortar come 15 to 20 feet of selected stones, carefully laid. The remainder of the dam is of tipped rubble from the hills. The waste weir is nowhere near the dam. In two other dams in the Pacific States this blend of steel and dry-stone construction has been adopted. In one of them the steel plating is embedded in the middle of a concrete wall, and in the other it is locked and faced with an asphalted concrete made by adding 8 lbs. of asphalt to the cubic yard of sand and gravel. The South Platte dam is an offshoot of the Denver Union Water Company.

#### The Cost of Dust Collection by Motor Vans.

An instructive example of the partiality of the statements upon which municipalization occasionally proceeds is afforded by the history of dust collection by motor vans in Chiswick. The particulars are taken from the "Municipal Journal." It appears that the last tender for collecting the dust by contract was £1900; and the District Council were advised that the work could be done by motor vans for £1100. Accordingly vans were procured at the price of £350 each. There was nothing the matter with the vans themselves, and at first they were regarded as a success. Glowing accounts of their performances were circulated; municipal deputations went to look at them; and a certificate bearing the signature of the Sanitary Inspector was published, stating that each van was doing the work of three ordinary dust-carts. There were sceptics, however, in the district, one of them being the former dust contractor, who eventually obtained a seat upon the Council. He seems to have been instrumental in procuring a comprehensive report on the matter from the Surveyor. Comparisons were easy to make, because the whole of the dust collection of the parish is done by two motor vans, two horse vans, and two ordinary dust-carts. During the year ended May 3 last, the two motor vans collected 2261 tons, the two dust-carts 1950 tons, and the two horse vans 2084 tons of dust. This is a very different story from that told by the Sanitary Inspector. Moreover, the work done by the motor vans cost 6'45s. per ton, while the carts cost 4'18s. and the horse vans 4'18s. per ton of dust collected. So much for steam vans for dust collecting, and also, be it said, for municipalization estimates. It is concluded that, whatever may be the general advantages of motor vans, the economical collection of town's refuse is not one of them. The vans cost more than £100 a year each for repairs and small tradesmen's bills; and each required a driver who was not available for helping in the work of the van. Unless, therefore, these peculiar expenses can be counterbalanced by economies in other directions not yet apparent, motor van dust collection is likely to prove an expensive luxury wherever it is adopted.



## COMMUNICATED ARTICLES.

WATER GAS AS A REMEDY FOR THE PREVALENT  
SCARCITY OF COAL.

By H. DICKE, Chief Engineer to the Dellwik-Fleischer Water Gas Syndicate, of Frankfort-on-Maine.

Perhaps the most significant economical feature of the last winter was the scarcity of coal. Experts assured us that in Germany we had a hoard of coal buried in the earth, which even with a considerable increase in consumption would suffice us for five or six centuries to come; while the English, who still raise about twice as much coal as we do in Germany, would certainly reach the end of their store of coal much earlier. That, however, would still last a long time; and there was, in short, no necessity for us Germans to rack our brains about the Englishmen's outlook. But one fine day we were rudely awakened from our dreams; a coal famine had come, as a disagreeable reality, to our very doors.

The fact that for some years past coal has been exported from England to America in order to furnish the towns on the east coast of that Continent with gas coal, while at the present time coal has already commenced to arrive in Europe from America, demonstrates that the question is not one of a mere transitory difficulty due to a concatenation of unfortunate circumstances, but rather that the events of last winter are to be regarded as symptoms of a perennial calamity. This American coal, moreover, is not to be looked at askance as a base competitor (as are so many other consignments from that side); but it is to be gladly welcomed as a local alleviation of the scarcity, even though it be scarcely sensible in its effect on the great bulk of the coal used. In the long run, too, this assistance would certainly be refused us, as the Americans have not so much surplus coal under the prevailing conditions of trade that they can afford to present much to Europe. And in any case it can only pay to bring coal from America if the prices are such as would have been considered quite abnormal only a year ago. What would have happened if we had had a winter of prolonged severity, instead of one which was on the whole uncommonly mild, cannot well be imagined.

The agencies by which coal is supplied are already so strained that any considerable increase in the output is impossible in a short time. There is even at the present time a great dearth of labour in the industry. The means of transport, railways, waggons, and all else appertaining to the winning and distribution of coal, will not suffice for more than the present scale of operations; and they can for the most part be amplified only at such a cost that we must count upon a permanently enhanced cost of coal.

The question therefore arises imperatively whether economy is not possible at the other end. Cannot the coal be replaced by other materials or natural powers, or cannot its consumption be diminished by means of better appliances for its combustion? Both these objects we may hope to attain in the future. But the first only by slow degrees, and—at least, so far as the present generation is concerned in Germany—probably not at all. Peat is the only material available for use to-day in place of coal; and although I do not wish to speak at all despondently of the prospect of means and ways being some time found for the better utilization of our peat deposits, notwithstanding the numerous bad experiences afforded by it as a fuel, nevertheless it will most certainly only become of importance locally, and will not appreciably affect the price of pit coal. Of other sources of power—for coal must be regarded in this light—only water power is now directly applicable; and we in Germany, as is well known, are more sparingly endowed than many other countries with water power. England is our companion in misfortune in this respect. I need not therefore speak of coal as being able to be replaced in many of its functions by water power. Consequently, it only remains to turn to the second means, which is to economize the coal. In this direction, an advance has lately been achieved which promises help in our need—a new and rational water-gas process.

Water gas, which had been previously used in America for lighting purposes, was introduced also in Germany about 20 years ago, where it was brought into use in the first place by the European Water Gas Company, at Essen. Water gas had, indeed, been invented in Europe; but previously little attention had been paid to it there. It had been likewise pointed out at the time that this gas, which is produced by the action of steam on incandescent coke, anthracite, or similar material, and consists chiefly of hydrogen and carbonic oxide, is exceptionally useful for numerous other purposes besides lighting. Among these may be named industrial firing, especially in operations which must be conducted at very high temperatures, and are even now almost always performed with a disproportionately high consumption of coal. Cases in point are the manufacture of steel and glass. Water gas was at that time straightway hailed by some experts as "the fuel of the future." But soon there ensued a period when people were undeceived; and a reaction set in. It was not that water gas had shown itself unsuitable for the purposes for which it had been stated to be applicable, but it was merely that it was too costly.

In order to understand this fact, we must bear in mind that when water gas is formed by the action of steam on incandescent carbon, a great quantity of heat is consumed. Consequently, the carbon after a few minutes ceases to have a sufficiently high temperature for the process, which therefore stops. It must be re-started by interrupting the flow of steam, and raising the carbon again to bright incandescence by a blast of air. This blowing-up the heats must therefore always alternate with the gas making. Unfortunately, the blowing-up consumes a large quantity of carbon; and formerly it was not possible to obtain more than 40 per cent. of the heating value of the fuel in the form of water gas. From this, it will be self-evident why water gas was too dear for most purposes, and was only applicable in special cases.

This position of affairs has been altered by a quite recent fundamental discovery, which has been designated the "Dellwik-Fleischer" process, after the names of its two inventors. This water-gas process has attracted great attention in technical circles; and it appears destined at one stroke to furnish water gas with an enormously enlarged range of operation. In place of 40 per cent., which was the maximum with the earlier process, it transfers over 75 per cent. of the heating value of the carbon into the water gas. The general public so far have learnt scarcely anything of this invention, notwithstanding that the Dellwik-Fleischer process has already been introduced in twelve gas-works, and in numerous iron and steel works, engineering shops, and other large factories. The installations already at work at the present time produce over 2825 million cubic feet of water gas per annum. The enormous economy of fuel that will ensue from the extended application, which must inevitably follow, of this process in gas-works and industries, will be evident from the following examples—one taken from the province of artificial lighting, the other from that of industrial firing.

A town of 100,000 inhabitants, which at the present time uses coal gas, requires for the manufacture of the gas about 21,000 metric tons [=about 20,670 English tons] of coal per annum. With simple water gas, however, it would use only 4025 metric tons, which implies an annual saving of about 17,000 tons. The whole of the gas-works of Germany at the present time consume about  $3\frac{1}{2}$  million metric tons of coal in the manufacture of coal gas. With simple water gas in its stead, they would consume only 680,000 tons. Consequently there would result an annual saving of 2,820,000 tons of coal. These figures apply to simple or unmixed water gas. With a water-gas installation as an auxiliary plant for enlarging the output of existing gas-works, a town of 100,000 inhabitants would save annually about 6300 tons of coal; and the whole of the gas-works of Germany, about 1,050,000 tons.

According to statistics published on April 25, 1897, in "Stahl und Eisen"—the organ of the Association of German Iron-Works Engineers—there were produced in Martin furnaces in 1896, 1,543,100 metric tons of steel. Owing to the rapid increase in production which has taken place during the last four years, the quantity produced annually must have risen to about 200 million tons. If this quantity of steel were smelted by means of water gas, about 400,000 tons of coal would be saved.

The prevailing scarcity of workmen, it may be pointed out, would be considerably moderated by the introduction of water gas. For lighting by means of simple water gas, only one-fifth of the number of workmen employed on coal-gas works would be required. With mixed gas, the number would be diminished (according to the proportion of water gas added to the coal gas) to about one-third. In welding by means of water gas, only one-half the present number of workmen would be required. Martin steel furnaces make 20 per cent. more in the same time when using water gas, brass foundries accomplish 100 per cent. more, and iron smelting and smith's furnaces 33 per cent. more than at the present time. There is, consequently, a corresponding saving in workmen for a given output.

These figures speak for themselves. The increase in the utilization of the heating value of the coal which the Dellwik-Fleischer water-gas process has brought about, implies such a husbanding of national resources that the process must be looked upon as an agency for preserving us from the effects of the present coal famine.

In connection with the foregoing article, we have received from Herr Dicke a list of works which have already adopted the Dellwik-Fleischer water-gas process. Among these are the following gas-works, which use the water gas, after carburetting with benzol, as an auxiliary to their coal-gas supply, with which it is mixed. The municipal gas-works at Königsberg, in Prussia, the works of the German Continental Gas Company, both at Pforzheim, in Baden, and Barmen, in the Rhine Provinces, and the works of the Lyons Gas Company. At all of these works there are two generators of a maximum total make of 540,000 cubic feet per diem. The works of the German Continental Gas Company at Erfurt, Remscheid, and Plauen, at each of which there is one generator of a maximum make of 270,000 cubic feet per diem; the municipal gas-works at Nuremberg, which have one generator of a maximum daily make of 550,000 cubic feet; and the German Continental Gas Company's works at Iserlohn, in Westphalia, where there is one generator making a maximum of 110,000 cubic feet. At the following places simple or unmixed water gas is supplied: Viborg, in Finland, by the



municipality, from two generators of a total manufacturing capacity of 356,000 cubic feet per diem; the small towns of Osterfeld and Warstein, in Westphalia, in each of which a Berlin Company have installed two generators, capable of a maximum total make of 68,000 cubic feet per diem; and Brummen, in Holland, where there is one generator making a maximum of 34,000 cubic feet a day.

There are numerous installations of the Dellwik-Fleischer plant at other industrial works. Of these, only a few can be mentioned here. At Leeds, both the Leeds Forge Company, Limited, and Deighton's Patent Flue and Tube Company, Limited, have generators for a maximum daily make of 460,000 cubic feet; Messrs. R. & J. Dempster, Limited, have a small plant at Manchester; and the Cassel Gold Extracting Company have a small plant at Glasgow. The largest installations yet supplied are at a boiler works at Sielce, in Russian Poland, and at the glass works of Messrs. Pilkington Brothers, Limited, of St. Helens, Lancashire. At both of these works there are two generators, capable of producing upwards of 920,000 cubic feet of water gas per diem. In several instances where the gas has been introduced primarily for heating purposes, it is also used for lighting the factories.

### SLOT CONSUMPTION WHERE METERS AND FITTINGS, &c., ARE SUPPLIED.

AN OPINION ON PAYING AVERAGES, AND ONE WAY OF OBTAINING THEM.

By GEORGE HELPS, of Nuneaton.

The profit of a slot-meter business, it is assumed, depends on the following considerations:—

- 1.—The capital chargeable to the slot consumption business for works, plant, and mains, and the interest to be provided by each slot consumer on such capital.
- 2.—The extra cost of administering each slot account, over and above that necessary with the ordinary consumer.
- 3.—The depreciation reckoned for the wear and tear of the various gas fittings, cookers, or fires.
- 4.—The extra amount charged per 1000 cubic feet to cover the foregoing extras.
- 5.—The cost price of gas delivered at the consumer's meter.
- 6.—The selling price of gas to ordinary consumers.

**Capital Chargeable to Slot Consumption Business, &c.**—The amount of the capital of a works chargeable to slot consumption should be in direct proportion to the quantity consumed. Thus, if slot consumers use one-tenth of the gas sold, the interest on one-tenth of the capital should be charged to them. The interest each consumer should be expected to provide would obviously be the total divided by the number of consumers.

**Administration.**—Any one who has had much experience in the slot business, and adopted a system whereby the special charges connected with it are distinguishable from ordinary expenses, and gone carefully into figures, will admit that the extra office expenses are considerable, and will amount to at least 2s. 6d. or 3s. 6d. per consumer per annum, and may even reach considerably more than this.

**Depreciation on Fittings, &c.**—The amount of depreciation is generally fixed at one-tenth of the first cost of service, meter, and fittings per annum, or 2s. for every pound expended.

**Extra Charge for Slot Consumption.**—The extra sum charged varies from 5d. to 10d. per 1000 cubic feet; the average figure being about 8d.

**Cost Price of Gas.**—The cost price of gas in this connection must, of course, be considered as including all ordinary charges, less the amount received for residuals, coke, tar, liquor, or sulphate; but unhampered by any of the special charges for a slot business, as all these must be taken separately.

**Selling Price.**—The selling price of gas to ordinary consumers (by ordinary consumers is meant all consumers other than slot) it is hoped is now uniform, or nearly so; that differential prices—if not already non-existent—are fast dying out. It is assumed that the only reduction now made to consumers is a small discount based on quantity, and not on the uses to which the gas is put. It is also assumed that the selling price to ordinary consumers is a fair one. It then becomes evident that slot consumers should be charged the same price as ordinary consumers, plus the extra expenses they cause.

For supposition, let us take a gas-works having a capital of £45,000, on which 7 per cent. dividend is paid—the slot consumption being one-tenth of the whole, and the number of slot consumers 1000; the extra administration at 2s. 6d. per slot consumer; the cost of fitting up a house at £4; the extra charge to slot consumers at 8d. per 1000 cubic feet; the cost price of gas at 2s. 6d. per 1000 cubic feet; and the selling price to ordinary consumers at 3s. 6d. On the lines now laid down, each

slot consumer, to pay a minimum profit of (say) 6s. 3d. per annum on the capital employed, must provide per annum—

For interest on the proportion of capital employed—

one-tenth of 7 per cent. on £15,000 = 6'3s. (say) £9 6 3

1000

For extra administration (say) 0 2 6

For depreciation on cost of service, meter, fittings, &c.,

2s. per £1 on £4 0 8 0

For the quantity of gas which must be consumed to

realize a profit of 16s. 9d. (the profit per 1000 cubic

feet being 1s. + 8d. = 1s. 8d.) =  $\frac{16s. 9d.}{1s. 8d.} = \frac{201}{20} = 10,050$

cubic feet, at 2s. 6d., the cost price 1 5 1½

10,050 cubic feet, at 4s. 2d. £2 1 10½

The consumption of 10,050 cubic feet should, therefore, be looked upon as the very lowest average allowable; and, of course, at this figure the slot consumer has the advantage over the ordinary consumer of 4'54d. per 1000 cubic feet. Thus—

Amount received for 10,050 cubic feet from slot con-

sumer £2 1 10½

Less extra charges 0 10 6

Leaving for the 10,050 cubic feet £1 11 4½

Or 37'46d. per 1000 cubic feet.

The difference per 1000 cubic feet to be provided by the ordinary consumer being 42d. - 37'46d. = 4'54d. per 1000 cubic feet.

Now, if slot consumers are to be put on the same basis as ordinary consumers—and surely they should be—it is necessary for the average consumption to be such as will, with the price of gas at 4s. 2d. per 1000 cubic feet, produce 3s. 6d. - 2s. 6d. = 1s. per 1000 cubic feet profit, in addition to the other charges. Thus—

Wear and tear and extra administration = 10s. 6d.

Therefore, the quantity of gas to be sold at 4s. 2d. to realize 3s. 6d. per 1000 + 10s. 6d. the profit per 1000 being 4s. 2d. -

3s. 6d. = 8d. is  $\frac{126}{8} = 15'759$  cubic feet, or, if gas is to be sold

to slot consumers on an equitable basis with ordinary consumers, the extra amount charged to the slot consumers must cover the extras for depreciation and administration; and in the case cited, the necessary consumption would be 15,750 cubic feet. The profit obtained from a sale of 15,750 cubic feet will amount to 15,750 at 1s. = 15s. 9d. per consumer. It is thus seen that, with a difference of 8d. per 1000 cubic feet between slot and ordinary price, for every £1 spent in fitting up a slot house, 2s. has to be produced over the price to ordinary consumers, which calls for a consumption of  $\frac{24}{8} = 3000$  cubic feet. In addition, 2s. 6d. has

to be allowed for on account of administration, calling for a further consumption of  $\frac{2s. 6d.}{8} = \frac{30}{8} = 3750$  cubic feet. If

it is desired to reduce this average, it should be done by increasing the extra amount charged to slot consumers above that of the ordinary. Thus, if the difference is 1s. 1d. per 1000 cubic feet, then the necessary average will have to be reduced to 10s. 6d. ÷ 1s. 1d. =  $\frac{126}{13} =$  (say) 9700 cubic feet.

A good many people may urge that the slot consumers should have a preference over the ordinary consumers for the following, among other reasons: (1) The slot consumer is a cash customer. (2) He is to be charged with the service as well as all other fittings, meters, and things, which he pays off in ten years. (3) That, being a new business, it should have as much encouragement as possible, without unfairly dealing with ordinary consumers. (4) That a slot consumption is a valuable adjunct to a gas company, and should be welcomed by the ordinary consumers, as it should bring about a greatly increased consumption, which, in its turn, is bound to be a harbinger of a reduction in price all round. (5) That the slot consumer tends to utilize the mains and plant of a gas-works at times when otherwise they would be partially idle. (6) That it develops a day consumption all the year round, particularly in the summer months when plenty of slot-cookers are in use, and therefore little or no additional capital for mains or gasholders is in use on this account.

The last reason requires qualifying, as it holds good only up to a certain point; for it can be readily imagined, seeing the enormous strides day consumption is making, that, in time, it will perhaps mean that the sectional area of the town mains will be governed by the day requirements, and not the night. Again, if the slot consumer is chiefly a day consumer, he invariably increases the night consumption as well.

Even if all these reasons could be admitted—and most surely they cannot be—the very most that can be allowed by the champion of the slot consumer is that on account of the town mains and holders not having to be increased for slot consumers. This is quite an erroneous notion; but it can be readily seen how it would affect the question of price.

The distributing plant of a works may be taken at about 30 per cent. of the capital; and the holders 10 per cent. So that slot consumers might be charged 40 per cent. less for capital than ordinary consumers. The capital in the present case has been stated as £45,000; so that each slot consumer would have to provide only  $\frac{60}{100}$  of one-tenth of 7 per cent. of £45,000 = 3s. 9'3d. as interest on the capital supposed to be employed on his



behalf. Or whereas 1s. per 1000 cubic feet sold to ordinary consumers is sufficient profit to pay the necessary dividends, 60 per cent. of 1s. = 7<sup>1</sup>/<sub>2</sub>d. would be all that was required for the slot consumers to pay. On this basis, the necessary amount of profit per 1000 cubic feet to be charged to slot consumers could be reckoned as 7<sup>1</sup>/<sub>2</sub>d. or 4<sup>9</sup>/<sub>16</sub>d. per 1000 cubic feet less than ordinary consumers—say 5d. per 1000 feet less. The price, then, to be charged would be 3s. 6d. — 5d. = 3s. 1d.; and as the slot price has been put at 4s. 2d., this would leave 1s. 1d. per 1000 cubic feet sold to slot consumers to pay for depreciation and extra charges, and reduce the necessary average, as previously shown, to 9700 cubic feet, where an expenditure of £4 per house has taken place, and where 2s. 6d. only is allowed for extra administration. It will be well, therefore, if the heads of gas undertakings, who are satisfied with low averages, will now look this matter squarely in the face. The profit to be derived per slot consumer on this basis is 9700 cubic feet at 7d. per 1000 feet = (say) 5s. 7<sup>9</sup>/<sub>16</sub>d. per consumer. So that an undertaking supplying 2500 consumers would make the magnificent (?) profit of 2500 at 5s. 7<sup>9</sup>/<sub>16</sub>d. = £707 5s. 10d.; and this after giving the slot consumer an unwarranted advantage in price.

Having dilated on the necessity of keeping the averages of slot consumers up, it will perhaps be as well to consider how this can be done. There are many ways; but that which can be called the system of *minimum averages* has been found to work well. To begin with, it is necessary to know the minimum average consumption required, and to have a distinct understanding with the consumers before their houses are fitted up. The condition should be embodied in the ordinary slot agreement, that the company, in supplying and fixing cooking-stoves, fittings, &c., free, reserve to themselves the right to remove all, or part of, such, if the consumer does not consume sufficient gas to cover the wear and tear consequent on the use of the same. Under such conditions, the consumer will be given the option of retaining such fittings by purchase, by payment of an increased price for the gas, payment of hire, or any other method that may find favour.

Unless the slot business is very hopeless, it is clear that there will be several consumers using above the minimum average, as well as a good many below it. It therefore follows that it is not necessary to draw a hard-and-fast line, and say that all consumers below the minimum average must be cut off; because such a proceeding, were it practicable, would put the average consumption higher than that called for. It does not require very deep inquiry to see that such a suggestion would be unworkable. On the other hand, it is quite a simple matter to work on the system of minimum averages. For instance, take a case where there are 1000 slot consumers using 8 million cubic feet, giving an average of 8000 cubic feet per consumer, made up somewhat as follows:—

200 consumers under 3000 cubic feet.				
100	"	"	4000	"
100	"	"	5000	"
100	"	"	6000	"
100	"	"	7000	" and so on.

If the 200 consumers under 3000 are cut off, the average is brought up at once to 11,170 cubic feet. If it is agreed that the minimum average consumption must be 10,500 cubic feet, there can be no doubt that the 200 consumers at 3000 cubic feet are an absolute loss; and the sooner they are done away with the better. If 15,000 cubic feet are taken as the necessary average, then the 500 consumers under 6000 cubic feet would have to come off. Again, if 15,000 cubic feet is the minimum average required, consumers using 6000 can but be a loss, and are best done away with. There can be no hesitancy in coming to these conclusions. If desired, the consumers can be given the option of purchasing the fittings already referred to. Of course, a system that would necessitate the removal of half the slot consumers to begin with, is likely to be looked on with a deal of misgiving; but surely the sooner a consumer who is a source of annual loss is done away with the better?

When the business is tackled in this way, fresh consumers for the honours of slot consumption are not put on without a proper exercise of discrimination; and after a time, it is found that very few meters have to be removed each year to keep up an average which is satisfactory. The system can be worked to any desired degree. By the adoption of some such method as this, it can be seen that the business is kept well in hand. The idea of a penny-in-the-slot gas consumer is very nice in theory; but it would be interesting to know how many corporations or companies would be satisfied with the profits derived from the business, if they really knew what the profits were. The tendency is to mix the slot and ordinary consumers' business together, so that nobody *shall* know how the respective profits stand. The ordinary consumer thus has to pay for the shortcomings of the slot consumer—a most unfair dealing. The slot business has undoubtedly been a good one for the meter manufacturers; but it has yet to be shown that gas companies have profited by it to any extent, unless at the expense of the ordinary consumer.

For the supplying of small consumers, the weekly system, including hire-purchase of fittings, advocated some years ago by managers, unfortunately now forgotten, has much to recommend it. It is far less costly to the gas company; and its result, when properly worked, are far more satisfactory. There may be some corporations and gas companies who are in the happy position of

having paying averages, and where there is no necessity to deal with the matter in such an elaborate way as is here suggested—they may indeed congratulate themselves—but they have yet to be known to the writer.

## TECHNICAL RECORD.

### MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Ripon.

The One Hundred and Twenty-third Quarterly Meeting of this Institution was held last Saturday at Ripon, under the presidency of Mr. T. N. RITSON, Assoc. M. Inst. C.E., of Kendal. The party, numbering about 80, travelled from Manchester to Ripon by special saloon train, arriving there about noon, and were conveyed in brakes from the station to the Crown Hotel, where they were received by the Mayor (Mr. R. Wilkinson), who is also Chairman of the Gas Committee, the Deputy-Mayor (Alderman A. Wells), the Vice-Chairman of the Committee, who also presides over the Water Committee, the Town Clerk (Mr. M. Kirkley), and the Gas Engineer (Mr. E. E. J. Anderson). Lunch was then partaken of, and at its close a short business meeting was held, at which the minutes of the previous meeting were confirmed and a new member—Mr. John Hilton, of West Houghton—was elected.

#### VISIT TO THE GAS-WORKS.

The party were then conveyed in coaches to the gas-works, where Mr. Anderson, the Mayor, and the Deputy-Mayor undertook the duties of guides. From particulars supplied by Mr. Anderson, it appears that the first gas undertaking at Ripon was in the hands of a Company, and dated back to 1830, when, with a capital of £9000, the works were established. In 1863, the Corporation acquired the undertaking, under Act of Parliament, for £9850, and obtained borrowing powers in 1865 for £18,000, to cover the cost of purchase, and of the Act, as well as to provide for further developments. The cost of obtaining the Act was £1200. The expenditure between that date and August, 1868, was £13,250. In 1873, new offices were built, costing £217; in 1877, a second-hand holder was purchased from Dewsbury for £2050; and in 1891, a new warehouse and shops were erected, absorbing £1283—bringing up the total to £18,000. In 1870, a sinking fund was established to repay the amount in 30 years; and 27 years later a further grant of £10,000 was asked for. It is for the development of the enterprise from that time up to the present date that Mr. Anderson is responsible. Under his supervision, the old purifier-house has been converted into a meter-house, the original meter-house is now a governor-house (the old governor-house being used as a carburettor-house), and the coal-shed has been changed into an exhauster-house. A large number of mains which were in a very poor condition have been relaid. In the existing works, the retort-house is undergoing transformation. The old house is 38 feet long, 50 feet wide, and 18 feet to the eaves, with six settings of retorts built back to back, on the shallow regenerative system, by the Leeds Fire-Clay Company, and containing 36 retorts. The new house, now in course of construction, will be 100 feet long, 35 feet wide, and 22 feet to the eaves, from the charging-floor, with a subway 7 feet high and 12 feet wide running the whole length. There will be provision for eight settings containing 64 retorts. The coal-storage capacity at the works is about 700 tons, and an additional shed is shortly to be erected. The condensers consist of six 8-inch pipes in a water-tank, and eight annular steel tubes 20 feet high, and 2 ft. 6 in. diameter, with a cylinder 20 feet by 5 ft. 6 in., containing a few plates for tar extraction. In the engine and exhauster house the plant includes a combined engine and exhauster by Gwynne, having a capacity of 5000 cubic feet per hour, and one of Donkin's exhausters, with an hourly capacity of 25,000 cubic feet. The washer engine is also in this building; and the connection to the washer, although 12 inches higher than the engine, is worked by means of universal couplings and a worm gear. The boiler-house contains one Cornish boiler 17 feet long and 5 feet diameter. A Laycock-Clapham washer is used. The scrubber is 20 feet high and 5 ft. 6 in. diameter, filled with wood grids. The purifier-house, which is 50 feet square and 14 feet high, contains four purifiers 14 feet square and 5 feet deep, erected by Messrs. W. C. Holmes and Co. two years ago, and capable of being worked either three or four at a time. There are two station meters with a capacity of 25,000 cubic feet of gas per hour. In addition to four small underground liquor and tar tanks, there are two overhead tanks; the total capacity of these being about 10,000 gallons. The underground tanks work separately, to ensure that the liquor is of the proper strength when sent out. The governors are two in number—one an 8-inch by Braddock, and the other an old 10-inch pattern. Sulphate of ammonia and tar-distilling plants are in course of erection, and they will be capable of making a ton of salt and distilling 400 gallons of tar per day. The benzol will be used for enriching purposes. The carburettor is of the Maxim-Clark pattern, and will use carburene, benzol, or naphtha. There are three gasholders, with a total capacity of 200,000 cubic feet. The heaviest day's consumption of gas last year was 239,000 cubic feet. There are



about 16 miles of mains for two districts, each of which is supplied by 10-inch trunk mains. The quantity of gas unaccounted for has been reduced from 23 per cent. in 1897 to 16 per cent. in 1899; and during the same period 7 miles of new mains have been laid. On the 25th of March last there were 1357 consumers on the books; the total amount of gas sold during the past year being 31,890,540 cubic feet—this consumption being distributed as follows: Ordinary consumers, 23,217,600 cubic feet; 344 prepayment meter consumers, 1,627,320 cubic feet; 255 public lamps, 2,854,030 cubic feet; 388 stoves and engines, 4,191,590 cubic feet. The total quantity of gas made was 40,000,800 cubic feet. It may be added that an electric light scheme is at present before the Council.

#### THE WATER-WORKS.

The party had not sufficient time at their disposal to visit the water-works, but a few details of the method of supply, which is entirely by gravitation, may be of interest. The present system, which replaced an old pumping scheme, consists of two reservoirs. The lower, or Whitfields, reservoir is 315 feet above Ordnance datum, and is supplied over a distance of five miles by means of a 10-inch pipe—from the upper, or Lumley Moor, reservoir, which is situated about seven miles from the town, on the moors. With the exception of a few small springs, the supply is surface water. The latter reservoir is 597 feet above Ordnance datum, and consists of a dam 485 feet long and 66 feet high, made of puddle clay, impounding about 93 million gallons of water. There are two filter-beds 66 feet square and 9 feet deep, filled entirely with sand. The cost of the scheme was £31,800. The storage area is 27 acres; and the total drainage area 700 acres. A Siemens inferential meter is used for measuring the daily consumption, which is about 300,000 gallons. The average rainfall during the past ten years has been 38.1 inches.

After a thorough inspection of the gas-works, the members paid a visit to the grounds of Studley Royal, the seat of the Marquis of Ripon, and the ruins of Fountains Abbey—probably the finest in the country. A number of the members also visited the Cathedral.

Returning to the hotel, the party were entertained to tea by the Mayor. At its conclusion,

The PRESIDENT moved a hearty vote of thanks to his Worship for the prominent part he had taken in the day's proceedings, and also to the Deputy-Mayor and the Gas Committee. The members had, he remarked, been very glad to have an opportunity of visiting the gas-works, and were only sorry they had not had time to go to the water-works. He congratulated the city on having an Engineer like Mr. Anderson to advise them in the considerable extensions they had been making.

Mr. C. WOOD (Bradford) seconded the motion, and observed that great credit was due to the Corporation and to Mr. Anderson for the present state of the gas-works, especially when they remembered what the works were like a few years ago.

The MAYOR, in responding, said he was glad to hear the approving remarks which had been made respecting the gas undertaking of the city, especially as he was largely responsible for the initiatory steps in connection with putting the place into a modern condition. With regard to the production of gas, he might refer to the importance of having some proper means of purification; and he remarked that, with efficient apparatus, they could supply a better article, even of lower illuminating power, than with inadequate appliances. In advocating changes in the gas-works, he had kept in view the importance of securing the most modern machinery for both extracting the gas from the raw material and purifying it. Touching on the development of electricity, his Worship observed they would have their work cut out to compete with it, though he did not doubt that they would win in the long run. The questions of both cost and distribution were very important, and particularly that of supplying the highest illuminating power at the lowest possible cost. He did not think electricity would ever compete to any very large extent with gas for interior illumination, though it might do for street lighting. Gas would always be used, not only by specialists, but also by the million; and as long as they catered for the million, they would make money.

Alderman WELLS also responded, and observed that they had every confidence in Mr. Anderson. He had had a free hand, and they were more than satisfied with the result.

The MAYOR then proposed a vote of thanks to the President. He said he had often heard of the Kendal works as being practically model ones, and had hoped to be able to visit them. But his anticipations had, if anything, been exceeded by meeting Mr. Ritson that day, and discussing with him matters of gas-works interest.

Mr. WOOD seconded the motion, and it was carried.

The PRESIDENT, having briefly responded,

Mr. R. G. SHADBOLT (Grantham) proposed a vote of thanks to Mr. Anderson, who, he remarked, had put himself to an exceptional amount of trouble in making arrangements for this most successful visit.

Mr. S. S. MELLOR (Northwich) seconded the motion, which was carried with acclamation.

Mr. ANDERSON, in responding, said the work had been to him simply a labour of love.

The proceedings then closed.

#### PACIFIC COAST GAS ASSOCIATION.

##### Annual Meeting at San Francisco.

The Eighth Annual Meeting of this Association was held at San Francisco, on the 10th, 11th, and 12th ult.—Mr. John Clements, of Red Bluff (California), President, in the chair. Twenty-one new members were elected. The President delivered an Inaugural Address, in which he claimed that the Association had taken its place among the best and foremost of the Gas Associations of the world. He gave some attention to the history of artificial lighting from the earliest days, and passed on to notice the latest improvements (such as Welsbach burners), also the uses of gas for purposes other than lighting, and spoke hopefully of the future of the gas industry. Referring to municipal ownership, he remarked that while they were all deeply interested in the question as individuals, he did not think that, as an Association, they should deal with it. The uses of petroleum, acetylene gas, the coke-oven process, and other questions of the day also received passing notice in the address.

"Some Notes on Larger Types of Gas-Engines" formed the subject of a paper read by Mr. J. B. Crockett, of San Francisco. He commenced by quoting from Mr. Bryan Donkin's work on gas-engines a number of paragraphs tracing the gradual development of these motors, which he stated had advanced more rapidly in Europe than in America. Only ten years ago, it was said at the meeting of the American Gaslight Association that no engine larger than 7-horse power was at that time in use in the United States. At present, engines as large as 650-horse power were actually in operation; and the Westinghouse Company had a 1500-horse engine in process of construction. During a recent visit to the East, he had seen several large engines varying from 90 to 650 horse power. One of the latter size was running in the Westinghouse factory at East Pittsburgh; and he quoted a description of it from the publication the "Gas-Engine" of April last. He next referred to the engines made by the Union Gas-Engine Company of San Francisco, which were fitted, according to requirement, with three, four, or five independent cylinders, each of which could be shut off as desired. A paragraph approving this principle (also from the "Gas-Engine") was given in full. The author's purpose in entering upon these investigations was to ascertain whether his Company would be justified in displacing the steam-engines at their electric station, which aggregated 3500-horse power, and putting in gas-engines. The 650-horse power engine previously described was supplied with natural gas of 1000 B.T.U. heating quality; and it used from 12 to 14 cubic feet per horse-power-hour. One of the most important things to know was the horse-power-hour consumption of ordinary artificial gas, the quality of which was below 700 B.T.U. The Union Company had not built an engine larger than 150-horse power; but he had just placed an order with them for a four-cylinder 300-horse engine. He was satisfied the gas-engine would eventually supersede other forms. With a consumption of less than 20 cubic feet per horse-power-hour, and regulation guaranteed to within 2½ per cent., the economy of being able to stop or start at a moment's notice, and the saving in cost of attendance, no other engine could compete with it. If he were installing new plant of any kind requiring power within the limits named, he would not hesitate to put in a gas-engine.

Discussion being invited, Mr. Lowe remarked that Mr. Casey, the President of the Union Gas-Engine Company, was a member of the Association; and he asked him to add to the notice in the paper a few particulars respecting the 300-horse engine. Mr. Casey said the machine comprised two double cylinders, but each cylinder was distinct, having its own governor, and could be shut off for reducing the load or disconnecting for repairs. The base of the frame was in two halves; and the machine could, in half an hour, be taken apart across the middle, and worked as two separate engines, if required. The governors were vertical, and placed above the valves, which were balanced; and each valve was double. The four cylinders fired in rotation—no two at the same time; and thus there was an impulse every half revolution. The normal speed was 200 revolutions per minute, and there were two fly-wheels, 8 feet in diameter, and weighing 6½ tons. He expected the regulation would be within 1½ per cent., and the consumption at full load 16 to 17 cubic feet per horse-power-hour. The total weight was nearly 40 tons, the length 24 feet, and the main shaft 7 inches diameter. The stroke was 22 inches, and the cylinders were thoroughly cleared after each explosion. No residue of burned products remained to dilute the next charge. Mr. L. P. Lowe said that gas companies did not properly appreciate the capabilities of the gas-engine. If they carefully figured out the costs, they would find no other power in the world could approach it. Gas companies had at their own doors the cheapest possible power, not excepting water. The Lowe railway was run by gas-engine power, using one 120 and two 60 horse power Otto engines; and they worked quite satisfactorily. Mr. Crockett produced a table showing the results of tests made on large gas-engines. It was as follows:—

Full load . . . . .	18.3 c. ft. gas per H.P. hour.
77 per cent. load . . . . .	18.6 " " "
54 " " " . . . . .	21.9 " " "
50 " " " . . . . .	27.5 " " "



With steam-engines it was observed that running at half power involved a loss of efficiency; but gas-engines could be so easily stopped and started that it was a simple matter to use several, of various sizes, so as always to keep near the full load.

Dr. R. M. Powers, of San Diego (Cal.), read a paper on the use of crude petroleum for firing benches. His attention was first directed to the subject as a means of keeping up the heats during clinkering. From this commencement, it soon became evident that the exclusive use of oil would not only save labour but also money. Selecting two Weber half-depth regenerator beds of sixes, he made a month's trial of coke, tar, and oil respectively; the output of gas, &c., being practically the same throughout the three months. For the first month he used 134,220 lbs. of Wallsend coke; for the second, 7680 gallons of tar; and for the third, 8745 gallons of oil. The oil cost less than 2d. per gallon; and on the basis of the cost of the oil, the fuel value of tar was 2d. per gallon, and of coke 19s. per ton. For steam raising he obtained similar results; the oil proving cheaper than tar, coke, or coal. Considering that anthracite cost him £2 5s. per ton, and washed coke £2 7s. 3d., his gas coke was worth £1 17s. 10d. to him for making water gas. Therefore it was folly to use coke as fuel, or buy coal or coke, while he could get oil at the present price. The oil was not only economical, but was always under control, with no clinker or other residue to be removed from time to time.

Mr. Thompson commenced the discussion by observing that he used an oil-burner for raising steam, with the advantages claimed in the paper. The consumption was 6 to 8 gallons per hour. Mr. Jones used a sort of chequer brickwork on the grate-bars, and thus secured some considerable saving. In an open furnace the heat went away too freely; but the baffle-work arrested and radiated the heat, and thus led to better results. He added that this was a very important question, because in many parts of the States oil was becoming cheap, while coke advanced in value. As compared with coke at £1 9s. 2d. per ton, crude water-gas tar was worth 9s. per barrel as fuel; and he could run a bench of sixes for 24 hours with a consumption of 95 gallons. Mr. Joslyn spoke highly of the satisfactory character of oil as fuel. It was also economical, as he found that Coalinga oil at 2d. per gallon was cheaper than coal at £1 15s. per ton. He had not altered his furnaces at all. He simply inserted the oil-burner about a foot above the bars, and could go back to solid fuel at any time. He started the fire with coal or wood, and this left on the bars a little clinker, perhaps an inch thick, which was allowed to remain. He had recently seen a large traction-engine operated by oil. Mr. Osborn said he used oil for raising steam for his water-gas plant and the consumption was 1·3 gallons per 1000 cubic feet of gas made. This was working during the day only; but if he could run continuously the consumption would be less than half the quantity. Mr. Parker was using tar and also oil in regenerative benches with satisfactory results. Mr. L. P. Lowe said that almost every boiler in Southern California was fired with oil. The usual plan was to cover the bars with brick and also to use baffle-work, as suggested by Mr. Jones. A good burner could be started with a piece of waste. Oil was used on the Santa Fé locomotives with excellent results. He recommended the use of a regulator to maintain a constant pressure at the injector. The railway companies took a supply from the air-brake apparatus to work the injector. Mr. Gregory said that, instead of employing brick in the furnace, he used breeze or any other cheap fuel on the grate-bars. He injected the oil on to the fuel; thus avoiding the flame being played upon the boiler plates, and very little solid fuel was consumed. Dr. Powers had used breeze in the way suggested by the last speaker, and found that it economized the oil.

Mr. T. N. Parker, of Napa (Cal.), read a paper entitled "Thoughts Suggested by Boiler Explosions." He first considered the properties of water and steam, passing on to notice those of fire, then touching upon iron and the methods of working it, the manufacture of steel, and lastly the history and development of the boiler as we now know it. He remarked that there is no instance on record of the explosion of a modern well-designed high-pressure boiler. The thin-tube small-pipe type of boiler was rapidly coming to the front; and he mentioned several well-known varieties of tube boilers, which offered the advantages of rapid circulation, quick generation, ease of repairs, high pressures, and factors of safety—the rupture of a tube being very unlikely to cause serious trouble or disaster. It was now quite practicable to construct and manage steam-boilers in such a way that there was absolutely no danger of explosion. The general belief was that low water was usually the cause of explosions, but they must also consider the electrical properties of water vapour and steam, as exemplified by clouds, atmospheric electricity, waterspouts, and in other ways. Many attributed pitting and grooving to the influence of electrolysis. The reason for complete ignorance on these points seemed to lie in the fact that their investigation required a larger scale of operations than was practicable in the laboratory. Then it had been surmised that steam might be subject to similar conditions to those of finely-divided solids, such as coal dust and flour dust, which were known to be capable of exerting explosive properties. Many boiler explosions could only be accounted for by assuming a sudden development of energy far in excess of that usual in regular working, and some French writers had characterized them as "*explosions fulminantes*." Then they must remember that, while steam represented volatile matter only, water

contained a great variety of fixed constituents which accumulated in the boiler, and might possibly lead to complex chemical and electrical reactions. In conclusion, he remarked that, by the adoption of the gas-engine, boiler explosions would become a thing of the past.

The President having invited discussion, Mr. Gregory said that, if the knuckles were held near the dome of a boiler in full work, a blue flame would appear—demonstrating the presence of electricity; and he would ask whether this was generated by the motion of the boiling water. It was possible that the electricity might lead to electrolytic action. Mr. Hollidge remarked that there was a certain amount of electricity in all things on rainy days. One could not touch the wires of a transmission line during heavy rain, even if all the machines were stopped. Mr. Lowe remarked that, as regarded theoretical efficiency, the gas-engine nearly doubled that of the steam-engine. Mr. McNeil said that no one had found out exactly why boilers exploded, but no doubt a great deal depended upon the man in charge of the boiler.

A paper on "The Investigation of New Processes," written by Mr. A. C. Humphreys, of New York, was read by the Secretary, in the absence of the author. He stated that for 25 years he had been called upon to investigate processes, and in many cases a detailed examination was not required to show that the claims of the inventors were not possible. One must not, however, be prejudiced by experience, but approach each new case with a perfectly open mind. And it was necessary not only to satisfy practical men, but outsiders (such as investors or municipal authorities), as to the merits or otherwise of a process. It was well to reduce claims to actual figures. In one case it was alleged that nearly half-a-million cubic feet of ordinary illuminating gas could be obtained from a barrel of oil, which would be very little reduced in bulk by the process, but improved in quality, and rendered fit for sale as a lubricant. Taking the weight of the oil as 300 lbs., the heating value of the whole barrel full would be about 6 million units. But 250,000 cubic feet of gas gave 162 million units; and he wanted to know where the odd 156 million units were to come from. Two well-known authorities had spoken favourably of the process, apparently vouching for the accuracy of the claim. But while their statements were true, neither of them was complete. One simply certified as to the yield, and the other only touched on the photometric and calorimetric value of the gas. When read together, it was natural to assume that both referred to one and the same test; but they did not. As the process was of the air-gas kind, it was easy to see that any quantity of gas could be registered when quality was not considered; and conversely that any quality could be made without reference to quantity. It was lamentable that professional men should be misled into making partial statements, as they must either be the result of wilful deceit, or want of care and common sense. In testing such processes, it was very necessary to be exact in measurements of quantity of material used, of gas made, &c., so as to avoid unintentional mistakes or actual fraud. One favourite form of claim was that the inventor could reduce the cost of gas by one-half; and, as a rule, it would be found that this statement was based upon the result of practice that is, or should be, obsolete, and the inventor may be totally ignorant as to good modern practice. It would almost invariably be found that extravagant claims were based upon crude estimates and hopes, rather than upon accurate, careful, and exhaustive experiments; and many inventors had been led astray, not only by the lack of proper apparatus, but by the want of skill and experience in its use. For many years a candle balance by a well-known maker had been on the market, although it was absolutely valueless; and special care was necessary in respect to statements based upon accurate photometrical observations. Even an experienced routine photometrist was not necessarily qualified to make examinations under new and strange conditions. The question of candle power always came up; and therefore the accuracy of the instrument and the ability of the operator were prime considerations. Where he had made complete investigations, he usually found that, notwithstanding definite claims, no previous similar examination had been made. And when he had been invited to take charge of the works, it would be found that there was no bar photometer or even station meter. Very often the inventor furnished his own condemnation, such as the statement that one ton of coal would produce 200,000 cubic feet of gas having a heating value equal to 80 per cent. of that possessed by natural gas. But, notwithstanding such inherent weakness, this particular process had been backed by commercial and professional men of high standing, and, in spite of repeated failures, capital could be found for its support. Then he had known the Welsbach burner as compared with the flat-flame to be utilized—the process and not the burner, receiving the credit of the improved results. The "continuous process" man had given a great deal of trouble from time to time; usually claiming that by electrical or some obscure chemical action he could convert the nitrogen in the producer gas into combustible gases; and as the promoter was invariably a man of nimble wit and ready tongue, it was difficult to meet him before a gallery audience when he quoted scientific opinion for the statement that nitrogen was really a mixture of many different gases, and that the constituent called "nitrogen" in gas analyses was really a residue, and was not positively determined. The promoter



could usually obtain the more or less complete endorsement of some man well known, and believed to be a practical, able, and honest gas engineer. Sometimes this was secured by a "professional" fee, but frequently it was the result of enthusiasm and lack of self-control, which hurried the engineer into a position from which he would at a later period be glad to recede. The promoter's cause was almost always helped along by ill-advised or partial endorsement of so-called authorities who really were not qualified to make a complete examination or give a conclusive opinion. He would also remark that even a considerable part of the gas fraternity had been deceived by apparently promising new processes, probably because gossip and current opinion were relied upon, rather than complete investigation. In concluding, he advised those who had to deal with new processes first to obtain a full definite statement of results claimed; then to test these claims by comparison of weights, heating values, &c., in the materials and the products; and from this preliminary to decide whether or not an investigation was desirable. If one was decided upon, they should prepare to do the work guardedly, but with an open mind. Examine everything personally, take nothing for granted, and be sure that all apparatus is accurately standardized. If commercial results are quoted, do not accept them without an expert examination of the books; and generally remember that the investigation calls as much for common sense as for technical skill. If you make a report, remember that an incorrect opinion, whether for or against, must work an injury; and let no personal considerations influence your judgment.

The reading of the paper was followed by a discussion consisting mainly of anecdotes in reference to the dodges resorted to by so-called promoters. Mr. Britton remarked that by allowing a process, however absurd, to be started, the way was opened for a strong opposition company. This had been the case at San Francisco. A new process, believed to be impracticable, was started; and it soon changed into an opposition gas company.

(To be continued.)

THE CALORIFIC VALUE OF VARIOUS GASES.

At the close of the portion of Mr. R. Forbes Carpenter's annual report as Chief Inspector under the Alkali Acts, in which he deals with the economy of central sources of gas supply for engines, with the recovery of residuals (see *post*, p. 530), he gives the following table of calorific values of different descriptions of gas which he has gathered from various sources; many items being contained in the paper read by Mr. H. A. Humphrey before the Institution of Civil Engineers in 1897 on "Mond Producer Gas." The coal-fed blast-furnace gas (washed) is from Scotch practice :—

Nature of Gas.	Gross Calorific Value, in lb. Units. F. per Cubic Foot of Gas. B.T.U.
Producer gas—	
Siemens. . . . .	134'5
Wilson . . . . .	140'0
Dowson (from anthracite) . . . . .	155-160
Lencauchez (from anthracite) . . . . .	207'5
do. (quality of fuel not specified) . . . . .	135-166
Mond . . . . .	154'6
Blast-furnace gas—	
Coke fed . . . . .	100-110
Coal fed, and washed . . . . .	130-140
Water gas . . . . .	276-293
Carburetted (22'0 candle) American . . . . .	749'9
do. (21'7 candle) English . . . . .	618'6
do. (22'7 candle) " . . . . .	677'1
Coal gas—	
16 to 22 candle. . . . .	650-750
London (16'4 candle) . . . . .	648'8
Coke-oven gas—	
Semet-Solvay (average of the ovens) . . . . .	511'2
Otto-Hoffmann, Everett, Boston (U.S.A.) . . . . .	
Average of the ovens . . . . .	567'0
" Rich " oven gas (22'1 candle) . . . . .	749'7
Natural gas—	
Pittsburg (U.S.A.) . . . . .	892'4

**Rateable Property.**—A return has lately been presented to the House of Lords by the Local Government Board on the value of rateable property in England and Wales. It shows with respect to each union the rateable value of (1) lands, (2) buildings, (3) railways, and (4) "all other kinds of property;" the last including gas and water works. In 1870, the figure for this group was £5,006,898; whereas last year it had risen to £10,894,434 and £12,276,477, or about 145 per cent. The total rose from £104,870,334 in 1870 to £161,139,575 in 1894 and £175,622,758 in 1899.

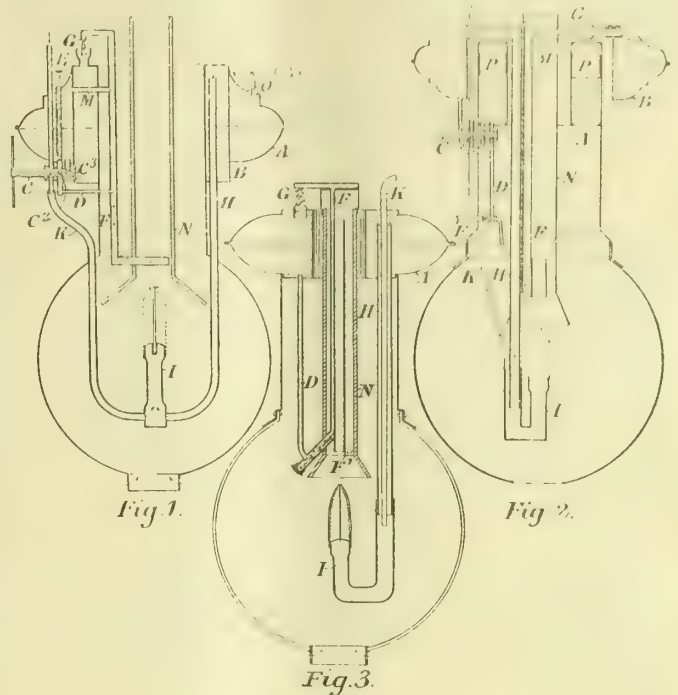
**Coal in China.**—According to a report lately published by Professor Drake, of Tien-tsin, on the coalfields in Shan-si province which he visited last autumn, he estimates that within the 150 square miles around Tse-chau there are about 3000 million metric tons of coal, and he says "it must be remembered that this area is only a little of the ragged edge of the great coal-fields of Shan-si." Most of Shan-si has been found underlaid by large coal beds. Baron von Richthofen, who drew attention to this coal area in 1870, estimates that the anthracite coal alone of Shan-si amounts to 630,000 million tons, and that the coal area is greater than that of Pennsylvania.

REGISTER OF PATENTS.

**Incandescent Gas-Lamps.**—Lucas, P., of Deutsch-Wilmersdorf, near Berlin. No. 18,971; Sept. 20, 1899.

This invention in gas-lamps (particularly for incandescent lamps) consists in supplying to the burner an increased volume of air, whereby the heat developed by the flame is "considerably increased," and the emission of light from the mantle is raised to "extraordinary effects."

In carrying the invention into practice, steam is generated by the evaporation of water, and, issuing from a fine nozzle, it carries along atmospheric air under pressure into a closed vessel containing water or other fluid, where the steam, coming into contact with the fluid, will be condensed, and the compressed air escape through a conduit to the burner, to mix up with the gas flowing to the burner.



In fig. 1, A is a reservoir partly filled with water, and B is another reservoir surrounded by the reservoir A. C is a three-way valve-cock—two ways of which simultaneously open and close both the passage for gas through the pipe K and the passage for water from the reservoir A to the pipe F, through the pipe D. The third way opens communication between the two reservoirs A and B, when the other two guide-ways are closed. Starting from the position shown, and giving the cock a quarter turn, the gas will be supplied to the burner I through the pipe K, and water will slowly pour through the pipe D to the pipe F; the passage being controlled by the regulation of the needle-valve E. A branch at the lower end of the pipe F projects into the chimney N, and is exposed to the heat of the flame rising from the burner. The lower or horizontal branch of the pipe F may be filled with asbestos or the like. The drops of water entering the branch will almost immediately be transformed into steam, which, rising within the pipe F, escapes through the nozzle G, issuing in a jet, and entering into a suitable cup or aperture leading into the reservoir B. The jet of steam from the nozzle forces air into the reservoir; while at the same time the steam is rapidly being condensed by coming into contact with the water contained therein. The compressed air collecting within the upper part of the reservoir B escapes, through a pipe H, into the burner I, where it becomes mixed up with the gas entering from the pipe K; and the mixture, when issuing from the burner, is ignited, and "develops the highest temperature which gas mixed with air is capable of producing." The small pipe M, branched off from the pipe F, and leading into the reservoir A, serves to establish within the reservoir A, the same amount of steam-pressure as exists within the pipe F. Otherwise, if the pressure of steam within the pipe should exceed that in the reservoir, the water would be prevented from flowing through the pipe D into the pipe F. A safety-valve O serves to enable the steam to escape from the reservoir A if an excess of pressure should be generated.

The modification represented in fig. 2 is materially the same; but the reservoir A, delivering water, is inside the other reservoir B, which receives the steam and compressed air. A float P is carried by the fluid in the reservoir A, which float serves to diminish the surface of contact between the steam entering the reservoir and the fluid therein. By this means, the pressure existing within the reservoir will always be sufficient to ensure the required escape of water through the pipe D to the pipe F. This pipe (in this modification) is entirely located within the chimney N; thus being exposed to the heat of the flame for its whole length. The lower part of the pipe F may further be surrounded by an enlarged metal pipe in contact with it, to "increase the heating surface exposed to the direct heat of the burner-flame, and to secure a rapid evaporation."

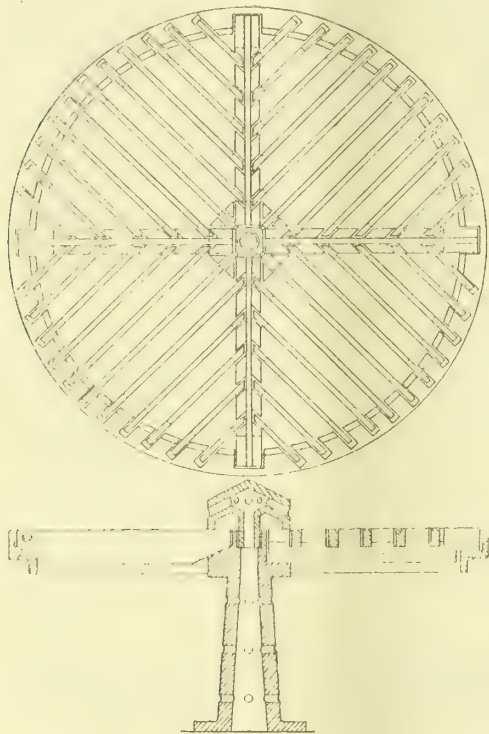
A third modification, represented in fig. 3, "affords a great simplicity of construction." Instead of using two reservoirs A and B, a single reservoir A, partly filled with water, will suffice to obtain the same effect. While the water slowly flows down from the bottom of the reservoir A, through the pipe D, into a connecting-pipe between the pipe D and the pipe F (which connecting-pipe may suitably contain wire-gauze or asbestos), the steam rising within the pipe F will enter into the cup at the top of the reservoir A; and the compressed air will collect in the upper part of the reservoir. The pressure of steam existing at any time within the pipe F will force the level of the fluid rising within the connecting pipe so much down as to entirely dispense with a controlling



valve (such as C in the modifications before described). The small pipe F is in close contact with a larger metal pipe, which serves to increase the heating surface of the pipe F, and "accordingly to accelerate the generation of steam." The gas supply-pipe K may be arranged inside the compressed-air pipe H, both leading to the burner I, and mixing together their contents within the burner.

**Fire-Grates for Water-Gas Generators.**—Boult, A. J.; a communication from J. E. Goldschmid, of Frankfort-on-Maine. No. 19,271; Sept. 25, 1899.

In grates of water-gas generators, the whole of the coke or coal material is often placed (the patentee remarks) on a single, flat grate, extending over the full cross sectional area of the lower part of the furnace; but such an arrangement requires very long grate-bars, and renders the working of the fire very difficult, especially in cases where the grate can be worked from two sides only. In order to meet these drawbacks, he proposes the special arrangement of grate shown—divided into (say) four



quadrants, in which the grate-bars are secured in parallel lines; the outer ends of the bars being supported by a ring or frame extending all round the side of the furnace, while their inner ends are supported on a cross device or plate or arms radiating from the centre. The grate-bars, of course, vary in length. But such furnaces are said to offer the great advantage that they can be worked from four sides; only comparatively short lengths of bars having to be attended to.

**Ignition Gear for Gas-Engines.**—Hinchley, J. W., of Fawcett Street, S.W. No. 19,641; Sept. 30, 1899.

The object of this invention is to provide for the automatic alteration of the point of ignition of the charge contained in the cylinder of a gas-engine, according to the speed at which the engine is running. Usually, a cam or commutator, fixed on the main or secondary shaft, causes the electric circuit of a battery and induction coil to be completed—producing an electric spark in the valve or combustion chamber of the engine, which determines the explosion. But this invention consists in slightly revolving the cam on its shaft to an extent dependent on the speed at which the shaft is turning, so that ignition takes place earlier or later, according as the engine is running faster or slower. For this purpose, small equal connecting links are carried from the ends of a diameter of the cam to the two moving weights of the controlling mechanism. This consists of a drum, fitted to the shaft on which the cam is placed, inside which are two flat springs fixed by one end to the curved face of the inside of the drum at opposite ends of a diameter, while the other end carries the weight. The relation in position of each spring to the shaft is the same. The springs are cut or bent to a semicircle the diameter of which is less than that of the drum, and are thicker at the ends carrying the weights than at the ends which are secured to the drum. On rotation, the weights tending to move outwards cause the springs to change their curvature—gradually, as the speed increases—to that of the inside of the drum. The change commences at the supports, so that the effective length of spring diminishes as the speed increases.

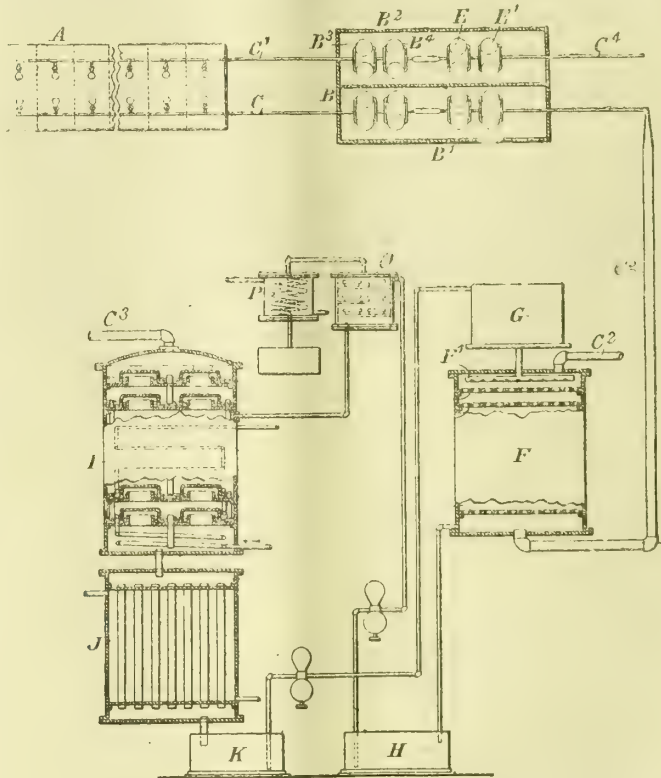
**Treatment and Utilization of Gases.**—Schniewind, F. W. C., of New York. No. 10,589; June 9, 1900.

This invention relates to the treatment and utilization of gases generated in the process of carbonizing fuels in closed externally heated retorts; and it has for its object "the saving and utilization of illuminants contained in such gases which have heretofore been to a large extent wasted." The invention consists, broadly speaking, in a process, the first step of which is accomplished by separating the rich and poor gases given off in the distillation process—as by drawing off the gases evolved in the retorts during the first stages of the distillation process (and which are the richer gases) through one main, and drawing off the gases evolved during the later stages of the distillation (and which are the poorer gases) through another main, also connecting with the retorts, and then subjecting the fraction of the gases relatively poor in illuminants

to a treatment by means of which the illuminants are removed from it for independent use or sale.

In practice, the patentee states that he has found it highly advantageous to utilize the illuminants extracted from the poorer fraction of gases for increasing the illuminating power and value of the richer fraction of gas—by preference adding the illuminants extracted to such richer fraction without concentration or condensation; but this process of utilizing the illuminants forms the subject-matter of a separate application for a patent. The present invention "is designed to cover the process of recovering the illuminants irrespective of the utilization subsequently made of them."

As to the nature and distribution of illuminants, the patentee states that bituminous coal, "which is the most important raw material for the manufacture of gas," produces "coal gas" when subjected to dry distillation in closed retorts. While the quality and illuminating value of the gas varies considerably with the character of the coal, about 65 to 80 per cent. of the illuminating value of the gas is due to benzol and its homologues, and about 20 to 35 per cent. to the presence of hydrocarbons of the olefine series (ethylene and its homologues). A very large proportion of benzol produced during the distillation of the coal remains in the gas after it leaves the condensing plant. Of the total benzol yield, 90 per cent. was found in the gas, and only 10 per cent. in the tar. Again, a certain coal with which he had worked and subjected to dry distillation in a modern by-product oven, yielded about 10,000 cubic feet of gas per gross ton; and of this there were approximately 5000 cubic feet—the first fraction available as a surplus after applying the remaining 5000 cubic feet (the second fraction) for heating the coking-ovens. He also ascertained that in the first fraction were contained about 62 per cent. of the total illuminants produced—including benzol and its homologues, and ethylene and its homologues; while the second fraction contained about 38 per cent. And it will be understood, he said, that his present process "contemplates the utilization of the first or richer fraction for illuminating gas or otherwise, and the extraction from the second or poorer fraction of the greater parts of its illuminants before it is utilized for heating the coking-ovens, or for other purposes, or allowed to go to waste."



With regard to the removal of the illuminants from the second fraction of the gas, he states that several methods are applicable—depending upon the nature of the illuminants to be extracted. Generally speaking, the different methods in use are of two characters—one (the cooling process), according to which the benzol or its homologues are condensed by exposing the gas to low temperature, and the other (the absorption process), in accordance with which the benzol is extracted from the gas by exposing it to the action of oils or other materials having the property of absorbing benzol.

In this latter (absorption) process, comparatively cold tar oil is generally employed as the solvent; and in his preferred method, he subjects the second fraction of gas—preferably, after treatment in the condensing house—to a scrubbing with tar oil in what he calls the benzol-washer, the oil, on entering the washer, having a low percentage of benzol, and on leaving it about 12 to 15 per cent. of benzol. He then carries the oil to a benzol-still, in which the benzol, or the greater part of it, present is thrown off as a distillate, and afterwards treated in any convenient manner for commercial utilization. By preference, however, he subjects the oil to fractional distillation—first driving off the bisulphide of carbon, which it also absorbs, and which can be readily separated before the benzol is driven off (because the boiling-point of the bisulphide of carbon is 47° C., while the boiling-point of benzol is 80.4° C.). The boiling-point of toluol is 111° C., and the boiling-point of xylene is from 137.5° to 142° C. After passing through the benzol-still, he cools the tar oil down to the proper degree, and again passes it through the benzol-washer; the process of extracting the benzol being thus conveniently made continuous.

The illustration diagrammatically represents a plant suitable for the practice of the invention. A indicates a bank of coke-ovens; each provided with two outlets for gas connected by pipes, each having situated

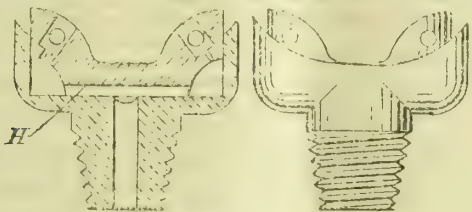


in it a controlling valve with either the rich-gas main C<sup>1</sup>, or the poor-gas main C. B is the condensing house of the gas plant, divided into two separate systems—B<sup>1</sup>, in which the poor gas is treated, and B<sup>2</sup>, in which the richer gas is treated. The various washing and condensing devices usually employed in such condensing houses are indicated at B<sup>3</sup>, B<sup>4</sup>, E, and E<sup>1</sup>. C<sup>2</sup> indicates the main for the richer fraction of gas leading from the condenser system B<sup>2</sup> and C<sup>3</sup>; a main for the poorer fraction of gas leading from the condenser system B<sup>1</sup> to the benzol-washer F. This washer has at its top a distributing device F<sup>1</sup> for tar oil, and is filled with perforated trays above its lowermost chamber into which the pipe C<sup>3</sup> enters. C<sup>2</sup> (leading from the top of the washer) is the conduit through which the poorer fraction of gas—robbed of its illuminants—is conducted either to heat the ovens A, or to any other point of utilization or storage. G is a reservoir for cool tar oil, connecting with the distributor F<sup>1</sup>, and having situated in it a force-pump connected with the oil-reservoir K. There is also a pipe having in it a force-pump leading from the reservoir H to the bisulphide of carbon still O, which connects with the benzol-still I, also with the coil in the condensing-tank P. The benzol-still is divided into separate chambers by partitions having flanged openings, over which are flanged caps. It is heated by a steam-pipe in the lower chambers of the still indicating the exhaust for the steam. The tar oil leaves the cooler J through a pipe which leads to the reservoir K, from which, as already indicated, it is drawn into the supply tank G.

#### Acetylene Burners.—Bray, J. W., of Leeds. No. 11,385; June 23, 1900.

This invention in acetylene burners has for its object "the production of a light in which the whole of the gas is consumed, with a minimum deposit of carbon."

As shown, the burner is made in two parts (an upper and lower) ultimately combined by heat. The burner is formed of porcelain or other



non-corrosive material. The underside of the upper portion is provided with a channel H communicating with the curved ends. It is formed along the underside of the upper portion of the burner, so that when the combination is made, by the fixing of the upper to the lower portion, the gas can pass along the channel to the fine orifices for the admission of the gas to the burner. After placing the upper and lower portions together, they are coated with a glazing mixture, and subjected to heat so as to combine them—that is, the upper and lower parts—into one complete and gas-tight burner.

#### APPLICATIONS FOR LETTERS PATENT.

- 14,446.—GRUNDY, D. R. & D., "Automatic valves for water and other fluids." Aug. 13.
- 14,462.—WIRTH, E., "Purifying anthracene and recovering the purifying agent." Aug. 13.
- 14,485.—BENNETT, A. H., and JONES, S., "Automatically lighting gas-burners." Aug. 13.
- 14,494.—MUCKE, F., and the DEUTSCHE CONTINENTAL GAS GESELLSCHAFT, "Brackets or suspension fitting for pendant lamps and the like." Aug. 13.
- 14,499.—ALLEY, S. E., "Pressure-reducing and self-closing valves for water or other fluid supply-pipes." Aug. 14.
- 14,514.—JONES, P. C., "Gas-fittings and method of igniting the gas at the burner." Aug. 14.
- 14,531.—TROQUENET, J. L. C., "Incandescent gas-burners." Aug. 14.
- 14,553.—DYMOND, G. C., "Incandescent gas-lamps." A communication from S. Zielenziger. Aug. 14.
- 14,556.—BATE, J. J., "Pipes, conduits, or the like." Aug. 14.
- 14,569.—HADDAN, R., "Washing gas." A communication from the Berlin-Anhaltische Maschinenbau Actien-Gesellschaft. Aug. 14.
- 14,635.—BARROILLIER, J., "Incandescent lamps and the like." Aug. 15.
- 14,668.—BROWN, J. W., "Spigot and socket joints for various pipes." Aug. 16.
- 14,692.—SUGG, W. T., "Lanterns for public incandescent gas lighting." Aug. 16.
- 14,717.—GENESTIN, P., "Gas-motors." Aug. 16.
- 14,730.—HAYWARD, F. W., "Explosive vapour or gas-motors." Aug. 17.
- 14,753.—HOPKINSON, E., "Regulated distribution of liquids, particularly applicable for filter-beds." Aug. 17.
- 14,781.—BULT, A. J., "Ignition devices for incandescent gas-burners." A communication from W. Kraetke. Aug. 17.
- 14,821.—WILLIAMS, W. S., "Exhaust valve and valve and governing mechanism for oil and gas engines." Aug. 18.
- 14,823.—BERT, E., "Automatically regulating the pressure or supply of fluids in pipes and the like." Aug. 18.

**Mr. Ellis's Remarks at the Croydon Meeting.**—Mr. H. D. Ellis, the Secretary of the Commercial Gas Company, Stepney, writes, under date of Aug. 22: "In your report of the Croydon Commercial Gas Company's meeting there is a slight inaccuracy in the text of my remarks, which I should like to see corrected, as it is calculated to mislead. I said that it was the insurance fund (not the reserve fund) to which resort cannot be had in order to provide the increased cost of coal; and that the reserve fund, though applicable to make good deficiencies in the statutory dividends, should not be wholly dissipated in a desperate attempt to maintain the statutory rate without raising the price of gas."

## LEGAL INTELLIGENCE.

### HOVE PETTY SESSIONS.

Monday, Aug. 20.

(Before Mr. R. A. BEVAN, Chairman, and a Bench of Magistrates.)

#### Gas-Works and the Factory Acts.

To-day, the Brighton and Hove Gas Company were summoned at the instance of Mr. J. Owner, one of the Inspectors of Factories, for infringement of the Factory Act.

Mr. OWNER stated that the actual employment complained of would be admitted; but, in inferring that the defence would be that a gas-works was not a factory, he contended that it was, as gas was an article and a commodity. There were a large number of engines employed, and steam was used in connection with the production of gas.

Mr. E. HATTON, who appeared for the Company, stated that, to save the time of the Bench, he would admit that machinery was employed, but not that the defendants came under the Factory Acts.

The first summons, that for employing Albert Carrington, a lad, on Sunday, July 22, was then proceeded with.

Mr. OWNER stated that the age of Carrington was 14 years, and his employment on a Sunday was contrary to the Act.

Carrington was called, and stated that he was in the employ of the Company. On the Sunday in question he worked from six in the morning till six at night, having meals at intervals.

Mr. HATTON said the boy's statement as to his age and the certificate differed; but he was not going to fight the case on a quibble, as he had several strong points to submit. He then urged that the production of gas could not be considered to be the making of an article. He further contended that the Act did not apply at all. In proof of this, he alluded to one section of it, which had since been repealed, which required that notices of accidents in factories should be given; and he averred that never, during the whole time the section had been in operation, had the Company given notices of accidents. If, he contended, this section had applied to the Company, the whole Act would have done so. Similarly, as the section did not include the Company, neither did the entire Act. He then went on to show that, by subsequent legislation, the Company had never come under the Act of 1878.

Mr. OWNER contended that they did come under the Act, as they used machinery in the production of gas, which, he said, was an article.

Mr. HATTON said he should have to advance his other points and, if the case were decided solely upon the one as to whether or not gas was an article, he should be compelled to take the matter to another Court, as it was of great importance.

Mr. J. Cash, M.Inst.C.E., the Engineer and Manager of the Company, was then called, and stated that he had never given to the Board of Trade notices of accident under the Act of 1878, neither had he been requested to do so. It was after the passing of the Act of 1895—namely, in 1896—that an Inspector first called at the works, owing to an accident.

In answer to the BENCH, witness maintained that legally the Company could employ children when they pleased, though they never took advantage of the Factory Act not applying to them.

Mr. OWNER contended that gas was an article, and could be measured and weighed; and he further said that the fact that since 1896 notices of accident had been given showed plainly the Company came under the Factory Act.

The Magistrates retired to consider their decision. On their return,

The CHAIRMAN asked if the defence in the other cases would be the same as in the one before them.

Mr. HUTTON said it would.

The CHAIRMAN then said that, in view of the importance of the points in dispute, the case would be adjourned for a week, with the others.

#### Leaving Work without Notice.

Albert Jones, living at Grange Road, Hove, was summoned by his employers, the Brighton and Hove Gas Company, for £1 2s., including the cost of the summons, in consequence of his leaving their employ without giving proper notice of his intention to do so. Defendant pleaded guilty, and an order was made for payment of the amount demanded.

#### Tampering with Slot Meters.

At Longton, a few days since, two lads named Alfred Nabney and Harry Bartlam were charged with entering an office, breaking open a slot meter, and stealing 1s. They were ordered to pay 15s. each.

At Glastonbury recently, Henry Banfield, of Street, pleaded guilty to tampering with a slot meter, and was fined 20s. and costs. He altered it so that it registered 17 cubic feet when 24 feet of gas had been burnt.

#### Interference with a Stream.

In the Chancery Division of the High Court of Justice last Wednesday week, before Mr. Justice Farwell, application was made by a firm of mill-owners named Grist for an injunction to restrain the Stroud Water Company from interfering with a stream by taking water from it. The plaintiffs alleged that the Company intended to pump 360,000 gallons of water a day from the Frome, a stream which supplied their mill and also a canal belonging to the Thames and Severn Canal Trust, the result of which would be to seriously affect the working at the mill, and also to render the canal unnavigable. It was stated on behalf of the plaintiffs that the Company had been in existence since 1882, and had hitherto been able to carry on their undertaking without taking water from the stream in question, and further, that they had no power to take the water. Mr. G. Henderson, for the defendants, submitted that no order should be made. The quantity of water which the defendants proposed to take was very trivial, and would not interfere in any way with the plaintiffs. His Lordship said *prima facie* it did not seem that the Company had any right to take water from the stream. There was obviously a question to be tried, and therefore he would make an order restraining the defendants, until the trial, from using their pump so as to divert the water from the stream.



## MISCELLANEOUS NEWS.

### THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

We continue to-day our notice, commenced last week, of the above-named report.

In the next portion of his report, Mr. Carpenter reverts to the subject of the production of sulphate of ammonia, the totals for the past three years being set forth in the following table:—

	1899. Tons.	1898. Tons.	1897. Tons.
Gas-works . . . . .	136,529 ..	129,590 ..	132,724
Iron-works . . . . .	17,963 ..	17,935 ..	17,779
Shale-works . . . . .	38,780 ..	37,264 ..	37,153
Producer gas, coke, and carbonizing works . . .	15,209 ..	11,568 ..	10,624
Total . . . . .	208,481 ..	196,357 ..	198,280

He remarks that it is to the last item contributing to the total production that the eyes of so many chemical manufacturers and technologists will be directed. Interesting information as to the recovery of residuals from coke-ovens is furnished from various sources as to the progress which is being rapidly made in developing this branch of industry, which is responsible for a great deal of the increased yield of sulphate of ammonia. Several additional plants started operations in the early part of the present year; while others are in course of extension. During the last two years, the new Otto coke-oven has been introduced into this country to compete with recovery retort-ovens of other systems already in the field. Since it was first introduced in the Rhenish Westphalian Provinces three years ago, 690 ovens have been erected; and out of 642 in course of erection in 1899, 462 are of this type. Only 50 exist as yet in this country; and expert opinion here is greatly divided as to the merits of the system. No complete installation of the system as a whole has yet found a place in Great Britain. Two great divergences in construction are to be noticed. (1) The heating flues are vertical, not horizontal, as in other retort-ovens, from the date of the Coppée ovens onwards, erected in this country. (2) There is no attempt to pre-heat either gas or air before combustion of the former. The burners heating the oven are underneath the latter in a cave, of which the temperature may be 100° Fahr., and are of the bunsen burner type. For both these features advantages are claimed with regard to (1) the coke yield of the oven, and (2) the quality and quantity of the bye-products obtained. Mr. Carpenter says time alone will show how far such claims are justified. To the physical technologist an interesting study in heat economics is presented.

In his report for 1896, the Chief Inspector called attention to a paper read by Mr. Charles Hunt at the annual meeting of the Institution of Gas Engineers in May of that year on the prospects of coal carbonizing in bulk from a gas maker's point of view, and before closing his report, he was able to add that at Halifax (Nova Scotia), plant embodying the ideas sketched in Mr. Hunt's paper had been erected. During 1899, and towards the close of the year, a very important new development on these lines was made in the neighbourhood of Boston (Mass.), of which full accounts were given in the "JOURNAL."\* Already four benches of Otto-Hoffmann retort-ovens, 50 in each bench, are carbonizing charges of 6 tons of coal, the coking time of the ovens being about 32 hours. During the first 10 hours the "rich" gas of high illuminating value is taken off, condensed, scrubbed, and purified in ordinary gas-works fashion, and supplied to the mains of the Massachusetts Pipe-Line Gas Company for consumption in Boston and its suburbs. At present, the candle power of this "rich" gas (2900 cubic feet per ton of coal coked) is 22-1, and its calorific value 749-7 B.T.U.; comparing with average carburetted water gas now supplied in Boston of 22-candle power and 749-9 B.T.U. calorific value. It contains only 8 grains of organic sulphur per 100 cubic feet.† If more gas is taken, the candle power and calorific value will, of course, be reduced. It is hoped that more than 4000 cubic feet may be taken without reducing the illuminating power below 17 or 18 candles. Experience shows that 5250 cubic feet of "poor" gas—that portion coming off at the later period of coking—is required to coke a ton of coal in the ovens. Up to the point of purification, the "poor" and "rich" gases are similarly, but not identically, treated in separate apparatus as regards condensing, scrubbing, and washing. At this point, the "poor" gas is returned to the oven for combustion with air in volume about  $4\frac{1}{2}$  times that of the gas, and preheated by regenerative arrangements to 1800° Fahr. It is considered here that economy by regeneration effects a saving of over a million cubic feet of gas per 1000 tons of coal carbonized. Any variety of coke producible by the coal used can be made at pleasure, by varying the time of coking in the oven. There are also subsidiary plants for working up residuals. The operation is a complete antithesis to carburetted water-gas making, and is of great technical interest. The very predominance, indeed, of the latter gas in Boston, with the consequent cessation of the local coke output, appears to have favoured the new enterprise in a climate where domestic stove heating is so general. Mr. Carpenter thinks it is quite conceivable that circumstances favourable to the establishment of such a plant in this country may, as indicated when Mr. Hunt's paper was discussed, already exist in some districts, and that energy and skill are only needed to take advantage of the situation.

Passing to the subject of the economy of central sources of gas supply for engines, coupled with the recovery of residuals, which has been broached, Mr. Carpenter says the circumstances of the manufacturing districts of the Midlands have been suggested as favourable for the introduction of such a scheme. Certainly great advances are being made in the construction of gas-engines to be worked by various descriptions of producer or

blast-furnace gases. Engines of 500-horse power are already working with blast-furnace gases on the Continent, and with remarkable economy. The coal consumption of a 300-horse power gas-engine worked by Mond producer gas in 1889 gave a result of something less than 1 lb. of coal per horse power per hour as delivered by the engine to the dynamo.

American engineers, however, always bold in conception, do not rest content with following on the lines of Continental advance. The Westinghouse Manufacturing Company, at East Pittsburg, are building a 1500-horse power gas-engine; and it is hoped that these engines, with three cylinders close together (inverted vertical), and with the Otto cycle, developing impulse for 75 per cent. of the revolution, will be shortly adapted for working with blast-furnace gases.

Mr. Carpenter closes this survey of the annual progress made in adding to our national wealth by recovering for use substances which, fifty years ago, were in so many isolated cases—and there were many—causes of anxiety to their producers in regard to how best to get rid of them without nuisance, with quotations from the addresses of Professor Lunge, of Zürich, at Liverpool, in October last year, and of Mr. George Beilby, to the Society of Chemical Industry in the preceding July, as sounding a note of warning on impending changes in chemical industries. He points out that Mr. Beilby indicates that the use of tar as fuel must in the future extend with a more economical treatment of coal, the use of which in a raw state as fuel will tend to diminish with time. Both of the addresses referred to have been fully noticed in our columns.

In continuation of the series of examinations recorded in his last three annual reports, the Chief Inspector gives the results of those made in 1899 on liquors from English and Scotch sources, and notes the difference in the constitution of the two kinds. He next discusses the conditions of oxidation of ammonium sulphide in liquors; and these remarks are followed by an interesting section on the analysis of these liquors. The next subjects taken up are cement and arsenic manufacture; and then Mr. Carpenter comes to tar-works. He alludes to the improvements which have taken place in plant in this description of works, and especially to the perfection, as far as this is possible, of methods in use for rendering innocuous and inoffensive the foul gases evolved in the process of tar distillation. Some extension of the Lennard continuous tar still\* has already taken place, and two more plants are expected to start operations during this year. An entirely new works on a very extensive scale is in course of erection in the North of England. After full consideration of the matter from every point of view, the intermittent principle of distillation was adopted, and not the continuous one of Mr. Lennard. Mr. Carpenter says the neighbourhood where the works are situated is one which has hitherto been innocent of any knowledge of the conduct of tar distillation or of any other chemical manufacture. He trusts, therefore, that the sanguine expectations formed by those responsible may be completely fulfilled.

In this connection, the Chief Inspector offers some observations on explosions in tar and liquor wells. They are called forth by the circumstance that in the early autumn of last year his attention was drawn by one of the District Inspectors (Mr. Jackson) to the collapse of half the cover of a large tar and liquor well in the works of the Corporation Gas-Works at Burton-on-Trent. This occurred during the night, and was preceded by the sound or report of what appeared to be an explosion of combustible gas. The tank was provided with two ventilating shafts, each one terminating in a small oxide of iron purifier of about 9 feet superficial area. One of these remained intact—the oxide being in fresh and active condition, with no indication of heating having been set up. The explosion occurred after the sulphate of ammonia plant had been in operation for a fortnight; and as liquor was gradually lowered in the well, fresh air must, it is thought, have entered by the purifier. There appeared to be no time or opportunity for accumulation of fouled oxide under such circumstances. Investigation by the Manager of the works has elicited no further information aiding in a solution. Mr. Carpenter was, however, aware that from time to time explosions had occurred in tar and liquor wells in gas-works; and Dr. Fryer, the Inspector for the South-West of England and South Wales, had knowledge of two explosions having occurred in his district from ten to fifteen years ago. The Chief Inspector pursued his investigations into this matter, and eventually produced the following list:—

- Nov., 1885 (Devizes Gas-Works).—Sulphate plant in building erected on top of well. Gaslight always burning when plant at work. Purifying material on floor above sulphate-house. One man killed.
- 1887 or 1889 (Weymouth Gas-Works).—Cover of well blown off. No light said to be near.
- July, 1892 (Nottingham Corporation Gas-Works).—Oxide in process of revivification on floor above tar-well (liquor stored separately). Temperature of tar less than 70° Fahr.; 3 inches of liquor above tar. No light nearer than 50 feet away.
- (Bury Corporation Gas-Works).—Tar-well.
- Dec., 1892 (Bradford Corporation Gas-Works, Valley Road).—Partially quenched coke from retort-house tipped close to well. Ventilating pipes inadequate in area, and found choked with crystalline deposit. Works partially wrecked. One man killed.
- Sept., 1899 (Burton-on-Trent Corporation Gas-Works).—Tar and liquor well. Two oxide purifiers, 3 feet square, erected on ventilating holes. One-half of cover wrecked by explosion at night; the oxide in remaining purifier in good condition. Liquor had been gradually lowering in tank for past fortnight. No light near.
- Dec., 1899 (Douglas, Isle of Man, Gas-Works).—Tar and liquor tanks separate. Naked light held close to open manhole of liquor-tank. No ventilating shafts. Three men killed.

Mr. Carpenter points out that the circumstances at Nottingham were peculiar, inasmuch as liquor was divided from tar; the latter being conveyed to a separate well covered by a floor on which some oxide of iron was in process of revivification. It was in this well that the explosion occurred. Mr. Chester, it will doubtless be remembered, was led to investigate the conditions under which coal gas might become mechanically entangled with tar and liquor in the scrubbers; and he experimentally determined the quantity of gas subsequently given off per superficial foot at different points in the system. At the seal-box of the scrubber, gas was given off at the rate of 390 cubic feet per square foot per 24 hours; at the separator, the evolution was 4 cubic feet on the same ratio. If even 1 cubic foot were evolved in the tar-well in 24 hours per

\* See Vol. LXXIV., pp. 1114-15, 1176-7; and Vol. LXXV., pp. 205-6.

† Sulphuretted hydrogen is removed by oxide of iron purification. It was natural to expect that "rich" gas produced at this stage of low temperature would be low in organic sulphur. In discussing Mr. Hunt's paper, however, in 1896, one eminent gas engineer gave reasons for believing that, taking the whole gas throughout the charge, the proportion of bisulphide of carbon would be much higher than with the practice of carbonizing thin masses of fuel in ordinary gas-retorts.

\* See "JOURNAL," Vol. LXIV., p. 604; also Vol. LXXIV., p. 1065.



square foot of superficies, this, with 10 volumes of air, would make a highly explosive mixture. Mr. Chester brought the matter under the notice of the members of the Manchester District Institution of Gas Engineers; and while his theory was accepted by some, opinion was greatly divided.\* Attention being again aroused in the subject by the explosion at Douglas, Mr. Carpenter found that totally different views were held by members of the profession as to the precautions which should be taken to obviate such occurrences—some favouring ventilation, others preferring the total closing of the wells. He offers these remarks on the matter:

The following fact, I think, is of great significance as supporting the correctness of Mr. Chester's views—viz., not a single explosion has to my knowledge, or to that of any of my colleagues, occurred in tar-wells attached to residuals works, where tar is daily being received in barrels, tanks, and pipes. I know of cases where the loose boarded cover of such a well is used for revivifying fouled oxide of iron, such use having continued for years without any indication of explosion. The suggestion was made that by agitation of the surface of the gas liquor (which always, moreover, has a fine skim of light tar oils on its surface) by discharge in bulk into a well of fresh volumes of liquor, sulphuretted hydrogen might be given off, which together with naphtha vapours from the source above mentioned might form an explosive mixture with air. Laboratory experiments showed that the theory *quâ* sulphuretted hydrogen may be dismissed as inadequate.

Nature.	LIQUOR.					GAS. H <sub>2</sub> S.
	Temperature.		H <sub>2</sub> S.	CO <sub>2</sub> .	NH <sub>3</sub> .	
	°C	°F.	Per Ct.	Per Ct.	Per Ct.	Per Ct. by Volume.
1.—Ammonium sulphide solution . . .	17	63	0.50	0.00	0.87	0.056
2.—Do. do. . . . .	32	90	0.50	0.00	0.87	0.154
3.—Gas liquor . . . .	35	95	0.63	2.02	2.20	1.070

A lighted match burned freely in the atmosphere of No. 3 without explosion.

It was felt to be impracticable to imitate in the laboratory the exact conditions of the atmosphere above the surface of the liquor *quâ* the vapour arising from the skim of light naphthas mentioned above. In the discussion following Mr. Chester's paper, no serious importance was attached to this as a contributing factor.

Mr. Carpenter adds an expression of his hope that, now that attention has been directed to the subject, it will not be lost sight of.

In the concluding portion of his report, the Chief Inspector refers to the sanction by Parliament last year of the scheme for the establishment and organization of a National Physical Laboratory, and to his acceptance, with the sanction of the Local Government Board, of an appointment on one of the Sub-Committees nominated by the Executive Committee to draw up suggestions on the work which, in their opinion, could be most usefully carried out by the Laboratory in connection with the science or industry they represented. His Sub-Committee had the subject of "Chemistry" assigned to them. Being in touch with so many of the leading chemical industries in the country, he was enabled to collect a number of problems of physical nature awaiting solution. The point of first importance in his own mind, as well as in the minds of all he had consulted, is summed up in one very comprehensive sentence: "To establish, collect, and codify trustworthy data on the transference of heat, by radiation, conduction, or convection, per unit difference of temperature through unit area of various materials of unit thickness in unit time."

The interesting report closes with a few remarks on chemical engineering. Following it are the reports of District Inspectors, some extracts from which will be given in a subsequent number.

# THE FORTHCOMING GAS EXHIBITION AT MANCHESTER.

The exhibition which is being organized by Mr. T. G. S. Hersey, at the St. James' Hall, Manchester, will be inaugurated on Sept. 10. The Chairman of the Manchester Corporation Gas Committee, Alderman Robert Gibson, J.P., has consented to perform the opening ceremony; and this may almost be regarded as a guarantee of the eventual success of the exhibition, as a "send-off" by the Alderman is bound to attract attention. The support of the Lord Mayor-elect (Alderman Higginbottom), who presides over the Corporation Electric Light Committee, has also been secured; and he will act in the capacity of Chairman at the opening. It is truly gratifying to see, metaphorically speaking, the lion lying down with the lamb in this way. The Gas Committee are also taking a practical and tangible interest in the exhibition. They are having an exhibit of an exceptionally fine character erected under the guidance of their Engineer, Mr. J. G. Newbigging—comprising a dark room for photometrical gas-testing, and apparatus for gas analysis, &c. The action of the Manchester gas officials in putting before the public the means of acquainting themselves with the safeguards adopted by the department in ensuring the production of gas of the quality demanded by the Acts which govern the supply is to be highly commended, and could be followed with advantage by other gas authorities. The exhibition will include departments for gas cooking, heating, lighting, motive power, plant, and photos and models. There will also be sections providing for the display of by-products recovery plant, models of plant for the recovery of tar and ammonia, samples of the products, gas coal, cannel, oil for carburetting water gas, oxide of iron, lime, &c., and the before-mentioned fully-equipped laboratory for gas analysis, and light and heat testing. It is understood that, with few exceptions, the whole of the firms taking part in this exhibition will be exhibiting at the Rifle Drill Hall, Bristol, on Nov. 9; so that the completion of the one exhibition practically means the formation of the other.

# MUNICIPAL GAS SUPPLIES IN GREAT BRITAIN.

Our readers may remember that in the "JOURNAL" for the 31st ult. we gave a list of questions on the above subject which the Committee on City Affairs of the Reform Club, New York, have been sending to gas engineers in England. We have since received from the Secretary of the Committee, Mr. Milo R. Maltbie (No. 52, William Street, New York), a revised list of the questions, with a request that they may be published in our columns, accompanied by an invitation to everyone interested in the matter to send his opinion thereon; the Committee desiring all the information they can obtain from every point of view. Their aim is to publish a study showing as accurately as possible the actual results of private ownership, public control, and municipal operation. The results of their investigation will probably be issued towards the close of the year; and the Reform Club will be pleased to send them to all who will render assistance by answering the inquiries and forwarding such reports and documents as may be of service. The following are the questions referred to above:—

- 1.—Is there competition between gas plants in British cities?
- 2.—Is it the policy of Parliament to authorize a company to supply an area when one company is already doing so?
- 3.—Is competition considered advisable?
- 4.—Can municipal corporations establish gas-works without purchasing those already existing; and, if so, under what conditions?
- 5.—Has the Borough Funds Act of 1872 practically made this impossible?
- 6.—If a company refuses to sell its plant to the town, can the town compel it to do so?
- 7.—If so, under what conditions?
- 8.—Do the Private Bills now passed usually contain clauses regarding purchase by the public?
- 9.—What means have been used to prevent over-capitalization or the "watering" of stock, and the consequent evasion of the sliding-scale or the statutory limits upon dividends?
- 10.—How far have these means been successful?
- 11.—Has the sliding-scale proved satisfactory?
- 12.—What, if any, are its disadvantages?
- 13.—Has a company ever been compelled to reduce its price because it has exceeded the maximum rate of dividends?
- 14.—Has the limit upon dividends retarded the development and progress of the gas industry?
- 15.—Is this method of control considered satisfactory?
- 16.—Are the limits usually reached?
- 17.—Are the limits fixed by General Acts, by Provisional Orders, or by Local Acts?
- 18.—Is the limit upon the price of gas effective? Would the companies charge higher prices if there were no limits?
- 19.—Are prices lower under municipal or under private operation?
- 20.—Are prepayment meters more generally adopted by municipalities or companies?
- 21.—Are prices for meters, fittings, &c., lower under municipal or under private operation?
- 22.—Is the quality of gas better under municipal or under private operation?
- 23.—Are wages higher under municipal or under private operation?
- 24.—Are hours of labour less under municipal or under private operation?
- 25.—Do labourers work more efficiently under municipal or under private operation?
- 26.—Do municipalities set aside sufficient funds for depreciation, renewal, and sinking funds?
- 27.—Does the requirement that loans be approved by the Local Government Board have a beneficial influence in this regard?
- 28.—Are municipal or private plants the more progressive and the quicker to adopt new inventions?
- 29.—Do municipal or private plants secure more gas from the same quality and quantity of coal?
- 30.—Do municipalities or companies get more from the sale of by-products?
- 31.—About what proportion of the gross profits ("receipts" less "expenditures" in the Board of Trade returns) are used in aid of rates, or placed to the credit of the borough fund?
- 32.—Is it the policy of the towns to use large sums in aid of rates?
- 33.—What is the method of valuing private works for the purpose of taxation?

# EXTENSIONS AT THE TAMWORTH GAS-WORKS.

In order to cope with the increasing demand for gas, the Tamworth Gas Company have lately completed the erection of new plant, comprising condensers, tower scrubbers, and a holder; and the ordinary half-yearly meeting last Thursday was made the occasion for formally inaugurating these extensions by an invitation to the members of the Corporation, the Contractors, and others interested in gas undertakings, to an inspection of the works, and to a dinner in the banqueting-hall of the Castle in the evening. Before noticing the new plant in detail, a brief sketch of the recent history of the undertaking may be useful. In 1892, the directorate and management of the Company underwent a complete change; and the new Board decided upon a progressive policy. The make of gas for that year was barely 17 million cubic feet; and the Company had only about 350 customers. On the introduction of gas stoves and fires, the make went up to nearly 22 millions in two years—an increase of 29 per cent.; and, as a consequence, troubles began with the manufacturing plant, and the inadequate storage. The holder capacity at Christmas, 1894, was about 100,000 cubic feet, against a day's consumption of 132,000 cubic feet; and the purifiers, which were very old (four boxes, 8 feet square and 2 ft. 6 in. deep), were found quite incapable of purifying the largely increased quantity of gas to be dealt with, to say nothing as to the future. The Directors decided to take out the holder, which had a capacity of 40,000 cubic feet, and was in a very leaky state, and not worth repairing, and erect in its tank a two-lift holder on the Gadd and Mason principle, having a capacity of 80,000 cubic feet. On

\* See "JOURNAL," Vol. LX., pp. 946, 994.



the completion of this work, a new purifier-house was built, 64 ft. 9 in. long and 46 feet wide, and four purifiers, 14 feet square and 5 feet deep, were placed in it. In 1896, the exhausters and connections being so small, having been in use many years, trouble again arose in the manufacturing department; and a new engine and boiler house was put up, and the old engine and exhauster replaced by one of a much larger type. During the years 1896, 1897, and 1898, the consumption of gas went up rapidly; and this again led the Directors to consider the advisability of putting in new scrubbers and condensers. Accordingly, they decided last year to remove the old and inadequate appliances, and provide others on a much larger scale and more modern principle. At the same time, as the make of gas had reached 34 millions, or an increase of 100 per cent. in seven years, the holder capacity had again fallen short of the requirements, as there was only storage for 120,000 cubic feet to a maximum day's consumption of 215,000 cubic feet. During last and the present year, two tower scrubbers, 7 feet in diameter and 50 feet high, with machinery rooms above, and connected with a spiral staircase, and four condensers 27 feet high, with 3 ft. 6 in. outer and 2 ft. 9 in. inner pipes, have been erected, together with a new brick and puddle tank containing another Gadd and Mason holder, 78 feet in diameter, and 25 feet deep, having a capacity of 120,000 cubic feet. The latter is prepared for telescoping, so that at any time another lift can be added, and the capacity of the holder doubled. With these very extensive alterations in the manufacturing plant, the Company have now works of a thoroughly modern kind; and in course of time they hope to compete with any town of similar size in the quality of the gas supplied and in the price charged per 1000 cubic feet. As the consumption has gone on increasing, the Company have had to enlarge the mains throughout the town and district. There are now 1250 consumers, 700 of whom are supplied by penny-in-the-slot meters, while about 300 have cooking-stoves; and nearly 400 gas-fires. The extensions have been carried out by Messrs. R. & J. Dempster, Limited, under the supervision of Mr. W. A. Sapey.

A goodly number of guests, including the Managers of neighbouring gas-works, accepted the Company's hospitality in the evening. The Chairman (Mr. M. S. Wales) presided. Mr. R. Nevill proposed "The Tamworth Gaslight and Coke Company," and eulogized the Chairman, to whose business capabilities, he said, much of the success of the undertaking was due. The Mayor (Mr. A. M. Sculthorpe, M.R.C.S.), who is a Director of the Company, proposed "The Contractors," remarking that Messrs. Dempster were a firm of world-wide reputation as makers of gas plant and appliances. They had supplied the Tamworth Company with two holders on the Gadd and Mason principle, as well as with purifiers, scrubbers, and condensers, and had done so to the Company's entire satisfaction. Messrs. Dempster were now putting up for the Longport Corporation one of these holders, which was the largest in England. Subsequently, the Chairman proposed "The Manager and Secretary." He said that during the seven years Mr. Sapey had been with them they had had continuous alterations to the works; and the plans and specifications he had prepared had shown him to be a man of no mean ability. Those who had seen the works must feel that the Company had an up-to-date Manager, and a man whom they could trust to do his duty. The Directors were thoroughly of this opinion. The toast was received with musical honours. Mr. Sapey, in reply, said he tried to do his duty to the Company; and his ambition was to make the works second to none for a town of the size of Tamworth. Other toasts followed.

### NEXT YEAR'S EXAMINATIONS IN "GAS MANUFACTURE."

We learn from the Programme of Technological Examinations of the City and Guilds of London Institute for the Session 1900-1901, which was issued last week, that the examinations in "Gas Manufacture" will take place on Wednesday evening, the 1st of May, from six till ten—the Examiner being Dr. Harold G. Colman (with Mr. Robert Morton and Mr. Charles Hunt as Consultative Examiners)—and that they will include questions founded on such subjects as the following:—

#### ORDINARY GRADE.

1. The construction of a retort or oven best adapted for the destructive distillation of coal.
2. The setting of retorts and construction of retort furnaces.
3. The effects of temperature in modifying the quantity and quality of the gas produced.
4. The description and arrangement of apparatus employed for the conveyance of the gas immediately upon its leaving the retorts.
5. The description of apparatus best adapted for cooling the gas.
6. The most suitable condition of the gas for effective purification.
7. A description of the various instruments used in gas-works for ascertaining and recording pressure and exhaust.
8. The laying of mains and service-pipes.
9. The construction of gas-meters.
10. The fixing of meters and the fitting up of premises for the supply of gas.
11. A description of the various kinds of gas-burners in general use.
12. The use of an exhauster.
13. The methods employed for controlling pressure at the works so as to secure an adequate supply of gas at the various points of consumption with a due regard for economical effect.
14. The simplest methods of ascertaining the purity and illuminating power of gas.
15. A description of the materials and methods employed for the purification of gas.
16. Influence of temperature and atmospheric pressure upon the volume of gas.
17. A description of the various tests employed for determining the values of ammoniacal liquor and spent oxide.

#### HONOURS GRADE.

In the Honours examination more difficult questions will be set in the above subjects; and, in addition, a knowledge will be required of—

1. The characteristic properties of the various kinds of coal and their value for gas-making purposes.
2. The effects of temperature upon the production of residuals.
3. The chemical composition of coal gas.
4. The chemistry of purification.
5. Gas analysis.
6. The development of illuminating power.
7. The practice of photometry.
8. The determination of the calorific power of illuminating gas.
9. Labour-saving appliances in the retort-house and the working of retorts.
10. The construction of gasholders, purifiers, and other gas apparatus.
11. The working up of ammoniacal liquor.
12. The principles of combustion and their application to the working of retort-furnaces.
13. Carburetted water gas.
14. The enrichment of coal gas by means of oil, &c.

### COALOWNERS, GAS COMPANIES, AND THE COAL QUESTION.

#### Importation of American Coal.

The principal event of the past week in connection with the coal question, apart from the effect on the coal-carrying trade of the strike of railway-men in South Wales, was the arrival in the Thames of a consignment of 3700 tons of Philadelphia coal for the South Metropolitan Gas Company, respecting which various rumours had been current the preceding week. It reached Gravesend on Thursday evening in the *Queenswood*, which was in the Victoria Dock early on Friday morning, and was discharging during the day at Messrs. Cory's hoists—the ship being too large to be accommodated at the Company's landing-stage at East Greenwich. The coal is, of course, of a kind suitable for gas-making purposes, and it has been shipped by the Westmorland Coal Company, of Philadelphia; the price on board being 12s. a ton, as compared with 16s. 6d. in the Tyne. It comes to this country with the reputation of having a productive capacity 40 per cent. higher than that of ordinary English gas-making coal; but nothing can be said definitely on this point until thorough tests have been carried out. An offer was submitted to Mr. Livesey some time ago to make a trial of the coal, and, in view of the high prices now prevailing in this country, the present time was thought to be favourable for conducting some experiments; and upon the result of these will depend the decision of the Company as to whether or not they will seek from distant shores an auxiliary supply of raw material. Mr. Livesey has stated that there is no likelihood of the present consignment being the beginning of a regular traffic. The coal, however, has been tried by Mr. Arnott, the Engineer and Manager of the Port Elizabeth Gas-Works, who considers it "as much superior to Australian gas coal as Australian is to English." It was noticed during the unloading of the *Queenswood* that the coal was, unlike English gas coal, mostly in lumps; and had it not been known to be from America, it would have been taken for Durham house coal. It should be explained that the Company are not by any means short of coal; in fact, deliveries from the ordinary sources have had to be postponed in order to make room for the special new consignment.

The action of the South Metropolitan Gas Company in this matter has brought their name and that of Mr. Livesey more under public notice than probably on any occasion since the great strike of about ten years ago; and it was only to be expected that his house would be quickly invaded by the "man" of this, that, or the other paper for information. A representative of the "Daily Chronicle" had an interview with him towards the end of the week, and gave the result in that paper on Saturday. He first elicited from Mr. Livesey the confession that the Company had gone to America for coal because of the high prices prevailing at home. They had heard, he said, that American coal was very much superior for gas-making purposes to English, so they determined, as prices were becoming extortionate at home, to give it a trial. Asked if the American coal would have cost any more than the home supplies by the time it was delivered on the works, he replied that, owing to the freight, it would; but if the coal turned out to be all that was claimed for it, there would be a considerable saving in the end. If prices went up much higher than they now are, American coal could be sold in this country so as to compete with the home supplies. In fact, it was likely to become an important factor in keeping down the prices at home in future. The cost of transit being so heavy, the Americans could not quite compete with the English yet; but he felt sure that unless there was a considerable reduction in the charges now imposed here, they would soon be able to do so successfully. "You see," Mr. Livesey added, "it is only within recent months that American coal-owners have realized the possibilities of trading with England and the Continent, owing to the rapid rise in prices which has taken place on this side of the water. They have not yet got their arrangements in working order; but when once this is done, they are capable of proving serious competitors. They are likely to reduce their present prices, and to secure a systematic service of colliers, which will lower the cost of freights, and enable American coal to be sold in Europe cheaper than English coal. If they cannot compete to any serious extent with the home supplies just yet, they can, and are preparing to, compete with our export trade to the Continent, and particularly to the Mediterranean, where so much of our coal goes. It costs very little, if any, more to ship coal to the Mediterranean from America than it costs to bring it here. But by the time English coal reaches the Mediterranean, the price is necessarily higher than it is at home. The Americans can therefore cut us out; and I shall not be surprised to find a diminution in our coal exports. It seems to me that this would be the best thing that could happen for the home consumer." In answer to further questions, Mr. Livesey said he thought coal from Canada might in time become a competing factor in Continental markets. With regard to the prospect of an immediate fall in prices at home, he said that, now the coal market is quieter, he anticipated a fall within a few weeks.

Some idea may be formed of the activity produced on the other side of the Atlantic by the scarcity and high price of coal in England and on the Continent, from a communication published by the "Daily Telegraph" last Friday from their correspondent in New York. In the course thereof he stated as follows: "Fuel shortage in England, Germany, Austria, and the Continent generally, together with the substantial advance in the price of coal in Europe, has attracted the attention of the managers of the large coal-carrying railroads in America. As a result, steps have been taken by railway managers and big coal operators to meet the insistent demand, and to supply the markets of Europe with American coal. Mr. Oscar G. Murray, Vice-President of the Baltimore and Ohio Railway, recently examined the capacity of the coal mines along the Baltimore-Ohio route. He estimates that about 25 million tons were the output over that road in 1899; and he thinks this can be increased if a large amount of coal is sent abroad. The Baltimore and Ohio Railway Company, anticipating a heavy coal export business, have agents at various places in Europe negotiating for piers and docking privileges. It is understood that the Company are also considering the advisability of leasing or building other coal-carrying freighters. If the plans are adopted, the Baltimore and Ohio Railway Company will have the largest fleet of coal-carrying steamers owned by any railroad. Pennsylvania officials are also watching the European coal demand, and



planning to increase their export of coal. The control of the Chesapeake and Ohio and the Norfolk and Western gives them a practical monopoly of the coalfields in that territory. Arrangements are being made to provide for the increased coal output along these roads, and to secure a fleet of coal-carrying boats and European docks and piers. This increase in the coal export business is likely to cause changes in the physical condition and management of these properties. Many extensions—branch lines, additional tracks, and other improvements—are contemplated on the Chesapeake and Ohio and the Norfolk and Western, to enable them to tap additional territory and handle a greater tonnage. Pennsylvania officials believe that the traffic of the former line will be enormously developed in the next few years, owing to the foreign demand for coal. Much attention will be given to management and the condition of the property. Nearly all the big coal operators along the lines of these roads know the officials desire to handle greater tonnage, and are consequently preparing to increase their output. The coalfields in Western Pennsylvania are so thoroughly absorbed and controlled by the Carnegie and other steel companies, and the output all used for home consumption, that the railroads are obliged to turn to the West Virginia fields for coal for export. There are indications that the territory will be tremendously developed in the next few years. In business circles, the news that an enterprise of such far-reaching importance is being inaugurated created much sensation."

The New York correspondent of the "Standard," telegraphing on Sunday night, said: "On this side of the ocean, as on yours, there are rumours of an impending avalanche of American coal upon Europe; but when rumours here become concrete enough to be examined, they always refer to something in the indefinite future. If Europe would guarantee that its price for coal would remain permanently upon its existing unprecedented level, Americans would supply any quantity. But, in default of such a guarantee, what is requisite is contracts of such dimensions as would warrant providing steamships confined to this trade, and terminal facilities with automatic loading appliances, as in the iron ore and oil trades. Even orders for a million tons, such as the cable hazily attributes to Russia, would not suffice to provide such equipment, unless there were a practical certainty of their repetition."

According to the "Daily Express," Mr. H. M. Rylatt, of New York, was in attendance at the London Coal Exchange last Friday, with samples of coal similar to that brought by the *Queenswood*. This gentleman describes himself as a "direct selling agent for Great Britain and Europe for the best American coal, bituminous and anthracite." He gives "special facilities for shipment;" and his coal is "sold on certified official analysis." He is in London seeking to open up Great Britain to American trade, which he says he can do if prices are kept up here. If they are not, then he has an impression that there is a bigger demand than the English trade can supply—for instance, in the Continental market. Mr. Rylatt's firm have lately signed a contract for 100,000 tons for Havre.

Speaking at the luncheon which preceded the first business meeting of the Iron Trades Consultative Council last week, Sir Benjamin Hingley, who presided, in proposing "Success to the British Iron and Steel Trades," said prices had been of late unduly forced owing to the cost of raw materials, fuel, and consequently labour, and something in the nature of a slump had resulted. Though himself largely interested in collieries, he had no hesitation in saying that coalmasters had gone to great extremes, and that trade had suffered in consequence. But the talk about a coal famine was all nonsense; and if we had a fairly open autumn and winter, there was more likely to be a plethora than a dearth of coal; and the stocks now accumulated would be sufficient to carry them through. The advice he offered to ironmasters was to hold on, and not to give way. Mr. Ebenezer Parkes, M.P., who replied to the toast, said causes had tended to check the boom in the iron and steel trades; but he did not think it was yet spent. Coal and coke governed the situation; and he believed the outside demand which had artificially forced their value was gradually slackening, and that the present high rates for fuel could not be much longer maintained. The panic among householders was largely responsible for the present state of things.

WORK OF THE PUBLIC CONTROL DEPARTMENT OF THE LONDON COUNTY COUNCIL.

Gas-Meter Testing—The Sale of Oil—Constant Water Supply.

The Annual Report of the Chief Officer of the Public Control Department of the London County Council (Mr. Alfred Spencer) has lately been issued. It furnishes, as usual, a large amount of interesting information upon a variety of matters relating to the municipal administration of London; but the portions which specially concern our readers are those dealing with the stamping of gas-meters, the consumption of oil and the accidents resulting therefrom, and the supply of water.

With regard to the first matter, Mr. Spencer points out that the Sale of Gas Act, 1859, provides one uniform standard for all gas-meters, and requires that they shall be tested and stamped. It also authorizes local authorities to appoint inspectors and provide and equip offices to carry on this work. Until May, 1898, three such offices were provided for the County of London; but, owing to the great increase of the work, the Council had to provide an additional office in Clerkenwell. This office proved a great help to the gas-meter testing service during the past year. The work has been fairly evenly distributed among the four offices—Westminster, Southwark, Clerkenwell, and Spitalfields—and no one office has been subjected to lengthy periods of high pressure, as was the case in former years when the facilities for testing were unequal, and not sufficient to enable the staff to promptly deal with the work. The Council obtained power in their General Powers Act, 1899, to acquire by compulsory purchase the freehold of the site of the Westminster office. The price is now being negotiated, and as soon as it is settled, the contemplated enlargement of the office will be proceeded with. The testing plant at all the offices is in good working order. All the 10-feet holders at the Spitalfields office have been thoroughly overhauled and repaired, and the repairs to the remaining four 5-feet holders will shortly be completed. Two of the 10-feet and two of the 5-feet holders belonging to

the Westminster office are also undergoing repairs and reverification. The continuous growth of the work is shown by the following figures:—

Year.	Number of Meters Tested.	Amount of Fees Received.
1864 . . . . .	31,186 . . . . .	£1026 13 0
1868 . . . . .	55,576 . . . . .	1862 19 0
1878 . . . . .	80,147 . . . . .	2930 3 0
1888 . . . . .	73,080 . . . . .	2670 2 6
1898 . . . . .	201,216 . . . . .	6368 16 0
1899 . . . . .	208,830 . . . . .	6620 11 0
1900 . . . . .	211,392 . . . . .	6724 14 0

The statutory fees for testing gas-meters range from 6d. upwards, according to the capacity of the meter; and the amount produced by the offices renders the service almost self-supporting. As mentioned in the "JOURNAL" last week, a marked feature in connection with this service is the great and increasing popularity of the prepayment or "slot" meter; nearly half the total number of meters tested during the past year being of this kind. Where meters are too large to be removed to the testing offices or in other special cases, they are tested *in situ*, for which double fees are charged. Last year 119 meters, ranging in size from 10 to 5000 lights, were so tested. The following figures show the total number of meters tested in the year ending March 31, 1900: Wet, 5565; dry, 205,827—total, 211,392. Of these, 189,933 were stamped and 21,562 rejected. The fees received amounted to £6724.

On the subject of petroleum, Mr. Spencer reports that during the past year 60,730 petroleum spirit (under regulation) barrels, and 2,212,689 petroleum oil (not under regulation) barrels were imported into London, each barrel containing about 42 gallons. The figures for the previous six years were as follows:—

Year.	Petroleum Spirit.	Petroleum Oil.	Year.	Petroleum Spirit.	Petroleum Oil.
1893 . . . . .	59,882 . . . . .	1,515,637 . . . . .	1896 . . . . .	84,761 . . . . .	1,858,613 . . . . .
1894 . . . . .	70,895 . . . . .	1,749,343 . . . . .	1897 . . . . .	102,486 . . . . .	1,834,873 . . . . .
1895 . . . . .	83,535 . . . . .	1,768,147 . . . . .	1898 . . . . .	77,275 . . . . .	2,242,511 . . . . .

Mr. Spencer notes the extended use of petroleum spirit in manufacturing processes, as evidenced by the increased number of licences granted by the Council during the year. There are now 420 licensed premises where petroleum spirit is kept otherwise than for sale, as compared with 390 in 1898-9 and 370 in 1897-8. Referring to legislation affecting petroleum, Mr. Spencer remarks that since June, 1898, when the Select Committee of the House of Commons issued their report, the Government have not taken any steps to give legislative effect to any of the recommendations. The Committee recommended (*inter alia*) that the flashing point should be raised to 100° Fahr.; and, although individual members of the Committee have introduced Bills for carrying out this object, their efforts have not been successful. During the past year the Council's inspectors investigated the causes of 203 lamp accidents, 22 of which had fatal results, and the remaining 181 caused fires to which the Fire Brigade were called. Particulars of these are given, as well as a table setting forth the lamp accidents investigated from July, 1890, to March 31, 1900. It shows a total of 2055, of which 250 were fatal, and involved the loss of 276 lives in the Administrative County of London. Mr. Spencer notes, with pleasure, a considerable diminution last year as compared with previous years. He says it is difficult to assign a definite reason for this decrease; but it is noticeable that a much larger quantity of Russian oil was imported into London during the year 1899-1900 than in previous years, and he thinks there can be no doubt that a considerable percentage of it was of a high flashing-point.

It is gratifying to find from the report that the whole of the County of London is now, for the first time, receiving a constant supply of water, in accordance with the provisions of the Metropolis Water Act, 1871. Upper and Lower Sydenham, supplied by the Lambeth Company, and a few houses served by the Kent and New River Companies, are situated above the statutory limits of height to which these Companies are required to furnish a constant supply. The New River Company dealt with a large area in Hampstead during the year. There are 3387 houses in this area; and of these 1500 are situate above the statutory limit of height to which the Company are required to give a constant supply. Of these houses, 1390 receive a full constant supply; 100 receive a constant supply at low level, supplemented daily by a high service of several hours' duration; and the remaining 10 houses do not receive a constant supply, but a daily service extending over some hours. This Hampstead district was the last one to be transferred from the intermittent to the constant supply; so that with the exception of 10 houses, the Company practically give a constant supply to the whole of their London area. The following table shows the number of premises in London under constant and intermittent supply on the 31st of March last:—

Name of Company.	Area in Acres of Company's London District.	Approximate Number of Houses in Company's London District.	Approximate Number of Houses under Constant Supply.	Approximate Number of Houses under Intermittent Supply.
Chelsea . . . . .	3,482 . . . . .	37,905 . . . . .	All . . . . .	None . . . . .
East London . . . . .	7,593 . . . . .	104,000 . . . . .	All . . . . .	None . . . . .
Grand Junction . . . . .	4,258 . . . . .	33,469 . . . . .	All . . . . .	None . . . . .
Kent . . . . .	18,463 . . . . .	62,426 . . . . .	62,240 . . . . .	186 . . . . .
Lambeth . . . . .	15,297 . . . . .	82,311 . . . . .	75,952 . . . . .	6,359 . . . . .
New River . . . . .	10,250 . . . . .	133,000 . . . . .	132,990 . . . . .	10 . . . . .
Southwark and Vauxhall . . . . .	14,788 . . . . .	114,000 . . . . .	All . . . . .	None . . . . .
West Middlesex . . . . .	6,330 . . . . .	62,044 . . . . .	All . . . . .	None . . . . .

Carlisle Gas and Water Profits.—It is understood that the annual accounts of the Carlisle Corporation Gas and Water Departments were submitted to a meeting of the Committee last Thursday. They showed roughly that the gas profits amounted to £7000—about £2000 less than last year, owing to the advance in the price of coal; and that the water profits showed a decrease of something like £200 as compared with last year. Nothing will be carried to the reserve fund. Mr. Corbet Woodall has had an interview with the Committee on the question of introducing carbureted water gas.



## LIVERPOOL UNITED GASLIGHT COMPANY.

The Annual Meeting of this Company was held last Tuesday—Sir EDWARD LAWRENCE in the chair.

The report of the Directors, which was noticed in last week's issue (p. 484), having been taken as read,

The CHAIRMAN moved the adoption of the report. He first referred to the great loss the Company had sustained by the death of Sir Thomas Earle, who had been associated with the Board for 31 years, and who, besides being an agreeable and cheerful colleague, was always devoted to the interests of the concern. Regarding the accounts, the Chairman thought they were eminently satisfactory. It had, he said, been a year which it was customary to call a record one. This meant that their greatest production and sale of gas had been achieved. They had sold 3,518,477,000 cubic feet, against 3,373,750,000 cubic feet in the preceding year; the net increase being 4.29 per cent. At the beginning of the year, they little dreamt that they would have such a demand for gas; but it was very satisfactory and assisted their finances very materially. The main point in the accounts to which he would call attention was that the cost of carbonizing material had been, in round figures, 15s. 2d. per ton, against 14s. in the previous year; the result being that they had paid £31,073 more than they did twelve months ago. Notwithstanding, the results were satisfactory; and the accounts showed that they had made a handsome profit, which enabled them to pay the statutory dividends as well as clear off all arrears of work outstanding twelve months ago. The receipt side of the accounts showed a remarkable state of things. They had received from the public for gas £443,418, as compared with £435,336 7s. 3d. in the previous year, notwithstanding that the price was reduced from 2s. 9d. to 2s. 8d. per 1000 cubic feet. Naturally, there was a slight reduction in the receipts from the lighting of street-lamps; and he supposed the Corporation probably looked forward to the day when that item would disappear altogether. The sale of residual products had been very satisfactory indeed. From coke they had an increase of £14,315, from tar £5167, and from ammoniacal liquor £4674—the total increase in residual products being £24,157, which was only £7000 short of the increased cost of the material used. He did not know that they could expect to go on at the same rate; but at all events they were starting this year very satisfactorily. The consumption of gas showed an increase of about 1 per cent. over last year; and therefore they had every reason to hope that the coming year might, so far as the demand for gas was concerned, be as satisfactory as the past had been. The result of the working of the coming year must, of course, be very different from what it had been in the past. It was no secret that everywhere throughout the country the price of gas was steadily rising owing to the increased cost of coal. Their own new contracts for coal from July 1 were made at, in round figures, about 4s. per ton above the price in the previous year. They advertised in the usual way; and the amount of coal offered was about the smallest they had ever known. They had, therefore, no alternative but to take what they could get, and pay the price that was required for it; for it was absolutely essential for a Company like theirs to purchase their year's supply beforehand. Living from hand to mouth as regards coal, they would be absolutely at the mercy of coal dealers and colliery proprietors. They had to consider their position on July 1; and they found that, to make things meet in the coming year, it was essential that the price of gas should be raised 3d. per 1000 cubic feet. Of this he did not think anybody could complain. Of course, it was not satisfactory to anyone to have to pay a higher price; but when they considered the rise in the price of coal and of gas all over the country, he thought they would come to the conclusion that Liverpool was not suffering badly as compared with many other places. He had a return from 45 of the leading towns in the country; and it showed that in one town there had been a rise of 10d. in the price of gas, in another 9d., in another 7d., in fifteen 6d., in four 5d., in twelve 4d., and in eleven 3d.—Liverpool being one of the eleven. Taking the average increase of all the towns, it amounted to close on 5d. per 1000 cubic feet; so that, inasmuch as they had only raised the price in Liverpool 3d. per 1000 feet, he thought consumers would see they had no reason to complain, or to imagine that the Company had been mismanaged. Respecting the price of coal, there were various reasons given for the increase. What was to happen in the future, he would not venture to predict. It was stated by many that the great boom in iron had passed away, and that there would not be the same demand for coal as there had been. Then, on the other hand, wages difficulties were continually cropping up; and the demand for coal for war purposes still went on. When the Government came into the market with a demand for 300,000 tons of coal, it must have an effect upon the price, and an immediate decrease in the price of coal could not be expected. Still he hoped that, before the Directors met the shareholders at this time next year, the worst would have passed away, and that coal would be on the high road to its former price. They had had difficulties with regard to getting coal delivered, during the winter months particularly; and, having seriously considered the matter, the Directors came to the conclusion that it was desirable to acquire more space for the storing of coal, and to endeavour to lay by during the summer months a stock which would be valuable in case colliery proprietors failed to discharge their contracts and deliver the coal which had been sold to the Company. The Directors had therefore rented some land adjoining the works at Linacre; and they hoped during the course of the next few months to be able to get a good store of coal there, so that they would not be at the mercy of contractors during the coming winter, and so that they might give their Engineer a little more peace in this regard than he had enjoyed during the past one or two winters.

Mr. J. LISTER seconded the motion.

Mr. W. E. M. TOMLINSON, M.P., remarked that he was glad to hear the Chairman's announcement about obtaining more accommodation for coal during the summer. From his own experience as a colliery proprietor, he knew that it was often very difficult, on account of weather and railway facilities, to supply the requisite quantity of gas coal in the winter.

The motion was adopted; and a dividend (tax free) was declared for the past half year, of 5 per cent. on the ordinary consolidated "A" stock and of 3½ per cent. on the consolidated 7 per cent. "B" stock.

The retiring Directors and Auditor having been re-appointed, the usual complimentary votes were passed.

## TOTTENHAM AND EDMONTON GAS COMPANY.

Mr. Corbet Woodall on Coal and Gas Prices.

The Ordinary General Meeting of this Company was held on Saturday, at the Offices, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. James Randall) read the notice calling the meeting; and the report and accounts, the principal points of which were given in last week's issue, were taken as read.

The CHAIRMAN, in submitting the accounts, was able once again to say they were satisfactory. It was, he said, hardly possible they could be otherwise when the Directors commenced their report by recording an increase of nearly 14 per cent. in the amount of gas sold. But while the accounts had been very satisfactory, they might have been more so. Unfortunately, some of their contracts for coal terminated at the end of March. Consequently, they had during the half year been buying a proportion of their coals at the high rates now ruling. On the other hand, their contracts for coke were made up to June 30; and therefore the Company had not been reaping the advantage of the higher price of coke upon a very large part of that which they had made for sale. It would be noticed that, as the result of the half-year's working, the Directors had to draw some £300 from the reserve fund; and in addition to this, they used up the balance brought forward on the profit and loss account. With the Tottenham Company, it had been almost invariable for many years past that, in the June half year, the balance had not been sufficient for the payment of the dividend. The Christmas half year was always a more profitable one than the June half. In the last half year, too, in addition to the high price of coal (which had been a most serious element), they had spent a considerable sum in the repair and maintenance of works. Upon the repair of works they had expended £2247 more than in the corresponding six months of last year, and upon the repair of mains £1289 more. It would be remembered that two years ago, when the Directors commenced the reconstruction of the retort-house, he told the proprietors how large a sum they had paid out of revenue towards the reconstruction, and he also explained that they were dealing at the time with only one-half of the house, and the other half would follow as soon as the first was completed. They had had the advantage of the reconstructed half for twelve months; and they were now completing the reconstruction of the second half. The addition of £3500 more to the wear and tear for the half year was, of course, a very grave burden; but he was quite sure he should have the proprietors with him unanimously when he said that their true policy was to meet special charges of this kind out of revenue, and to run no risk of unduly swelling the capital. In the current half year, their purchases of coals would be entirely at the higher rates; and, in fact, he thought that, during the year from June, their expenditure would be at the rate of something like 7s. 6d. per ton higher than in the past year. This involved an additional cost for coal and also for oil (because oil had gone up in about the same proportion as coal) of about £24,000 a year. Towards this they would have some economies. They would do better with coke; and they would also have some advantage in wages by the introduction of mechanical appliances. But still the year would be one of heavy expense. The Directors were unanimous in feeling satisfaction that they had not needed to raise the price of gas so far. Following the policy they had often avowed, they desired to consider the interests of the consumers equally with those of the shareholders; and as they had accumulated in the past—in the good years—some reserves to meet bad days, or lean years, they drew upon those now, and deferred as long as might be an increase in the price of gas. It would be necessary, no doubt, at the end of the year to add something to the price; but the addition would be as little as they could make it. The Directors had been slow to raise the charge; and they would be as quick as they could to reduce it. He felt sure the consumers who had shared the good times, and who he thought did recognize that the Company had done their utmost to consider their interests, would feel that the Directors were doing all they could for their interests now, inasmuch as they had delayed certainly beyond the vast majority of gas companies any increase in the price of gas. With regard to the cost of coal, he thought the inevitable fall was not far off; the present price could not be maintained much longer. But he believed all present felt with him that it was pitiful the reduction of these extravagant prices would only come about as the result of strangled industry, and would be accompanied and followed by great misery to many thousands of people. Gas companies were used to the idea of a regulated monopoly; and they believed that in their industry it had proved an exceedingly good thing for the community as well as for themselves. And the experience they were now having might possibly suggest an extension of that principle in the direction of the coal supply. He felt that coal was the nation's capital; and it might be that the nation would some day claim to have a voice in its disposal. For the present, they might grumble, but must pay; and the consumers who, as he said before, had shared their good times would now share with the Company, and the Company with them, the extra cost to which they were subject. He should like to say here that the regulations under which the Company carried on their operations were eminently just. When from any cause—such as improved manufacture, low price of materials, or cheap money—they were able to cheapen the cost of gas and lower the price they (the proprietors) shared to some extent the advantage with the consumers. When, on the other hand, the pendulum swung the other way, they shared with the consumers the loss which came upon them. He was not quite sure that the experience gas companies were passing through now had not in it just a little good. It showed that the regulations made for the government of their undertakings were not one-sided—were not made simply for the purpose of swelling dividends, but would operate equitably under adverse circumstances as well as favourable ones. He had nothing further to say in respect of the half-year's accounts; but he thought that possibly the proprietors would expect a word with regard to the remarkable fall in the price of the Company's stock. It was not for the Directors to advise the proprietors with regard to their investments. The proprietors were not speculators in shares. If the dividends were maintained, he, at any rate, did not care very much what the market value of the shares might be. He trusted that proprietors would not be so foolish as to part with their stock at the present price; but if they had any surplus money, they would



find in the Company at the present time an extremely good investment for it. When, however, he had had this idea, and had tried to profit by it, he had found there was no stock to be had. With regard to the position of the Company, he believed some of the proprietors knew he had had experience of a great many gas companies one way and another; and he could conscientiously say he knew of no company in the kingdom with a better prospect before them than their own Company had, with such a district as they had, and with works such as they had. Under such conditions as theirs, he thought the prospect before them was about as good as any public company could desire; and, this being so, although people might be so foolish as to allow the value of their stock to go down, the proprietors had no reason to fret themselves on that account. He had pleasure in moving the adoption of the report and accounts.

Mr. JAMES WARREN seconded the motion.

Mr. W. HALL remarked that the Chairman's assurance as to the stability of the concern was a gratifying feature to the proprietors. At the same time, in view of the large advance in the price of coal and oil, he thought they should make a moderate increase in the price of gas. Referring to the raising of new debenture stock, he thought that in future issues, payment might be extended over a longer period, so as to give the smaller proprietors a better chance of taking up some of it.

Mr. J. CRAWTER asked that in future accounts the figures for the corresponding period of the preceding year should be given, so as to facilitate comparison. He also inquired whether the reserve fund was entered in the accounts at the present market value of the stock in which it was invested, or at the sum paid for it. As to the contracts for coal having been made at the higher prices, the Chairman had stated that the old contracts expired in March; and yet he (Mr. Crawter) thought he was right in stating that the prices only began to rise in February.

Mr. J. CLOUDSLEY thanked the Chairman for his encouraging remarks. Considering the great expansion of the district, he (the speaker) thought there was a future before the Company which ought to reconcile the shareholders to the present drop in prices. It was very satisfactory to hear from the Chairman, with his great experience, that before long they might hope that the price of coal would be down again. In his own experience, there was never a boom in anything, with very high prices, but there was a reaction to very low prices. Speaking as a local man, he expressed the opinion that the Company had dealt fairly with the consumers. He was pleased to see the Directors were erecting a new habitation for the business of the Company in a central position. The building, he understood, would be an ornament to the district; and he agreed that the Directors should be very liberal in this matter.

The CHAIRMAN, in reply, said the Directors would bear in mind the suggestion as to allowing longer time for payment in issuing debentures. They were, however, limited by the Legislature to three months within which to get in the money. The Board would also consider the question of putting the comparative figures in the accounts. With regard to the investments, they stood at the amounts paid for them; but he believed the market value was somewhat higher. As to the purchase of coal, Mr. Crawter was not the only person who was wise after the event. Without waiting for the end of March, the Directors proceeded to purchase coal. They bought as they thought wise. But in March they had the hope that prices were not going to be quite so high as they had reached; and they shared that hope with many people in the coal trade, and many purchasers of coal. As to the new offices, they were putting up a building of which Tottenham would not be ashamed.

The motion was unanimously carried.

On the proposition of the DEPUTY-CHAIRMAN (Mr. D. FORA GODDARD, M.P.), seconded by Mr. H. BAILEY, a dividend at the rate of 6 per cent. per annum was declared on the "A" consolidated stock, and  $4\frac{1}{2}$  per cent. on the "B" stock.

The retiring Directors (Messrs. Bailey and Goddard) and Auditor (Mr. J. L. CHAPMAN) were unanimously re-elected.

The DEPUTY-CHAIRMAN, in accordance with notice, moved—"That the half-yearly meetings of the proprietors be held in the months of February and August, the day and hour to be fixed by the Directors." He explained that at present they were bound to meet on one particular day every six months; and, for the general convenience, it was thought wise to have a little margin.

Mr. J. L. CHAPMAN seconded the motion, which, after some slight discussion, was unanimously passed.

In a very cordial manner, the proprietors thanked the Chairman and Directors, and officers and staff for their devotion to the interests of the Company.

#### BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN said his first words would be of regret that their Chairman (Mr. James Glaisher) was unable to be with them again that day. He was pleased to say, however, that Mr. Glaisher was a great deal better; but did not feel well enough to attend the meeting. He (Mr. Horsley) was sure the shareholders sympathized with their Chairman; and were gratified to hear of his improved condition. Moving the adoption of the report and accounts, he remarked that in this Company they had two strings to their bow—gas and water; and they generally found that, when one went down, the other went up. On this occasion, however, he was pleased to say they were both going gradually the right way. Speaking of the water undertaking first, he said that, with the new well, although not completed, the Company were able to hold their own very fairly; and he did not think that, during this summer, any fault had been found with them by any of the authorities. At their last meeting, the shareholders were informed that the engines would be fixed at the East Barnet well by June or July. This had been done; and they were now pumping a large amount of water from this source. It was hoped they would soon be able to drive the adits; the water which they were now getting being merely derived from the area of the shaft itself. With the larger amount of water they would then

get, he did not think they would have any anxiety regarding shortness of the supply for many years to come. The Potters Bar works were not quite finished; but as soon as the adits had been driven there, the Directors would put down an engine of the requisite size for dealing with the water they would be able to derive from that source. Respecting the gas undertaking, he said the consumption was gradually increasing. Of course, when the price was raised, the increase did not, as a rule, proceed so rapidly as when the price was lowered. The high price of coal had caused the Board some anxiety; but they had not raised the price of gas sufficiently to compensate the Company for the loss which the additional price of coal entailed. They hoped, however, to get better prices for residuals. The charge for gas had been advanced by 4d.—they ought to have gone to 6d.; but they hoped to obtain the other 2d. out of the residuals. As to the results of the half-year's working, there had been an increase of 260 tons in the quantity of coal carbonized; and the average price up to June 30 had been 1s. 7d. per ton more. The gas made increased by 2,995,000 cubic feet; and the gas sold by 2,919,000 cubic feet. The gas made per ton of coal carbonized was 10,979 cubic feet, and sold 10,038 cubic feet—the gas unaccounted for being 7·07 per cent. The average price of coke sold was 11s. 6d. per chaldron. The amount received from the sale of gas was £8582, or an increase of £549; and for residual products £2872, or an increase of £526. It would be seen from this that the products had been increasing in value; and if they continued to do so, they would contribute, to some extent, towards the additional cost of coal, and prevent, he hoped, a further increase in the price of gas. Concerning the expenditure, coal had cost an additional £543; and the working expenses were £90 more. The profit on the gas undertaking for the half year was £3892, or an increase of £442. Turning to the accounts of the water department, he said the revenue amounted to £11,436, or an increase of £640. The expenditure was £6545, or an increase of £1276. He must explain why this increase was so much. It included £2500 for the extra cost of pumping and water bought. Through the extensions they had been carrying out, they had had to buy water from the New River Company; and the amount mentioned was the cost of the water and pumping. But when their new works were running satisfactorily—probably in about six months' time—they would not incur this extra expense. On water, there had been a decreased profit of £636. The total profit on gas, water, and fittings was £8828; and deducting interest on loans and income-tax (£1407), they had a net profit of £7421. The amount required to pay the dividend was £8869; and they had only £7421 to pay it with. But some years ago, the Directors saw the wisdom of not dividing up to the maximum, and instead they put by a little reserve, out of which they now proposed to take £1448. This would leave an undivided balance of £7500. He trusted that the Directors would not have occasion to draw on the reserve again—at all events for some time to come.

Dr. J. W. L. GLAISHER seconded the motion.

Mr. R. JOHNSON remarked that in the capital account, there was no expenditure charged in connection with the work which was going on at East Barnet and Potters Bar; but in the general balance-sheet there was an item on the credit side, "Amount expended on works in progress, but not yet charged to capital account, £36,162." In December last, the item amounted to £27,595; so that £8567 had been spent on this account during the half year. He should like to ask when the amount was going to be charged under its proper head.

The CHAIRMAN replied that it had been the practice of the Board to keep such charges open until the work was completed. It was hoped that it would be finished before the end of the half year; and when the next balance-sheet came out, Mr. Johnson would probably find that it met with his views in this respect.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. I. A. CROOKENDEN, a dividend was declared at the rate per annum of 9 per cent. on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" gas and water stocks.

The CHAIRMAN moved, and Mr. S. SPENCER seconded, a vote of thanks to the Engineer (Mr. T. H. MARTIN), to the Secretary (Mr. Drew), and to the other officers of the Company.

Mr. MARTIN, in responding, mentioned that he had been working for the success of the Company for the past 27 years; and he hoped and trusted they would see the day when they would have all the water they desired. It was a difficult matter to find water in North London; and when they did get to a good place, and thought they were on safe ground, they found a large Railway Company following in their wake, and taking the water from them. He hoped the East Barnet well would be completed before Christmas. They were getting about 600,000 gallons a day from the shaft. When the new machinery was finished, it would save expense; and by the time the shareholders met again, he hoped the Company would be able to say that they had as much water as the new engine would lift. The total quantity would be  $1\frac{1}{2}$  million gallons.

Mr. DREW also briefly responded.

On the motion of Mr. R. H. DYER, seconded by Mr. T. GUYATT, the devotion of the Chairman and Directors to the Company was also acknowledged.

**The Price of Coal and Gas at Huddersfield.**—Speaking at the last meeting of the Huddersfield County Borough Council, Alderman Stokes informed the members that the Gas Committee had purchased all the coal they required for the next twelve months; and, as nearly as he could see, the extra cost would amount to something like £12,000. It was proposed to increase the price of gas for heating, cooking, and motive purposes to 2s. 3d. per 1000 cubic feet. The minutes, which referred to the above matters, were adopted.

**A Water Scheme of the Chorley Rural District Council.**—Colonel W. R. Slacks has, on behalf of the Local Government Board, held an inquiry respecting an application by the Chorley Rural District Council for sanction to borrow £7000 for works of water supply for the townships of Clayton-le-Woods, Whittle-le-Woods, and Wheelton. At present water is merely obtained from wells in various parts of the district; but it has now been arranged to secure a supply from the Thirlmere mains of the Manchester Corporation. The agreed price is 8d. per 1000 gallons.



## PROVINCIAL GAS AND WATER COMPANIES.

## Gas Companies.

The accounts of the Ascot District Gas Company for the six months ending June 30, which will be presented to the shareholders tomorrow, show that the revenue in that period was £3060, as compared with £2798 in the first half of 1899; and the expenditure £1898 (coals figuring for £1083, against £923). The balance carried to the profit and loss account is £1161, as compared with £1054. After providing for every charge against the half-year's working, there remains a balance of £1882 at the credit of this account, out of which the Directors will recommend the payment of a dividend at the rate of  $4\frac{1}{2}$  per cent. per annum and the carrying forward of the balance, amounting to £893. The revenue in the past six months shows an increase of 9.38 per cent. over that of the corresponding period of 1899. The works and plant, under the supervision of Mr. A. E. Brooks, the Company's Engineer and Manager, are in good order. Since the last report, the Directors have acquired the Bagshot Gas-Works. A new trunk main is being laid to that town in order to supply it direct from the Sunninghill works; and the Directors have arranged for the improvement of the supply to Bracknell. These, with a railway siding into the works, will entail considerable outlay of capital; but the Directors fully anticipate that it will be justified by an increased revenue, as well as by a saving in the cartage of coal and other materials.

The Directors of the Bath Gas Company will report, at the half-yearly meeting next Friday, that in the six months ending the 30th of June the sales of gas increased at the rate of nearly 8½ per cent.; representing an addition of 21 million cubic feet to the quantity consumed in the corresponding period of 1899. The revenue from the sale of gas was £29,121; residuals produced £8988 (a substantial increase); and the total receipts were £40,371. The expenditure on the manufacture of gas was £24,312 (coal and oil costing £15,784); on distribution, £3841; and on management, £1660—the total expenses being £31,922. The balance carried to the profit and loss account is £8449; and there is a sum of £13,088 available for distribution. The payment of the usual dividends will be recommended.

According to the report to be presented to the shareholders on the 7th prox., in the six months ending June 30 the quantity of gas sold by the Brighton and Hove General Gas Company was 9.3 per cent. more than in the corresponding period of 1899. The income derived from this source and from the sale of residuals shows a satisfactory increase; but the cost of coal, oil, wages, and of nearly every class of material used in the manufacture of gas, has been much greater. Under these circumstances, the Directors were compelled to give notice of an increase in the price of gas of 6d. per 1000 cubic feet, to take effect from 1st ult. This advance brings the price up to the standard, and the adoption of the standard rates of dividend becomes a matter of course. The revenue in the half year amounted to £107,407; the expenditure, to £84,753—leaving £22,654 to go to the profit and loss account. The balance available for distribution is £27,188; and the Directors recommend that dividends for the half year be declared at the rate of 10 per cent. per annum on the original ordinary consolidated stock, 7 per cent. per annum on the "A" ordinary consolidated stock, and 6 per cent. per annum on the "B" preference consolidated stock; and for the three months ended June 30 last at the rate of 4 per cent. per annum on the "C" preference consolidated stock. For the payment of these dividends £20,521 will be required; leaving a balance of £6667 to be carried forward.

At the half-yearly general meeting of the Colney Hatch Gas Company last Thursday, the Directors presented accounts which showed that in the six months ending the 30th of June the revenue from the sale of 35,684,200 cubic feet of gas amounted to £6545; residuals produced £1782; and the total receipts were £9027. The expenditure being £6797, there was a balance of £2230 to go to the profit and loss account. The amount available for distribution was £5147; and the Directors recommended dividends at the rates of 10, 7, and 5 per cent. per annum on the original, additional, and preference shares and stock. The payment of these would absorb £1986, and leave a balance of £3161.

The report which the Directors of the Dover Gas Company will present at the ordinary half-yearly meeting on the 3rd prox. opens with the gratifying statement that in the six months ending June 30 there was an increase of upwards of 10 per cent. in the sales of gas, and that 390 prepayment meters were fixed. The net revenue from the sale of gas amounted to £14,030; residuals produced £5169; and the total receipts were £20,571. The expenditure on the manufacture of gas was £14,974 (coals and oil costing £9983); on distribution, £2627; and on management, £1068—the total expenses amounting to £20,049. The balance carried to the profit and loss account is £522; and the sum available for distribution, £3221. The Directors will recommend the declaration of the usual dividend at the rate of  $7\frac{1}{2}$  per cent. per annum, less income-tax. This will amount to £2875, and leave £346 to the good.

The report of the Morecambe Gas Company recommends dividends for the half year ending June of  $7\frac{1}{2}$  per cent. on the consolidated stock and  $6\frac{1}{2}$  per cent. on the new ordinary stock; making a total payment for the year of  $15\frac{1}{2}$  per cent. and  $12\frac{1}{2}$  per cent. respectively. It was also stated that the Bill for the purchase of the undertaking by the District Council received the Royal Assent on July 10; but at present the Company are working on behalf of the Council. The completion of the purchase is fixed for Jan. 1 next. Until then the Company will receive interest at the rate of 4 per cent. on the amount of the purchase money; and out of this interest, the dividends for the next half year will be paid. The revenue for the year ending June 30 was £14,906; the expenditure, £9993; leaving a balance of £4913.

In the first half of the year, the Riddings District Gas Company had a revenue of £2311, of which £1953 was derived from the sale of gas. The expenditure in this period amounted to £1475; so that there was a balance of £836 to go to the profit and loss account. The amount available for distribution was £2556; and at the half-yearly meeting of the Company last Friday the Directors recommended the payment of a dividend at the rate of 6 per cent. per annum, free of income-tax.

The annual general meeting of the Ryde Gas Company was held last Thursday, when the accounts presented showed that the revenue from the sale of gas in the twelve months ending June 30 amounted to £11,161; residuals produced £3884; and the total receipts were £15,413. The expenditure on the manufacture of gas was £8485 (coals costing £6557);

on distribution, £318; and on management, £858—the total expenses being £10,559. The balance carried to the profit and loss account was £4854; and the amount available for distribution was £2642. The Directors recommended the declaration of the maximum dividends. They stated that the whole of the plant on the works (under the supervision of Mr. F. F. Farrand) had been maintained in a condition capable of coping with the demands of a growing business. Notwithstanding the continued advance in the cost of coals, the price of gas had not been raised; and it was hoped that the consumers would realize and appreciate this advantage at a time when most gas companies were considerably raising their charges. The quantity of gas sold during the year was 5.89 per cent. more than in 1898-9—an increase due mainly to the growing recognition of the value of gas for cooking and heating purposes. The Directors recorded their appreciation of the efficient services rendered by the Manager, the Secretary (Mr. A. E. Coombes), and the staff under them. The report was adopted.

At the half-yearly general meeting of the Scarborough Gas Company on the 18th inst., the Chairman (Mr. B. Fowler, J.P.), in moving the adoption of the report, the principal features of which were noticed last week, stated that the undertaking was in a most satisfactory condition. The sale of gas in the six months ending June 30 showed an increase of 4,835,000 cubic feet, or 4 per cent., as compared with the corresponding period of last year; while for the entire year there had been a rise to the extent of 10,757,000 cubic feet, or 4 per cent. During the year, the number of consumers had gone up from 6704 to 7083, the public lamps from 1406 to 1472, and the cooking-stoves on hire from 1403 to 1526. On the sale of gas they had had an increase of £657; on meter-rents, of £53; and on stove-rents, of £23. This was most satisfactory, when they considered that they had the electric light to compete with. The gross receipts had been £21,043 15s. 3d., an advance of £1156 1s. 1d.; while the payments had been £15,614 8s., a rise of £435 4s. 11d. On capital account they had spent £2801 3s. 7d., chiefly in extensions of works and for new meters. The amount carried to the profit and loss account was £5789, as compared with £5068, or £721 more. The balance, after the payment of the dividends (which would absorb £6337), was £325 11s. 9d. The report was adopted, and dividends of 5 per cent. all round (free of tax) were declared. Thanks were accorded to the Chairman and Directors, as well as to the Engineer and Secretary (Mr. J. Holliday) and the officials, for their services on behalf of the Company.

The shareholders of the Tamworth Gas Company met last Thursday, and received a report which stated that the profit for the year amounted to £1411. An interim dividend of 10 per cent. and 7 per cent. on the old and new shares respectively was paid in December; and the Directors now recommended a similar distribution for the remaining half year. The Chairman (Mr. M. S. Wales) said the Company, owing to the increase in the price of coal, had had to raise the price of gas 5d. per 1000 cubic feet; but at the earliest opportunity it would be reduced. Mr. T. J. Hill having seconded the motion, Mr. Arnold protested against the adoption of the report, on the ground that there would have been no necessity to increase the price of gas had the Directors maintained the reserve fund instead of spending it on extensions. He alleged that the Directors had sold land to the value of £516 without having permission to do so under the Act of Parliament, and said the sale would have to be rescinded. Mr. Hill replied that the increased cost of coal was equal to 7d. per 1000 feet; but they had only charged 5d. to the consumer, and the rest was provided for by the economies they had effected owing to the new plant on which the reserve fund had been expended. As to the sale of land, Mr. W. Carr remarked that the former Board of Directors, of which Mr. Arnold was Chairman, had no right to buy the land in question; so that the present Board could not be acting illegally in disposing of it. The report was adopted.

The annual general meeting of the Taunton Gas Company was held last Tuesday—Mr. J. Barrett in the chair. In their report, the Directors stated that the quantity of gas sent out in the twelve months covered by it had been 73,356,000 cubic feet. The continued increase in the price of coal had compelled them to modify the scale of discounts allowed to consumers as from the 15th of June last. The amount available for distribution was £4103; and the Directors recommended dividends of 5 per cent. on the preference stock, and 8 and 7 per cent. on the "A" and other stocks. These would amount to £3221, and leave a balance of £882 to be carried forward. In moving the adoption of the report, the Chairman remarked that the quantity of gas delivered was 8,135,000 cubic feet more than in the previous year, which was, no doubt, caused to a considerable degree by the more extended use of gas for culinary purposes. With regard to the increase in the price of coal, the Directors had fortunately made their contracts for the year under most favourable circumstances, and they had at present a large stock. The only way in which they had been able to meet the increased price was by a little modification in the scale of discounts. The greatest amount that any consumer would be called upon to pay would be 3d. per 1000 cubic feet; and comparing this with the additional sums, ranging from 4d. to 8d., which were charged in other towns, he thought they were to be congratulated on being able to conduct their business so profitably, and to pay the same statutory dividends. He was pleased to say that the residuals were producing a larger amount than they had done for a considerable time. As to their prospects of prosperity for the future, he might say he had been looking back on a few of the old balance-sheets, and he found that in June, 1881, the output of gas was 42,138,900 cubic feet, so the increase during nineteen years had been 31,217,100 cubic feet, which he thought was a very good progressive advance in their business. Mr. R. Barnicott seconded the motion, and it was carried. Votes of thanks were accorded to the Chairman and Directors, as well as to the Engineer and Secretary (Mr. A. Edwards) and staff generally.

The annual general meeting of the Truro Gas Company took place last Tuesday, when the Directors presented the accounts for the twelve months ending the 30th of June. These showed that the sale of gas had produced £6336 out of a total revenue of £12,574. The expenditure having been £11,313, there was a balance of £1261. The amount available for distribution was £1596, which was disposed of as follows: Dividend at the rate of 6 per cent. per annum, £960; addition to the reserve fund, £200; carried forward, £436. The Directors reported that, in consequence of the enormously increased cost of coal, iron, and other materials, they were very reluctantly compelled to raise the price of gas by 5d. per 1000 cubic feet, as from the 1st of April last; but, notwithstanding this, the



business showed a diminished profit as compared with the previous year. The works and plant, under Mr. Ingram's supervision, have been maintained in a thoroughly efficient state.

The 107th half-yearly general meeting of the Wakefield Gas Company was held on the 20th inst.—Mr. W. A. Statter, J.P., in the chair. In making his usual statement, the Chairman referred to the satisfactory nature of the accounts for the six months ending June 30. The total expenditure was £15,450, against £11,932 for the corresponding period of 1899—a difference of about £3,400, which was accounted for as follows: Coals, £2000; wages, £350; repair of works, £650; rates, £250; and interest on banking account, £150. The income had gone up from £18,148 to £21,405, owing to an increase of nearly 12 million cubic feet in the sale of gas, and the greater value of residual products. The balance of profit was about £400 more than the amount required for the dividend. During the half year, the Company had spent £914 on capital account, which was now overdrawn to the extent of £7865. The Directors proposed to call up on the 1st of October £1 per share on the 2500 £10 shares (£4 paid), and to raise on loan £6200. The alterations and extensions at the works commenced some time since were making satisfactory progress. A portion of the Company's district having, as the result of an inquiry by the Local Government Board, been included in the borough of Ossett, the Corporation were requested to agree to a clause being inserted in the Provisional Order protecting the rights of the Company. This they refused to do, but made an offer which was so inadequate that the Directors could not entertain it. It was therefore necessary to fight the matter out before a Committee of the House of Commons, with the result that the whole of the present lighting had been retained. The report was adopted, and the usual dividends at the rates of 11½, 9, and 8½ per cent. per annum were declared. The retiring Directors (Messrs. R. E. Goldthorp and G. A. Moorhouse) were re-elected, as was also the retiring Auditor (Mr. C. Hopkinson). A hearty vote of thanks was accorded to the Chairman for presiding, and to the Directors for their attention to the business of the Company. The Chairman, in responding, accepted the vote as a sincere expression of confidence, and in very appreciative terms proposed a similar vote to the Engineer and Manager (Mr. H. Townsend), the Secretary (Mr. W. H. Parker), and the staff, which was duly acknowledged.

At the meeting of the Waltham Abbey and Cheshunt Gas Company next Friday, the accounts to be presented will show that the revenue in the six months to June 30 amounted to £5313, as compared with £4759 in the corresponding period of 1899; and the expenditure to £3707, against £3119. The balance carried to the profit and loss account is £1606, against £1490. The sum available for distribution is £2487; and the Directors will recommend the declaration of dividends at the rate of 8 per cent. per annum on the "A" shares, and of 6 per cent. per annum on the "B" and "C" shares—being ½ per cent. per annum additional on all classes—leaving £1200 to be carried forward. Under the supervision of Mr. W. Bince Randall, the Company's Engineer and Secretary, 2043 tons of coal were employed in the manufacture of 21,515,000 cubic feet of gas, of which 18,526,000 cubic feet were sold for private consumption, as compared with 16,123,000 cubic feet in the first half of 1899.

The usual statutory dividends were declared at the recent half-yearly meeting of the Weston-super-Mare Gas Company; and it was reported that there had been an increase of 3,300,000 cubic feet in the consumption of gas, as compared with the corresponding period of last year. At a subsequent special meeting, it was resolved to raise the balance of the loan capital—£11,500 having been authorized, out of which £7375 had been already raised.

The Directors of the Winchester Water and Gas Company, in the half-yearly report presented at the meeting of shareholders yesterday, stated that the receipts on revenue account in the six months ending June 30 amounted to £11,886, and the expenditure to £7799; leaving a balance carried to profit and loss account of £4087. They recommended the payment of dividends at the rates of 10 and 7 per cent. per annum on the original and new capital respectively.

At the meeting of the Wolverhampton Gas Company to-day, the accounts to be presented, covering the six months ending June 30, show that the revenue from the sale of gas amounted to £36,564, while that derived from the sale of coke, tar, &c., and from fittings and rents, was £19,492; making together £56,056. The expenditure having been £47,027, the balance on the half-year's working was £9029. This, added to the amount brought forward, £1811, enabled the Directors to recommend the payment of a dividend of 3 per cent. upon the preference and new ordinary stocks, and one of 5 per cent. upon the consolidated stock, less income-tax. In the previous half-yearly report, it was mentioned that the Directors had applied to Parliament for power to raise additional capital to enable them to meet the cost of further extensions of the works, the enlargement of mains, &c. They now state that an Act authorizing additional capital, not exceeding in the whole £140,000, received the Royal Assent on the 30th ult. Pursuant to its provisions, after the ordinary meeting, a special general meeting will be held, and a resolution submitted to sanction an increase in the capital of the Company by the creation and issue of £30,000 new ordinary stock entitled to a standard rate of dividend of 6 per cent. The very large increase in the price of coals and other materials used in the manufacture of gas compelled the Directors in July to raise the price of gas by 3d. (to 2s. 9d.) per 1000 cubic feet.

#### Water Companies.

The net revenue receipts of the Brymbo Water Company for the past year were £2312; and a dividend at the rate of 4½ per cent. has been declared. The business is increasing; and it is intended to raise further capital—the expenditure having already exceeded by £1619 the amount received.

The Directors of the Lewes Water Company recommend dividends of 5, 3½, and 2½ per cent. on the various classes of shares for the past half year, making 10, 7, and 5 per cent. for the year, and, in addition, the payment of 15s. per original share to the holders on account of arrears. These payments will absorb £1270, and leave only £18 to be carried to the reserve fund, which will then amount to £598. The Directors refer to the death of their colleague Mr. James Broad, who had been a devoted Director for above 14 years. The vacancy has been filled by the appointment of Mr. C. R. Kemp.

The water-rental of the Maidstone Water Company for the past half

year is remarkably close to that for the corresponding period of 1899. The total was £5458 5s. 5d., which is an increase of 9s. 11d. The amount to the credit of the profit and loss account is £2550; and dividends at the rate of 5 and 3½ per cent. per annum on the 10 per cent. and 7 per cent. shares respectively are recommended. After paying these, £1430 will be carried forward.

The half-yearly general meeting of the West Surrey Water Company was held last Tuesday, at the London Offices, No. 38 Parliament Street, S.W.—Mr. A. Telford Simpson in the chair. The Directors reported that the income for the half year ending June 30, after making provision for empty houses, irrecoverable rates, &c., amounted to £5000, and the expenditure to £1980. Comparing the account with that for the corresponding period of 1899, the income exhibited an increase of £391, and the expenditure a rise of £248. There were 2544 yards of cast-iron pipes (6 inches and 3 inches in diameter) laid for the extension of service-mains, and 149 additional supplies were connected, representing a future rental of about £328 per annum. The Engineer and Manager (Mr. John K. Hill) reported that the plant, mains, and works were in good order. After transferring £100 from revenue to the contingency fund, the amount available for distribution was £4277 15s. 7d., which the Directors recommended should be applied in payment of dividends at the rates of 5 and 6 per cent. per annum upon the preference shares, amounting to £536 10s., and of a dividend at the rate of 7 per cent. per annum upon the ordinary shares, amounting to £1978 18s.; leaving a balance of £1762 7s. 7d. to be carried forward. The recommendation was agreed to.

#### GAS AND WATER FINANCES AT WARRINGTON.

The Borough Treasurer of Warrington (Mr. J. Fairhurst) has published an abstract of the Corporation accounts for the year ending March 31 last; and a local paper—the "Observer"—in drawing information from it, made the following remarks concerning the finances of the Gas and Water Departments:—

The gas-works accounts show that the Gas Committee made a grant out of their profits of £1135 to the relief of the improvement rate when they could not afford it; and to this extent gas consumers have narrowly escaped having to make up the amount. The total profits amounted to £10,047. But from this has to be deducted £7836 for a year's interest, annuities, and sinking fund; £1288 added to the reserve fund; and the £1135 given to the relief of the rates—three items which more than absorb the total profits. As a rule, the Gas Committee have a substantial balance at the bank; but now, largely owing to their generosity in assisting the rates at the expense of the gas consumer, they owe the bank £2506. The Gas Engineer, in his annual report, states that "the postponement of the renewals and repairs of buildings and plant where not absolutely necessary, together with increased receipts from residuals, will probably enable us to carry on the works for the coming year without loss. An early reduction in the price of gas was promised last year, but owing to the present inflated prices for raw material, it is not advisable to make any alterations at present." From the foregoing, it will be seen that the Gas Committee have not much money to give away.

The Water Department appears to be about paying its way. The total profits amounted to £11,514, from which has to be deducted £10,500 for interest, annuities, and sinking fund, and £1024 expended on new mains; so that there is really a small adverse balance.

The accounts in connection with the Bill for the extension of the water-works, &c., show that the expenses amounted to £6860. Expenses attending the Committee of the House of Commons came to £384; professional services and expenses of witnesses £1604; legal expenses £3918; printing, stationery, and advertising £30; extra assistance £39; and sundry expenses £35. A sum of £216, the proportion of expenses incurred in arranging the poll, was taken from Walker's Gift Account. Evidently going to Parliament is a very expensive process.

#### WEST BROMWICH GAS-WORKS EXTENSION SCHEME.

##### The Local Government Board and Water-Gas Plant.

The Gas Committee of the West Bromwich Corporation have issued a special report dealing with several important matters relating to the Gas Department. After notifying the acceptance of tenders for iron roofs and an exhaustor-house, the Committee state that they have had under consideration a letter received from the Local Government Board announcing that the Board are not prepared to entertain that part of the Council's application for sanction for a loan of £9000 for gas-works purposes which refers to the provision of water-gas plant. The amount included in the application for this object was £3700, with an added 10 per cent. for contingencies; and as further gas-making power is urgently required for the ensuing winter, the Committee feel it incumbent upon them to lose no time in proceeding with the erection of the necessary plant. They have fully considered the question as to whether an extension of the existing coal-gas plant should be made, or whether the plant should be augmented by water-gas plant: and they recommend the latter course, not only on the ground of economy in the initial outlay, but also because of the many advantages which this plant offer for running in conjunction with coal-gas plant in the depth of winter, when the productive power of the works is most severely taxed. In view of the refusal of the Local Government Board to sanction a loan for this purpose, the Committee point out that the cost must, of necessity, be a charge upon the revenue account, spread over a period of two or three years. A complete installation of water-gas plant sufficient for the requirements of the borough for some time is estimated to cost approximately £4000; whereas an extension of coal-gas plant is reckoned to entail an expenditure of between £16,000 and £17,000. They recommend the acceptance of the offer of Messrs. R. & J. Dempster, Limited, of Manchester, for a complete installation of a Dellwik-Fleischer water-gas generator, and that they be empowered to enter into arrangements for obtaining other parts of the plant, machinery, and buildings in connection with the scheme. They also advise the Council to withdraw their application to the Local Government Board for sanction to a loan, so far as it relates to the water-gas plant, and to amend the remainder so as to make the total £5524,



ELECTRIC LIGHTING IN GLASGOW.

The Annual Accounts—Sharp Criticism.

At the Meeting of the Glasgow Corporation last Thursday week—Lord Provost CHISHOLM in the chair—the annual report and accounts of the Electricity Committee were submitted. The report was as follows:—

The gross revenue amounts to	£59,762	2	0
The gross (or working) expenditure to	£34,999	15	11
To this is added depreciation written off capital.	3,181	10	11

38,181 6 10

The balance carried to the profit and loss account being . . . £21,580 15 2

Out of this, the Committee had to meet the following requirements:—

(1) Interest on loans.	£15,256	0	7
(2) Sinking fund . . . . .	6,285	0	0

£21,541 0 7

Leaving a balance of . . . . . £39 14 7

This has been placed to the credit of the reserve fund.

The Committee regret that, owing to the large amount which has had to be paid as interest on money borrowed for new works during the past year, which are as yet unproductive, it has not been found possible to write off in the account now submitted so large an amount in respect of depreciation as was written off in the previous year.

With reference to the charges to be made for the supply of electrical energy during 1900-1, the Committee recommend that these should be as follows:—

I.—Under the demand indicator system—

- (1) When a quantity not exceeding the maximum demand for 865 hours in the twelve months (being an average of one hour per day) is used . . . . . 6d. per B.T.U.
- (2) All current consumed over the above quantity at 100 volts pressure . . . . . 2½d. "
- (3) All current consumed over the above quantity at 200 volts pressure . . . . . 2d. "
- (4) All current consumed over the above quantity at 250 volts pressure . . . . . 1½d. "

II.—Under the fixed charge system—

- (1) A fixed charge of 4s 6d. per annum for each 8-candle power (32 watt) lamp or its equivalent fixed in consumer's premises (or 470s. 8d. per kilowatt) for 100-volt supplies; 4s. 4d. per 8-candle power lamp fixed (or 4615s. 5d. per kilowatt), for 200-volt supplies; and 4s. per 8-candle power lamp fixed (or 465s. per kilowatt), for 250-volt supplies—this charge being spread uniformly over the twelve months.
- (2) An additional charge for all current used as recorded on the meter, at the rate of 1½d. per B.T.U.

III.—All consumers who take a supply for the equivalent of five hours or more per day for 365 days per annum to be charged throughout at the rates of 2½d. per unit for 100-volt supplies, 2d. per unit for 200-volt supplies, and 1½d. per unit for 250-volt supplies.

IV.—That a special rate of 3d. per unit be charged for supply to churches.

V.—That for domestic consumers only, a uniform charge of 3½d. per unit for 250-volt consumers, and 4d. per unit for 100-volt and 200-volt consumers, be made without the use of the demand indicator.

VI.—That for motive power purposes only, subject to such conditions as it may be necessary to enforce for the proper protection of the Corporation, a uniform charge of 1½d. per unit for 250-volt consumers, and 2d. per unit for 200-volt consumers be made, also without the use of the demand indicator.

(Note.—The charges under heads IV., V., and VI. have already been approved by the Corporation.)

The quantity of electricity sold to private consumers during the past year was 3,788,795 units, as compared with 2,566,016 units during the previous year; being an increase of 47·65 per cent.

The above 3,788,795 units were sold at the following prices per unit: 1,314,259 at 6d., 13,252 at 3d., 635,338 at 2½d., 923,875 at 2d., and 902,071 at 1½d.

An analysis of the consumers' accounts for the past year shows the following figures:—

Consumption not exceeding		100 units	No. of Accounts.	Quantity Consumed.
			553	23,078
"	"	500	864	288,112
"	"	1,000	520	370,951
"	"	2,000	415	593,671
"	"	3,000	184	449,007
"	"	4,000	96	342,339
"	"	5,000	68	249,954
"	"	7,500	66	384,486
"	"	10,000	39	339,898
"	"	15,000	31	374,462
"	"	20,000	8	133,625
"	"	30,000	5	113,923
Consumption over		30,000	5	175,289

The number of consumers on May 31, 1900, was 2852, as compared with 1858 on May 31, 1899; being an increase of 994, or 53·49 per cent., during the year. There were 162 consumers who used the equivalent of five hours or over per day of their maximum demand throughout the year.

The number of motors in use and supplied off the Corporation mains on May 31, 1900, was 212, as compared with 78 at May 31, 1899.

The total number of arc lamps erected and in regular use in the streets as at May 31, 1900, was 265, as compared with 227 at the same date last year; and the quantity of electricity consumed for street lighting was 461,874 units, as compared with 258,334 units during the preceding year.

The number of 8-candle power lamps applied for, or the equivalent in other devices, recorded in the books of the Department as being connected to the mains at May 31, 1900, was 241,625, as compared with 191,062 at the corresponding date last year; being an increase of 50,563. These figures, however, cannot in either case be regarded as absolute, on account of the additions which consumers repeatedly make to their installations without giving notice to the Department, although such notice is required by the regulations. It is probable that the actual number of lamps connected, or the equivalent thereof, is far in excess of the figures now given.

The number of units consumed by private consumers, per lamp fixed, averaged out month by month according to the date of connecting up, was 17·42, as compared with 14·8 last year; but this figure also cannot be taken as absolute, for the reason above stated.

The maximum load or demand made on the generating stations during the year occurred on the 9th of January last, when it was 4258 kilowatts.

During the year, the buildings at Port-Dundas have been practically completed, as far as the first section is concerned. The amount of steam plant erected, or in process of erection, and nearing completion, as at May 31, 1900, at Port-Dundas, was nearly 7000-horse power; being rather more than double the amount of plant (3300-horse power) previously fixed

in the Waterloo Street station. There is, therefore, 4500-horse power extra available at Port-Dundas to meet the coming winter's load as compared with the amount available last winter. In addition to this, the buildings at the Pollokshaws Road station have been advanced to a stage nearing completion; and the erection of the boilers, engines, and dynamos to an aggregate of 2200-horse power is now being proceeded with. This will provide an additional 2200-horse power beyond that above indicated to meet the demands of the coming winter; and after the wants of Pollokshields and other parts of the South Side area in which mains will be ready for supply have been met, a considerable amount will remain available for assistance on the North Side if required. A further extension of plant for the Port-Dundas station of about 5000-horse power is on order, and this is expected to be in full operation before the 31st of May next. An arrangement has also been made to put in additional plant of 2200-horse power in the Pollokshaws Road station, after the close of the Glasgow Exhibition of 1901. This plant, consisting of two engines and dynamos, is due for delivery at the Exhibition in January, 1901, where it will be erected and used till the close of the Exhibition.

About 20 miles of new feeders and 20 miles of distributing mains have been laid during the past financial year on the north side of the Clyde, and about seven miles of feeders and five miles of distributing mains have been laid on the south side of the river, in addition to what had been laid down before May 31, 1899. These feeders and mains the Committee confidently hope may be put in use by October of the present year.

The undertaking of the Kelvin-side Electricity Company, Limited, came into the hands of the Corporation in August, 1899, and the Committee are now putting in about 1000-horse power of new plant to meet the rapidly growing demand in the Hyndland district of Kelvin-side, and also in the Downhill district. There is a steadily increasing demand within the area of the Kelvin-side Estate; but it should be specially noted that during the past year 81 new consumers have been connected to the mains in the new tenements in Hyndland Road district alone, and this number is rapidly growing—as many as 22 having been added since the 31st of May last.

The accounts show that of a capital of £700,000 there has been borrowed £628,500, and that there has been repaid £11,500; leaving the amount sanctioned but not borrowed at £60,000. The capital expenditure during the year was £269,102, of which £135,851 was upon mains and cables. The generation of electricity cost £21,000, of which £12,478 was for coal or other fuel, £1072 for oil, waste, water, &c., £329 for salaries at works, £4529 for wages, and £2072 for repairs and maintenance. The distribution of electricity cost £5007, of which £3701 was for repairs and maintenance of mains, cables, &c., £725 for repairs and maintenance of meters, and £580 for salaries. Attending and repairing public lamps cost £1124. Management cost £3818; and rents, rates, and taxes, £4549. The sinking fund amounts to £18,170; and the reserve fund to £4378. The percentage of current lost in distribution or otherwise not accounted for was 15·7. There were 265 public lamps.

Baillie MACLAY, the Convener of the Committee, formally submitted the report and accounts.

Mr. J. CRONIN said that in the report six different methods were stated by which it was proposed to charge consumers. He wanted to know whether the Convener could not give them an assurance that some other method would be adopted. He suggested that they should have a uniform charge. Why should they not have, as in Edinburgh, one charge for lighting and one for motive power, which anyone could understand?

Baillie MACLAY said he had never recognized their system of charging as perfect, or even satisfactory; but it was known well enough that they were taking steps to alter the system; and he promised that during the current year, if the present accounts were passed, they should be quite willing to consider their mode of charging; and he hoped they would be able to arrive at some method which would give satisfaction to the consumers.

Mr. W. BURRELL said that, to give them the experience of his own firm, they consumed 1576 units, for which the charge was £20 16s. They were just within the charge for a high-power consumer. If they had used double the quantity of current they would have been charged £18 5s., or £2 11s. less than they were.

Baillie FERGUSON remarked that this statement was of a very startling character; and perhaps some explanation might be given to them. It appeared that by wasting current they could save money to themselves. They would certainly have the Citizens' Union in there immediately if this sort of thing were to go on.

Mr. BURRELL moved that the report be referred back.

Baillie FERGUSON seconded the motion.

Baillie MACLAY said the Council must bear in mind that electricity could not be treated in the same way as gas, and that it was difficult for them to please all their consumers. It was important that they should have their rates fixed that day, especially seeing that three months of the year had elapsed. He would like to have an opportunity of bringing the matter before the Committee; and if Mr. Burrell or anyone could show them any other way of charging, he was sure they would be pleased to adopt it.

Baillie D. M. STEVENSON thought the Council would have to agree to Baillie MacLay's suggestion. The system of charging followed was agreed to after a remit to a Committee. He did not think anyone had yet hit upon an ideal method. If every one would use electricity for five consecutive hours each day, a rate could be fixed. But some only used it one hour, and others two hours; and the producing plant was not required again till next day.

Mr. H. ALEXANDER thought that to lower the charge by 75 per cent. when a certain quantity of electricity was taken was absurd. No one among them would do this in his own business.

Mr. P. G. STEWART asked if it was the case that consumers who burnt enough to get the 1½d. rate saved their own money and wasted that of the citizens. He thought they should leave the matter open. Let them give the Committee a little time, and things would come right.

Mr. W. FINLAY said that, in the opinion of most scientific men, the maximum demand system was the most perfect. He admitted that there was an anomaly in it—some of them knew that very well. He had no doubt that the time was coming when they would have to do what was being done in Edinburgh; but, in the meantime, they had spent such a large sum in laying down plant, that this was not a time to change horses.

It was agreed, by a large majority, to adopt the report, and to fix the charges as recommended.

Baillie MACLAY then moved approval of the accounts. He said that the amount paid as interest upon borrowed money, £15,256, was more than



double what they paid the previous year. The sum set aside for sinking fund, £6285, was also more than double what they wrote off for sinking fund the previous year. Those two items were a grievous burden to be borne during the past year; but they had been able to carry it, and to leave a net balance of £39 14s. 7d. Their reserve fund, now amounting to £4378, was created the previous year. It was an excellent institution; and they would probably take every opportunity of adding to it, because it might come to be useful, in certain contingencies. It was not compulsory; but it was a good nest-egg. They found that they could not write off for depreciation quite their usual amount. He wished the Council to understand that they could afford to write off a little less for depreciation; because so much of the plant was new, and they had already so well written down their old and obsolete plant in the John Street station, that they were able to discard it without carrying forward a penny of debit. He promised that if, as they expected, in the present year their new works at Port-Dundas and Pollokshaws Road were running, and the Kelvin side station giving its quota to the lighting of the city, they should do well for depreciation. He could refer to the miles of cables laid which had not yielded any revenue. Indeed, the wonder was not that they had not been able to write off a sufficient amount for depreciation, but that they should have been able to write off any at all. Their consumers had increased by over 40 per cent., and their output of current had also increased 50 per cent. So that, on the whole, he thought the Council had reason to be thankful for the past and hopeful for the future.

Mr. FINLAY seconded. They had, he said, been making provision for the future, and had been spending a large sum of money. During the year, they had spent about £260,000, of which some £150,000 was unproductive. But in October they would begin to earn revenue from their works on the South Side.

Bailie STEVENSON thought that the accounts, as stated, were a very great improvement on previous years; but he was of opinion that the accounts of all the departments of the Corporation should be kept upon a uniform system, so that they could compare the one with the other. The Convener told them that there had been a grievous burden on the Committee, which they had been able to meet by not writing off the usual depreciation. He thought that the proper course would have been to have written off the normal depreciation, in accordance with previous years. In 1897, there was a capital expenditure of £140,000, and £10,000 was written off for depreciation; in 1898, the capital expenditure amounted to £188,000, and £9000 was written off; in 1899, the capital expenditure amounted to £338,000, and £7000 was written off; and last year the capital expenditure amounted to £609,000, and £3000 was written off for depreciation. Nobody would accept that as a proper system of accounting. What, he thought, the Committee ought to have done was to have stated that they had extra interest on unproductive capital, to the amount of £8000 or £9000; and that that should have been carried forward and divided over a period of years. What they did was not accounting at all. It was simply haphazard business; and he hoped that if the Council passed the accounts that day, they should do so on the principle of letting the Convener squeeze through a tight place, and that it should not be a precedent. A balance of £30,000 was carried forward in the capital account. The balance-sheet showed that the capital expenditure was £609,000, and that there was a balance of £30,000. There was no information in that at all.

Mr. PRIMROSE thought that Bailie Stevenson was somewhat hypercritical in dealing with this new venture—a venture which was so new that they were only at the constructional part of their work. To criticize it in detail at that stage was, he thought, to some extent, a needless task.

Treasurer MURRAY said that the minutes referred to some letters from the Auditors. But he was unable to make out from the minutes what the letters contained.

Bailie MACLAY said that in their Provisional Orders they were under no compulsion to write off anything for depreciation; and certainly they had not observed any rate of depreciation in the past. But, as business men, they had always written off depreciation. The Auditors, thinking they had not considered the question fully, thought they would give the Committee a reminder that it would be a good thing to write off more for depreciation. That was what the letters were about.

Treasurer MURRAY thought the explanation was, on the whole, pretty satisfactory. At the same time, he agreed with Bailie Stevenson that that haphazard way of dealing with depreciation was not satisfactory. Depreciation undoubtedly ought, in the first place, to be provided for. There should be some principle guiding the Committee as to the amount they should write off for depreciation; otherwise they could not compare accounts, one year with another. He had in his hand a copy of the accounts of the Liverpool United Gas Company; and he found that they were made out exactly on the same principle as the gas accounts of the Glasgow Corporation. He understood that there was some regulation of the Board of Trade as to the form of gas accounts; and, if that were so, he was afraid that they could not expect a uniform system of accounts in the city, because the various departments differed so much from one another.

The accounts were then approved of.

**The Warrington Gas Committee and the Gas Workers' Union.**—Mr. J. R. Clynes, the Organizing Secretary of the Gas Workers' Union for the Lancashire district, mentions in his quarterly report, that at Warrington the Union were nearly having serious trouble with the Corporation Gas Committee. This is how he puts the matter: "They 'would not deal with the Union,' and the out-of-date talk about 'third parties' was indulged in. As usual 'they did not object to the gas-workers being in a Union.' Not at all. But what is the use of men being in a Union if they are to act as though no Union were in existence? We regretted this action of declining to negotiate on the lines generally accepted by all other gas committees in the country, as these lines have usually enabled us to maintain friendly relations between the committees and their employees. I am pleased to state that eventually we obtained concessions satisfactory to our men." It would be interesting to read the comments of the Warrington Gas Committee on the egotistical statement above referred to.

## ELECTRIC LIGHTING NOTES.

The Northern Counties Electrical Supply Company have asked the consent of the Consett District Council to an application for a Provisional Order for the supply of electricity in the district. The Company inform the Council that they are prepared to furnish current for public lighting for the season of 1902 at a charge of 20 per cent. below the present prices for gas illumination. The Gas Committee of the Council are investigating the matter.

The accounts of the Halifax Corporation Electricity Works for the year ended March 31 show that the output has been more than doubled; the number of units sold being 1,371,333, as compared with 628,759 in the previous year. The lamps connected number 45,403, as against 32,020; and the gross revenue was £16,069, as compared with £8957—an increase of £7112. The gross profits amounted to £9001, as against £4565 last year—an increase of £4436. The average price obtained per unit, after deducting discounts, is 2-77d., as against 3-33d. per unit last year.

On the evening of Sunday, the 19th inst., the electric light in St. Paul's Church, Canterbury, suddenly failed on account of one of the main wires parting, and the service had to be conducted in semi-darkness. The mishap occurred just before commencing, when it was found that the light could not be switched on. The service proceeded up to the reading of the second lesson, when, darkness having set in, the verges obtained a couple of wax candles—one for the use of the organist and the other for the curate. At the end of the prayers, the clergyman walked up to the pulpit with a candle in one hand and his sermon in the other; but it was with the greatest difficulty that he could read his notes—the candle giving very little light. An examination of the wires was made on Monday; but no definite explanation of the failure could be given.

A special meeting of the St. George's, Hanover Square, Vestry, convened in pursuance of a requisition signed by ten members, was held on Friday to consider urgent business connected with the proposed electric lighting of the streets at a cost of £17,000 annually for a term of 31 years. Mr. Owen Smith presided. Mr. Edward Burch moved to rescind a resolution passed at the last ordinary meeting adopting the electric light as the illuminant for the streets. He said he did not think any vestryman was opposed to electric lighting, but they ought to wait until the Borough Council were elected, when a more comprehensive scheme could be submitted. Mr. P. T. Saunders seconded the motion, and denounced the proposed scheme as a gigantic innovation, monstrous and wholly unwarrantable, and a wilful waste of ratepayers' money. On a division being taken, the motion was carried by 23 votes to 13.

The London Correspondent of the "Yorkshire Post" can hardly be expected to hold biased opinions on the question of artificial illumination; and therefore his views on electric lighting in London may have some interest: "Residents in the localities in the Metropolis publicly lighted by electricity make strong complaints of the unsatisfactory results obtained. It is not that the individual lights are of less power. The familiar arc lamp is, of course, much more powerful than the old gas-flame. The source of the dissatisfaction lies in the inconvenient arrangement of the lights. The standards are a very long distance apart. On each of them there is placed a light of very great power—so powerful, indeed, that in its immediate vicinity it is almost blinding, which makes the area between the lamps to seem worse lighted than it really is. Practical electricians, acknowledging the justice of this criticism, are now advocating a return to the former system of a double row of lamp-posts with an incandescent electric light on each. By this means the light would, it is urged, be more diffused. The way in which the light is concentrated at present is in total contradiction to scientific principles. An effort is to be made to get the Strand District Board to place their new electric installation on the old lamps."

The Chester Corporation having sought the sanction of the Local Government Board to the borrowing of £35,000 for the purpose of extending the electric lighting in the city, Colonel A. C. Smith held an inquiry into the matter last Wednesday. It was explained by the Town Clerk that the original loan was for £65,000; and the expenditure had exceeded this by £740. The loan now required was for new machinery and other extensions. So far the undertaking had proved an unqualified success; and out of the revenue they had been able to pay off all preliminary expenses which were not included in the loan. To the reserve fund a sum of £2465 had been placed. They started lighting at a charge of 6d. a unit; and this had now been reduced to 4½d. In addition, the Committee allowed large consumers a considerable discount. As showing the increased demand for the electric light, during the last three years, he said that 355,957 units, 473,656 units, and 617,792 units respectively had been sold. In the first period, there were 83 public lamps, for the second period 236 lamps, and for the last period 361; 165 of these being arc lamps. It was not absolutely settled, but most probably the Corporation would be able to work the trams (which they proposed to take over) by electric traction, and would be able to generate the energy at the present station.

The foundation-stone of a new central electric light generating station, which is to be erected in Lombard Road, Battersea, at a cost of £57,000, was laid on the 18th inst. by Mr. W. Matthews, Chairman of the Vestry. Mr. W. Willis, Chairman of the Lighting Committee, who presided, said the question of electric lighting was originally brought before the parish in 1891, when a Company tried to introduce the system. Two years later the Vestry took the matter in hand, and a permanent Committee was appointed; the result being the present electric lighting scheme. It was proposed at the commencement to erect 240 arc lamps, which would be distributed over a distance of 13 miles. The work of laying the mains began on the 5th of February; and 11 miles had been completed. He was assured that the mains would be entirely finished early in November. If required, it was intended to introduce the light to private houses; and they hoped to place it within reach of the poorer inhabitants by supplying fittings without prepayment. Commencing with a charge of 5½d. per unit, they trusted they would be able to reduce it to 5d. Mr. Matthews, who was presented with a silver trowel suitably inscribed, then declared the stone to be well and truly laid. Mr. John Burns, M.P., moved a vote of thanks to Mr. Matthews. Professor Kennedy, who has devised the scheme, seconded the motion, and said he would go farther than Mr. Willis by anticipating that before very long the charge would be reduced to 4d. per unit.







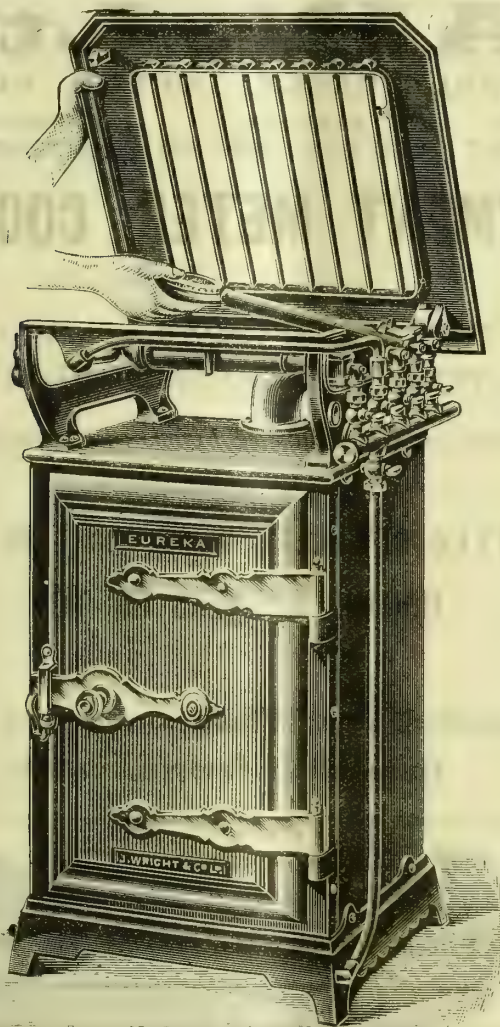
must be made a scapegoat; and the man upon whom they can lay hand readiest is the Convener of the Gas Committee—Mr. T. Mitchell. At this week's meeting of the Trust, Mr. Mitchell submitted the minutes of more than one meeting of the Gas Committee, in which there was narrated, among other things, that Mr. Stewart had agreed to act as Gas Manager in the meantime; that Mr. Stewart reported that he had got offers of 12,000 tons of Lanemark cannel at 18s. 9d. per ton, and of 5000 tons of the five-foot seam from the same colliery at 15s. per ton, which, after communicating with the Convener, he had purchased; that the coal purchased would keep the works going till about February next; that the Committee approved the transaction, and authorized the Clerk to advertise for a further supply of coal; that a marine boiler had been purchased, at a cost of £300, by which a considerable saving had been effected; and that at a subsequent meeting, three members of the Committee dissented from the purchases being made without the previous sanction of the Committee. Mr. Mitchell moved the approval of the minutes. Their disapproval was not moved; but a resolution was, expressing the regret of the Trust that the Convener had been a party to the contracting for coal without consulting the Gas Committee or the whole Trust, and to the purchase of the boiler without consulting the Gas Committee, and expressing disapproval of that mode of conducting business, in respect that it was a contravention of the standing orders of the Trust. In reply to this resolution, Mr. Mitchell explained that the Gas Committee had powers to purchase coal, conferred by the Trust on the 17th of May of this year; that he had followed the practice of other Conveners; that meetings of the Committee had been called; and that the members who were making complaint now were those who did not attend the meetings. The resolution of disapproval was carried by eleven votes to seven. Mr. Mitchell writes to the newspapers to say that, when the purchase of the coal was made, it was subject to approval by the Gas Committee, which was unanimously given, and that the dissent was only entered at a meeting held four weeks afterwards; and that six members who, in the Gas Committee, gave their approval to the purchase, voted in the Trust this week against the purchase. Reading all this, it is evident that there are members of the Gas Trust who are acting a very unseemly part. If on no other ground, they are doing so in respect that a Committee have been appointed to make inquiry into last year's financial transactions. Until that Committee have reported, the dissentients should stay their hand. Seeing they have not done so, an impartial inquiry is not to be expected; and therefore, if the Trust are still minded to prosecute an inquiry, it should be by an accountant, or some independent body. As to the conduct of Mr. Mitchell, I have said that he followed the practice of other Conveners. Even in doing that, he transgressed the standing orders. But there is nothing heinous in that, for it is done every day; and, indeed, unless it were so, the conduct of business would be a grievous burden upon public men. In the previous instances, the end seems to have been held to justify the means. That does not seem to be the case now; for, although Mr. Mitchell was able to say that the same coal could not be bought now for less than 2s. 6d. above the prices paid, and that £500 had been saved in the purchase of the boiler, it availed nothing. The vote went against him, and he stands censured. In the circum-

stances, a headstrong man would resign. It is to be hoped that Mr. Mitchell will not—at least, until he and Mr. Stewart see the matter through, and have their conduct vindicated. I have no doubt they can do so. Mr. Stewart is once more Manager; and if anything has gone wrong while he was away, he may be trusted to put it right.

The subject of the recognition of the agents of Trades Unions was brought before the Glasgow Town Council on Monday by Mr. W. Stevenson, the Sub-Convener of the Gas Committee, who called attention to the fact that the Cleansing Committee had been in correspondence with the Secretary of the National Union of Gas Workers and General Labourers, and asked whether the Committee had received authority from the Corporation to correspond with that gentleman. The Gas and Tramways Committee, he said, only corresponded with the workmen themselves, and not with the secretary of any association. Lord Provost Chisholm said that the fact that the Corporation had confirmed the minutes of the Gas Committee, declining to correspond with the Secretary, did not bind other committees. This seems to leave the matter in a somewhat chaotic condition.

The accounts of the Glasgow Corporation Electricity Department are, taken as a whole, quite satisfactory, showing, as they do, a continuously progressive business. But while that is so, I question if the responsible head of any large undertaking ever exhibited such impotence as did Bailie Maclay, over the system of charging, when he submitted the accounts. A state of matters in which a member of the Corporation, and himself a member of the Electricity Committee, should be able to state that, if his firm had used double the current they did, they would have been charged £2 11s. less than they were, is far from what should be. Bailie Maclay acknowledged as much, and practically asked the members of the Corporation to help him out of his difficulty. It may be desirable to encourage long hours of use; but a reduction of 75 per cent., I think, will be acknowledged by most people to be overdoing the process of encouragement. I should fancy that it ought to be a rule never, in any event, to go below cost price. Another point which is open to criticism is that of depreciation. The Committee have this year simply set down as depreciation whatever sum was left over after meeting all other charges. This is not sound finance by any means; but as Bailie Maclay says it is for one year only, nothing more need be said about the matter.

The Cowdenbeath Gas Company have had an unfortunate career for the last year or two; and this week they have suffered a very serious disaster, in the destruction of their retort-house by fire. After the Company relinquished the manufacture of acetylene gas, they adopted an oil-gas process (which, I do not know), and they have been working it since. On Monday night, about eleven o'clock, an old man, who has acted as retort-man for some three years, was about to clean out a retort before retiring for the night. He disconnected the retort-bench from the gas-holders, and opened the retort. There was at once an explosion, which threw him out by the open door of the building. At the same time the oil caught fire, and the whole house—a building 22 ft. by 18 ft.—was immediately in a blaze. The roof soon fell in. There were about 70 gallons of oil, and 40 gallons of tar in a barrel in the house. These burned fiercely, making it out of the question to do anything to save



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the retort-house. An oil-store adjoining was soon emptied of its contents, which were happily saved, as were also the horses in a stable. In about two hours the fire died down. In the morning, it was found that the retort-house was a wreck. The gasholders contained a quantity of gas equal to several nights' supply, but not sufficient to keep going till new retorts can be fitted. It is stated that the majority of the inhabitants use paraffin oil for lighting, but that the oil-gas was largely consumed by shopkeepers, and that the streets were lighted by it. A sorry feature of the situation is that about a month ago the Burgh Commissioners resolved to decline an offer by the Gas Company to transfer their undertaking for £500. Misfortune seems to dog the footsteps of the Company. The loss by fire is said to be covered by insurance.

Lord Kincairney has this week issued his judgment in an action which was recently argued before him in the Court of Session, relating to the transfer of annuities, which may, if allowed to stand, give trouble to those who administer stock funds. The Trustees of a Midlothian gentleman found themselves in possession of annuities of the Dundee Water Commission, of the value of £157 and £95 11s. respectively. They resolved to divide these into four, and to apportion the sums as follows : £95 11s., £20, £70, and £67. These sums the beneficiaries were agreeable to accept; and the Trustees submitted their scheme to the Treasurer to the Commission, who approved of it. Transfers were accordingly made out, and were sent to Dundee to be registered. Now, the register of annuities is not in the possession of the Treasurer, but of the Clerk, who is a lawyer, and he objected to register the transfers. He averred that they were not according to form, but more particularly that they did not identify the annuities which were to be transferred. The Clerk suggested that new forms of transfer should be prepared, which would cost but a few shillings. The Trustees declined to do this, because the beneficiaries were far apart, and there would be trouble in getting new transfers executed. Neither party would give way; and then the Trustees came into Court, asking an order on the Commissioners to register the transfers. Lord Kincairney has given the order which the Trustees asked; but has allowed neither party expenses. He had no difficulty in holding that the transfers were in proper form; but he thought that the want of identification was a serious objection, though not sufficient to entitle him to sustain the objection of the Commissioners. The decision is doubtless sound in law, but it is a somewhat unfortunate one, because in the transfer of any sort of property identification is the first essential; and to make transfer easy without strict identification, would seem to be opening the door for fast-and-loose dealing with annuity stock. Mistakes are easily made. Fraud is frequently successful. And it may be that the keepers of registers, knowing that these things are so, will feel a new and heavy burden laid upon them. They will require to be more than doubly careful to see that the proposed transfer will not bring them into trouble.

The Carlow Gas Company, Limited, has been registered with a capital of £5500, in £5 shares, to acquire and carry on the business of the Carlow Gaslight Joint-Stock Company, Limited.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 25.

**Sulphate of Ammonia.**—In the early part of the week, sales were made at a decline both by makers and middlemen; but later the market became steadier, and the closing value at the ports is £10 17s. 6d. per ton f.o.b. Consumers are still very quiet, and direct buying has again been limited. Scotch makers have become firmer, and elsewhere available supplies have been small; the larger makes being already sold for the month. There has been considerable inquiry in the forward position; but buyers' views for October-December are not above spot prices, while makers require a premium of 2s. 6d. to 5s. per ton. For October-March delivery, £11 5s. per ton is required, f.o.b. Leith.

**Nitrate of Soda** is quieter in the forward position; but spot remains firm at 8s. 1½d. per cwt. for ordinary, and 8s. 4½d. for refined, quality.

LONDON, Aug. 25.

**Tar Products.**—The higher prices being asked for coal and other fuel has brought about a better inquiry for pitch. Briquette makers are said to be extremely busy; and they have recently announced an important advance in prices, which should, sooner or later, reflect itself in the market value of pitch. A good business is noted in benzols. But the last few days buyers have eased off; and quotations are not quite as strong. Very little is doing in anthracene; but this article is well held, besides being in decreasing production. Creosote and other oils are weak, with very little new business doing. Carbolic acid is steady; and cresylic acid is dearer.

The week's quotations average as follows: Tar, 17s. to 25s. 6d. Pitch, east coast, 37s. 6d.; west coast, 32s. 6d. Benzol, 90's, 9½d.; special qualities for gas, 10½d.; 50's, 11d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2½d.; crude naphtha, 3½d.; heavy naphtha, 1s. Creosote, 2d.; heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene, 75s.; salts, 50s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—For prompt, the market is flat; but for forward delivery, buyers will pay more money than current quotation, which is in all positions £10 17s. 6d. per ton, less 3½ per cent. The firmer position of nitrate should influence sulphate. The world's markets for sulphate are continually extending; and this is notably the case during the past year or two.

COAL TRADE REPORTS.

From Our Own Correspondents.

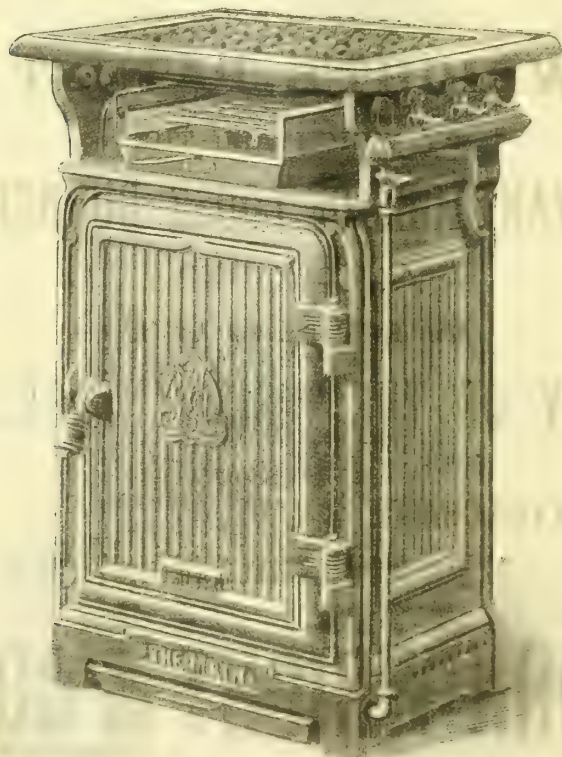
**Lancashire Coal Trade.**—A pressure for all descriptions of round coal continues to be reported at collieries throughout this district—the demand being still more than sufficient to take away what they are raising; and in many cases they are quite unable to clear off the arrear of orders on their books. This applies both to house-fire qualities, for which the demand is still altogether abnormal for the time of the year,

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and to the lower qualities of round coal, which, in addition to a fairly brisk inquiry for inland requirements, are also in extra demand for shipment, owing to the railway dispute in South Wales, which is throwing a good many shipping orders on to this market. Prices under these conditions continue exceedingly strong; house coals being firm at the full list rates of 16s. 6d. to 17s. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four feet and seconds Arley, and 14s. to 14s. 6d. for common house coal, with steam and forge coals for inland sales fetching 12s. 6d. to 13s. at the pit mouth. On shipping orders, although the basis quotations remain at 15s. 3d. per ton, collieries for prompt cargoes have no difficulty in getting 9d. to 1s. above this figure; but very few of them have supplies they can offer outside their regular customers. For engine fuel, the demand is slackening down, owing to holiday stoppages in the manufacturing districts, and to the less favourable condition of the cotton trade. Lancashire collieries, however, have not any great surplus of slack on their hands; and are not at all disposed to accept lower prices, preferring rather to put into stock. Slack from other districts—chiefly, however, the lower sorts—still comes in at lower figures; and consumers in many cases are content to go on from hand to mouth with cheap supplies, rather than contract for Lancashire slack at current rates. The Lancashire slack prices remain firm at from 10s. 6d. to 11s. per ton at the pit mouth, according to quality. For coke, prices continue easier, especially in the furnace qualities. In some instances, it is reported that contracts are being placed at 5s. per ton under the maximum quotations; and generally they could be had at about 2s. 6d. below the prices that have been quoted a few weeks back. Yorkshire coke averages about 21s. per ton, and Lancashire 21s. 6d. to 22s. at the ovens. Foundry cokes, however, are fairly steady, but not quite so strong; and prices range from 28s. to 31s. per ton at the ovens, according to quality.

**Northern Coal Trade.**—The demand for coal at the north-eastern ports has been much influenced by the strike of the railway men in Wales, which has diverted some steamers to this district. The effect has been most marked in the steam coal trade; but other branches of fuel have been influenced in sympathy. Best Northumbrian steam coal has risen irregularly, and for small lots it is said that as much as 24s. per ton f.o.b. has been paid. It is very difficult, however, to quote prices, because there has been very little coal sold by coalowners, who were generally fully contracted before; so that any small lots sold have been by middlemen, and prices varied with almost each sale. Steam smalls are averaging about 12s. 6d. per ton. Bunker coals are also higher; about 17s. per ton f.o.b. being the quotation for unscreened bunkers, which seem likely to be more in demand. This may affect the supply of gas coals slightly. The price is at least stiffer, though the quotation is still about 17s. per ton f.o.b. for best Durham gas coals. The production seems rather fuller this week; the rainy weather having perhaps lessened the length of the holiday time at some of the pits. No additional contracts of moment are reported for gas coals this week. In the coke trade, the demand is very full, and the prices are firm—from 34s. to 35s. per ton f.o.b. being quoted for best export coke; while for blast-furnace qualities, the price is 29s. per ton at the furnaces. Gas coke is in rather larger production; but the supply is well taken up at the advanced prices of the last few weeks.

**Scotch Coal Trade.**—The market is again stronger, partly owing to the railway strike in Wales, although, as yet, not much business has been diverted by it to Scotland. Most of the available coal is booked ahead, so that for a week or two there will be little trade for prompt delivery. That which is not booked is being held for an expected rise. The quotations are: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 17s. to 18s., and as high as 20s. for the best quality for August-October delivery, and splint 16s. to 16s. 6d. The shipments for the week were 241,693 tons—an increase upon the previous week of 13,544 tons, and upon the corresponding week of last year of 50,285 tons. For the year to date, the total shipments have been 6,669,499 tons—an increase upon the corresponding period of last year of 1,143,675 tons.

**The Restricted Water Supply in South London.**—Mr. H. W. Forster, M.P., has been in communication with the President of the Local Government Board, with regard to the complaints made by Beckenham residents of the recent temporary failure of the water supply of the Lambeth Company. Mr. Chaplin has forwarded a letter, in which he calls attention to the powers possessed by local authorities under the Metropolis Water Act, 1897, to appeal to the Railways and Canal Commissioners in the case of a deficiency in the water supply, and points out that "large powers of bringing compulsion to bear on the Metropolitan Water Companies have been conferred on local authorities as well as upon individuals," and that "it devolves on these rather than upon the Local Government Board to take any necessary action in the event of any of the Companies failing to discharge their statutory duties."

**Gas-Works Extensions at Driffeld: A Little Bit of History.**—The Gas Committee of the Driffeld District Council are making laudable efforts to bring the gas-plant up-to-date; and a few days since a new tower scrubber, erected by Messrs. Clapham Bros., of Keighley, was inaugurated. Mr. Henry Tobey, the Engineer to the Committee, explained that this was the second great improvement effected at the works since they were purchased by the Council; and further additions, including greater storage capacity, were in contemplation. The consumption of gas had already increased by 15 to 20 per cent. since the transfer of the undertaking. Mr. W. Scotchburn, J.P., Chairman of the Council, turned the valve which admitted gas into the scrubber for the first time, and in an interesting speech he mentioned the fact that his father and the father of Mr. Tonge, the Clerk to the Council, took a prominent part in the inauguration of gas lighting in Driffeld. The price of gas at the outset was 15s. per 1000 cubic feet; but, though the charge was so high, the works were not for a long time a financial success. Mr. G. B. Tonge said the father of Mr. Scotchburn, in 1835, accepted the clerkship of the undertaking at the munificent salary of £5 a year; and his (Mr. Tonge's) father succeeded him. His (the speaker's) first connection with the works was in 1858, when gas was sold at 7s. per 1000 cubic feet; and the revenue from private lighting was under £600 a year, with a total production of 1,600,000 feet per annum. Last year the sales for private lighting amounted to £3000; and the production was 17,000,000 feet.

# CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN . . . . .	1,250,000	BUFFALO, N.Y. . . . .	2,000,000
WINDSOR ST. WORKS, BIRMINGHAM . . . . .	2,000,000	WINNIPEG, MAN. . . . .	500,000
SALTLEY WORKS, BIRMINGHAM . . . . .	2,000,000	COLCHESTER (Second Contract) . . . . .	300,000
COLCHESTER . . . . .	300,000	YORK . . . . .	750,000
BIRKENHEAD . . . . .	2,250,000	ROCHESTER . . . . .	500,000
SWINDON (New Swindon Gas Co.) . . . . .	120,000	KINGSTON, ONT. . . . .	300,000
SALTLEY, BIRMINGHAM (Second Contract) . . . . .	2,000,000	CRYSTAL PALACE DISTRICT . . . . .	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.) . . . . .	2,000,000	DULUTH, MINN. . . . .	300,000
HALIFAX . . . . .	1,000,000	CATERHAM . . . . .	150,000
TORONTO . . . . .	250,000	LEICESTER . . . . .	2,000,000
OTTAWA . . . . .	250,000	ENSCHDE (HOLLAND) . . . . .	150,000
LINDSAY (Remodelled) . . . . .	125,000	BUENOS AYRES (RIVER PLATE CO.) . . . . .	700,000
MONTREAL . . . . .	500,000	BURNLEY . . . . .	1,500,000
TORONTO (Second Contract; Remodelled) . . . . .	2,000,000	KINGSTON-ON-THAMES . . . . .	1,750,000
BELLEVILLE . . . . .	250,000	ACCRINGTON . . . . .	500,000
OTTAWA (Second Contract) . . . . .	250,000	TONBRIDGE . . . . .	300,000
BRANTFORD (Remodelled) . . . . .	200,000	STRETTFORD . . . . .	500,000
ST. CATHERINES (Remodelled) . . . . .	250,000	OLDBURY . . . . .	300,000
KINGSTON, PA. . . . .	125,000	TODMORDEN . . . . .	500,000
PETERBOROUGH, ONT. . . . .	250,000	SALTLEY, BIRMINGHAM (Third Contract) . . . . .	2,000,000
WILKESBARRE, PA. . . . .	750,000	YORK (Second Contract) . . . . .	750,000
ST. CATHERINES (Second Contract) . . . . .	250,000	ROCHESTER (Second Contract) . . . . .	500,000
		NEWPORT (MON.) . . . . .	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.



**Hunstanton in Darkness.**—Some inconvenience was caused at Hunstanton by the failure of the gas supply about eight o'clock last Tuesday evening. A number of lights all over the town, public and private, went out; while others flickered up and down. At some of the principal hotels the inconvenience was increased by the fact that dinner was in progress. After a time, the light was restored.

**The Success of the Atherton Gas Undertaking.**—On behalf of the Local Government Board, Colonel A. C. Smith held an inquiry last Thursday into an application for sanction to borrow £6000 for extensions to the gas-works. Mr. Thomas Newbigging stated that the gas undertaking was one of the most successful in the kingdom; the quantity of gas sold having doubled itself each ten years since 1880.

**The Gas-Workers' Union.**—The quarterly balance-sheet of the National Union of Gas-Workers and General Labourers of Great Britain and Ireland shows that the branch and other receipts for April, May, and June amounted to £5417—an increase of £660 over the corresponding quarter of last year. The membership now stands at 49,770—a rise of 4802 as compared with June, 1899. The Union paid in dispute money £1111, and contributed £1080 to the General Federation of Trade Unions.

**Labour Trouble at the Doncaster Corporation Gas-Works.**—Last Friday, the stokers employed at the Doncaster Corporation Gas-Works handed in their notices. They applied to the Gas Committee for an advance of  $\frac{1}{2}$ d. per 1000 cubic feet, which is said to represent nearly 8 per cent. The Committee, who have made inquiries as to the wages paid by gas companies within a certain radius, state that they find they pay from 3s. to 4s. per week more than the average of employers within the limit mentioned; and they have taken steps to fill the vacant places.

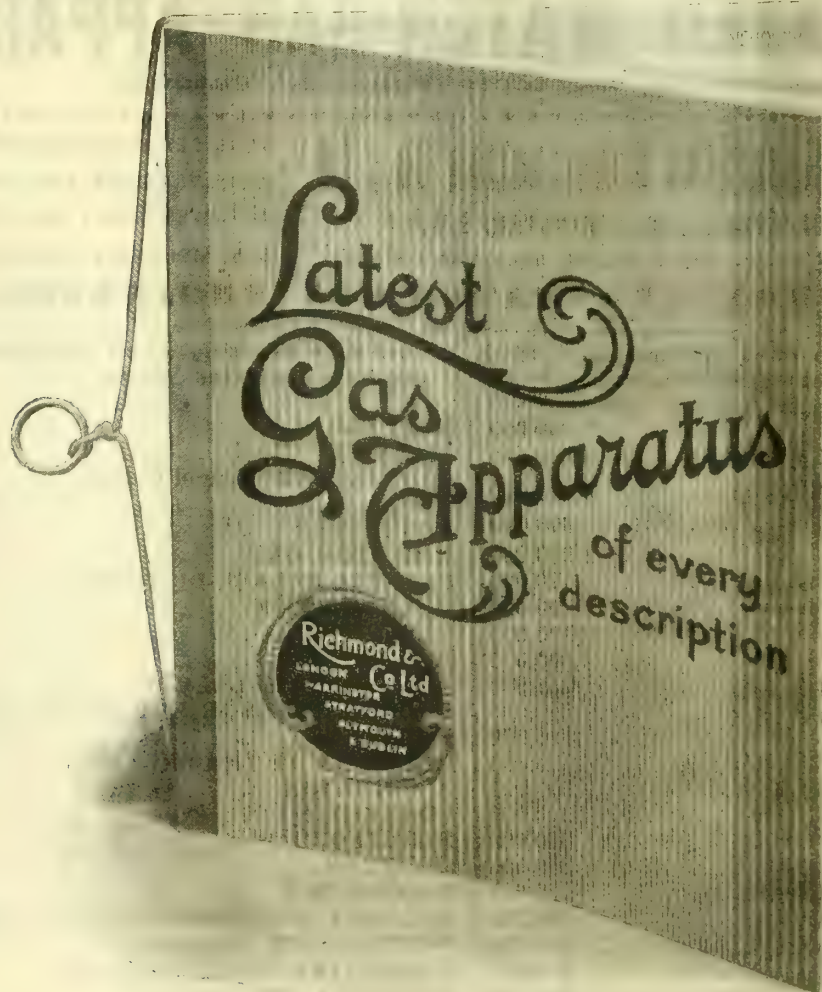
**An Unusual Piece of Pipe-Laying.**—The new gas-main which is being laid over the Regent's Canal at Bridge Street, Mile End, is a rather unusual piece of work. It is proposed to widen the bridge, and for this purpose the main has to be diverted from its original position and formed with a vertical curve to fit the arch of the bridge, and two beds to connect with the mains on each side. The pipe is constructed in sections, and for the most part these have been riveted together in place; the whole being then lowered into position on the north side of the existing bridge roadway.

**The Demolition of the Old Gas-Works at Hull** has been almost completed. Last Thursday morning, the smaller of the two chimneys was demolished; the expedient of cutting away the greater portion of the base, and then setting fire to the temporary wooden supports being resorted to. The fire was lighted at about 11.50, and a large crowd gathered to await the fall of the chimney. Twelve minutes only elapsed, and then the 80-foot structure was seen tottering to its fall. It had been expected it would collapse well inside the area of the gas-works; but the flames attacked the north corner first, with the result that it tilted in the direction of an adjacent narrow street, and did some damage to the woodwork of several houses. The people residing in these had received notice to quit for a time; but they elected to stay inside to watch the structure fall, and a man and a boy narrowly escaped serious injury.

**Fatal Gas Poisoning Case at Kendal.**—Last Wednesday, an inquest was held at Kendal on the body of Thomas Whitwell, aged 60 years, an old employee at the Corporation gas-works. On the previous Monday he was assisting in making a junction with a gas-main; and immediately upon the pipe being bored through, he fell down insensible. He was conveyed to the hospital; but attempts to restore him were of no avail, and he died two hours later. A *post-mortem* examination was undertaken by three medical gentlemen, whose evidence proved that deceased's heart had been weak, but that death was due to gas poisoning. The Jury returned a verdict accordingly.

**Shipley Gas-Works Purchase.**—A special meeting of the Shipley Gas Company was held last Wednesday, to consider the provisional agreement between the Directors and the District Council for the transfer of the Company's undertaking. The terms mentioned in the agreement are 30 years' purchase of the maximum dividends payable by the Company. The maximum dividends amount to £7600 per annum; and the amount of the purchase is thus £228,000. In addition, there is a loan capital of £8000, which the Council will have to pay; and certain other payments will have to be made for stock, &c. Some of the shareholders urged that the price to be paid was insufficient; and it was mentioned that the Morecambe Company received 31 years' purchase, and the North Bierley Company 31½ years' purchase. The Chairman (Mr. Joseph Hill) having explained the circumstances of the case, the agreement was unanimously confirmed. The Council will follow up the decision come to by promoting the necessary Bill to empower the purchase in the next session of Parliament.

**The Effect of "Bad Gas" on Public Worship and Domestic Comfort.**—The "Oldham Chronicle" of last Saturday's date may take full credit for the following: "General complaints are being made in Saddleworth regarding the gas which has during the past week been supplied to the district by the Mossley Corporation. The worst seems to have been sent out on Sunday night last, when the greatest sufferers were those who attended the different places of worship. People had not been in the churches and chapels long before they noticed a distinct smell of sulphur, which gradually increased in strength until the congregations felt almost suffocated. Those with tender throats coughed painfully. At one chapel the preacher stated afterwards that he could only see the worshippers through a kind of hazy cloud, and to speak was a very difficult matter indeed. Some householders who detected the unusual smell hurried off to the plumber thinking that there was a leakage in the gas-fittings. Others on ascertaining the cause turned off the gas, and either sat in the dark or resorted to oil-lamps. Gentle folks with valuable pictures were afraid of burning the illuminant lest they should do irreparable damage. Judging by report, many complaints have been sent to the Mossley Corporation; and more will doubtless be heard of the matter. The price of the gas, 3s. 2d. per 1000 cubic feet, surely entitles the consumers to a pure supply; but what has added to the bitter feeling is the fact that such gas was sent out immediately after a rumour had been circulated that the price was to be considerably increased." We give the paragraph as it appeared in our contemporary.





**The Gas-Works Purchase Question at Leamington.**—A memorial has been drawn up at Leamington, and is now being signed, asking the Gas Company to accede to the request of the Corporation that the latter may be permitted to withdraw from the purchase of the gas-works. The memorial states that the signatories are of opinion that, under existing circumstances, it will be in the best interests of the town and of gas consumers if the works remain in the present hands. They feel confident the townspeople generally are satisfied that the Company have served them well in the past, and do not wish for any change.

**The Price of Gas in Liverpool Early in the Century.**—"People who are inclined to grumble," says the "Liverpool Daily Post," "at the price of gas nowadays, might do worse than study a schedule of charges issued by the Liverpool Gaslight Company in the year 1817. Instead of so much per cubic foot being levied, each individual burner was charged for; and the price varied according to the hour at which the light was to be extinguished. Thus, for using one No. 1 argand burner up till eight o'clock, £3 per annum had to be paid; for the right to keep it alight until nine, £3 18s. was the figure; while those roistering blades who sat up till ten, eleven, or twelve had to disburse £4 16s., £5 12s., and £6 8s. respectively. Imagine the gas bill at a house where ten or twelve burners are flaring away until the small hours if such a method of taxation were in force nowadays."

**Dear Coal Benefits Gas-Engine Makers.**—Writing in the current number of the "Ironmonger," "Vulcan" says: "The dearthness of coal is proving a godsend to gas-engine makers. Agents for all the best-known motors of this class report that during the last few months there has been a wholesale displacement of steam power by gas; a fairly numerous proportion of the orders being for engines of large power. Notwithstanding the increase in the number of firms manufacturing gas and oil engines, nearly all the makers have been busy for several years past; and now deliveries are getting in arrears. The charges for gas have, of course, been advanced, but not to the same extent as boiler fuel. Apparently many of those who are now adopting gas for the motive power of their factories have been influenced by other considerations than direct economy. A gas-engine requires less space and attention than a steam-engine and boiler, and creates no dirt."

**Harrow and Stanmore Gas Company.**—The half-yearly report of the Directors of this Company states that the business continues to steadily progress. In consequence of the serious rise in the cost of coal, the Directors have been compelled to give notice of an advance of 3d. per 1000 cubic feet in the price of gas throughout the district. The balance on the profit and loss account is £3639. The Directors recommend that a dividend be declared for the half year at the rate of 8 per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, of £5 12s. per cent. on the additional "C" capital, and of 6 per cent. on the guaranteed shares, all less income-tax. At the close of the ordinary business, a special meeting will be held at which the proprietors will be asked to authorize the Directors to issue £20,000 of additional capital, and to borrow on mortgage, or by the creation of debenture stock, £5000 in respect of such additional capital.

**Harrogate and Ripon Water Supply.**—A strong deputation of the Harrogate Corporation, headed by Alderman Fortune, Chairman of the Water Committee, visited the source of the River Burn, above Masham, last Thursday, with a view to obtaining a supply of water from that district. The scheme would be an expensive one, approaching probably £250,000, as it involves the laying of a pipe-track 15 miles long. The source of the Burn is on Lord Masham's estate, and adequate compensation would have to be paid to his Lordship. The most severe opposition to be met with would be from the Leeds Corporation, who have already had water-gauges fixed on the stream for some time. The consent of the Ripon Corporation would also be needed, as the pipe-track to Harrogate would have to cross the west end of their reservoir at Lumley Moor.

**The Price of Alfreton Gas.**—A crowded public meeting was held in the Alfreton Market Hall, a few evenings since, to consider the merits of a dispute between the Alfreton Gas Company and the Alfreton Ward of the District Council as to the price of gas for the street-lamps. Mr. A. Houghton explained the objects of the meeting, which had been convened on account of the Gas Company having asked 3s. 9d. per 1000 cubic feet for gas for street lighting—an advance of 6d. He urged that this price should be paid, as the proposed charge was a small matter in comparison with the danger of having the streets in darkness. Mr. A. Forrest, on behalf of the Company, stated that their charge for gas was less than that of any town in the district. A resolution in favour of supporting the Council in their refusal to pay more than 3d. advance was moved; and an amendment was proposed in favour of paying what the Company asked. About a dozen voted for the amendment; and the resolution was carried by an overwhelming majority. The result of the dispute has been to throw the town into darkness.

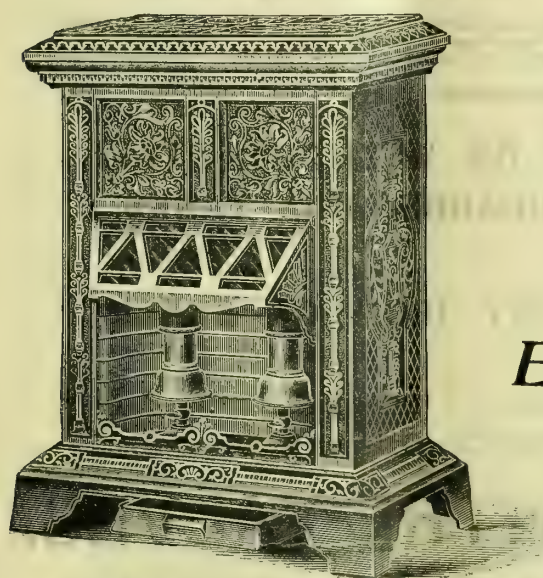
**The Wentwood Water-Works of the Newport Corporation.**—Last Wednesday, the Newport Corporation paid a visit to their new water-works at Wentwood, and were entertained to luncheon by the Water Committee. Colonel Lyne, the Chairman, took advantage of the occasion to say something with the object of soothing the troubled minds in the Council regarding the expense of the works. He said that in about two years' time there would probably be enough water to give a daily supply to Newport of 2½ million gallons. This would, with the present supply, be sufficient for the needs of the borough for the next hundred years. Water, however, was an expensive thing to obtain. At Birmingham the estimate for the works was £3,000,000; but it had gone on to £9,000,000. Bearing this in mind, there should be no alarm if the Wentwood Water-Works, instead of costing £150,000, proved to be more expensive. Over £200,000 had been spent up to the present; and the Corporation would have to go to Parliament to raise more money. Parliament would give longer time to repay the money than the Local Government Board; and the Corporation could take that course or else arrange with their bankers. He believed the undertaking would be a source of great revenue. What would Newport have been if the water-works had not been provided? It was nonsense to talk against the scheme. If Newport did not have it, the place would go back or remain stationary. He thought they might congratulate themselves on the work.

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**St. Mawes Water Supply.**—An inquiry was held at St. Mawes, near Falmouth, on the 9th inst., respecting an application by the Local Authority for power to borrow £2500 for carrying out a scheme of water supply. Considerable opposition was offered to the proposal, on the ground that it does not go far enough.

**Deal Water Supply.**—Alderman Chapman, the Chairman of the Water Committee of the Deal Town Council, placed a very satisfactory report before the members of the Corporation recently. It showed that for the past three years the profit on the water undertaking, after paying the £460 due to the Joint Board, amounted in round figures to £1466.

**A Diviner for Coal.**—Mr. S. T. Child, of Capel, Suffolk, who has achieved some reputation as a water-diviner, claims the possession of similar powers in regard to finding minerals. He told a representative of the "Daily Express" who interviewed him a few days ago that his method of proceeding was to take a piece of coal or any other product of the earth, and hold it along with the divining-rod. Should it be affected, it is a sign, he says, that whatever mineral he is holding exists below.

**Burley Water Supply.**—The new scheme of the Burley District Council, sanctioned by Parliament last year, has advanced another stage by the letting of the work of constructing the Carr Bottom reservoir, on Burley Moor, to Mr. T. Smith, of Bingley, at about 5 per cent. in excess of the estimate of the Engineer, Mr. Malcolm Paterson. The reservoir will be formed by an earthen dam about 367 yards long with curved ends, and will hold about 15 million gallons. It is expected to be completed in two years.

The Rhyl District Council have received permission to borrow £5721 for water-works purposes, and £15,250 for electric lighting.

The salary of Mr. W. Millhouse, Assoc.M.Inst.C.E., the Scarborough Water Engineer, is to be increased from £300 to £350 per annum, the advance to date from the 1st ult.

The Lighting Committee of the Newcastle Corporation have agreed to accept 616 incandescent lamps proffered by the Gas Company for streets in the outlying districts where the new tramway will run.

A statement recently issued by the Director of Municipal Affairs of Paris shows that the estimated value of the real estate of the city is £100,000,000, which includes all the permanent and unsaleable property. The reservoirs, conduits, and other parts of the water-works figure for £2,007,572.

With reference to the dispute which has arisen between the East End Local Authorities and the Commercial Gas Company on the subject of the increased charge for gas, the Company have informed the Stepney Guardians that they are under no legal obligation to give notice of any change in price.

A combined lamp-post and hydrant, in which are embodied no fewer than six separate appliances connected with street water supply, has been for some time past under trial by several Metropolitan and Suburban Local Authorities, and, it is reported, with much success. It is the invention of Mr. William Jones.

The Bolsover District Council have decided upon a summary course in dealing with the Gas Company in connection with the price of gas. The Company have given notice of an increase from 4s. 2d. to 5s. per 1000 cubic feet; but the Council have resolved to offer them 4s. 7d. If this figure is refused, the Council will discontinue lighting the streets.

The First International Petroleum Congress was opened in Paris on the 16th inst., and will close to-day. The President was M. Lesueur; and the Hon. Secretary, Dr. P. Dvorkovitz. A report of the first part of the proceedings is contained in a special supplement to the current number of the "Petroleum Review," which is edited by Dr. Dvorkovitz.

The Water Committee of the Warrington Corporation have decided to adopt electrical level recorders in connection with the reservoirs at a cost of £611. An arbitration regarding the purchase of 8 acres 26 perches of land for the undertaking at Winwick has been completed, and the award made. The offer of the Corporation was £1424, the claim of the Ecclesiastical Commissioners £3500, and the arbitrator's award £2100.

The Engineer to the Tamworth Town Council and the Tamworth Rural District Council, Mr. H. J. Clarson, has reported on the joint sewage scheme for the borough and part of the rural district. He points out that a joint scheme will be the most efficient and economical; and as to the treatment of the sewage, he recommends the adoption of a combination of the open septic tank system with bacteriological filters. The proposed site of the outfall works has an area of 19½ acres. The effluent from the bacteria beds can pass to a watercourse which discharges into the River Tame at the Tame Bridge, or it can be irrigated over the land for further treatment. The scheme is estimated to cost £40,859.

Messrs. Richmond and Co., Limited, have just sent out their new illustrated catalogue, comprising the whole of their manufactures. It is an elaborately got-up list, containing more than 220 pages, and illustrated by no fewer than 453 half-tone blocks, excellently printed. Views of the Company's premises are bound in the back and front of the book, while the frontispiece is a highly effective reproduction of the "Royal Sovereign" gas-fire in thirteen printings and heavily embossed. The catalogue is bound in an embossed cover, is corded, and has a ring for hanging; and altogether it is worthy of a place in every gas manager's office. With the catalogue, Messrs. Richmond likewise sent out the two sections in different parts—the "Gas-Cookers" forming the first, and the "Gas-Fires" the second section.

The extent to which the carburetted water-gas plant of Messrs. Humphreys and Glasgow and their colleagues, the United Gas Improvement Company of Philadelphia, has been adopted of late years is strikingly shown by the handsome volume which has just been issued by the firm, furnishing illustrated particulars of representative installations, accompanied by letters received from the engineers of the works where they have been put up. Since 1893, the London branch has undertaken the erection of 156 independent sets of apparatus; while in conjunction with the above-named Company they have, since Jan. 1, 1899, obtained commissions for 68 new installations, with a daily capacity of 58 million cubic feet, divided about equally between this country and the United States. The text and illustrations are exceedingly well printed.

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Copenhagen (2nd) . . . . .	2,500,000	Coventry (2nd) . . . . .	600,000	Commercial Gas Co. . . . .	850,000
Belfast . . . . .	1,700,000	Bordentown, N.J. . . . .	125,000	Commercial (2nd) . . . . .	850,000
Belfast (2nd) . . . . .	4,500,000	Winchester . . . . .	225,000	Commercial (3rd) . . . . .	1,250,000
Brussels. . . . .	750,000	Shanghai . . . . .	225,000	Rotterdam . . . . .	850,000
Brussels (2nd) . . . . .	750,000	Stockport . . . . .	600,000	Dorking . . . . .	150,000
Liverpool . . . . .	3,500,000	Norwich . . . . .	1,000,000	McKeesport, Pa. . . . .	500,000
Liverpool (2nd) . . . . .	4,500,000	Holyoke, Mass. . . . .	600,000	G.L.&C.Co., Bromley . . . . .	3,750,000
Tottenham . . . . .	750,000	St. Joseph, Mo. . . . .	750,000	G.L.&C.Co., Nine Elms. . . . .	2,750,000
Tottenham (2nd) . . . . .	750,000	Lea Bridge . . . . .	350,000	Durham . . . . .	200,000
Santiago de Cuba . . . . .	400,000	Lea Bridge (2nd) . . . . .	350,000	New York . . . . .	4,000,000
Swansea . . . . .	750,000	Stockton-on-Tees . . . . .	500,000	Scarborough. . . . .	800,000
Manchester . . . . .	3,500,000	Edinburgh. . . . .	2,000,000	Perth, W.A. . . . .	125,000
Brighton. . . . .	1,750,000	Guildford . . . . .	350,000	Bremen . . . . .	550,000
Preston . . . . .	1,400,000	Brentford . . . . .	1,200,000	Maidenhead . . . . .	225,000
New York . . . . .	1,200,000	Syracuse, N.Y. . . . .	850,000	Epsom . . . . .	225,000
Southport . . . . .	750,000	Bridlington . . . . .	150,000	North Middlesex. . . . .	150,000
Bath . . . . .	1,000,000	Middlesbrough . . . . .	1,250,000	Wandsworth. . . . .	1,800,000
Newburg, N.Y. . . . .	350,000	Croydon . . . . .	1,250,000	Aarhus . . . . .	800,000
Newburg (2nd) . . . . .	250,000	L. & N.W. Ry., Crewe . . . . .	700,000	Falmouth . . . . .	150,000
Hoylelake . . . . .	125,000	Taunton. . . . .	225,000	Southampton . . . . .	800,000

### SINCE JANUARY 1ST, 1899.

Hartlepool . . . . .	750,000	Brighton (2nd) . . . . .	1,850,000	Dublin (2nd) . . . . .	2,000,000
Utrecht . . . . .	1,000,000	Stockport (2nd) . . . . .	600,000	Faversham . . . . .	200,000
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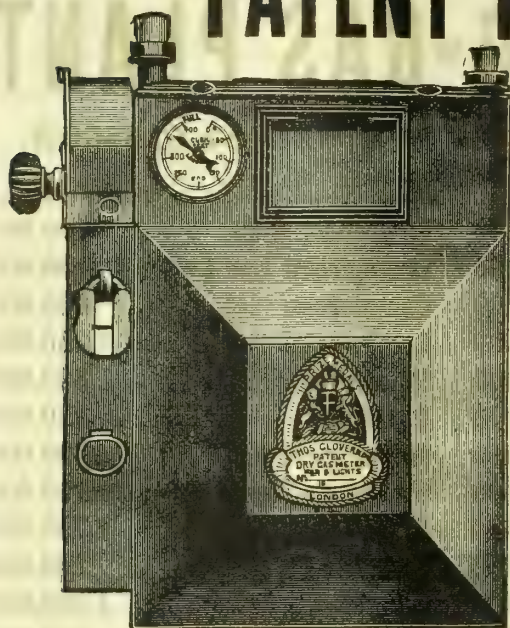
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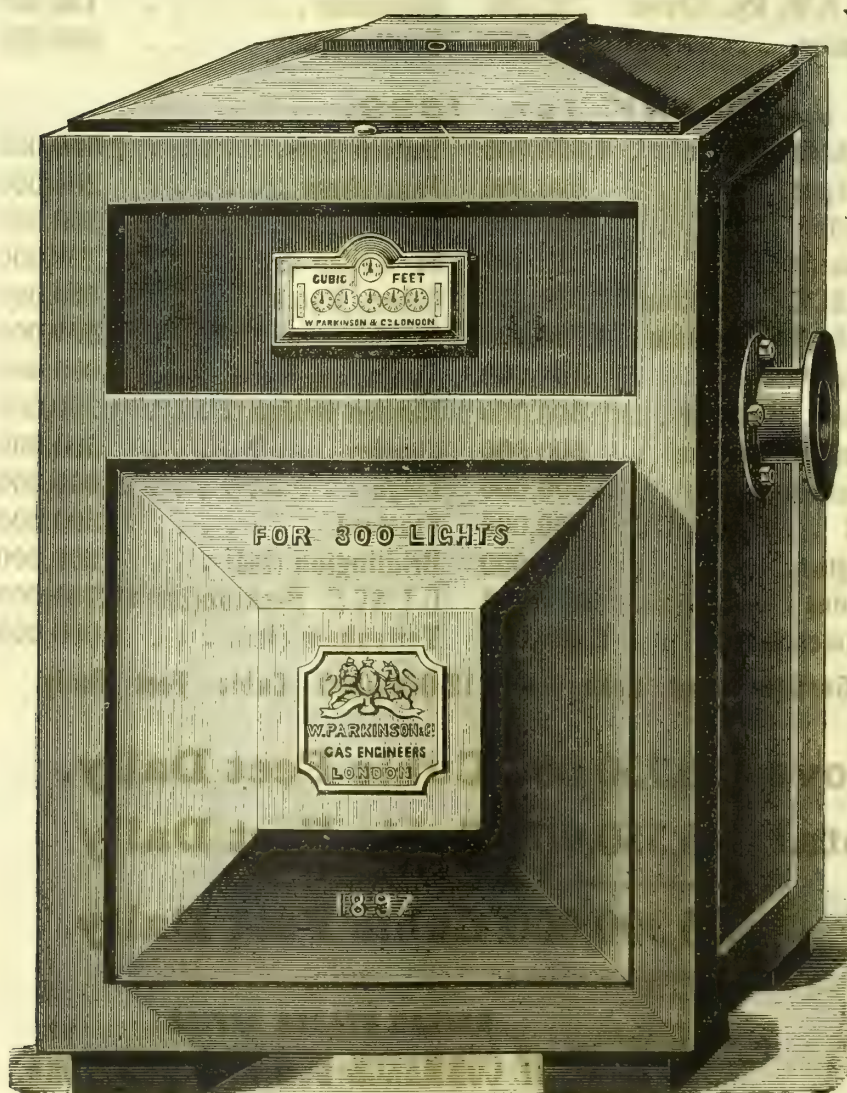
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EDITORIAL NOTES.

The Public Lighting of Provincial Towns.

THE observation that sentiment is a power in the workaday world is one of those truisms that everybody admits, and very few recognize when they encounter evidence of it in their own experience. Most people, when reminded of the fact, will agree as to its prevalence in various spheres of human activity of which they are more or less interested spectators; but when there is a question of the sentiment in regard to some affair of their own, the chances are that they will scout the suggestion that any such consideration is worth a moment's serious attention. The field of street lighting, for example, offers precisely one of these troublesome kinds of business in which commercial considerations and questions of sentiment jostle one another to the confusion of the practical wisdom that does not go much beyond the range of the principle that two and two make four. Since time out of mind, the hum-drum work of public street lighting had been settled between highway authorities and gas companies upon the barest, baldest grounds of necessity and economy. On the one part, the confessed desire was to spend as little as possible on this score, while, on the other, diplomacy was exercised to save everything that could be scraped out of the terms of the contract. Consequently, there were more disputes than enough over street lighting; but always on the ground of the expense. That there could be any other standard of merit never occurred to anybody concerned. The local authorities incessantly tried to screw up the photometric power of the gas, in order that they might be able to cut the hourly consumption of the street-lamps down by a cubic foot or two. They adopted the average meter system; and squabbled over the setting of the lamp governors. They were always scheming to cut out a supposed superfluous lamp here and there; and every necessary bit of extra lighting, as at busy street crossings, was a cause of groaning.

The appearance on the scene of the electric arc lamp was like the dropping of a new ferment into an old brew. Those who had the new luxury to sell flatly declined to recommend its adoption on the old grounds so painfully cultivated by the gas interest. They admitted that the lighting bill would be increased three or fourfold on the new system; but they dilated on the compensating advantages of novelty, fashionableness, innumerable candle power of light, and so forth. Amazing to relate, they were listened to favourably. Much-worried gas managers, grown grey in the service, and habituated to higgling over the cost of a cubic foot or two of gas, stood aghast at seeing their upstart rivals scooping in thrice or four times the lighting bills they ever made out of the business. They could not understand it at all. "Financial relations" had ever been their chief care; and they could not conceive of the possibility of conducting a street lighting branch on any other than the monetary basis. Consequently, they set to work valiantly to beat off the intruder with their old weapon of superior cheapness. The astonishing discovery was then made that a new and additional element, besides cheese-paring, had entered into the counsels of highway authorities. They had learnt to think somewhat of brilliancy of effect, attractiveness, and—most potent influence of all—they desired to be "in the fashion." If, like John Gilpin's wife, they still retained some frugality of mind, it was exercised upon the public gas lighting of the back neighbourhoods. In other words, sentiment had come into action in regard to public lighting.

It was hard for the gas interest to recognize the new fact; but evidence is accumulating that the recognition has at length come, and is ample enough in places to atone for all previous backwardness. It is, of course, the incandescent gaslight that has done it, through its own quality of novelty. Sentiment is no longer driven away from public lighting by gas by the familiarity and commonness of the whole thing. That is the redeeming feature of the actual situation; and local authorities are exhibiting a gratifying willingness to co-operate with gas companies to take full advantage of it. The other recommendation of the new system—its superior economy, which renders it available for the poor neighbourhoods as well as for the front streets—is peculiar to it, unprecedented, and unrivalled. It has for many years been contended in these columns that the best-lit city is not that which has the most brilliant boulevards—although this is admirable—but the one with no neglected



purlieus left in utter darkness. Perception of this principle is now also winning its way. Over all and through all this business, the power of sentiment is great, and must be studied that it may be controlled to good effect.

The following example is in point: Writing of the adoption by the Corporation of a certain town, in co-operation with the Gas Company, of a systematic scheme of public lighting framed with an intelligent appreciation of the resources of civilization in this respect, the local newspaper observes that "there is an idea in many minds that 'electricity is the more up-to-date and aristocratic illuminant.'" Here is the sentiment confessed. Notwithstanding the very same journal willingly testifies, on the strength of the experience of a neighbouring town, that electrically lighted roads have not altogether the best of it; since, "for steadiness and equal distribution of light, 'incandescent gas lighting is far superior to electricity.' It has also the recommendation of being much cheaper." This is a place, be it noted, where the Company supply the gas, while the Corporation do the electric lighting. Similar instances might be multiplied, and examples named. We do not propose to advertise all these progressive places by name, however, for the simple reason that to do so would bring upon the enterprising officials concerned a torrent of inquiries as to how it is done. This is not desirable. Every locality should work out its own schemes of lighting, and not be content with mere imitation. Emulation is admirable; and if the municipal corporations of this country would all concentrate their ambitions on the point of excelling in the proper work of local government and sanitary administration, there would be no municipal political scandals.

#### The Welsh Railway Strike Ended.

WHEN a fire is observed to have broken out in the vicinity of a gunpowder magazine, the first duty is to get it put out as speedily as possible. All considerations of how it originated, or who might have been responsible for it, interesting and important enough in their way, must of necessity be reserved for subsequent investigation. Similarly, so that the spark is effectively quenched, it is not of primary importance that this should be done strictly according to rule, and by regularly accredited agents. There is a legend of an infirm King of Spain who was burnt to death through being placed too near an overheated stove, because the high Court functionary whose sole duty it was to shift the Royal invalid's chair could not be communicated with in time to prevent this unfortunate result. On this score, and on this alone, it is possible to feel a strictly moderate satisfaction in the sudden termination of the Taff Vale railwaymen's strike. South Wales is so eminently a region mined, so to speak, with a most sensitive kind of industrial explosive, and the trade of the country-side is so peculiarly one in substance—and that substance coal—that the prospect of the workpeople in any department of this trade being out on strike was something to be altered quickly, at almost any cost. In this case, happily, the trouble has been composed upon terms which, thanks to the foresight of Sir William Lewis, amount to considerably more than a patch-up of actual differences; but still, the whole affair has unquestionably been a sad muddle.

A synopsis of the story, as it has been told at extravagant length in the newspapers during the past few weeks, reads like a sketch-plot for a Gilbertian satirical comedy. It begins with an alleged grievance arising from the treatment by the Company of a signalman, whose hard case appears to have consisted solely in his being put to some other job at an advance of wages. Hereupon the Local Executive of the Amalgamated Society of Railway Servants decreed a strike, which the Central Executive of the Society at first censured as being hasty, and based on frivolous grounds. When next heard of, however, the same Society, by their chief officers, are "bossing the show," and working it for all it might be worth as a means of procuring "recognition of the Union." So clear was this political issue, that the coal miners of the district served by the Company, who now belong to the most militant of Trade Unions, were getting ready to back their fellows in the endeavour to win upon it; when in a moment the strikers yielded the point, and put the management of their case in the hands of men of the Company's service. Meanwhile, an injunction was applied for by the Company, and granted by the Court, to restrain the officials of the Union individually from doing that which their Taff Vale clients no longer desired them to do. Lastly, the incriminated officials are

found playing the part of peacemakers, without credentials; but simply helping Mr. Hopwood, of the Board of Trade, and Sir William Lewis, to put the speediest end to a situation which had no reason for continued existence. The strikers, sobered by loss of wages and the unwelcome conviction that they were not indispensable, were willing enough to go back to their work; but, of course, they wanted their temporary supplinters sent away. This was perfectly natural; and so also, on the other hand, was the resolve of the Company not to throw over those who had come to their aid in the hour of need. A reasonable way of satisfying both demands was hammered out in the course of the negotiations, and accordingly the acute phase of the trouble is over. More than this, Sir William Lewis has persuaded both employers and employed in this particular service to accept a plan of conciliation which should render frivolous strikes impossible in the future; while the authorities of the National Free Labour Association have made it clear that their resources are not shorn of half their efficacy by being tied to rigid and perhaps impossible conditions.

The only safe moral of these railway labour troubles is the awkward one—for the companies—that it is incumbent upon them to reconsider their rates of pay and conditions of employment whereon these may have fallen behind the standard of the times. We say this with full regard for the interest of those other large employers of unskilled labour which is made valuable by organization—the gas undertakings of this country—who naturally compete with, as they partly support, the railway companies. The rural parts of the kingdom are drained of their able-bodied population to feed the railways and the organized industries of the towns. It is expedient that students of the industrial situation should go into the agricultural districts occasionally, and see for themselves the extent to which this process is going on. There is practically no unskilled, and very little skilled, labour of any value remaining in rural England. Not to speak of artisans, or of men who early take to some avocation which requires a period of apprenticeship, young country labourers are all on the look-out for berths on the railways, or in more arduous town employments if their physique is good enough. For obvious reasons, the railway company, which goes into the country, has the first pick of the untrained manhood of the country-side. The service offers a rate of pay which is attractive to the mere unformed agricultural hand. Once in the service, however, the man is fast bound to the system. He is liable to be sent hither and thither; and it is at least open to question whether the standard of pay and advantages is always and everywhere corrected to date. Gas undertakings have to do this, Union or no Union; and other large employers whose record in this regard is not similarly clear have only themselves to thank for any trouble that may arise in consequence.

#### Factors Affecting the Price of Coal.

THE termination of the railway dispute in South Wales has happily removed what threatened to become a serious obstacle in the way of a return of coal prices to more reasonable figures. The effect of the strike will, of course, be felt for some two or three weeks to come, as so many vessels and orders have, during its continuance, been diverted from the Welsh to the North Country ports. But, provided that the spirit of disaffection do not spread and trouble break out on other coal-carrying lines—it is threatened, we note, on the North-Eastern Railway, on which the bulk of the goods traffic is mineral—no permanent disturbance of the coal market will ensue from the extra-trade difficulties of the past fortnight. The strike has, however, served to incidentally reveal, to those who were not previously aware of the fact, that the peace which at present reigns in the coalfields of South Wales does not rest on the sure foundation of goodwill between men and masters. Anything better calculated to prevent the successful termination of the negotiations, which were then in progress, for the settlement of the railwaymen's dispute, than the speech delivered by Mr. W. Abraham, M.P., to a mass meeting of colliers held at Porth on Wednesday last, could not be imagined. The suggestion that the Board of Trade representative, Mr. Francis Hopwood, had brought all his pressure to bear on the men and none on the masters, was as mischievous as it was contrary to the facts. And if this be the spirit in which disputes not directly concerning the colliers are approached, what hope is there of reasonable dealing with their own employers?

The significance of the speech lies, moreover, not only



in its substance—for many provocative and unwise speeches are made at such times—but also in the fact that the speaker was one who, in former days, was essentially a moderator and peacemaker in all disputes between the miners and the mine-owners of Wales. “Mabon,” as he is always called down there, did more than any man to bring about the adoption by the men of the sliding-scale system, and was formerly trusted by employers and employed alike. Now, unhappily, the Miners’ Federation have captured Mr. Abraham, and “we have changed all that,” with the result that, with the zeal of a pervert, “Mabon” is now more Trade Unionist than the Union leaders. The struggle of 1898 did not, unfortunately, end with the termination of the strike, as will be only too plainly seen when the existing sliding-scale arrangement ends, if it be not brought into evidence at an earlier date by the fall in coal and wages.

At the present moment, however, we may dwell rather upon the satisfactory circumstance that the output of coal will now resume its usual course, and upon the generally brighter prospect of the price resuming its normal level. The rush of the deluded householder to buy his winter requirements will soon be over, and this will have a steady effect upon the market. It is amusing to note, in this connection, that the daily paper which had more than any other to do with the creation of the belief in the mind of the public that there was going to be a real coal famine this winter, is now—with the delightful inconsequence of the “ha’penny press,” sublimely indifferent as to whether to-day’s opinions tally with yesterday’s—calmly informing its readers that “the price of coal is in part due to this panic rush of the public, excited to believe that coal would go to some figure like 50s. a ton.” And this is the same paper that, on the 25th of July last, wrote, in a leading article headed “The Empty Grate”: “It is expected that coal will be dearer and dearer, till at Christmas fifty shillings a ton may be looked for as *more than probable*. . . . The prospects of winter are very dreary—most dreary of all for the poor, who cannot make any provision for the evil day. . . . But the sensible man who has a little money in the bank, and a little room to accumulate coal in cellar or back garden, will set about providing material for his winter fires at once. . . . Anyhow, coal is a good investment which promises to pay 50 per cent. on capital within six months.” So does the Press “enlighten” the Public! The plan adopted is apparently to send the office boy or a “young man from the country” on to the Coal Exchange, to ask when coal is going to be cheaper. “Cheaper?” says the coal merchant who has a thousand tons or so to dispose of, “Why, you’ll be lucky if you can get it at any price in a month’s time!” Off trots the young man to the office of the paper, and out come the head-lines: “Buy your Coal! Going up Next Week!” The gentle reader sends off an order for all he can stock, under the impression that he is getting the better of his neighbours, who all do the same, and the price *does* go up next week. Then the coal merchant smiles. Of course, the public must have its paper, and have it cheap; and how could it be done if the journalist troubled about the accuracy of what he wrote?

#### When a Gas-Works is a “Factory.”

THE decision of the Hove Magistrates in the matter reported in last week’s “JOURNAL” (p. 529), where the Brighton and Hove Gas Company were summoned for infringing the Factory Act, 1898, is of considerable importance to gas companies throughout the United Kingdom. The facts were not disputed; the only question being as to whether the Company really came within the scope of the legislation cited. This is an old difficulty, which has always troubled managers of small and moderate-sized gas-works. Indeed, it is impossible to lay down by hard-and-fast rule that a gas-works is or is not a factory. This is a question of conditions and of degree. Its solution is complicated by the habit of legislating simply by reference, which is so frequently complained of. Everybody is familiar with the roundabout way by which alone it can be decided whether a gas-works is or is not subject to the Workmen’s Compensation Act. So likewise with the subject-matter of the Brighton and Hove Company’s case. Here it was admitted that the gas-works was a factory within the meaning of some Acts; but not of others, including the one under which the local Inspector of Factories took his action. The law, however, seems to be as the Bench interpreted it.

The Company employed seven “young persons” on a Sunday; and it was alleged that this was an offence against the provisions of section 93, sub-section 3, of the Factory and Workshop Act, 1878. It is difficult to see any escape from this conclusion. A gas-works in which power machinery is used is a factory within the meaning of the Workmen’s Compensation Act; and one in which “young persons” are employed is as certainly within the scope of any law intended for the protection of this class of labour. Doubtless, the Company acted in perfect good faith, and they could plead with some effect the confusion caused by the enactment in one year, and the repeal the next, of the statutory requirement to give notice of works accidents. The contention raised by Counsel for the Company that gas is not an “article” the manufacture of which brings them within the section cited, is a legal quibble which is not entitled to respect. In the last stage of the case, the Company were better advised, and pleaded simply in mitigation of penalties that the prosecution had taken them by surprise. An offer on the part of the Bench to state a case for the Superior Court was wisely declined; and the defendants got off for nominal fines. The lesson will not be thrown away. Gas companies who find it expedient to employ young persons, and necessary to work on Sundays, will have to adjust their arrangements to the same law that applies to other factory owners.

#### More Financial Journalism.

THE “Financial News” recently published some terrible balderdash in reference to the asserted failure of Parliament last session to do justice to what is vaguely described as “electrical promotions.” The fact that the various schemes for the generation and supply of electricity in bulk were not allowed to ride roughshod over all the municipalities and established companies within their sketched-out areas, seems to be at the bottom of this complaint. To the ordinary person, it appears a very debatable proposition that any scratch company professing so nebulous an aim as the supply of electrical power for all purposes at next-to-nothing prices should be granted statutory powers for the asking. Yet here is a “grievance”—that a House of Commons exceptionally well furnished with engineers of high repute, with ardent electricians, and with an ample contingent of capitalists, has distinctly shown the cold shoulder to these schemes. “It did not require a death-daring temerity, for example, to risk the assertion that electricity would eventually supersede mineral oils, if not gas, and would probably run gas down to a normal instead of to the present exorbitant price.” If the writer of these nonsensical lines had had any experience of the work of Parliament, he would have known that these generalities will not carry a Bill through Committee. The electricians and their Press partisans have a wonderful knack of self-deception. But there are others in the same business; and the marvel is, not that the Electrical Power Bills of last session survived in a modified form, but that they survived at all. For they all failed of proof that the supply of cheap electricity in bulk is economically possible. It was not the gas interest that checked the aspirations of these “wild cat” projectors, but the undeniable statements of working municipal electricians. They talked of supplying cheap electrical power for industrial purposes, and were confronted by evidence that the Manchester Corporation and others are quite ready to do this, and have offered it for years without meeting with any real encouragement. Talk of the “exorbitant” price of gas! Why, the lowest-priced electrical power ever heard of in this country leaves the gas-engine master of the situation. That is the real trouble of the electricity-in-bulk promoter. And what of his newspaper friend? The “Financial News” says that “the well-established theory of the electrician is that the larger the area of distribution the more efficient and the cheaper is the supply of motor and lighting power.” This is as much as to say that the commercial value of a “milk-walk” depends upon its extent. Ordinary business men would have supposed the contrary to be true; but your financial journalist is no ordinary man. He lives in a strange world, where the greatest of all powers is not usually talked about.

The Chancellor of the German Empire has issued an ordinance to the effect that the Réaumur thermometer will not be admitted to official control after Jan. 1, 1901. This will lead to the exclusive use of the centigrade thermometer in Germany.



## WATER AND SANITARY AFFAIRS.

THE news which reached London at the close of last week, that the investigation which it was considered advisable to institute into the cause of the death of a patient in the Belvedere Hospital, Glasgow, on the 27th ult., had justified Dr. A. K. Chalmers, the City Medical Officer of Health, in stating authoritatively that it was due to bubonic plague, came as an unwelcome exemplification of the truth of the adage that history repeats itself. It is two centuries and a half since London was stricken by the terrible scourge which has again made its appearance; nearly one-seventh of the population being carried off. Its home was formerly Lower Egypt, Turkey, and the shores of the Levant; but it has absented itself since 1844, and has taken up its abode in India, where it has assumed epidemic form. How it has been imported into this country we do not know. It is stated with some authority that rats are very active agents in the spreading of imported plague among populations; and it is, of course, possible that one of these objectionable rodents, arriving from abroad in an infected condition, may have been landed in Glasgow. But it is not very clear how the creature could have communicated the infection. But there is the very patent fact that twelve people are under treatment in the hospital (five of them, however, presumably suffering from enteric fever, with some symptoms of the plague), while fifty suspected patients are in the reception-house. These were to have been inoculated last Friday night with anti-pestiferous serum from the Pasteur Institute in Paris. Prompt measures have been taken by the Corporation to prevent the spread of the disease—all the houses standing near the one in which it originally broke out having been declared within the sanitary area, and arrangements made for their cleansing and fumigation. The child of the man whose death gave rise to the investigation has also died; and the bodies of both are to be cremated. It is understood that the same course will be adopted in all other cases in which death may ensue. The Customs authorities of Glasgow last Friday refused to clear vessels in the harbour; but lower down the Clyde no impediment was offered.

It is not surprising to read that the announcement made by Dr. Chalmers has created quite a consternation in Glasgow, as it dispelled all the hopes which had been cherished that the rumours as to the case under investigation being really one of bubonic plague might prove unfounded. It has been deemed advisable to publish full details of the nature and symptoms of the disease, with the view—commendable to some extent—of ensuring detection and preventing unfounded scares. Unfortunately, however, nervous people reading these details, and possibly being troubled at the time by a slight ailment which resembles some characteristic of the dreaded disease—glandular swelling, for example—are apt to take unnecessary alarm. This was the case on the occasion of the great epidemic of cholera in 1848-9. Now, this is just where trouble is likely to arise. Only a small proportion of the medical practitioners of this country have had opportunities of seeing cases of plague, the signs and symptoms of which, as pointed out by the "British Medical Journal," are not of such a character as to lend themselves to speedy diagnosis. If it were stamped with symptoms as definite as those (say) of small-pox, there would be but little chance of infected persons getting ashore from ships or being allowed to remain unisolated. It is owing to its insidious and complex nature that plague finds its way over the world. There is all the more reason, therefore, that the utmost care should be exercised in the diagnosis of any suspected cases coming under the notice of the general practitioner, in order, primarily, that the disease may be properly dealt with if present, and all unnecessary alarm dispelled if not.

If the disease which is now causing trouble to the medical authorities and inhabitants of Glasgow is an importation from abroad, it is one which will scarcely be received with the cordiality which Englishmen have been so fond of displaying towards anything of foreign origin. But we are inclined to think that local conditions are to some extent responsible for the outbreak. Bubonic plague, like typhus, is a "filth" disease. Of all the causes co-operating to its propagation, apart from the "rat" theory and communication by means of clothing and merchandise, uncleanness is the most powerful—that is to say, the accumulation of decaying animal matter around dwellings, and the consequent saturation of the soil with filth, accompanied by poverty, over-

crowding, and defective ventilation. Such conditions as these may be considered to act by supplying a suitable environment for the life and growth outside the body of the specific poison which when received into it produces the febrile state which develops into the disease. When they are absent, one of the main factors contributing to the spread and permanence of the plague will be wanting—a fact which makes it probable that the greater attention to cleanliness facilitated by ample water supply and improved sanitary arrangements is the chief cause of its disappearance from Europe. We do not say that in the particular street in Glasgow where the disease first showed itself all the conditions conducing to the existence of plague which are enumerated above are to be found; but, at all events, it is one of the poorest in the city, the residents having, it is reported, been forced to "huddle together" in single apartments owing to an adjoining railway extension. Moreover, certain parts of Glasgow are, as most people know, by no means salubrious; while, interesting as is a journey by steamboat down the Clyde to hear the "music of the hammers," those who are not to the manner born generally prefer to escape the disagreeable odour rising from the river by going by train to Greenock or Gourock, and embarking there for the Highlands. Dr. Bruce Low is of opinion that the plague is indigenous in many hitherto unsuspected quarters; and Sir Richard Thorne Thorne, writing in his capacity of Chief Medical Officer of the Local Government Board, declared that, inasmuch as no system of inspection or other restriction is perfect, all we can do is to "trust to" "such local sanitary administration as will deprive such a "disease of the means of diffusing itself." One of the first measures to be resorted to must be the isolation of the patient; the next, the remedying of those insanitary housing conditions which are capable of producing an epidemic. Fortunately, Glasgow has a good and abundant water supply; and, as the sanitary staff has been doubled, the Medical Officers of Health are confident that they will succeed in arresting the progress of the disease, and finally stamping it out. Though the announcement of its appearance among us naturally caused anxiety, we believe, with the "Lancet," that, owing to the ability of modern sanitary science to localize outbreaks of infectious disease in well-governed communities, there need be no cause for panic.

We referred last week to some of the subjects discussed at the International Health Congress recently held in Paris. The importance of keeping the air inside a dwelling-house sweet, came in—and deservedly—for a large share of attention; but seeing that this air enters the building for the most part by the windows and doors, it was only right that some consideration should be given to the question of aerial sanitation. This was dealt with by experts selected for the purpose by the Committee of Organization—M. Armand Gauthier and Professor Gréhan taking up the question of the prevention of smoke, noxious gas, and dust in towns; and M. Pucey discoursing upon the interior arrangements, the decoration, and the aëration of houses. Of course, allusion was made to the labours of the Committee appointed to examine and report upon the smoke-consuming appliances exhibited at South Kensington in 1882, and to the experiments of Professor Chandler-Roberts in connection therewith; also to those of M. Gauthier on the atmosphere of Paris. The principal conclusion arrived at was that the insalubrity produced in the air of large towns is much less redoubtable than one would be led to suppose; but it was acknowledged that local causes might give rise to a dangerous accumulation of certain gases in particular quarters or in densely populated places. It was as well that this was admitted by a body of sanitarians, because the ordinary person is quite conscious of the fact. And here it may be incidentally remarked that in removing one nuisance we are very liable to create another. For example, the proximity of garbage and refuse is admittedly undesirable; and any means of effectually destroying it are welcomed. Yet most people are aware that the process is attended by the evolution of a certain pungent odour which is certainly not pleasant. At the same time, it is doubtless less dangerous to health than would be the emanations from the rubbish which is being consumed. The Congress did not make any definite pronouncement on the subject of the air of towns, but passed a resolution embodying the very self-evident proposition that all the rooms in a dwelling-house ought to be perfectly ventilated; the air being continually renewed in winter as well as in summer, on the sole condition that no injury results to the occupants' health.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 593.)

BUSINESS on the Stock Exchange in the week just concluded shows no improvement upon its predecessor, so far as any increase in volume is concerned; but there was certainly a decided amelioration of the tone. The causes are naturally to be sought in the brighter prospects in the Transvaal and in the avoidance of the Taff Vale difficulty, coupled with one or two minor influences working in the same direction. Consequently, prices show an advance in most departments, though not an extensive one; gilt-edged securities being in front of the movement. The settlement was a light and easy operation. In the Money Market, there was a good demand—Stock Exchange necessities and the usual requirements at the end of the month creating a want; but discount rates were somewhat easier. In the Gas Market, business continues to be at a very low ebb, and quite devoid of interest. It is, however, a favourable indication that, in spite of the inactivity, which so often produces a tendency to droop, prices rather show a disposition to improve. Actual changes are very few; but they are in the upward direction, and they affect the two leading stocks in the market—the Gaslight and Coke and South Metropolitan. Gaslight ordinary had a rise of a point after being very moderately dealt in at steady figures; but the secured issues were hardly touched, and made no sign. South Metropolitan opened at top price, and then gained a point, but the closing figures did not evince any disposition to advance further. Commercial were almost untouched and unchanged. Transactions in the Suburban and Provincial Group were of the lightest; and the only change was an advance in Tottenham and Edmontons from the very low figures they had been put back to. Among the Continental Companies, there was business on a small scale in Imperial and European at the old figures, without any sign of change. All the undertakings in the remoter world were devoid of feature. In Water, although actual business done was on about the usual limited scale, there was a marked improvement in prices pretty well all round.

The daily operations were: Business in Gas opened extremely quiet on Monday, and quotations did not vary. There was a very slight increase in volume on Tuesday; but still nothing moved. Wednesday was about the same; but South Metropolitan improved 1. In Water, Chelsea rose  $4\frac{1}{2}$ , East London and both Lambeths 2 each, and Southwark 1. Thursday was a very quiet day; but Gaslight ordinary advanced 1. In Water, East London rose 3, and Chelsea  $2\frac{1}{2}$ . Gas was again unchanged on Friday; but in Water, Lambeth tens rose 2. Saturday was almost a blank day, and quotations closed as before.

### ELECTRIC LIGHTING MEMORANDA.

#### The Electricity Supply of Dublin—Change of Regime—The Political Scandal—A "Twopenny-halfpenny" Venture!

THERE has been little of political interest of late to record in connection with electric lighting; but the decision of the Dublin Corporation to proceed with their very questionable electric lighting scheme, involving the creation of a new generating centre at Pigeon House Fort, is too serious an event of this nature to escape mention. We have already explained in all necessary detail the characteristic features of the Dublin situation, and have shown how different obscure political and personal considerations have influenced its developments. Essentially, doubtless, the case of the people of Dublin in respect of electricity supply is very much that of the gentleman of the classical period who, upon asking a professional Augur whether he should marry or not, was assured, in response, that whichever course he might take he would surely repent of it. The Dublin Corporation have hitherto made a wretched mess of their municipal electric lighting, both financially and technically. It ought not to be forgotten that this Corporation was the originator of the grand idea that a sinking fund for the repayment of a loan is tantamount to a depreciation fund for the maintenance of industrial plant in a profit-earning capacity. This "Dublin plan," as it was called, was gleefully adopted by the St. Pancras Vestry; and other local authorities have not been backward in following such an easy way into the "Fool's Paradise." Long ago, however, the plan came to grief in the place of its origin, when the Corporation experienced the greatest difficulty in obtaining more money for the renewal of worn-out cables before the first advance to pay for them had been half or a quarter repaid.

Dr. Kennedy then came to the assistance of the Corporation, and, by a plausible convention under which the new cables were charitably supposed to be extensions, and not merely replacements of the old ones, the Government of the day winked at the financial juggle. The result has proved the reverse of satisfactory, and should serve as a deterrent from any repetition of the operation to "save the face" of a local authority. The whole of the original Dublin Corporation electric lighting venture is to be swallowed up in a big extension, upon lines which the expert who has once saved the Corporation could not recommend. It is needful to tread warily in this part of the narrative; but, as the Lord Mayor recently put it, "Professor Kennedy reluctantly withdrew his connection with Dublin, and Mr. Robert Hammond was appointed in his stead." It is Mr. Hammond's scheme,

already criticized in the "JOURNAL," that the Corporation have determined to carry out, under influences which cannot be described here. In the interval between Kennedy and Hammond, there arose in the land of Erin a new power, whose name was Murphy. He came with American ideas of electric tramway traction and lighting, and offered to take the responsibility of providing ample electricity for Dublin off the shoulders of the Corporation, who had already failed under a smaller burden of the kind, upon terms which the House of Commons regarded as fair and reasonable.

The affair, however, was Irish to the core. The various "interests," instead of relying on the merits of their respective schemes, proceeded to acquire or influence local newspapers, which duly belauded them and abused their opponents. Rival contingents of Members of Parliament were engaged to "lobby"—euphemistic term—for and against the various schemes; and the proceedings at Westminster were accordingly of the kind which newspaper reporters of "scenes in the House" love, but make the judicious grieve. The Dublin Gas Company were, of course, accused of having a hand in this high political and municipal game; but the truth or falsity of this accusation does not concern us. We only repeat the story to show how little the merits of anything of the kind have to do with its fortunes. Now the Corporation have committed themselves to the acceptance of tenders for £46,000 out of an estimated expenditure of £254,000 for the starting of Mr. Hammond's scheme, which, of course, means that, whatever the subsequent costs, the whole enterprise must be gone through with. It is to be desired that the next public advocate of the municipalization of such undertakings as electricity supply will not overlook the example of Dublin. The spirit in which the Corporation have gone into the business is sufficiently disclosed by the concluding words of the Lord Mayor's speech recommending the approval of the Committee's report: "They talked of Home Rule; but if they were not capable of carrying out a twopenny-halfpenny job like this, they were not capable of governing Ireland." This is the politics of the whole thing. Politics it is, for good or for evil; but it certainly is not business.

Just look at this "twopenny-halfpenny business" in relation to the financial position of the Corporation and the crying needs of the City of Dublin. One of the most insalubrious of British or Irish towns, to judge by the death-rate, Dublin has almost everything to do to get into a thoroughly healthy state. There is not a penny of superfluous rateable value in the Corporation area; and, in face of this, the Town Council, which certainly does not contain the best industrial and commercial talent of the city, is bent upon incurring an immediate further capital liability of over a quarter-of-a-million sterling, with nobody knows how much more to follow in the inevitable "surprise packet." The cream of the joke is, besides, that the Tramways Company would have done the whole service as cheaply as the Corporation, with the certainty that in the regular course all the plant would fall to the Corporation at the actual value. The precise figures are as follows: The Tramways Company would have bound themselves to supply the Corporation in bulk with electricity at from  $2\frac{1}{2}$ d. to  $1\frac{1}{2}$ d. per unit. And the Corporation could have seen that the Company did it, and did it well. There were other advantageous terms. Against this, the ratepayers have the bare statement that "the Corporation proposal is to supply the consumer for  $1\frac{1}{2}$ d. per unit." Who is to see that this promise is fulfilled? Those theorists of local self-government who make so much of the power of the ratepayers to keep a check upon the local authority might be commended to seek in all this story of the Dublin electricity supply for the faintest indication of any such power in practice. It will be small satisfaction to the Dublin ratepayers in a few years' time to turn out of office the mistaken, or unjust, town councillors who have consented to this extravagant scheme.

### THE LATEST AMERICAN DISCOVERY.

THE alleged discovery recently described in a contemporary as having been made by the great American electrician, Mr. Tesla, has been hailed in some quarters as affording, "if it proves true"—an "if" of some importance—a solution to all problems concerning the future supply of energy to the World's commercial wheels, and as, incidentally, extinguishing the whole industry of gas manufacture. Everything in future will be done by electricity—coal will not be "used at all in industrial undertakings, and used in houses only as we now use wood, to give the pleasant sensations attendant upon an open fire." Electric lighting will be so cheapened that we shall no more be "poisoned by gas or run the risk of fire from lamps" (there is none, of course, from electricity!). Light and warmth will be supplied "with as much ease as water, and possibly at a smaller cost." Fogs will be banished for ever and a day. All this will happen, we are told, if Mr. Tesla's discovery makes good its claims.

What, then, the trembling holder of gas shares may be asking, is this subversive discovery that is going to revolutionize the economics and habits of the world? It is nothing less, nor more, than that of means for conveying electricity unlimited distances, across continents and under oceans, without loss of power. This is to be done by freezing the conducting metal by means of liquid air or gas. Mr. Tesla, we read, purposes to carry a metal tube, immersed in a trough containing sawdust and water, and placed some 6 feet below the surface, to any required distance



from the source of power (which, we gather, is to be Niagara Falls). Through this surrounding material—we are quoting from the "Spectator," not usually given to the dissemination of the absurd—Mr. Tesla will "force a current of liquid gas, which will freeze the enclosed metal, and thus neutralize the heat generated by the passage of the electric current. There is no reason why this trough should not be carried across an entire Continent, and probably none why it should not be laid (like any ordinary cable) under the Atlantic or Pacific Ocean." Well, in these days of scientific achievements of the apparently impossible, one approaches the account of any new discovery with a mind prepared for the surprising, and free from a preconceived scepticism as to the value or truth of the alleged attainment. But the foregoing is too strong meat for the digestion of our credulity.

The application of liquid gas to the conductor may and doubtless does facilitate the transmission of electricity—that is, a thoroughly credible contention. But how, in the name of fortune, is it proposed to maintain a constant flow of liquid gas, which shall remain liquid throughout the whole length of its course, from one side of the Atlantic to the other, even presupposing the possibility of successfully laying such a trough as is described from Ireland to Newfoundland? Indeed, how could such a flow be maintained from one end of London to another? We await the answer to this rather important question with interest. Further, assuming these preliminary—and vital—points to be satisfactorily answered, What of the cost? All we are told is that "it has been calculated"—mark the word—"that electricity generated at Niagara could be delivered at Albany, 330 miles away, at a cheaper rate than steam-power can be generated there with coal at 12s. a ton." When the word "calculated" is able to be written "proved," we will then consider the further statement that "it will be as easy to take the electric current 3000 miles as to take it 300."

The writer in the "Spectator" remarks that "at any time this discovery would have extraordinary interest; but at a moment when every industry and every housekeeper is alarmed by the rise in the price of coal, it comes with exceptional opportuneness." It would be nearer the mark to say that, at a moment when, as a rule, the silly season is in full swing, an enterprising journalist has introduced a new form of "sea-serpent," trailing its trough along the bed of the ocean and living upon liquid hydrogen. If the coal consumer has to wait for relief from his present sufferings at the hands of the coalowner, until the Niagara-generated electricity arrives in this country, he had better cut his losses and resign himself to his fate. But we really don't advise gas stock proprietors to sell out just yet.

### THE BURDEN OF COAL.

THE September number of the "Nineteenth Century" contains an interesting article under the above title on the burning question of the day, from the pen of Mr. Benjamin Taylor. The subject is handled in a very able manner by a writer who, not by self-announcement, but by performance, is seen to be "one who knows"—a phrase so frequently used as a gloss for ignorant anonymity. Mr. Taylor hits the serious nature of the present situation on the head at the outset, when he says that "the burden of coal . . . is crushing the life-blood out of our industries, for we have the fact, more serious than the woes of the householder, that the cost of production is going up, while the prices of finished products are coming down. One cannot imagine a worse economic position than the combination of advancing costs and lowering prices." This is the outcome of the extraordinary and almost universal growth of industrial enterprise during the past two or three years, with its consequent increase of demand upon the available supply of power, of which coal is the prime source. The production, although stimulated, proving inadequate to this demand, the colliery owners have been enabled—and have not withstood the temptation—to run the price of coal up to such a figure as is becoming a veritable millstone round the neck of the iron and steel trades. Such is, in face of the increasing competition of other countries, a matter of serious national importance; and we have on more than one recent occasion given expression to the conviction, borne in upon us by a careful consideration of the present and probable future situation, that the consequences to the trade of this country of the tremendous increase in the cost of fuel will be more grave and lasting than the coalowners appear to have realized, or care to consider.

While it is true that the colliery proprietors have been guilty of taking extreme advantage of their opportunity—to their own eventual undoing—it must be admitted that, unless they were formed into an all-comprising ring, the owners must necessarily be led, as regards the ruling price, by the most grasping and least far-seeing among them; for if buyers be in such need that one colliery can obtain thirty shillings for all the coal it can produce, will its next-door neighbour be so heroic as to refuse to ask more than twenty, though he know full well that the ultimate result of imposing the higher price will be serious damage to his own trade? He is, we fear, much more likely to ask thirty-five shillings, and then try to sell his colliery to a company promoter. It is not easy to discover any remedy; there is probably none that would not, in the long run, be worse than the disease, except the natural course of events. But, as Mr. Taylor says, "it is

not pleasant to think that industries may die in order that colliery owners may dine off gold-plate."

If, further, the probable future damage which the coal trade, in common with the other industries of the country, will suffer as a consequence of present undue prosperity, be not recognized or heeded by the educated and shrewd men of business who own and manage the collieries, is it to be expected that the comparatively ignorant collier will take a more enlightened view? Of course not; and, therefore, the miner is in no hurry to bring down the price to reasonable levels by an increased output. He forgets, if he ever knew, that there is another factor that influences price beside supply, and that this is demand, which high prices tend to kill. The restriction of output fallacy, combined with the fact that there is "not much temptation for the collier to go down into the bowels of the earth six days a week, if in four days he can earn as much as will keep himself and family, not only in comfort but in luxury, compared with the short commons of recent years," are proving instrumental in accentuating the prevailing prosperity of the trade; but they will as surely result in considerably curtailing the period of its duration. A largely augmented output of coal at a moderately increased price would have sustained the industrial activity of the world for a very long time, with great benefit to all concerned in the business of coal mining. It is infinitely better for a man to earn £500 in each of two years, than to make £700 one year and £300 the next. He will very likely, in the latter case, be a bankrupt at the end of the period, to the damage of himself and his creditors.

Mr. Taylor naturally refers at some length to the fact that the increased coal consumption of Europe has been very largely responsible for the shortage of coal in this country; no less than 6½ million tons more being supplied to European countries in 1899 than in the previous year, while our total exports accounted for rather more than one-fourth of our output. This leads him to the consideration of the oft-discussed proposal to restrict or prohibit the export of coal. On this his views are emphatically hostile to the suggestion. "Such a proceeding," he says, "would be suicidal, for it would destroy the best part of our maritime commerce. Coal is practically the only commodity we have to send away in any quantity sufficient to provide outward cargoes for the ships needed to bring foreign food-stuffs and material for our mills and factories. It constitutes something like four-fifths of the entire weight of stuff we export. Without it, our ships would have to go away in ballast to obtain supplies of wheat, and cotton, and iron ore, and timber. Ballast costs money, whereas coal pays for its carriage. To stop, or even to arbitrarily restrict, the export of coal would be to so enormously increase the freight-cost of our imports as to raise both the cost of living and the cost of industrial production. We should quickly lose both our shipping—and our foreign trade; and without the foreign trade half our factories would be idle."

Mr. Taylor proceeds to further point out that a large quantity of the coal exported is eventually used by British vessels, and that a prohibition of the export of coal from these islands would therefore inflict damage on British shipping indirectly as well as directly. He then, however, makes a remark that is curiously crude and illogical compared with the rest of his article. After saying that "it would be extremely interesting to know (and the inquiry which Mr. A. D. Provand, M.P., advocates should enable us to ascertain) how much of our exports of steam coal are for the bunkers of navies of foreign countries that are, or soon may be, at enmity with us," Mr. Taylor adds: "Few people will be disposed to doubt the wisdom of permanently controlling exports of that kind." Now, that is the sort of unconsidered general remark that a journalist with no particular knowledge of his subject would probably make if he were suddenly called upon to write a paragraph on our coal exports. How, may we ask, does Mr. Taylor imagine that we can allow free export of coal for industrial purposes, and at the same time "permanently control" the export of coal for use in the bunkers of other countries' warships? Are we to sell coal in packets marked "for industrial purposes only; if sold for use in navies, the seller will be prosecuted," or how is it to be done? No; if coal exports be permitted, it is impossible to earmark them for any special use; and such an *obiter dictum* as we have quoted only darkens counsel.

The writer points out, while contrasting the situation of the present day with that in 1872-3, what we do not think has been previously brought to notice—namely, that coal is now dearer than—except in temporary periods of strike or accidental deprivation of supplies—it has ever been, in relation to other commodities; and that miners' wages are a great deal higher than ever before, if measured by the cost of living. Even taking the price of iron, which is proportionately higher now than other commodities, we find that a Scotch pig-iron warrant "is 73s. to-day; while it was as high as 145s. 6d., and averaged nearly 120s., in 1873." To take another instance of an article immediately dependent for its production on coal, the price of gas to-day is, of course, much lower than it was 27 years ago. A net increase in the charge for coal of 6d. per 1000 cubic feet is obviously a much more serious matter with gas at 2s. 6d. than when it was at 4s.

Another of "the many important facts, the exact significance of which can best be laid before the country by means of a Royal Commission," is the lower cost of production in America as compared with that in England. Mr. Taylor accounts for this difference by saying that "America has not only more



accessible coal, but also more industrious colliers—not by any means better workmen than ours, but working so many hours per week that they can turn out nearly 70 per cent. more coal per man in the year.” This, however, is not quite an accurate representation of the facts; the truth being that the larger output per miner in the States is in no small degree due to the general use of coal-cutting machinery. In this country, partly through the supineness of the owners, and partly through the stupid opposition of the men, almost all the coal is got by hand labour.

Mr. Taylor discusses the different and much-varying estimates of the probable duration of our coalfields; but, as he recognizes, the “man in the street” (the lineal descendant of Lord Palmerston’s “fat man in a white hat in the twopenny ‘bus”) is not so much concerned with statistics and the respective accuracy of hypothetical durations, as with the possibility of bringing down prices to a reasonable figure, and, further, with the chances of obtaining other supplies of energy which would make the world less dependent upon its coal resources. Well, Mr. Taylor gives him a needed reminder that he shamefully wastes the coal he has got. “About one-tenth of the coal yielded by our mines is consumed for domestic purposes; and it is computed that not more than about 1 per cent. of what is so consumed is used beneficially.” Mr. Taylor then promises him relief in the future, which will come all the sooner if he will be economical in his methods of utilization. Relief, he says, will be obtained from economical consumption, reduced requirements (owing to the freer use of electricity for motive power and illumination, the generating to be done by means of the water power of Cumberland, Wales, and Scotland, as to which we can only say that when a man prophesies you are free to doubt him), reduced cost of production, and utilization of deposits at present unavailable—the two last to be achieved by the increased use of coal-cutting machinery actuated by electricity. The wider adoption of liquid fuel in place of coal for use in the case of locomotives and steamers, is also spoken of as probable. In that direction lies a “potential saving” of 35 million tons of coal annually.

Mr. Taylor concludes with a reference to the influence which America must in future exert on our markets:—

There is another consideration, mention of which brings one with a shock face to face with the greatest bugbear. The largest consumption of coal is, as we have seen, in the manufacture of iron. It is now highly improbable that this branch of home consumption will increase in future in anything like the ratio of the past, because the United States is taking our place as iron manufacturer for the whole world. We shall, therefore, save our coal, because America will turn more of hers. When Jevons wrote on the Coal Question, he said: “While the export of coal is a vast and growing branch of our trade, a reversal of the trade and a future return current of coal is a commercial impossibility and absurdity.” Would he say that now—with American iron in the Black Country, with American steel in Sheffield, with American ship-plates in Scotland, and with American coal in London? If a return current of raw coal from America in persistent volume is not probable, though not a commercial impossibility, a permanent current of consumed coal in the shape of iron and steel may surely be looked for. This will gradually effect an industrial revolution, as we shall have to find employment for our energies in manufactures not so dependent on cheap fuel.

This, as the writer says, is casting forward into the distant future; and it may be remarked that employment in manufactures not dependent upon cheap fuel is not easy to find. But we fully agree that “the conditions of the problem of the immediate future relate rather to the development of the coal resources of the United States than to the exhaustion of those of Great Britain.”

### AMERICAN ENGINEERING COMPETITION.

(Concluded from p. 521.)

WE have now to consider the two articles in which “The Times” correspondent deals with the influence of the labour question in this country upon the power of English manufacturers to withstand the onslaught which their American rivals intend to make upon them, not only in neutral markets, but even, as becomes daily more apparent, in the markets of England and Scotland. The supreme importance of this aspect of the question of English *versus* American manufacturers is clearly seen and strongly emphasized by “The Times” writer. “Those,” he says, “who control the manufacture of commodities in Great Britain have already found that, with the disappearance of a practical monopoly in some of the world’s markets, they have had to attack many problems in quite different fashion. The chief of these has been the labour problem, which is a subject of such paramount importance that it should occupy the best attention in discussing the question of foreign competition.” Wherein lies the difference between the labour difficulties with which the English and American employers have to contend; and, if such difference largely favour the latter in their competition with the former, what remedies, if any, lie to the hand of the manufacturers of this country? These are the vital questions. Let us see what light is thrown on them by the articles before us, from which we must take the liberty of freely quoting.

First and foremost, and as the sole considerable factor weighing against English employers, is put the restrictive tyranny exercised by the Trade Unions over the methods of manufacture in this country—a tyranny lessened, but not destroyed, by the struggle of 1898. It is not contended that no labour troubles

are experienced on the other side of the Atlantic: “That would be flying in the face of recorded facts, for there have perhaps been more serious riots and bloodshed in recent years in the United States than in Great Britain in connection with labour disputes. The point is that employers have not meekly allowed control to pass out of their hands, nor tamely submitted to restriction of output and to general inefficiency, as the British employer has.” It must be remarked that we have ere now heard stories of Trade Union meddling in the States fully as vexatious as that experienced by traders in this country; but, inasmuch as “The Times” correspondent has recently visited a large number of the most considerable of the American engineering works, and testifies from his personal observation and inquiry that these factories at least are not hampered by Trade Union restrictive rules, we must assume that the cases which have been brought to our notice have referred to isolated works or other industries.

There can, indeed, in face of the testimony before us, be no doubt that American engineering masters are not handicapped by the opposition of their men, either direct or indirect, to the adoption and successful working of labour-saving appliances. As the writer of the article says, this of itself constitutes one of the chief advantages possessed by the United States manufacturer; “indeed, *that and free labour are the foundations of American manufacturing success.*” He then proceeds to point out the very different state of affairs existing in this country, and his remarks upon the pernicious effects of Trade Unionism, as it is run in the engineering trades particularly, are very exactly in accord with the views always held by the “JOURNAL.” He prefaces his indictment of the Unions as trade-hinderers by not unjustly blaming the masters for ever having allowed them to get such a hold upon the management and working of the shops as finally led up to the rebellion of the masters in 1898.

The recent successes of our foreign rivals are often attributed by employers to the conduct of British working men, or, perhaps, rather, to the Trade Unions which represent them. We hear of absurd yet most damaging restrictions on labour—that one man may attend only to one machine; that a certain low speed of output must not be exceeded; of shop stewards (the secret police who enforce the unwritten laws of the Unions); of demarcation of work which prevents a man of one trade from attempting the most trivial operation outside an exact boundary of his calling; and of many other hampering limitations which retard work and run up its cost to an extent altogether incredible to those who are not acquainted with the inner working of engineering workshops. There is no doubt that all these things exist, though to a somewhat modified degree since the great engineering strike. The employers say the fault is with the men. But it may be questioned whether the masters are not more to blame, for the reason that they are more educated, and their opportunities have been greater. The average working man is not much given to systematic examination of economic problems. He jumps to conclusions; and having once made up his mind, he is very difficult to move. Trade Union methods, on the surface, are for his good; so much so that many persons of education and position, having little practical knowledge of the subject, are led to think the same thing. Employers of labour—with a wider horizon than the working man, and having also that actual experience which the academic student lacks—see in the more objectionable methods of the Unions a danger to trade which must be destroyed, or it will itself destroy manufacturing industry. . . . It is plainly the duty of the masters to meet this common foe—to combine together and make such present sacrifice as may be needed for future gain, to act loyally towards each other without selfish considerations for individual profit. In place of these things, what have we seen? When the great strike in the engineering trade commenced about two years ago, . . . it was said that the engineering firms had not, in recent times, thoroughly supported each other. . . . Trade Union tyranny had been allowed to grow up and flourish because the firms had been too jealous or too greedy to help one another loyally. This was what was said. It was a severe view, but, it must be confessed, was not without foundation.

The engineering masters, of course, did hold together, to the surprise of many—the Trade Union leaders not least among them—and won the day. But that is really the first and only occasion on which employers in such a vast industry have combined, completely, loyally, and successfully, to fight the tyranny of the Unions; and we have quoted from “The Times” correspondent at such length because we so fully endorse his plea for united and firm action in the future, in the interests, not merely (nor mainly) of the employers, but of the men themselves and the nation at large. If we are to hold our own as a commercial power—and how else is the existing and rapidly-growing population to find employment?—the rule of militant Trade Unionism must, it is clear, be broken.

In dealing with this matter, plain speech is a necessity. A custom has grown up of speaking of the Trade Union system as something almost sacred, and that must not be assailed. This had its origin in political considerations; for working men are many, and have votes. It was strengthened by constant repetition, and by the fallacy that all the improvements in the pay and position of workmen were owing to their Trade Societies, instead of being the natural outcome of higher productive capacity, which in turn has been due to invention and the organization of capital, or in other words, the progress of the factory system. If the Unions had remained what they were originally intended to be—Benefit Societies—the regard paid to them would be worthy of observance; but militant Trade Unions have been the chief means of stopping the advance of British engineering industry, and . . . their unreasonable and pernicious rule must be suppressed.

That is the task which lies before the employers of this country; for, although the masters were successful in 1898, and although since then the Union officials have performed better more reasonable in their actions, it is, we fear, only too true that “the old ambitions are still cherished, the old fallacies are yet unshaken. It only needs a period of recovery, and then a favourable opportunity, for the spirit of two years ago to break out again.” Certainly, no one who follows the movements of Trade Union



politics in this country is under the delusion that the old spirit of the officials has been changed by the events of 1898 for a new and sincere desire to be reasonable in their dealings with the masters. What that spirit was, and is, is well illustrated by some quotations from the Official Journal of the Amalgamated Society of Engineers. The first quotation made is from an "editorial" in which a programme was sketched calculated to "assist in that alteration of the competitive system of industry which is now embodied in the rule-book as one of the objects of the Society." The Trade Union Mrs. Partington trying to sweep back the tide of competition between firm and firm with the mop of trade-hampering rules, will look particularly foolish when the tide to be kept in check is the competition of un-hampered manufacturers with the Union-restricted employers upon whose prosperity the dupes of the Union are dependent for their bread and cheese. "Its accomplishment," the editorial proceeds, "may, and we believe will, involve the registering of Trade Union desires by the force of legal enactment, and the better utilization of public bodies than has yet been endorsed. For labour-displacing machinery means an ever-increasing obstacle to be faced." It is the last sentence that is the most significant and revealing. Nothing can well be more injurious to the prosperity of this country than the hostility of the labour organizations to labour-saving appliances, or the fatal absurdity of insisting upon skilled workmen being employed to manipulate machines capable of being tended by youths or unskilled workmen. Yet this is the declared policy of the A.S.E., as the following quotations clearly show.

Referring to a dispute at Earle's shipbuilding and engineering works at Hull, the Journal of the Society said: "Our members, after a strike maintained with a pertinacity beyond all praise, have forced recognition of the principle that machines which supersede hand-skilled labour should be manipulated by skilled and full-paid men." Again: "The machine question has also been prominently to the front all over the [Glasgow] district. . . . There seems to be a determination on the part of employers to put labourers to this class of tools." Yet once more: "With a view to checking the employment of labourers on mechanics' work, the District Committee drafted the appended restrictive bye-law." Furthermore, it is of course notorious that not only must none but a skilled workman be employed to work the machine that replaces the need for his skill, but that the said skilled workman is forbidden by his Union to do more than a limited amount of work with the machine he is so expensively put to manipulate. It is only necessary for the reader to recall some of the points noted from the previous articles of "The Times" correspondent, in which he especially referred to "unskilled" men in the American shops he visited working their machines for all they were worth, and making suggestions for increasing their efficiency, to realize the tremendous handicap put on the English employer by the short-sighted, irritating, foolish policy of the A.S.E., the Boilermakers' Society, and others of the same kidney.

The idiotic extremes to which the Union rules governing "demarcation" of work have so often run are next held up—and very properly—to the scorn of all reasonable and practical men. The dispute which arose between the two Societies just named as to whether some water-tube boilers which were being made by Thorneycrofts should be deemed to be the work of fitters to whom all work on pipes belonged, or to the Boilermakers, who declared that A.S.E. men should not touch boilers, which led to weeks of delay, and finally to a strike, is instanced, only to be surpassed by another case of even greater absurdity, taken from the columns of "Engineering." The dispute occurred between shipwrights and ship-joiners. Both these trades work in wood on the structure of a ship, each doing planing, &c., with much the same tools. "A line of demarcation is drawn by the thickness of a plank or board, so that the difference of  $\frac{1}{8}$  inch may determine whether Sam the shipwright or Jim the joiner may claim the job. On one occasion a board had to be dealt with which was a little over the limiting thickness on one edge and a little under it on the other. It is disappointing to learn that so pretty a case for argument was swept aside by an unimaginative employer, who said that he did not care whether it was a shipwright's board or a ship-joiner's board, but if someone did not look sharp and plane it up he would discharge both sides, and get non-union men." One would really have credited the British workman with a sufficient sense of humour (to say nothing about common sense) to prevent the occurrence of such ridiculous—but none the less costly—squabbles, were it not that such cases, though perhaps extreme, are by no means isolated ones. As it is, these irritating and most expensive restrictions constitute another handicapping burden on the English manufacturer in the competition race.

Instances are quoted which help one to realize the expensiveness of the policy for which the Unions contend—the policy already referred to of obliging employers to give the minding of machines to skilled men. These instances occurred at the time of, and after, the 1898 struggle. A firm had been compelled by the Society to hand over two copying-lathes to two turners, each earning 35s. per week. When the strike came, one labourer at 24s. per week turned out more work than the two Society men together. Saving, £2 6s. a week, and more work done. "Another firm found it took a Society man 190 hours to plane a lathe-bed. A promoted labourer under a non-union foreman did the work in 135 hours," or (say) in seven days less time than the skilled

workman. "In another case, a turner had set a piece of work in the lathe which would go automatically for some time, and he therefore left the machine at work, and began to sharpen his tools. The shop steward told him he must stop either his lathe or the grinding of tools."

As to piece-work, which is emphatically discouraged by the rules of the A.S.E., "The Times" correspondent recalls what he had said on the point as regards American customs and workmen. He says:

In nearly every engineering factory I visited during my recent tour in the United States I found the system of piece-work followed to the fullest extent possible. Its effect is remarkable. . . . Instead of being checked by popular opinion, or the feeling of the shop being against hard work, the best worker is looked on with respect, whilst the loafer and larrikin find existence impossible. . . . In some instances, day wages are preferred by employers in the United States, not often by the men; but in that case the greatest care is taken in organizing the staff of foremen. . . . The American foreman is never a "men's foreman". . . . He feels that the efficiency of the shop is on his shoulders, and moreover, if he does not get a good result some one else will take his place. Of course there is no uniformity of payment in America such as is enforced by Trade Union rules here. A man gets just what he is worth; and it may be said that if he is not worth more than the generality of mechanics receive in England and Scotland, he is hardly considered worth keeping at all.

Reading all that we have quoted with the thought ever present of its bearing upon the coming struggle for industrial supremacy between the two great English-speaking nations of the world, can the future be looked forward to with unruffled equanimity? We have not yet lost faith in the vitality and resource of the mother country; but every pennyworth of it will be needed in the coming years if she is to make a good fight for her position as the first nation in the world's markets. We fear that the working classes will have to learn a bitter lesson from adversity before the manufacturers will be able to fight their competitors with any strong chance of success. Would that the letters of "The Times" correspondent, which have formed the groundwork of these articles, could be read by every Trade Unionist as well as by every employer in the country. That is, we know, an idle wish; but it is within practical limits to hope that those letters will before long be published in collected form. They have been scattered over too many weeks, or rather months, when the public mind has been otherwise engaged, to attract the attention they deserve.

#### PERSONAL.

Mr. WILLIAM T. LANE, of the Oxford Gas Company, has just been appointed to fill the position of Assistant-Manager of the Bombay Gas Company, in succession to the late Mr. Reginald A. Gandon.

As will be seen by our "Notes from Scotland," Mr. FORBES WADDELL, of Forfar, has been appointed Manager to the Broughty Ferry Gas Commission, in succession to his elder brother, Mr. A. Waddell, who has gone to Dunfermline.

Mr. G. MARSHAM has resigned his position as Chairman of the Maidstone Water Company on account of pressure of public duties. Mr. H. W. TYRWHITT-DRAKE has, with the approval of the Directors, undertaken the chairmanship of the Company.

Members of the Middlesbrough Corporation Gas Committee recently waited upon Alderman HUGH BELL, with the view of inducing him to withdraw his letter of resignation as Chairman of that Committee. He thanked them for their kind expressions, but replied that, acting under medical advice, he could not see his way to reconsider his decision.

A paragraph went the round of the papers last week, regarding the singular circumstances under which an Englishman had become the winner of the 100,000 fr. (£4000) prize in the Paris Exhibition lottery. We learn that Mr. GEORGE D. BAILEY, of Forest Gate, Chief Clerk at the Beckton station of the Gaslight and Coke Company, is our compatriot who is to be congratulated on this remarkable piece of good fortune.

#### OBITUARY.

Alderman CHARLES ELLIS, of Maidstone, died last Sunday week, at the advanced age of 76 years. He took a leading part in the public affairs of the town; and among the numerous public appointments which he had held was that of Chairman of the Water Company—his tenure of the office lasting from 1885 to 1897. His retirement took place at the time of the deplorable typhoid epidemic.

We regret to record the death, early last Friday morning, from an attack of dysentery, of Sir JOHN BENNET LAWES, whose name is inseparably connected with the progress of agricultural science during the past sixty years. Deceased was son of the late Mr. John Bennet Lawes, of Rothamsted, in Hertfordshire, who died in 1832. On succeeding to the estates in 1834, he at once commenced a series of experiments with the view of obtaining explanations of certain imperfectly understood points in agriculture. In 1840 and the following year, similar experiments were conducted in the field; the outcome of which was the taking out of a patent in 1842 for treating mineral phosphates with sulphuric acid, which marked the beginning of the manufacture of artificial manures. In 1843, Dr. (now Sir) J. Henry Gilbert, formerly a pupil of Liebig, became associated with Mr. Lawes;



and the foundation of the Rothamsted Agricultural Experimental Station dates from that year. It is impossible to indicate here, however briefly, the scope of the investigations carried out there. Suffice it to say that the relative values of sulphate of ammonia and nitrate of soda as sources of nitrogen, the composition of rain and drainage waters, and the utilization of town sewage, were subjects which were fully inquired into. Most of the results of the Rothamsted experiments have been given to the world through the medium of the "Journal of the Royal Agricultural Society" from the year 1847 onwards; and about 130 separate memoirs or papers have been published. Through the munificence of the founder of the station, the experiments will not cease by reason of his death; he having, by a trust deed, executed in 1889, set apart £100,000, together with the laboratory and certain areas of land, for the prosecution of the investigations in perpetuity. Deceased, who was born in 1814, was created a baronet in 1882.

## NOTES.

### The Storing of Plans.

The storing of plans and tracings is an important consideration in large engineering works. The "Engineering Record" describes the system adopted at the new offices of the Union Iron-Works, San Francisco, in connection with which the problem received special attention. In order to provide safe and convenient storage for tracings, a fire-proof vault was constructed from the basement. It serves as the safe deposit for every floor of the building, taking the tracings at the second-floor level. All the old drawings had been kept in chests of drawers. There were 60,000 sheets; and they were in a deplorable state. It was decided to store tracings in rolls, with an elastic band on each end to prevent telescoping. They were then to be packed in dustproof paper cylinders. The standard size of sheet used was 27 in. by 40 in.; with half and quarter sizes. There were exceptional sizes, of course; but wherever possible the standard sizes were used, and the cases were made 30 inches long and 3 inches in diameter. For the storage of these cylinders, galvanized iron bins were made, with grooves  $\frac{1}{4}$  inch larger than the cylinders. All the stock of tracings had to be classified and indexed. First comes the generic title, which is alphabetical, as Accumulators, Agitators, &c., under "A;" and Boilers, Bunks, and so forth, under "B." The largest classes, such as Boilers, were subdivided into classes for Stationary Boilers, Marine Boilers; and there are other classes under proper names. Sheet numbers are given to the drawings, with alphabetical letters, plenty of gaps being left for filling up. The tracings are stamped as finished, with the general description and number. They are then handed over to the indexers, who copy these particulars on a card which is duly filed. Tracings are made over a glass plate which can be lighted from beneath so as to show up fine lines. Only blue prints, taken from the tracings, are issued to the works. It is to be understood from this that the original drawings are only in pencil—never finished in the old laborious and expensive style.

### Power from the Waves and Tides.

With visions of exhausted coal supplies, says a writer in "Cassier's Magazine," even though the end be far off, come thoughts of power from sources other than coal—from wind and water, and from the restless ocean waves and tides. Of water power there are a goodly number of important installations, principally in the United States, where electric power distribution from them over comparatively long distances has reached a high state of development. In Great Britain, on the other hand, power from waterfalls is a scarce commodity, and not much is to be hoped for in this direction; so that there is something of interest in a recent forecast of the country, with every hill or other point of vantage studded with huge windmills for generating electricity, to be subsequently distributed to manufacturing centres. Many years, however, would have to elapse before coal would become sufficiently dear to make such a scheme worth considering in a practical way. Wave motors and tide-power schemes have been almost endless in number. The former have, in a few instances, been used for light pumping work at seaside places; but such pumping outfits have been very far from demonstrating that the wave motor could ever be seriously considered as a prime mover where large powers were demanded; in fact, the wave motor is little better than a toy. As to power from the tides, there is little to be said, except that much money has been wasted in vain endeavours to turn it to practical account. The tide-power scheme will probably always be alluring, and also disappointing. The disappointment comes from the fact that very few people seem to take the trouble to calculate how much water and how considerable a fall are required to give any useful amount of power. A horse-power for a day of ten hours, for example, would require something like 120 tons of water falling from a height of 100 feet; so that a 500-horse power factory would need 60,000 tons of water at a 100-foot head. On the basis of 36 cubic feet of water to the ton, there would be upwards of 2 million cubic feet of water, which would make a fair-sized pond—say about 1000 feet long, 200 feet wide, and 10 feet deep. In these few figures there is something that may help to open the eyes of

the tide-power plan inventor, and of those who are in the habit of putting money into such things.

### The Intrinsic Brilliances of Various Lights.

Some interesting particulars as to the general effect of light on the eye appeared recently in the "Iron and Coal Trades Review." As regards particularly the deleterious effect of rival illuminants upon the eye, the following statement—by no means favourable to the electric lamp compared with gas—may be extracted: Although a measure of intrinsic brightness is obtained by dividing the candle power of any light by the area of luminous surface, this latter quantity is very difficult to determine accurately, since (with the exception of the incandescent filament) no source of light is anywhere nearly of uniform brilliancy over its entire surface. For the sake of comparison we can, however, draw up an approximate table by assuming equal brightness over the generally effective lighting area of any light. It should be distinctly understood that the values tabulated are only average values of quantities, some of which are incapable of exact determination and others of which vary over a wide range according to conditions.

#### Intrinsic Brilliances in Candle Power per Square Inch.

Source.	Brilliance.	Notes.
Sun in zenith . . . . .	600,000	Rough equivalent values, taking account of absorption.
Sun at 30° elevation . . . . .	500,000	
Sun on horizon . . . . .	2,000	
Arc light . . . . .	10,000 to 100,000	Maximum about 200,000 in crater.
Calcium light . . . . .	5,000	Depending on efficiency. Opalescent globe.
Incandescent electric lamp . . . . .	200-300	
Enclosed arc . . . . .	75-100	Very variable.
Welsbach light . . . . .	20 to 25	
Kerosene lamp . . . . .	4 to 8	Very variable.
Gas flame . . . . .	3 to 8	
Candle . . . . .	5 to 4	
Incandescent (frosted) . . . . .	2 to 5	
Opal shaded lamps, &c. . . . .	0.5 to 1	

The striking thing about this table is the enormous discrepancy between electric and other lamps of incandescence and flames of the ordinary character. The very great intrinsic brilliancy of the glow lamp is particularly noteworthy, and (from the oculist's standpoint) menacing.

### Expeditious Method of Making Embankments.

A recent number of the "Engineering Times" contained a description of an expeditious method of making embankments, used in the construction of the Canadian-Pacific Railway, in places where abundant water power was at hand, and also immense banks of gravel or morainic material. The water was brought down from the streams above under great pressure, and with it the gravel and boulders were washed into large sluices, which carried them to the points where the filling was to be done. The water was then allowed to drain away, leaving the gravel thoroughly settled in the new position. By means of logs laid in rows one above the other, the filling was confined within the proper limits, and thus the embankment rose, tier above tier—the slope being kept well within the angle of repose, and the logs soon sprouting and forming a network of roots, firmly binding the mass together. Mountain Creek is the point at which a large amount of filling has been done on this plan in a most successful and economical way. Water is obtained from the creek some two miles above, and is led down in a flume, 2 feet high and 4 feet broad, to the flume-box, which is 206 feet above the railway track. From this point an iron pipe 14 inches in diameter leads the water to the monitor, which is provided with nozzles ranging from 3 to 6 inches in diameter. The small-sized nozzles are used for breaking up the mass of gravel; while the larger ones furnish an increased volume of water to flush the sluices. Boulders 18 inches in diameter are readily moved without assistance; but two men with hooks are constantly on the look-out to clear any obstructions. The sluice, which has a grade of about 1 in 10, conveys the material beneath the railroad track and deposits it in a great pile at the centre of the area being filled. From this point it is gradually washed down until stopped by the row of logs at the edge, which, however, allow the water to flow off freely. The sides are made to slope at an angle of 37° 40'. The cost of this filling is about one-half that of the ordinary method; but it is here carried on under great disadvantage. Not only must the work be entirely suspended between October and June, but the sluices and fixtures must be taken up in order to prevent wreckage by the avalanches; and so each spring the work must practically be constructed again. Nine men in all are required to conduct the filling—one at the monitor, two to keep the sluices clear, and six to prepare and lay the logs at the edge of the filling, and to level off the material as it falls. The total filling at this point will aggregate 300,000 cubic yards, of which 225,000 yards were put in place between June, 1897, and June, 1899.

**The Value of Gas-Retort Carbon.**—According to the Spanish journal "Revista Minera," there is a great demand for the above-named material, chiefly for the manufacture of carbons for electric light purposes. Prices recently increased, and seem likely to continue to do so, as there is talk of a combination among gas manufacturers to raise the figure to 125 pesetas per ton in gold—the existing one being 70 to 80 pesetas.



## THE INTERNATIONAL GAS CONGRESS.

## PALAIS DES CONGRÈS, PARIS EXHIBITION,

SEPTEMBER 3 TO 5, 1900.

M. THÉODORE VAUTIER, PRESIDENT.

By Saturday night last, the greater proportion of the members attending the International Gas Congress this week had gathered in Paris. The President (Mr. J. W. Helps, of Croydon) and a few of the party of the Institution of Gas Engineers travelled over on Friday by the Folkestone-Boulogne route; and they had as companions on the journey Mr. George G. Ramsdell, the President of the American Gaslight Association, and other members of the substantial contingent (distance considered) contributed by our friends across the Atlantic. The remainder of the Institution members and ladies who had registered their "*adhésion*" (as the French say) to the Congress travelled over on Saturday; and the same day (*vidé* Newhaven-Dieppe) came the President (Mr. T. O. Paterson, of Birkenhead) and the party of the Gas Institute. Little delays on the journey and a slight accident to the machinery of the steamer conveying the latter across the Channel were responsible for them alighting in Paris something like two hours after the time they were due. Altogether, the contribution from England numbers 68, with an equal division between Institution and Institute. Germany surpasses us considerably in numbers; the Dutch and the Italian Associations follow close on our heels; and America is the fifth best, with about 40. The strength of Switzerland, Austria, Belgium, and Russia follow in this order; and other attendants from divers parts will make the foreign representation a little short of 500, which number our hosts—the Société Technique du Gaz en France, upon whom has fallen the brunt of the work of organization—will raise to between 1000 and 1100.

The technical work of the Congress will extend over Monday, Tuesday, and Wednesday; and very full days of close attention the Organization Committee intend claiming. Thursday and Friday will be devoted to the Exhibition, the Clichy Gas-Works of the Paris Gas Company, and other excursions. With regard to the Clichy visit, the Company have, with their usual munificence, undertaken the whole of the arrangements, and have placed at the disposal of the Congress Committee a very fine steamer for the conveyance of a large proportion of the members by way of the Seine.

Although the proceedings connected with the Congress proper did not actually start before nine o'clock yesterday morning, there were on Saturday meetings and an important evening function which ushered in the more imposing proceedings of this week, and which gave one another insight into the thoroughness with which our friends across the Channel do these things, as well as the enjoyment of a further taste of their generosity and warmth in the reception of their visitors. In the morning, the annual meeting of the Société Technique was held; but (as will be seen by the report which appears elsewhere) only business of a formal nature was transacted. Then in the afternoon there was a meeting of the Congress Organization Committee, at which about fifty gentlemen were present. We cannot name all, but among them were men whom the gas profession universally honour and esteem. There were seen Bunte, von Oechelhaeuser, and Coze uniting heartily with Vautier, Delahaye, Salomons, Lebon, Helps, Ramsdell, Brackenbury, and many others in completing the preparations and programme for this week's work. M. Théodore Vautier, the President of the Société Technique and of the Organizing Committee, occupied the chair; and, by virtue of his office, he will, of course, be the supreme head during the Congress. But there is some talk of dignifying the Presidents of the different foreign organizations represented by installing each in the chair for a brief period during the sittings. M. Vautier opened the Committee's conference on Saturday by extending to the Presidents and Secretaries of the various Societies a very hearty welcome. Then the necessary arrangements were made for facilitating the management of the meetings; and the order of procedure was settled upon. Secretaries were also appointed for immediately reporting and preparing a *résumé* of the speeches made during the Congress; and, in such a polyglot assembly, this will conduce to a freer interchange of opinions. The gentlemen who had the temerity to undertake this arduous duty were MM. Bouvier, Godinet, and Visinet, representing the French section; Mr. C. E. Brackenbury, the English; Dr. F. Schœfer and M. Weiss, the German; Baron François Lucifero, the Italian; and MM. Bolsius and Van Heede, the Dutch and Flemish. After this the Committee adjourned; and the Secretaries conferred together.

In the evening, the annual dinner of the Société Technique was held in one of the gorgeously gilded and decorated saloons of the Hôtel Continental. Enhanced lustre and consequence were given to the ordinary function by the issue of invitations to the foreign Presidents and the leading delegates already arrived in Paris. To the right and left of M. Vautier were spread the guests, and a few whom the head table would not accommodate were disposed among the members of the Société Technique; and all were very charmingly entertained.

Altogether about 200 sat down. Good feeling and exhibitions of international courtesy were the predominant features of the occasion. The banquet was *recherché*; and the after-speeches were framed in elegance and neatness of expression. The toast-list was opened by M. Vautier, who, in well-chosen language, said he hoped that every member of the foreign societies would combine with the Société Technique du Gaz in their endeavour to increase the cordiality of international relationships, so that the Congress might result in the general advancement of the gas industry. He did not leave this to individual initiative; but he had organized, by means of his Society, the best means of obtaining a world-wide representative Congress. He had received 1100 promises of attendance at the international meetings, of which number no less than 500 were from abroad. He thanked most heartily the various technical societies who had conduced to such a highly satisfactory result. He was also very glad to find that not only did they signify their support of the idea of an International Gas Congress by their presence, but that they had also contributed largely to the papers to be read at the ensuing meetings. The principal guest, M. Jariel (who is not only an Engineer of considerable repute attached to the Ponts et Chaussées, but is also a physician of high standing), emphasized the importance of this first International Gas Congress. Other speakers following were: M. Victor Krafft, who, in himself, claimed a certain amount of cosmopolitanism, inasmuch as he was representing the gas industry in Italy, although not a native of that country; M. Th. Verstraeten, as representing the gas industry of Belgium; M. Gariel, the Organizing Director of the Congresses being held this year in Paris; and M. Bouchy, of the Paris Gas Company, who spoke of the value that such an international assembly would be in solidifying the foundations of the gas industry, and the feeling of cordiality which it extended among members of the various nations. The same point was also emphasized by M. Alfred Lebon (*fils*), the President-Elect of the Société Technique; by M. Maurice Piaton, the new Vice-President; and by M. Lebon (*père*). A word from Austria, in similar strain, fell from the lips of M. Nachtsheim. These gentlemen having spoken without any previous arrangement, the President of the Institution of Gas Engineers (Mr. Helps) only too gladly added a few words expressive of the sympathy and kindly feeling which he and his English brethren entertained for the members of the gas profession in other countries. Then speaking of gas engineering generally, he said he thought few would deny that England was the nursery or boarding-school of the gas industry; and at one time an engineer of any other country, if he wanted to know the latest methods of gas engineering, would consider he had failed in his duty if he did not, at any rate, pay a visit to one or two English gas-works. But things were changing. Those who had been taught were now becoming the teachers; and during recent years not a few English engineers had been to the Continent, and some, who had had the opportunity, to the other side of the Atlantic, and had returned having learnt very much more than those did who journeyed to England in the early days. The time had, he repeated, arrived when English gas engineers had to go abroad to learn the industry of which they were once the teachers. He congratulated the President and his colleagues on the splendid International Congress they had inaugurated. It would have the effect not only of teaching them, but of cementing together the profession throughout the whole universe. Whatever might be their differences of opinion with regard to political questions and matters of the kind, they were there meeting on a common platform to improve their knowledge of the industry of which they were devotees. He thanked the Société, on behalf of English engineers, for the opportunity given them of meeting their friends from so many countries in "the splendid city of Paris." Mr. G. G. Ramsdell, for the American delegates, similarly thanked M. Vautier and his colleagues, and said he regarded the Congress as one of the most important steps ever taken for the advancement of their common industry. He spoke of their experience of Gas Associations in America, and of how much they contributed to the progress of the industry; and he concluded "by drinking to the health of the honoured President of the Congress." The speeches were frequently interrupted by marks of earnest approval by the audience; and throughout a fraternal spirit was infused into the proceedings.

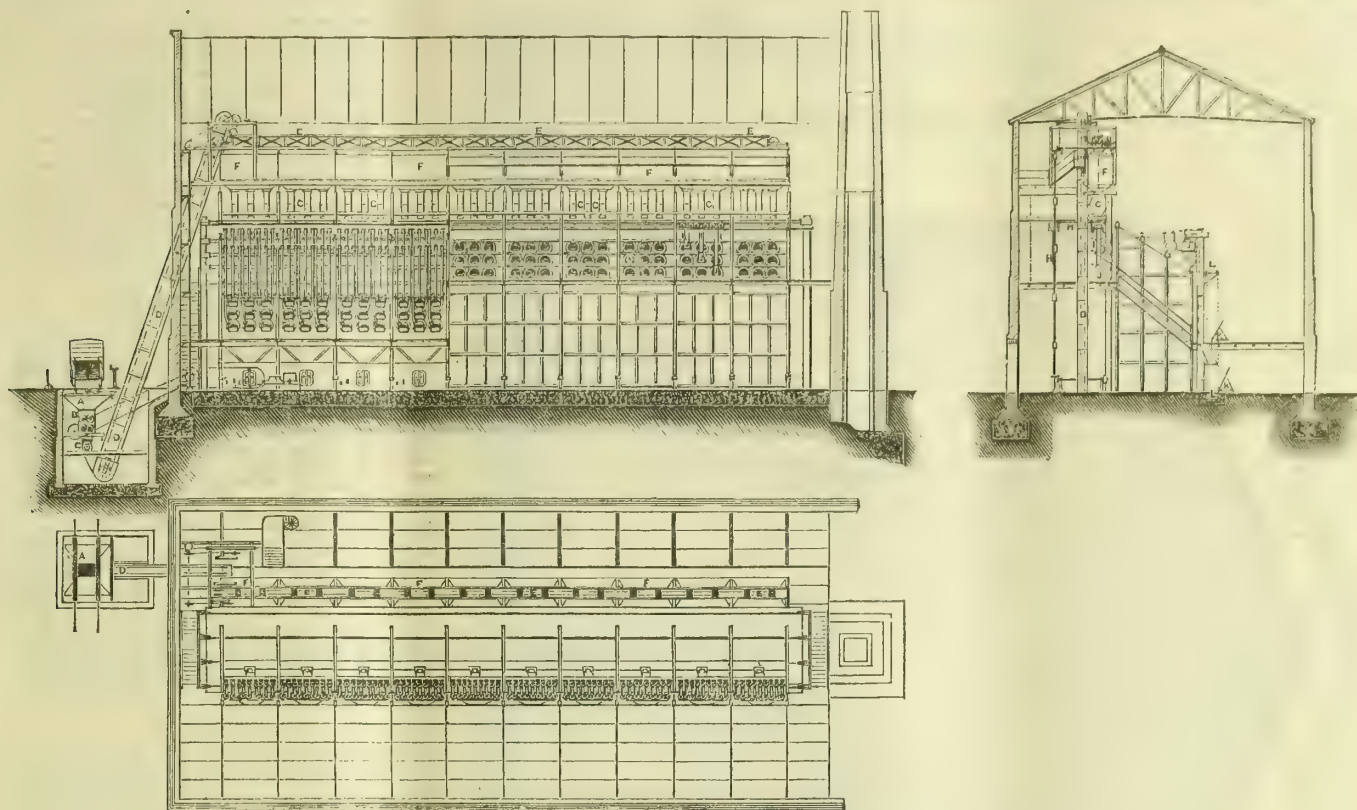
One of the early papers read yesterday morning was that prepared by Mr. C. E. BRACKENBURY. It was entitled—

## INCLINED RETORTS.

Since the practical introduction by M. Coze, to whom all engineers and workers in the world-wide gas industry owe a debt of gratitude, of the principle of carbonizing coal in inclined retorts, the system has rapidly been adopted all over Europe. Within the last ten years, in England alone, nearly 30,000 metres (98,400 feet) of inclined retorts have been put up, representing in value no less a sum than 17,500,000 frs. (£700,000), or an average yearly expenditure of 1,750,000 frs. (£70,000), without including the capital spent on the retort-house buildings. To have brought about, in spite of many obstacles, such a large capital outlay, the benefits arising from the adoption of this method of carbonization must have been considerable from all points of view—commercial, technical, and labour.

The annexed drawing of an installation of ten beds of inclined





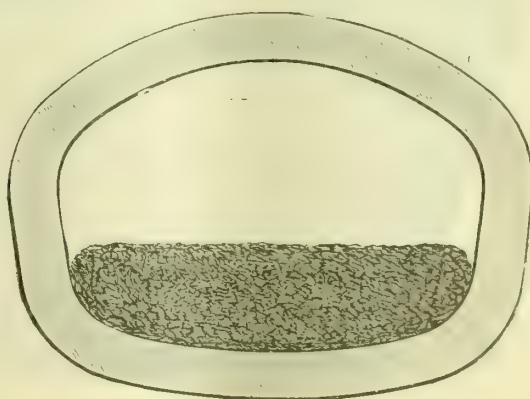
ORDINARY SETTING OF INCLINED RETORTS.

retorts may be taken, in its general features, to represent the lines now usually followed in England, though, of course, mechanical details and arrangements vary according to taste, experience, and local considerations. The coal is discharged into a tank or hopper A, from which it falls into a breaker B, either of the jaw or roller type, the former being perhaps more usual on the Continent, and the latter in England. Underneath the breaker may be used the revolving feeder C, the nature and advantages of which were pointed out in the paper on "Stoking Machinery," which the author had the honour of presenting to last year's meeting of the Société Technique de l'Industrie du Gaz en France.\* The elevator buckets D, receiving their regular supply, lift the coal and throw it on to a push-plate conveyor E, which fills the overhead storage tank F, running continuously the whole length of the bench. This storage tank is best made large enough to contain a 24 hours' supply of coal, so as to avoid the necessity of working the accessory machinery during the night time, and to give a surplus in case of need. Underneath the storage hopper, and in a direct line with each vertical tier of retorts, is placed a measuring chamber G, of the form shown, the upper door of which communicates with the storage hopper, while the lower one allows the coal, when required, to pass into the retort. These two doors are connected to a lever H, in such a way that pulling it from its normal position opens the bottom door, closing at the same time the upper one, which shuts off the coal from the tank above. The act of returning the lever to its place closes the lower door, opens the upper one, and thereby refills the measuring chamber. These chambers, as their name indicates, measure the exact amount of coal required for each retort, and can be regulated as desired. They are best fitted with a sure-feed arrangement of an automatic balance and flap-plate, which prevents the operator from shutting off the descending coal until the whole of the charge has passed into the retort, and renders it impossible for any coal to leave the chamber before the top door has been completely closed. This makes the full charging of the retorts independent of the goodwill of the worker, gives the management the security that the desired quantity of coal will be carbonized, and reduces the amount of superintendence required. A light travelling shoot I is provided for each tier of retorts, fitted with baffle-plates for ensuring that the speed of the falling coal will be the same for the varying distances it drops. J is the shoe, which is placed in the charging retort mouthpiece, and to which may, if desired, be added a spring door for further controlling the velocity of the coal entering the retort. Such additional check is sometimes of value where very varying qualities of coal are used, or where cannel or boghead is also to be carbonized. On the drawing stage is placed a moveable shield K, to protect the men from the hot coke falling from the retorts, and which also serves to divert it through suitable openings in the floor on to the conveyor and quencher below, lettered L. This is a rough outline of up-to-date English practice; and some further points in connection with it may be touched upon.

The retort-house itself, for a single bench of retorts, is generally covered with an ordinary trussed roof; while for a double

bench, with the charging floor in the middle, a semi-circular girder roof seems more advantageous, as it leaves uninterrupted space for conveying machinery and tanks, &c. The measurements of a suitable house for the latter arrangement would be about 30 metres (100 feet) in width, and about 20 metres (65 feet) from the ground line to the underside of the girder. The good ventilation and lighting of such a retort-house are of the utmost importance; and these points deserve to receive their full meed of consideration.

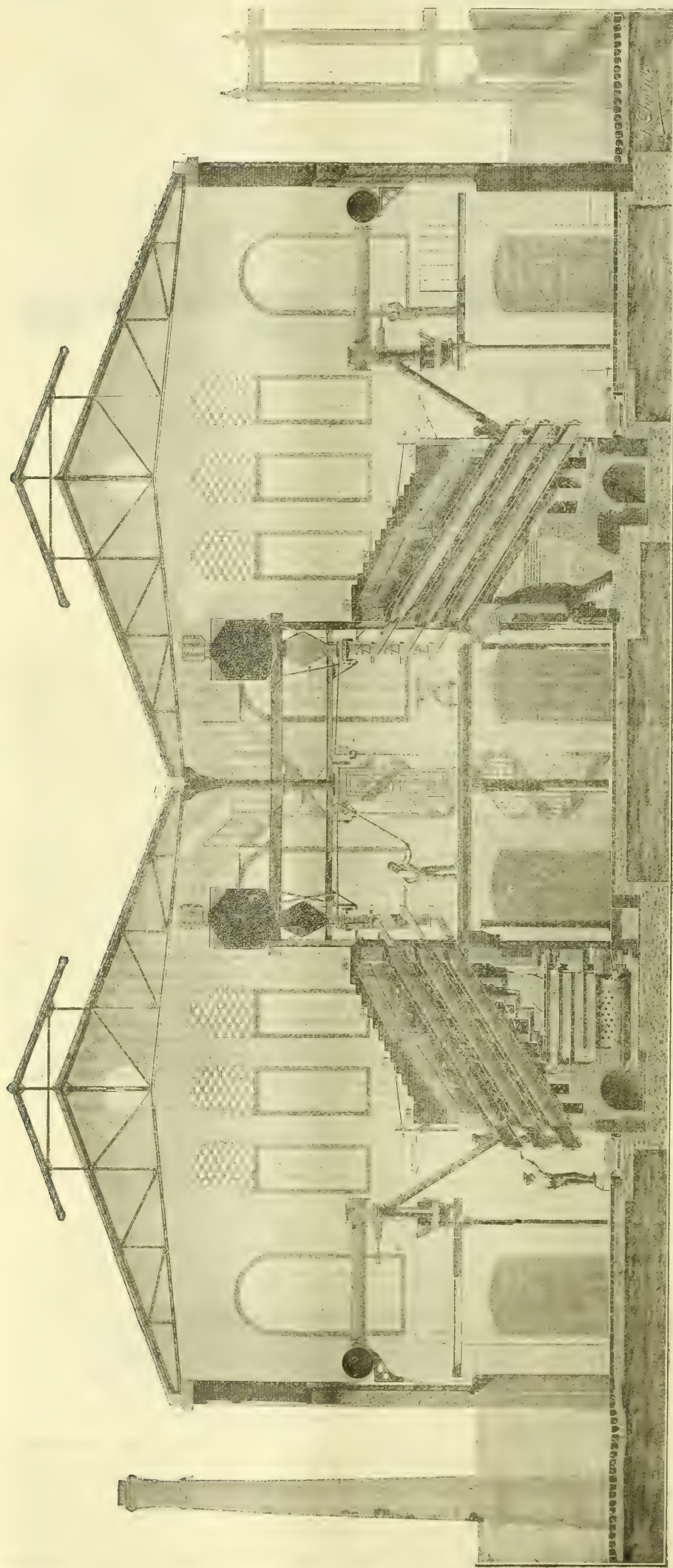
The dimensions given are for arches containing retorts 6.1 metres long (20 feet). Is this the best length for inclined retorts in large works? The writer believes that experience has fully shown this to be the case. It was natural and proper enough in the early days of inclined retorts to feel one's way with a length of only 3.5 metres (11 ft. 6 in.), increasing this, as experience gave confidence, to 4.57 metres (15 feet), and eventually to 6.1 metres (20 feet), which last may be taken as the now usual length in England. It has been argued that such a length has a deteriorating effect upon the illuminating power of the gas, and also that it presents undesirable difficulties in the way of repair. Both these contentions have been nullified by actual experience, and, if substantiated, would apply with equal force to a retort of the same length placed horizontally. The advantage of carbonizing 350 kilos. (7 cwt.) of coal per charge and per retort, with the same machinery and with the same amount of labour expended, as for only 250 kilos. (5 cwt.), is sufficiently obvious and great to outweigh the most severe difficulties.



The form of the retort is a matter of supreme importance; but here, also, past experience serves to guide one to the best and most suitable. It depends largely on the chief character of the coal used, and should be designed to suit accordingly. With Durham coal, or coal that swells to any extent during carbonization, the essential feature is to give sufficient height to the sides of the retort to prevent the expanding charge from jamming against the crown. Another point the author thinks useful, is to give a slight inclination to the sides of the retort, instead of making them vertical, so that in rising the coal might, as it were, free itself from the retort, which would thus tend to

\* See "JOURNAL," Vol. LXXIV., p. 109.





SETTING OF INCLINED RETORTS FOR SMALL WORKS (SYSTEM OF M. DERVAL AND MESSRS. GRAHAM, MORTON, AND CO., LIMITED).

increase the facility of discharging the coke. The preceding section of such a retort will serve to illustrate this.

A curved bottom to the retort, though to a slight extent impeding the easy drawing of the coke, adds considerably to its strength, and thus to its life, particularly in the case of a retort 6·1 metres long (20 feet). Provided a sufficient taper, which the author believes to be about 150 mm. (6 inches), be given to the retort, he thinks that the labour of drawing will be reduced, and rendered more automatic than is sometimes found to be the case with parallel, or with but slightly tapered, retorts. As there has been a tendency to increase the length of the retorts, so has there been to augment the angle at which they are placed, from the original  $20\frac{1}{2}^{\circ}$  to  $33^{\circ}$ , and even more.

The usual number of retorts in an arch is nine; though in England, for some reason or other, there seems to have been some hesitation in adopting this general Continental practice.

For large works, one might think that the setting of even twelve retorts in three vertical rows in a bed—thus utilizing the same charging apparatus for still more work—would prove a success, especially as such a number has been satisfactorily worked in horizontal arches. Continental gas engineers are still ahead of their English colleagues in many points, principally, the writer thinks, in regard to the admirable design and construction of their furnaces, due partly perhaps to their greater readiness to spend capital on such plant, owing to dearer fuel, and with a view to increased economy of working and longevity of life.

To compare the capital cost of inclined retorts with that required for horizontal arches and for stoking machinery is exceedingly difficult, owing to the variety of circumstances—the differences in the character of the work done, and in the cost of the labour and materials employed in each case. There are in any such comparisons so many pitfalls—any one of which might

be sufficient to destroy their value and accuracy—that it is not easy to arrive at an absolutely unimpeachable basis of fact. The author, for example, has heard of an installation of inclined retorts reported to cost as low as 7000 frs. per 1000 cubic metres of gas per day (£7 17s. 6d. per 1000 cubic feet), and of another to cost as high as 17,250 frs. (£19 8s. 1d. per 1000 cubic feet). Installations of horizontal arches with stoking machinery, put up under similar general circumstances as in the two cases cited, cost, respectively, about 5000 frs. and 13,30 frs. per 1000 cubic metres of gas made per day (£5 12s. 6d. and £14 15s. 5d. per 1000 cubic feet). In yet another instance, the comparative cost of inclined retorts, and horizontals with stoking machinery was reversed; the former costing approximately 11,000 frs. per 1000 cubic metres of gas made per day (£12 7s. 6d. per 1000 cubic feet), compared with 13,000 frs. (£14 12s. 6d.) for the latter.

Likewise the economy resulting from the adoption of one or



other of the two systems is extremely variable; but, generally speaking, their respective merits may be summed up as follows:—

- (a) *With inclined retorts*, in normal cases, a saving of from 60 to 75 per cent. may be made in the number of men employed; and the cost of carbonizing per 1000 kilos. of coal, excluding depreciation and interest on capital, may be as low as 1 fr., or, reckoning 300 cubic metres (10,600 cubic feet) as the gas made by this quantity of coal, 3.33 frs. per 1000 cubic metres of gas.
- (b) *With horizontal retorts and stoking machinery*, a saving of from 45 to 60 per cent. may be made in the men employed; while the cost of carbonizing per 1000 kilos. of coal, excluding depreciation and interest on capital, may be 1.30 frs., or 4.33 frs. per 1000 cubic metres of gas made per day, or 1 fr. more than with inclined retorts.

Leaving, however, figures on one side, there cannot be the slightest doubt that putting coals into horizontal retorts by stoking machines, however perfect and however suitably arranged, must of necessity be harder work than letting it drop automatically into inclined retorts. In the former case, there is the same coal-breaking, elevating, and conveying plant as for the latter, but with the addition of machinery for raising the power required by the stoking machines—be it hydraulic or compressed air. It is to be remembered, also, that for working a set of horizontal retorts 6.1 metres (20 feet) long, four machines in all are required, with their dozen or so levers; their demand for some amount of skilled labour; their endless wear and tear; and the continual chance of break-down. With inclined retorts, on the other hand, there is but one lever to work for each retort; and, providing the breaking, elevating, and conveying machinery be in duplicate, risk of break-down is completely avoided. It must not be forgotten, moreover, that a greater make of gas per unit of floor-space can be obtained by placing retorts at an angle instead of horizontally; and experience has also shown that the wear and tear of inclined retorts is less than of horizontal.

There is no need, however, as some have done, to advocate one system to the total exclusion of the other; as for existing horizontal retorts and exceptional cases, the successful and admirable stoking machines of Mr. West and Mr. Foulis are most useful. But for new work and the large majority of instances, the writer believes the superiority of the inclined-retort system to be unquestionable.

Yet one other point should be borne in mind in considering the question of inclined retorts *versus* stoking machinery, and that is the suitability of the former for small or medium-sized gas-works. To work power stoking machinery to the best advantage, it is essential to have a sufficient number of retorts at its disposal, as one pair of machines can deal with between 200 and 300 mouthpieces. It is also true, of course, that for the most economical results in carbonizing with inclined retorts, a certain number of beds should be at work; but, on the other hand, it is quite practicable and feasible to have but one or two arches in service. Where there are only two or three beds in action, it is customary to allow one man per bed and per shift. This results in about 6000 kilos. (say, 6 tons) of coal being carbonized per man per twelve-hour shift.

To extend still further the applicability of the inclined-retort principle to very small works, M. Derval, of Paris, in conjunction with Messrs. Graham, Morton, and Co., Limited, of Leeds, has patented the arrangement shown herewith, and drawings and a model of which are on view in the Champ-de-Mars. In addition to several unique features in the design of the furnace, principally in there being two admissions of heated secondary air, arranged so as to secure the regular and sufficient heating of the lower, as well as the upper, end of the retort, the chief aim has been to reduce the initial cost of inclined retorts as much as possible, so as to facilitate their adoption by small and average works. For the same make of gas, these arches will not cost more than horizontal regenerative settings; and they are adapted to works not requiring more than four or six retorts per bed. The benefits and economies resulting from the inclined-retort system may thus be rendered even more extensive and general than at present.

The author has not attempted in this paper to deal in any detail with the many interesting points in connection with inclined retorts. He has simply tried to follow the lines suggested in the programme of questions proposed, and has merely wished to place at the disposal of members of the International Gas Congress a few notes from his own experience of the subject.

## TECHNICAL RECORD.

### MEETINGS OF THE FRENCH AND ITALIAN GAS SOCIETIES.

The Twenty-seventh Annual Meeting of the Société Technique de l'Industrie du Gaz en France was held in the Palais des Congrès of the Paris Exhibition last Saturday morning. There were present upwards of 100 members, with M. Th. Vautier in the presidential chair.

The proceedings were merely of a formal character, owing to the following of the meetings in connection with the International Gas Congress. Mr. T. O. Paterson, the President of the Incorporated Gas Institute, was elected (as is customary) an honorary

member of the Société for the current year; and 26 full members and 4 associate members were also added to the roll—making the total membership 625. The names of members deceased during the past year were then given by the President, who added a few appreciative remarks concerning the career of each. Among the most notable were two Past-Presidents of the Société—M. Samson Jordan, one of those who originally contributed very largely to the prosperity of the organization, and who was known not only for his generosity, but for his devotion to duty and the smallest affairs which came under his notice in connection with business and professional matters. He began his gas career at Marseilles, and became a Professor at the Central School of Arts and Manufactures. He is also well known for the part he took in the foundation of the "Journal des Usines à Gaz." The other Past-President deceased was M. Eugène Breitmayer, who was the French President of the Union des Gaz, and was also the respected Director of several important concerns. Other names were those of M. Henry Drory, who had for many years been attached to the Imperial Continental Gas Association, and was their Manager at Vienna, and M. Auguste Rebuffel, who had been connected from the beginning with the gas industry in Italy—having from 1844 to 1853 built works at Genoa, Parma, and Turin, and following, in 1854, with the works at San Pier d'Arena, where he remained Manager till 1863. He afterwards occupied a similar position at the Milan Gas-Works, from which he retired in 1896, when he was appointed Honorary Manager until his decease.

For the five places vacant on the Committee, eleven names were proposed; the result being that MM. Coze, Frère, Séguin, Marquisan, and Sigaud were chosen. The Treasurer's report showed an increasingly satisfactory state of affairs in the finances of the Société—the capital reaching 203,652 frs. (£8146).

Last year's papers were then reviewed; and those members of the Committee who had contributed were thanked for their efforts. The conclusions of M. Vautier's paper on "Incandescent Lighting by Denaturated Alcohol" were given as showing that at present it was not economical to adopt this method of incandescence as compared with gas, and was only feasible where the price of a litre of alcohol was rather less than that of a cubic metre of gas. M. Brouardel's description of the method of carbonizing in the gas furnace of the Compagnie Française du Centre et du Midi was referred to; and attention was drawn to the successful mode adopted of scurfing retorts by air pressure, as is done regularly in that Company, thereby increasing the life of the retorts. Allusion was likewise made to M. Bouvier's paper on the mechanical transport of coal and coke; and the economy secured by the aerial-way system at Metz was given at 48c. per ton of coal, besides which the material was carried three times more quickly than formerly. These papers, being by members of the Committee, were, according to the rules of the Société, inadmissible for consideration in connection with prizes. The three papers adjudged worthy of the 250 frs. given by the Société Technique were by MM. Lecomte, des Gouttes, and Daudy. The first dealt with incandescent gas lighting, and was a very complete examination into the causes of the varying power of mantles; the second was a paper describing the new works at Geneva, and the elaborate arrangements employed for storing coal for use in inclined retorts and carrying coke; and the third was a theoretical explanation of the stoppages in ascension-pipes, and a description of some means of relieving these difficulties.

As may be remembered by "JOURNAL" readers, every year there are distributed prizes of 200 frs. each to the oldest and most faithful workmen in the gas-works of France. This year 36 workmen received prizes out of 53 applicants. The time of service varied from 20 to 38 years. Twelve foremen and others were also presented with medals of honour from the French Government. This concluded the formal meeting, which was adjourned until the international assembly yesterday.

It may be mentioned that M. Vautier continues to hold the presidential chair throughout the Congress, after which he vacates his position in favour of M. Alfred Lebon, of the Compagnie Centrale du Gaz.

The Annual Meeting of the Italian Gas Association was also held in Paris on Saturday; but, at the time of assembling, there were only fifteen members present. The proceedings, as in the above instance, were simply formal, and were presided over by M. Victor Krafft, of Naples, who had to report a reduction in the number of members by four deaths, while only two new members were admitted. A few prizes were also in this case presented to workmen in Italian gas-works, for length of service and good conduct. It was further resolved that next year's meeting should be held at Florence, and the following one at Palermo.

We learn from Messrs. J. & A. Churchill, of Great Marlborough Street, that the third volume of "Chemical Technology, or Chemistry in its Applications to Arts and Manufactures," edited by Mr. C. E. Groves, F.R.S., and Mr. W. T. is practically ready for delivery. Our new volume of special value to them, as it deals exhaustively with "Gas Lighting" advantages of gas and electricity. The of course, comes under consideration







the other—a cone integral with a conical pinion gearing with another pinion mounted on the rod, by means of which a screw is turned which displaces the screw or nut wherewith the block of the slide is connected, and consequently allows the admission of the explosive and the expansion of the exploded gas, to be automatically regulated.

3. A socket is arranged on the aspiration valve-spindle, in order to compress the spring of the valve when, during the third phase of the motor, the projection of the tappet which governs the outlet-valve bears on a lever whose displacement affects that of the socket. Thus, the explosive does not enter the cylinder at the end of the third phase of the motor.

4. An endless screw arranged on the slide-rod gears with a toothed sector whose angular displacement produces, by means of a lever, the angular displacement of the ignition cam; so that the advance to the ignition is automatically brought about in proportion to the quantity of aspirated air, which is modified by the rotation in one direction or the other of the slide-rod.

**Prepayment or Coin-in-the-Slot Machines.**—Grice, J., of Sutton Coldfield. No. 16,940; Aug. 21, 1899.

This invention of "improvements in machines for the automatic delivery of various articles," has for its object to prevent the freeing of the delivery or operating mechanism and the blocking of the same by iron discs or blanks. For this purpose, the patentee proposes to employ a magnet in combination with the machine in such a manner that, on the insertion of a disc or blank in the admission aperture, it will be attracted and deflected by the magnet, or will itself attract and deflect the magnet, and thus be arrested before passing on to the balanced lever or other part of the coin-freed mechanism.

**Gas Cooking-Stoves.**—Prior, J. D., and Yates, H. J., of Birmingham. No. 18,285; Sept. 11, 1899.

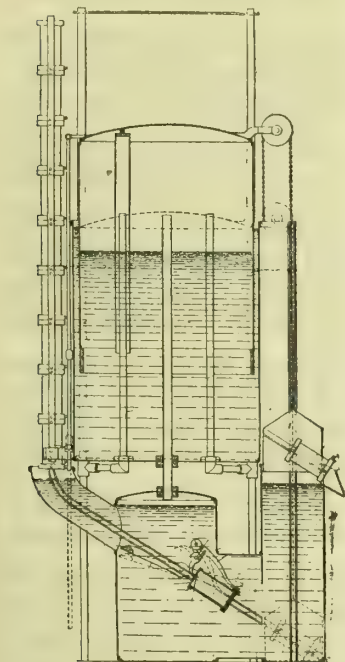
The patentees claim, in gas cooking-stoves: 1. The employment of a high or low pressure boiler for water, heated by the hot air and waste products of combustion from the stove, which are compelled to circulate in direct contact with, under, or around the boiler, and be deprived of their heat by absorption gills or their equivalent. 2. The employment of a hot closet heated by pure atmospheric air, through the medium of the hot air and products of combustion from the oven being compelled to circulate under, over, or around an air-chamber, arranged in the top of the stove, and being open at one end to the atmosphere and having communication with the interior of the hot closet—the chamber being also provided with gills, or their equivalent, for increasing the heat absorption surface.

**Generating Acetylene Gas.**—Hervieu, G. A., of Nanterre, France. No. 2631; Feb. 9, 1900.

This acetylene generator is arranged so as to prevent any dangerous over-production, by means of mechanism for distributing the carbide operated by the movements of the bell of a gasholder. The generator is also characterized by a device which permits of the bye-products or residues resulting from the manufacture of the gas being automatically evacuated, and also by its general arrangement, which does away with the use of any cocks, valves, or other similar stoppers.

The apparatus (shown) comprises essentially a generating receptacle properly so-called, a water reservoir or tank together with a gasholder bell, an automatic distributor operated by the bell, a device for receiving the carbide and placed within the generating receptacle, a receptacle for first receiving, and then carrying off, the residues left by the spent carbide, and mechanism operated by the bell for extracting the residues.

These different parts, considered separately (says the patentee), "may vary in form and dimensions, but, taken as a whole, they operate in a well-defined manner"—their "essential characteristic being that they are absolutely self-acting or automatic, both in the matter of feeding the carbide and of evacuating the residues."



**Gas-Engines.**—Robinson, H., of Manchester. No. 19,164; Sept. 23, 1899.

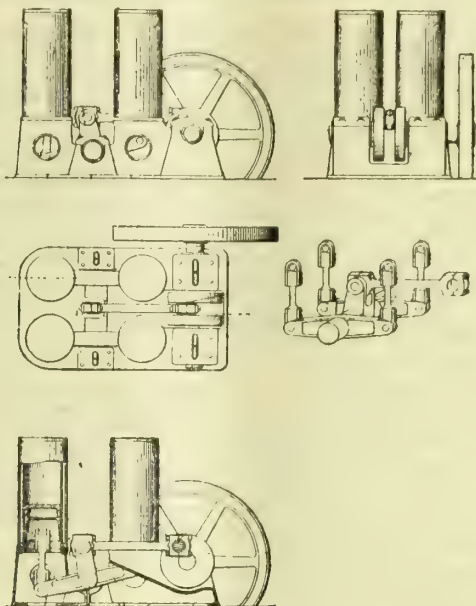
This invention relates more particularly to the means of controlling the speed of gas-engines, as follows: The piston draws in to the cylinder the inflammable charge of gas and air or other supporter of combustion, through an automatic inlet valve, which may be held to its seat by a spring, during the outward stroke, and compresses the charge during the inward stroke. The combustion of the charge drives the piston upwards. The exhaust is now opened, and the products of combustion are expelled during the next inward stroke of the piston. Should, however, the speed of the engine rise above the normal, a trigger pivoted to a fixed point comes into action, and holds open the exhaust valve by coming into contact with a suitable nut or piece attached to the exhaust-valve spindle. A valve placed near the exhaust-valve on the atmospheric side of it, when the exhaust valve is held open, allows the piston to simply draw in air and expel it through the exhaust-pipe.

A rod or equivalent working backwards and forwards, by suitable gear,

at half the number of reciprocations of the piston, opens the exhaust valve at the proper times. Pivoted to the rod is a sliding-rod or projection, with a weight which hangs in such a manner that, when the speed of the engine exceeds the normal, the inertia of the weight causes the rod or projection to bear against a projection on the trigger, which moves it into the position necessary to come in contact with the nut or piece on the exhaust valve spindle, and hold it open.

**Gas-Engines.**—Morgan, C. H., of Worcester, Mass., U.S.A. No. 10,856; June 14, 1900.

The object of this invention is to couple four or more cylinders to a single crank-shaft, all supported upon a common bed, with the cylinders in proximity to each other, "whereby the engine is rendered more compact, its parts simplified, and an increased resistance afforded to the working strains."



Referring to the engraving, the base of the engine (upon which the crank-shaft and cylinders are mounted) has on it four upright cylinders mounted in two rows side by side. The cylinders—closed at their upper and open at their lower ends—each contain a reciprocating piston; and journaled in the base, and between the rows of cylinders, is a rocking-shaft provided with a pair of arms extending laterally beneath the open ends of the left-hand cylinders, and on the opposite side of the rocking shaft are a similar pair of arms extending laterally beneath the open ends of the right-hand cylinders. The free ends of the arms are connected with the pistons of the cylinders by rods; and extending upwards from the rocking-shaft (and preferably from its centre) is a short arm connected by a rod with a crank on a shaft journaled in the base, parallel with the rocking-shaft, and carrying a fly-wheel.

The engine is provided with the usual valve mechanism for the admission and exhaust of the explosive charge in the closed ends of the cylinders; but such valve mechanism is not represented, as it may be of any well-known type in common use in gas-engines.

The four cylinders represented are placed in two rows on opposite sides of the rocking-shaft and in proximity to each other. The cylinders in each row are also placed in proximity to each other, with a space between the lower cylinders for a connecting-rod and for access thereto.

#### APPLICATIONS FOR LETTERS PATENT.

- 14,845.—YEADON, S. N., and MASON, W. D., "Revivifying gas lime (sulphate of calcium) and other analogous material." Aug. 20.
- 14,855.—WILSON, G., "Gas and explosive vapour engines." Aug. 20.
- 14,892.—LUTTEN, L., and BLUMER, E., "Manufacture and purification of anthracene." Aug. 20.
- 14,952.—SANSON, L. H. M., "Carburetter." Aug. 21.
- 14,957.—SUGG, W. T., "Incandescent gas lighting." Aug. 21.
- 15,011.—GROVE, D., "Sterilizing water for drinking purposes." Aug. 22.
- 15,030.—BLOXAM, A. G., "Incandescence gas-mantles." A communication from the Phlox-Glühlicht-Gesellschaft mit Beschränkter Haftung. Aug. 22.
- 15,045.—CLAY, W. R., and ENNIS, C. F., "Incandescent gas-burners." Aug. 23.
- 15,108.—DARGUE, W. H., "Production of acetylene gas." Aug. 24.
- 15,147.—MOISSON, J. O., "Pressure regulators." Aug. 25.
- 15,164.—WINN, P., "Pendant gas and other lamps." Aug. 25.
- 15,187.—BROPHY, M. M., "Cocks or valves." Aug. 25.

**New Gasholder at St. Annes-on-Sea.**—Messrs. Clayton, Son, and Co. have recently completed the construction of a new gasholder and tank at the St. Annes-on-Sea Gas Company's works. The Engineers were Messrs. Thomas Newbigging and Son; and at the inauguration of the new structure a few days since, the Chairman of the Company (Mr. George Webb) paid a most generous tribute to the work of both Engineers and Contractors, and to the services in connection with the matter of the Manager (Mr. W. H. Nutter) and the Sub-Manager (Mr. Hargreaves). On the same occasion, Mr. Newbigging gave a brief description of the new structure. He said that both tank and holder, with the guide-framing, were constructed of mild steel throughout; and the holder was telescopic in principle, in two lifts. The outer one was 90 feet in diameter; and each was 20 feet deep—the holding capacity being 240,000 cubic feet.



## LEGAL INTELLIGENCE.

## HOVE PETTY SESSIONS.

Monday, Aug. 27.

(Before Mr. R. A. BEVAN, Chairman, and other Magistrates.)

## Gas-Works and the Factory Acts.

Judgment was given to-day in the case of the summonses taken out at the instance of the Inspector of Factories against the Brighton and Hove Gas Company for a breach of the Factory Acts. Seven summonses had been issued against the Company for employing young persons on a Sunday; and the defence raised was that gas-works do not come within the provision of the Factory and Workshop Act. Only one summons was dealt with as a test case; and the proceedings thereon were reported last week (p. 529).

The CHAIRMAN, in giving judgment, recited the facts of the case, as already set forth, and referred to the contention of the defendants that, being a Gas Company, they did not come under the Act. In support of this contention, the Bench were referred to the Notices of Accidents Act, 1894, to show that "gas work" was one of the employments specified therein for which notice in case of accident had to be given to the Board of Trade; and, further, that in the following year that portion of the schedule to the Notices of Accidents Act, 1894, which applied to gas-works was repealed by section 54 of the Factory and Workshop Act, 1895, and therefore that no notice of any accident had now to be given to the Board of Trade. He said the Bench were unanimously of opinion, on the hearing of the summons, that notwithstanding the defence raised, the defendants came within the provisions of the Factory and Workshop Act of 1878; and that the making of gas and other products was the making of an "article" within the meaning of section 93 of that Act. They reserved their decision, however, in order that their attention might more particularly be called to the sections of the different Acts of Parliament referred to by the learned Counsel who appeared for the defendants. He continued: Having fully considered these, and the arguments raised upon them, we see no reason to alter or vary the opinion we came to on the hearing of the summons—namely, that the defendant Company came within the provisions of section 93, sub-section 3, of the Factory and Workshop Act, 1878. We therefore hold that the case for the prosecution has been made out; and we convict the defendants upon the summons, and impose a fine of 10s. and costs.

A representative of the Solicitors for the defendants said the case had taken the Company by surprise; and he asked the Magistrates not to impose penalties in the other six summonses.

It was thereupon stated that the Magistrates did not think the Company had wilfully infringed the Act.

Mr. T. A. GOODWIN, Clerk to the Magistrates, said they would state a case for the Queen's Bench Division if the Company desired.

The offer was, however, declined; and a plea of "Guilty" in the six other summonses, which stood over awaiting the result of this case, was entered, and a nominal fine of 1s. and costs imposed in each case.

### Action against the Barnstaple Gas Company for Specific Performance of an Agreement.

His Honour Judge Beresford gave judgment last week in an action brought in the Barnstaple County Court against the Barnstaple Gas Company, for the specific performance of an agreement to purchase certain land. The plaintiff, Mr. Thomas Pine, is a cab proprietor. On the 25th of April last, five Directors of the Company, together with the Secretary, made an inspection of his premises, and agreed to purchase, for £400, a yard of which he was the owner. Subsequently, it was agreed that £25 should be paid for an adjoining piece of land. Some difficulty arose respecting the claim of an adjoining owner to a right of way; but this, it was contended, was overcome, and the parties consented to the engrossing of the contract. Then a difficulty arose over a question of ancient lights; and, after inquiries as to the willingness of plaintiff to sell the whole property, the Company refused to proceed with the purchase. For the defence, it was urged that there was no binding contract, inasmuch as it was never signed. His Honour said there was strong evidence of an agreement to purchase in the correspondence, and especially in a letter written by Mr. C. E. R. Chanter, Chairman of the Board of Directors, and a member of the firm of Messrs. Ffrench and Chanter, whose head is the Solicitor to the Company. Counsel said that letter was written not by Mr. Chanter as a Director of the Company but for his firm; and, in any case, it did not satisfy the Act of Parliament, which required that a contract or agreement must be signed by two Directors. After taking time to consider the legal points raised, his Honour found for the plaintiff with costs.

**Melbourne Metropolitan Gas Company.**—The report of this Company for the half year ended June 30 states that the amount at the credit of the net revenue account is £57,947. After transferring to the reserve fund £15,000, the Directors recommend a dividend of 4s. per share; leaving £8659 to carry forward. In reference to the above transfer to the reserve fund, the Directors point out that this amount is towards providing for liabilities incurred in connection with improvements to the West Melbourne and Fitzroy works.

**The Gas Question at Leamington.**—A meeting of the Directors of the Leamington Gas Company has been held to further consider the communication recently received from the Leamington Corporation, in which that body asked the Company to allow them to withdraw their offer to purchase the works. The Directors had also under consideration a memorial, signed by over 200 ratepayers and gas consumers, in opposition to the purchase scheme. The question was discussed at great length; but it was decided that the result should not at the present stage be made public. The Directors also resolved, in consequence of the advance in the price of coal, to increase the charge for gas by 3d. per 1000 cubic feet from the Michaelmas quarter. The price in the borough before the increase was 2s. 5d. per 1000 cubic feet.

## MISCELLANEOUS NEWS.

## THE GAS AND WATER ORDERS OF THE PAST SESSION.

The report of the Board of Trade on their proceedings under the Gas and Water Works Facilities Act, 1870, during the past session has been issued. It states that in December, 1899, twenty-one applications for Provisional Orders were made to the Board—twelve relating to gas, and eight to water undertakings, and one to a gas and water undertaking combined. The amount of capital proposed to be authorized was £536,200 by shares and £135,800 by loan; and of the total amount (£672,000) £225,200 of share and £58,050 of loan capital was for gas, and £311,000 of share and £77,750 of loan capital for water purposes.

The applications for Gas Orders were in regard to Abergele, Dunggannon, Heswall, Irthingborough, Littlehampton, Lymington, Mablethorpe and Sutton, Manningtree and Mistley (Essex), Romford, St. Margaret-at-Cliffe, Elmsall and Kirkby, and Wath-upon-Dearne. Two of the applications—viz., those relating to Littlehampton and Romford—were in respect of undertakings already authorized by Provisional Orders, and sought the following powers: The Littlehampton Gas Company, Limited, authority to construct further works for the storage of gas, and to extend their limits of supply; and the Romford Gas and Coke Company, Limited, authority to raise additional capital. Eight applications—viz., those in regard to Abergele, Dunggannon, Irthingborough, Lymington, Mablethorpe and Sutton, Manningtree and Mistley, Elmsall and Kirkby, and Wath-upon-Dearne and the district—sought for authority to maintain and continue existing gas-works; and in the Irthingborough and Elmsall and Kirkby applications power was also sought to construct additional works. Two applications—those for Heswall and St. Margaret-at-Cliffe—were for authority to construct and maintain new works; and in regard to Heswall also the promoters sought to be empowered to manufacture and supply acetylene gas.

In the case of the Heswall application, objections were lodged with the Board of Trade, and the promoters were also unable to obtain the consents of the Local and Road Authorities concerned. They accordingly informed the Department that they did not propose to proceed with the application. The St. Margaret-at-Cliffe application was withdrawn by the promoter, in consequence of objections lodged by the Dover Gas Company; the greater part of the proposed area of supply being within the authorized limits of that Company. Objections were lodged against several of the other applications, and were fully considered by the Board of Trade; but Orders were granted in every instance, except in those before mentioned, subject to certain modifications and amendments. Local inquiries were held in two cases.

In the case of the Dunggannon application, objections were lodged on behalf of the Dunggannon Town Commissioners (subsequently the Dunggannon Urban District Council). The promoters were also unable to obtain the consents of the Road Authorities in the proposed extended area of supply, and asked the Board of Trade to exercise the power conferred upon them by section 4 of the Gas and Water Works Facilities Act, 1870. The Board appointed Mr. Ingram B. Walker to hold a local inquiry, and upon his report decided to grant the Order, subject to modification and amendment, but refused their sanction to the proposed extension of the limits of supply.

In the case of the Wath-upon-Dearne and district application, the promoters were unable to obtain the consents of some of the Local and Road Authorities concerned, and asked the Board of Trade to dispense therewith. The Board appointed the above-named Commissioner to hold a local inquiry on the matter. When before the Commissioner, the promoters stated that they no longer proposed to include the parishes of Hickleton and Barnbrough in the limit of supply; and the consent of the Parish Councils and of the Doncaster Rural District Council (the Road Authority in respect of these parishes) therefore became unnecessary. They also agreed to the insertion of clauses to meet the objections of the Brampton Bierlow and Thurnscoe Parish Councils. The opposition of the Wath-upon-Dearne and Bolton-upon-Dearne Urban District Councils was, however, maintained; and, after hearing the parties, Mr. Walker reported that, subject to certain conditions, the Order should be allowed to proceed. After considering his report, the Board decided to grant an Order in accordance with his suggestions.

In the following Orders a maximum price per 1000 cubic feet of gas was fixed; power being reserved to the Board of Trade, after three years, to alter the maximum or to substitute a sliding-scale: Abergele, 5s. 5d.; Dunggannon, 5s. 10d.; Irthingborough, 4s.; Lymington, 5s.; Mablethorpe and Sutton, 5s. 3d.; Manningtree and Mistley, 5s. 2d.; South Elmsall, South Kirkby, and North Elmsall, 4s. 6d.

The supply of gas in bulk beyond the limits of supply was authorized, subject to the usual limitations, in all the Orders except Romford. The usual minimum of 15 candle illuminating power of the gas to be supplied was prescribed where necessary.

Special provisions were inserted in the Irthingborough Order with regard to the capitalization of certain premiums obtained from the issue of original capital; and in the South Elmsall, &c., Order, with regard to the price to be charged for gas to the Rural District Council of Hems-worth. The Lymington Order contained an agreed clause as to the purchase of the undertaking by the Lymington Corporation. The Wath-upon-Dearne Order gave power to the promoters to supply gas within a portion of the authorized area of the Elsecar and Wentworth Gas Company. Under an agreement entered into between the promoters and that Company, a clause was inserted in the Confirmation Bill to repeal their powers of supply within the district in question.

The applications for Water Orders were in respect of East Surrey, Elham Valley, Hayling, Maidenhead, Sevenoaks, the South-West Suburban district, Steyning and district, and Tonbridge. The Elham Valley application was for authority to construct new water-works. With this exception, all the applications were in respect of undertakings already authorized by Acts of Parliament or Provisional Orders, and sought for power to raise additional capital. The application of the East Surrey Water Company also included sanction to the purchase of lands by agreement; the South Hayling application, an extension of time for the completion of authorized works; and the Tonbridge application, the construction of works, the extension of the limits of supply, and the purchase of lands by agreement.

The promoters of the Elham Valley application failed to obtain the



consents of the Local and Road Authorities concerned, and did not proceed with their application. In the case of Tonbridge, the promoters failed to obtain the consents of all the Local and Road Authorities concerned, and asked the Board of Trade to dispense with such consents. The Board accordingly appointed Mr. Walker to hold a local inquiry in the matter. Upon his report they decided to dispense with the consent of the Tonbridge Urban District Council, and to grant an Order subject to certain modifications and amendments. The usual report was presented to Parliament. The remaining applications were granted, and Provisional Orders were made, with such amendments in detail as appeared desirable. The Sevenoaks Order contained an agreed clause as to the purchase of the undertaking by the Sevenoaks Urban District Council.

With regard to the only Gas and Water Order, the Hoylake and West Kirby Gas and Water Company, Limited, already authorized by Provisional Orders of the Board of Trade, applied for power to construct additional gas-works and water-works, and to raise further capital for gas and water purposes. The application was granted, and a Provisional Order made.

The Gas and Water Orders were submitted for confirmation by Parliament in five Bills—viz., the Gas Orders Confirmation (No. 1) Bill and the Gas Order Confirmation (No. 2) Bill, both introduced into the House of Lords on April 30; the Gas Provisional Order (No. 3) Bill, introduced into the House of Commons on May 3; the Water Orders Confirmation Bill, introduced into the House of Lords on April 30; and the Gas and Water Orders Confirmation Bill, introduced into that House on April 9. A petition was lodged against the Gas Provisional Order (No. 3) Bill by the Bolton-upon-Dearne Urban District Council in respect of the Wath-upon-Dearne and District Gas Order. The Water Orders Confirmation Bill was also petitioned against in the House of Lords by owners, &c., in Sunningdale and Windlesham, in respect of the South-West Suburban Water Order. The petition against the Wath-upon-Dearne Order was, however, withdrawn; and the Select Committee to whom the South-West Suburban Order was referred passed the Order without amendment. The second reading of the Gas Order Confirmation (No. 2) Bill in the House of Commons was opposed in respect of the Dunganon Gas Order; and, after debate, it was decided to postpone the second reading for a fortnight to allow of negotiations between the promoters and the Dunganon Urban District Council with a view to the sale of the undertaking to that Authority. The negotiations led to no result; and when the debate was resumed, the House of Commons decided to reject the Bill. No other opposition was offered to the remaining Orders; and the Bills passed through the various stages. The Royal Assent was given to the Gas and Water Orders Confirmation Bill on the 10th of July, and to the Gas Orders Confirmation (No. 1) Bill, the Gas Order Confirmation (No. 3) Bill, and the Water Orders Confirmation Bill on the 30th of that month.

The number of Orders applied for since the passing of the Gas and Water Works Facilities Act, 1870, is 520; and the Board of Trade have made 480 Orders, of which 470 have been confirmed by Parliament.

## THE INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACTS.

### The District Inspectors' Reports—The Chief Inspector's Report for Scotland.

We continue to day our notice of the report of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter) for the past year by giving some extracts from the reports of the District Inspectors, and from Mr. Carpenter's report to the Secretary for Scotland by which they are followed.

Dealing first with Ireland, Mr. E. G. Ballard reports that 24 sulphate of ammonia and 5 tar works were registered in his district last year. With one or two exceptions, the former are in good order and well conducted. Taking all the places where sulphate of ammonia is manufactured in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 22; the number burning it, 5; the number working on the continuous system of distillation, 14; and the number working on the intermittent system, 13. The proportion of sulphuretted hydrogen treated by various methods (in terms of sulphate made and per cent. of total make) is given as follows: Oxide purification, 92.8; retained by lime, 4; by combustion, 3.2. Products equivalent to 2992 tons of sulphate were made during the year. At the works where tar is distilled, proper arrangements are provided for dealing with the noxious vapours evolved in the operations; and no complaints have arisen.

In the district embracing the North of England, Mr. J. W. Young reports that 41 sulphate of ammonia and 6 tar works were registered last year. The total production of sulphate of ammonia last year from 48 works was 11,563 tons—an increase of 9 per cent. over 1898. The greater portion of the gas liquor is distilled in continuous plants; 37 works, or 77.1 per cent. of the whole number, using a continuous system for 96.1 per cent. of the liquor, the remaining 11 works, or 22.9 per cent., distilling 3.9 per cent. on the intermittent principle. Oxide of iron purifiers continue to be the general means for the destruction of the foul gases evolved from the saturators of sulphate of ammonia plants; the proportion of works being 82 per cent. of the total number, and 59.3 per cent. in terms of the entire bulk of sulphate made. There was less cause for complaint with the conditions of sulphate of ammonia works last year than in 1898, although in some cases the purifiers were found overworked and passing foul gas. Insufficiency of preliminary cooling and condensation of the foul gas from the saturators still remains a feature of several works. It was sought to obviate the inconvenience of back-pressure in the saturators at one works by cutting a hole in the top of the saturator, and allowing the foul gas and steam free egress into the saturator-house. But the unsavoury danger and illegality of this action, when discovered, proved less obvious to the manager than its seeming expediency. At another works, long-deferred alterations to the plant resulted in the saturator being left without "curtain" or "apron," so that the foul gas and steam followed the easy path thus left open into the saturator-house, in preference to the narrow way to the purifier. Elaborate inducements were tried by the manager and failed. The simple plan of confining the gases at the saturator by a bell did not suggest itself to him spontaneously. The erection of additional coke-

ovens with plants for the recovery of residuals continues in this district. One works with Semet-Solvay ovens has lately begun to manufacture, and others with ovens of the same design will soon be in operation. Five plants for the working of the Claus sulphur-recovery process as applied to the foul gases arising from sulphate of ammonia manufacture were in operation during last year. Care was taken in the working of all of them; and satisfactory results were attained. An additional works for the distillation of tar was registered and brought into operation last year. The acidity of all the chimneys under inspection last year was greater than in 1898, mainly due to the use of inferior coal on account of the high price of that ordinarily employed.

In addition to Ireland, Mr. Ballard has under his supervision Cheshire, North Wales, and part of Lancashire, in which there are 23 sulphate of ammonia and 10 tar works. One new works of the former class, on the continuous system of distillation, was added to the list during the year. The older works remained the same, with one exception. There are, therefore, in the districts—18 works on the continuous system of distillation, 5 on the intermittent system, 19 absorb the sulphuretted hydrogen in oxide of iron, 3 burn it under boiler fires or in retort-flues, and 1 converts it into sulphur in a Claus kiln. The proportion of sulphuretted hydrogen treated by various methods (in terms of sulphate made and per cent. of total make) is as follows: Claus process, 3.8; oxide purification, 26.6; by combustion, 23.6; precipitated by metallic salts, 46. Mr. Ballard has no change to report with regard to tar-works. They are well conducted, and every care is taken to prevent the escape of noxious vapours into the atmosphere.

Reporting on the district comprising Widnes and Runcorn, Dr. J. Affleck states that all the sulphate and muriate of ammonia works are provided with excellent plant, which is well maintained; and therefore no perceptible nuisance is caused. The joint production of ammonia salts in the five works during 1899 was equivalent to 1336 tons of sulphate. The proportion of sulphuretted hydrogen treated by various methods of disposal (in terms of total liquor distilled) is as follows: Oxide purifiers, 22.6 per cent.; vitriol chambers, 28.4 per cent.; combustion, 49 per cent.

In North and East Lancashire and part of Yorkshire, the district over which Mr. H. Porter presides, there are now 14 liquor and 41 sulphate and muriate of ammonia works. The total quantity of liquor distilled equivalent to sulphate of ammonia was 19,102 tons; the proportion of liquor ammonia produced being only 0.53 per cent. of the total. The methods of dealing with the foul gases evolved in the manufacture of sulphate or muriate of ammonia were: Passed to vitriol chambers, 28.77 per cent.; absorbed by lime or oxide of iron, 55.22 per cent.; treated by the Claus process, 13.03 per cent.; by other processes, 2.98 per cent. There was one addition to the sulphate works during the year, where large plant was erected for manufacturing sulphate of ammonia from the ammonia produced by coke-ovens. At one works Claus plant was erected for dealing with the waste gases from the sulphate plant in place of the oxide purifiers. Mr. Porter says the plant is a fine example of this kind of apparatus, and is in every way well designed and constructed. By adopting this system, only two men are now required—one for day and the other for night duty; whereas in the past two extra men were needed for the best part of their time refilling the purifiers and turning over the oxide. At another works, where the continuous distillation process is now carried on, no lime or alkali is used for liberating the fixed ammonia, and the "devil" water from the condensers is constantly pumped back into the still. These changes were made on account of complaints of nuisance outside that part of the works; but they were proved not to be due to the sulphate plant. The manager is of opinion that the fixed ammonia lost is compensated for by the saving in labour in using and carting to and from the works the lime and subsequent lime sludge; and, further, the still never gets blocked up from deposit, or requires cleaning. The "devil" water from the condenser is continuously pumped back into the still, and the hot spent liquor from that vessel diluted with cold water to cool it. Mr. Porter calls attention to an excellent method for producing sulphate of ammonia which has been gradually developed by Mr. H. Green, Engineer and Manager of the Preston Gas Company, who gave him permission to publish the following description of it: The process is continuous. The waste gases heat the incoming liquor by passing through a tubular heater, and the hot liquor then passes to a divided flanged pipe, in which is a steam-pipe connected with the steam-boiler at both ends—one end returning the condensed water to the boiler. These pipes are of considerable length, with a slight rise from the horizontal from the outlet; and at two points in the length of the divided flanged pipe, the ammonia gas is drawn off to the saturator. The liquor with the fixed or combined ammonia is conducted to a small liming vessel of simple construction, provided with arms or agitators to prevent the lime from depositing. The saturators are copper vessels, into which mother liquor is pumped and acid run in continuously. After some hours' working, the saturator becomes heavily charged with salt, which is discharged from the bottom into a tip-box standing over a well into which the mother liquor drains. Sometimes two saturators are employed; but if only one, the process is not stopped, as fresh mother liquor is immediately run in from a store-tank over head. Another very excellent feature of this process is the arrangement for supplying a continuous and steady feed of ammonia liquor, lime liquor, and acid to the apparatus by means of floating telescope syphons, three in number, where the liquor, lime, or acid can be measured in a few moments, and the quantity adjusted to a nicety. The most striking feature of the process is the beautiful white crystalline salt produced, which can be bagged up very shortly after it is discharged, and is quite dry. Mr. Porter states that, with the 29 tar works in his district, there were no accidents of a serious character.

In the East Midland district, there are 8 gas liquor, 29 sulphate and muriate of ammonia, and 15 tar works. Mr. E. Morley Fletcher, the Sub-Inspector for this district, reports that there was an addition of two sulphate works during the year; while one sulphate works and another for the manufacture of liquor ceased to register. Of the two new works, one derives its liquor from coke-ovens and the other is a small gas-works. Both absorb the saturator gases in oxide of iron. The total quantity of ammoniacal products manufactured during the year amounted to 13,373 tons, calculated as sulphate of ammonia. No further progress was made with the revivification of the oxide of iron *in situ* other than that obtained by drawing air downwards through the oxide by chimney or artificial draught when the purifier is not in use. This method was introduced



at one other works in the district; making altogether four where it is in use. The total quantity of liquor distilled, equivalent to sulphate, was 17,073 tons, as compared with 16,769 tons in 1898; the proportion of sulphate and muriate of ammonia made by the continuous process being 94.2 against 89.5 per cent. The  $H_2S$  is disposed of as follows: Passed to vitriol chambers, 30.01 per cent.; treated by the Claus process, 37.56 per cent.; by oxide purification, 31.58 per cent.; and by combustion, 0.85 per cent. The number of tar-works was increased by one last year, and there are now 15 in the district. The new works are only small ones, with two stills; and, with the exception of this addition, there was practically no change. The foul gases from the still-worm ends were effectively dealt with; and, consequent on the low price of anthracene, distillation was in many cases not carried so far, and a less amount of sulphuretted hydrogen was doubtless evolved.

Mr. E. Jackson generally has something interesting to say about the South Midland district, in which there are 7 gas liquor, 78 sulphate of ammonia, and 22 tar works. Five sulphate of ammonia plants were erected in the district last year—three at works not hitherto registered. One was at a gas works—a continuous still with annular condenser and oxide of iron purifier attached for dealing with the foul gases. At another new works, the sulphate plant is connected with a large set of coke-ovens. A continuous still has been erected, with iron pipe condensers, water cooled, and two oxide of iron purifiers, with change-valve for alternate revivification of the oxide *in situ*. A steam injector is also attached to further assist in drawing away any offensive gases from the men, and to induce a current of fresh air on to them while emptying the purifier. The "devil" liquor is run into the crude liquor well, and so returns to the ammonia still. The third new plant consists of a continuous still, water tubular condensers, and two oxide of iron purifiers supplied with water-valves. These purifiers are worked alternately, and air is forced through the oxide by a small pump to revivify *in situ*. The "devil" liquor is returned to the still, but does not run in with the crude ammoniacal liquor. The supply of the latter is stopped, and the former, which accumulates in the 24 hours, is steamed in the still, separately to drive off the sulphuretted hydrogen. Gas liquor is concentrated at seven works in the district; but in four of them sulphate of ammonia is also manufactured. The methods of dealing with the foul gases escaping from the saturators are the same as described in previous reports. The treatment of the "devil" liquor is much the same also. Mr. Jackson is pleased to be able to report that with two exceptions, either water-seals or hydraulic valves have been fixed at all works where more than one oxide of iron purifier is employed, or a written undertaking has been given that no purifier will be emptied while the ammonia still is in operation. A considerable number of important improvements were carried out last year at various works; and particulars of the most notable of them are given. The total quantity of liquor distilled last year, expressed as sulphate, was 25,413 tons; 97 per cent. of it being treated by the continuous process. The following are the proportions of the gas liquor distilled, where the sulphuretted hydrogen is treated by different methods: Passed to the hydraulic main, 1.5 per cent.; treated by the Claus process, 12.7 per cent.; by oxide of iron or lime purification, 38.2 per cent.; by other methods, 45.6 per cent.; no sulphuretted hydrogen generated, 2 per cent. Mr. Jackson states that chemical manufacturers are finding increasing difficulty in satisfactorily disposing of the effluents from their manufacturing operations, and rendering them sufficiently innocuous to satisfy the different authorities responsible for the conservancy of water-courses into which spent liquors from their works have hitherto found an outlet. The spent limed liquor from ammonia works has presented considerable difficulty in this way; and any method that would enable the liquors to be easily and satisfactorily clarified would, he says, in many cases be very welcome. In two works in the district the whole of the spent liquor, after settling, is evaporated, and, with the present price of fuel, at enhanced cost to the manufacturers. With regard to the tar-works, Mr. Jackson has not much change to report as to the methods of dealing with the offensive gases escaping condensation in the worm. These are either burnt to render them innocuous, or, in some works, after further condensation, are scrubbed either with oil or water in coke-packed columns, and finally passed through oxide of iron or lime.

In the district embracing the South-West of England and South Wales, Dr. Alfred C. Fryer had last year 211 separate processes under inspection. Three new works for the manufacture of sulphate of ammonia and one for the distillation of tar were registered. The total quantity of ammoniacal compounds produced amounted to 8521 tons, calculated as sulphate of ammonia. The proportion of liquor distilled by the continuous process was 72.8 per cent. The sulphuretted hydrogen was treated by the various methods of disposal as follows, in terms of the sulphate of ammonia made: By the Claus process, 11.4 per cent.; by oxide of iron purification, 82.1 per cent.; by combustion, 6.5 per cent. The distillation of tar is carried on at 11 works in the district, and during the year one was added to the register. The waste gases from the worm ends and receivers are draughted by steam suction to the fire, and the vapours from the pitch-cooler are condensed and caught in a seal tank. Lennard's continuous tar-still is in operation at one works in this district; and Dr. Fryer points out that one of the advantages connected with it is the reduction of risk from fire and explosion on account of the small quantities of tar treated at one time. Comparatively little space is required for the erection of plant dealing with so large a quantity of tar. The heat, too, is utilized, and that given up by the condensers is employed for the distillation of light oils. The great freedom from the production of nuisance is, he adds, a praiseworthy feature of this still.

There were no fewer than 196 works registered for inspection in the eastern and south-eastern counties last year; 68 being works for the production of sulphate of ammonia, and 9 for the distillation of tar. The separate manufacturing processes under the supervision of Mr. E. Napier Sutton, who controls the district, numbered 262—a decrease of 4 as compared with 1898. Plant now exists at 75 works for the manufacture of sulphate of ammonia; but at two small works it remained idle throughout the year. The total quantity of ammoniacal compounds manufactured last year amounted to 44,063 tons, calculated as sulphate of ammonia. This is a decrease of 362 tons on the quantity made in the previous year. Upwards of 98 per cent. of the ammoniacal liquor treated is now distilled by the continuous method; and the old intermittent system is only in use at some 13 of the very smallest works. There is an increasing tendency for the manufacture of sulphate to be under-

taken by gas companies, and the quantity of liquor available for private distillers consequently diminishes. In 1898, the proportion manufactured by private firms in the district was 21.3 per cent.; whereas in the past year it fell to 16.4 per cent. Mr. Sutton says this was but natural, when the difficulty and expense of carriage of the weak raw liquor is considered. The sulphuretted hydrogen was treated by the following methods of disposal, in terms of sulphate made and per cent. of total make: Taken to vitriol chambers, 66.7 per cent.; treated by the Claus process, 11.5 per cent.; by oxide purification, 6.2 per cent.; by neutralization of sulphur dioxide (combustion), 5.3 per cent.; by hydraulic main and other means, 3.4 per cent.; by combustion *per se*, 6.9 per cent. The proportion of sulphuretted hydrogen treated by the different methods of disposal underwent some modifications in the past year; and the quantity treated by approved methods shows an increase. This is particularly apparent in that now dealt with by the neutralization method, while the number of works dealing with sulphuretted hydrogen by combustion *per se* and the proportion of gas treated show material decrease. By far the largest proportion of sulphuretted hydrogen is utilized direct for the manufacture of sulphuric acid; this amounting to 66.7 per cent. of the whole. Mr. Sutton says the method is undoubtedly the best practicable; but it is only available at a few works at which acid plant either exists or is contiguous thereto. The use of sulphuretted hydrogen as a source of sulphur for acid making has made much progress in recent years, and the difficulties experienced in the utilization of this material have been overcome. Treatment of the foul saturator gases by oxide purification is in use at 43 works, and the proportion of gases so treated amounts to 6.2 per cent. This method is most suitable for small works where the daily and annual make of sulphate does not exceed 30 cwt. and 200 tons respectively. Revivification of the oxide *in situ*, by chimney draught or other means, has been found very effective in prolonging the active life of purifiers which showed signs of exhaustion before such help was adopted. Revivification by downward draught to a chimney has the advantages of easy application and very complete control; but Mr. Sutton points out that there are disadvantages connected with the system. There is the tendency for the oxide to harden and give back-pressure—frequently necessitating the discharge of the material before it is anything like saturated; and there is the destruction by charring or corrosion of the wood or iron grids supporting the oxide, by the heat engendered by re-oxidation being drawn downwards. The latter feature has in one instance given much trouble, and at present the grids have been discarded for coarse brick rubble which has been placed in the purifier bottom as a support for the oxide. Absorption of the foul saturator gases by oxide has, in general, been carefully and conscientiously carried out; and the purifiers have rarely been found otherwise than in an active and inoffensive condition. Neutralization of the sulphurous acid produced by the combustion of sulphuretted hydrogen in a special furnace has been in use at three large works in the district, and has been accomplished satisfactorily on the whole. The proportion of sulphuretted hydrogen now treated by this method has reached 5.3 per cent. The results of tests made at three works where the neutralizing process has been in use are given by Mr. Sutton. They show that an average of more than 95 per cent. of the sulphurous acid was absorbed. At two of the works, the sulphuretted hydrogen given off on the distillation of the ammoniacal liquor is passed to the hydraulic main or to the crude-gas main, to be dealt with by the ordinary purification plant; while at a third it is retained in combination by lime and metallic salts. The proportion of gas treated by these means at the three works in question is 3.4 per cent. The balance is disposed of by combustion *per se* in the retort and boiler flues; and the resulting sulphurous acid escapes into the air with the chimney gases. It is satisfactory to find that there was no complaint of nuisance or damage arising from sulphate of ammonia works during the past year. Gas tar is distilled at 17 works in this district, and the stills employed number about 120. With the exception of one establishment where a very small still is occasionally used, all the works are provided with appliances for conveying away the permanent gases from the worm ends and receivers, and for treating them by absorption or combustion. No nuisance arose from those works.

The report of the Chief Inspector to the Secretary for Scotland includes the details of the work done, together with some interesting statistics, furnished by Mr. W. S. Curphey, the District Inspector. They show that the number of works in Scotland registered under the Alkali, &c., Acts for the past year was 127—an increase of one over the preceding year. Of these, 10 were registered as "alkali" works, and in the remainder one or more of the various manufacturing processes enumerated in the schedules appended to the Acts were in operation. The various processes under inspection numbered 207; being again an increase of one over 1898. Of the total, 2 were connected with the treatment of gas liquor, 63 with the manufacture of sulphate and muriate of ammonia, and 46 with the distillation of tar. The quantity of salts of ammonia made (expressed as sulphate) last year was 72,663 tons, as compared with 69,474 tons in 1898. The sources were as follows: Gas liquor works, 14,742 tons; iron-works, 17,563 tons; shale-works, 38,780 tons; and coke and carbonizing works, 1578 tons. The production of pitch was 129,327 tons, against 120,819 tons in 1898. In the course of inspection, 473 visits were paid, and 335 examinations were made of the gases passing into the air from the various works. The general average escape of acid gases from all the sulphuric acid works was equivalent to 1.66 grains of sulphuric anhydride per cubic foot of total escaping gases. The average escapes of these gases are very slightly less than the corresponding figures for 1898. Mr. Curphey says the condensation was efficient, and the actual amount permitted to escape into the air was less than half that allowed by the Acts. In works using gas liquor, the continuous system of distillation was in general use in the larger establishments. In some of the smaller ones, however, the old style of intermittent distillation still exists. The present high price of fuel, if prolonged, will tend to increase the adoption of the continuous system, by which at present 88.6 per cent. of Scottish gas liquor is treated. In the iron and shale works, all the ammoniacal liquor is distilled by the continuous method. In the carbonizing or coke works, the intermittent system is still in use in certain small establishments. Of the salts of ammonia produced in Scotland from all varieties of ammoniacal liquor, 97.5 per cent. was obtained by the aid of the continuous form of still. In 30 works, gas liquor was distilled; 18 of them working on the continuous, and 12 on the intermittent system. Three modes of disposing of the noxious gases were in use: (1) Oxide of iron



purifiers were used in 22 works, and dealt with the waste gases coming from 73.2 per cent. of the salts of ammonia produced from gas liquor. (2) Combustion was resorted to in five cases, and disposed of 22.8 per cent. (3) Decomposition of the sulphides present in the liquor by means of copperas was utilized in three works, and disposed of the volatile sulphurous impurities incidental to the production of 4 per cent. of the salts. The number of works in which tar was distilled last year was 46—an increase of one over 1898. No change as to the mode of dealing with the waste gases from tar distillation has to be recorded.

### ASCOT DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday, at the Offices, No. 46, Cannon Street, E.C.—Mr. ROBERT BERRIDGE, Assoc.M.Inst.C.E., in the chair.

The SECRETARY (Mr. W. A. Schultz, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said the report and accounts provided pleasant reading; showing, as they did, a profit of £1161. After providing for every charge against the working, there remained a balance of £1882 at the credit of profit and loss account, out of which the Directors recommended a dividend at the rate of  $4\frac{1}{2}$  per cent. per annum on the share capital—leaving a balance of £893 to be carried forward. This he thought the shareholders would consider very satisfactory; for on June 30 last year, they had only £728 to carry forward. It was certainly a decided improvement. They were making more gas now than they did last year. The gas produced in the June half of 1899 was 11,113,000 cubic feet, as against 11,763,800 cubic feet in the past six months. The gas sold in the same periods was respectively 10,031,000 cubic feet and 10,454,000 cubic feet; while the gas sold per ton of coal carbonized was 9296 cubic feet, and 9300 cubic feet. This, while only a slight rise, was on the right side. The amount received from coke per ton of coal carbonized was 6s. 3d. in the first half of last year, while this year, he was glad to say, it was 8s. 2d. This additional value was a little help to them in meeting the extra price of coal which they had now to pay. The amount received for coke per ton sold, less expenses, was in the June half of last year 14s. 11d., and in the past half year 18s. 8d. He was glad to say the ordinary consumers had increased from 385 to 400, and the prepayment consumers from 88 to 137. The number of stoves on hire had also risen from 107 to 151. He thought all gas companies were experiencing an increase in the number of consumers on account of the extra cost of coal. The number of public lamps had advanced from 81 to 98. Since the last meeting, the Directors had had a busy time in connection with the purchase of the Bagshot Gas-Works and other matters. Their attendances at Board meetings during the half year had been really considerable. Immediately after they got over the transfer of the Bagshot works, they proceeded to lay an 8-inch main from the end of the present main in the Bagshot Road to Bagshot; and the work was being steadily carried out—in fact, he believed it was now more than half done. For some years, the supply at Bracknell had been very short; and it had been troubling the Directors a great deal. Two years ago they duplicated the 6-inch main supplying that district. But this was not entirely satisfactory; and so they were extending their 12-inch trunk main up to the point from which they laid the two 6-inch mains, which, they hoped, would give a satisfactory supply to Bracknell. Part of the 8-inch main which was being replaced by the 12-inch one would be used in the Bagshot district. The Directors had also secured a small piece of land in Bracknell in case they required to build a holder there. Anyway, the ground would be very useful for other purposes. There was no question about this, that, with the Bracknell supply, with the increase in the number of consumers both at Ascot and Bracknell, and with the purchase of the Bagshot works, they would in time have to consider the question of erecting a larger holder either at the Ascot or Sunninghill works. The Directors had also made an arrangement with the South-Western Railway Company to lay a siding from their line into the works; for hitherto, ever since the works had been in existence, they had had to cart the coal and everything else nearly  $\frac{3}{4}$  mile. Even on the present working, the siding would save the Company about £100 a year; and afterwards, as the business increased, it would effect a considerably greater saving. Of course, they did not know what would be the result of the current half-year's working; but they hoped they would do as well as last year. He was afraid, however, they would not, because they must look forward to the present rise in the cost of coal. Although they had not had to advance the price of gas so far—and they trusted they would not be compelled to do so—they could not, of course, yet see what they would have to do in future. The price they were paying for coal was 25 per cent. higher than before. This was a serious increase; but they would try the experiment of continuing the existing price of gas for the present, and see how they got on. He moved the adoption of the report and accounts.

Mr. ALFRED KITT seconded the motion.

Surprise was expressed by Mr. F. B. Floate that the price of gas had not been increased. But it was pointed out to him that the present charge was high—4s. 6d. per 1000 cubic feet—and that to raise it might stop the progress the Company were now making. Mr. J. T. Pratt and Mr. Charles Gandon expressed their approval of the Directors' policy.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. F. H. PILLEY, a dividend at the rate of  $4\frac{1}{2}$  per cent. per annum was declared.

Dr. STRONG then gave notice that, in consequence of the large increase in the Company's business, coupled with the purchase of the Bagshot works, he should, at the next meeting, move that the number of Directors be increased, and their remuneration be also taken into consideration. He was satisfied that the present Board carried out their duties exceedingly well; but, with only three members, he feared that, in case of illness, they might have a difficulty in forming a quorum.

Mr. H. WOODALL moved a sincere vote of thanks to the Chairman and Directors for their services. He commented upon the large amount of work they had had to perform in the half year, and the insignificance of their remuneration.

Dr. STRONG, in seconding the motion, suggested that it should be extended by the incorporation of an honorarium of 100 guineas to the Board and the Secretary.

This was supported by Mr. Gandon, and accepted by Mr. Woodall; but

it was afterwards decided to omit the Secretary on the understanding that the question of an increased remuneration to him, in view of the extra work the business now entailed, should be taken into consideration by the Directors.

In its amended form, the proposition was unanimously carried.

The CHAIRMAN made suitable acknowledgment; and the proceedings terminated.

### HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Saturday last, at the Albion Tavern, Aldersgate Street, E.C.—Dr. J. W. LEE GLAISHER, F.R.S., presiding.

The SECRETARY and ENGINEER (Mr. J. L. Chapman) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts submitted to the shareholders. He said he was glad to be able to congratulate the proprietors upon the very successful half-year's working of the Company. The figures he would lay before them would speak for themselves. The coal carbonized amounted to 3156 tons; and the oil used, to 17,473 gallons. The quantity of gas made was 37,974,000 cubic feet; being an increase of 4,844,000 cubic feet. The gas sold amounted to 35,267,000 cubic feet, or an increase of 4,609,000 cubic feet. The gas made per ton of coal carbonized was 10,294 cubic feet. As regarded the oil gas, the oil used amounted to 3.19 gallons per 1000 cubic feet. The unaccounted-for gas was 2,096,000 cubic feet. This was about  $5\frac{1}{2}$  per cent. of the make, or a little less than in the preceding year. The amount of gas sold in the three districts served by the Company was as follows: Harrow, 19,008,000 cubic feet, or an increase of 2,859,000 cubic feet; Sudbury and Harrow Weald, 4,356,000 cubic feet, or an increase of 421,000 feet; and Stanmore, 7,783,000 cubic feet, or an increase of 919,000 feet. The amount of gas supplied for public lighting was 4,120,000 cubic feet, or an increase of 410,000 feet. There was therefore a large increase in each of the districts; but this would be shown more clearly by the percentages. In the Harrow district, the increase over the corresponding period of last year was 15 per cent., in Sudbury and Harrow Weald nearly 18 per cent., and in Stanmore nearly 11 per cent. The largest of these percentages was in Sudbury and Harrow Weald; but there the gas consumed was under  $4\frac{1}{2}$  million cubic feet. The increase in the gas used for public lighting was 11 per cent. When presiding at the meeting of the Company a year ago, his father referred to the long period of comparative quiescence which they had experienced in Harrow, and spoke of progress having begun there. On that occasion he said that there had been sold in the Harrow district over 16 million cubic feet of gas, which was an increase of close upon 5 per cent. over the corresponding period of the previous year, and was the largest consumption that had ever taken place in Harrow. This result, however, had been excelled greatly by the figures which he (the Chairman) had just given. Instead of an increased consumption of about 760,000 cubic feet in the Harrow district, the amount on the present occasion was nearly 3,000,000 cubic feet; and the percentage of increase, instead of being 5, was 15. The coke and breeze produced was 2051 tons, the amount sold 1277 tons, and there was used 554 tons. The tar made amounted to 38,474 gallons, and there was sold 40,674 gallons. The quantity of sulphate of ammonia manufactured was 29 tons, or 19 cwt. per 100 tons of coal carbonized. He would now pass on to the financial part of the balance-sheet. The expenditure showed an increase in every item. In the manufacture of gas, coal and oil cost £576 more, wages £60 more, and repairs of works £319 more. The last item, however, included the renewal of a gasholder to receive the water gas. With regard to distribution, they had spent £149 more on repairs of mains, maintenance, &c., and £58 more on repairs and renewals of meters. Rates and taxes showed an increase of £47. The result was that the total expenditure amounted to £6775, or £1216 more. This seemed a very large increase in the expenditure; but he was glad to say that the increase in the receipts exceeded it, for to set against the extra outlay they had an additional income of £1581. The receipts from all sources amounted to £10,038. The main items which went to make up the increase of £1581 in the receipts were £939 more for gas sold, £33 more for rental of meters, stoves, and fittings, £264 more for coke, £119 more for tar, and £18 more for sulphate of ammonia. The increase in the receipts for residuals amounted to £402, which was a very considerable sum. They had written off £200 from the suspense account; and they were enabled to pay the same dividends as last year, and to carry forward a balance of some £400. He thought these figures spoke for themselves more eloquently than anything he could say. There had been an increase in every item all round; and it was very satisfactory that the increase was again so large in the Harrow district, where some years ago they scarcely looked to find their greatest development. This, he thought, finished what he had to say about the balance-sheet. There were, however, some other matters that should be mentioned. First, there was the increase in the price of coal. They had very reluctantly had to raise the price of gas by 3d. per 1000 cubic feet; but this did not nearly represent the additional amount they had had to pay for coal. The working of the Company had, however, been so satisfactory in the past half year, that they hoped to be able to get along with the small increase of 3d. per 1000 cubic feet. Under their Act, if they wished to raise the price of gas above 4s. 3d. per 1000 cubic feet in the Harrow district, they had to obtain the sanction of the Board of Trade; and for this purpose a public inquiry was held. The figures were placed before the Inspector, who sanctioned an increase of 3d. per 1000 cubic feet in the price in the district referred to, from the next quarter day to the June quarter of next year. He thought the facts clearly proved that the price of coal forced them to raise the price of gas; but they were able to get on with a comparatively slight increase.

Mr. JAMES RANDALL seconded the motion, and it was carried unanimously.

The CHAIRMAN next proposed that dividends be paid for the half year ended the 30th of June last at the rates of 8 per cent. per annum on the original "A" capital, 7 per cent. per annum on the additional "B" capital, £5 12s. per cent. per annum on the additional "C" capital, and 6 per cent. per annum on the guaranteed shares, all less income-tax.



This was seconded by Mr. H. J. RYDON and agreed to.

The meeting having been made special,

The CHAIRMAN moved that the Directors be authorized to issue £20,000 of additional capital, and to borrow on mortgage or by the creation of debenture stock £5000 in respect of such additional capital, in pursuance of the Acts of Incorporation, in such manner and at such times as they might deem best. He said the balance-sheet showed that the capital account was already overdrawn by £6000. They had been erecting very considerable works; and they had now before them the plans for a new retort-house. The district, also, was growing; and this necessitated the laying of new mains, which was going on very fast now. All this required money, and they could not get along without increasing the capital. The Directors therefore asked for power to issue additional capital and to borrow a sum on mortgage or by the creation of debenture stock.

Mr. LENNARD seconded the proposition, which was carried unanimously.

The CHAIRMAN, in proposing a vote of thanks to the Engineer and Secretary, said the prosperity of the Company during the last twelve months had been quite phenomenal. They had had to increase the works, buy an acre more land, and erect water-gas plant.

The motion having been seconded and carried,

Mr. CHAPMAN returned thanks. He said the water-gas plant had been a very great help to the Company. They had their old coal contracts running until the end of April, and so had only bought coal at the higher price for the last two months of the half year. For a Company like theirs, 3d. per 1000 cubic feet was a very small rise in the price of gas. It was only the great increase in their business that enabled them to get along with less than 6d. rise. One very satisfactory point was that since the raising of the price in the outside districts there had been not the least falling off in the rate of increase of consumption; the increase was still running on at 15 per cent.

A vote of thanks to the Chairman terminated the proceedings.

### WINDING UP OF THE SKIPTON GAS COMPANY.

#### The Final Stage.

The Final Meeting of the shareholders in the above-named Company was held in the Board-room at the gas-works last Wednesday—Mr. J. Watson presiding. The Chairman explained the business of the meeting, and said the price which the Urban District Council paid for the works and undertaking was £66,500. The purchase price recently paid by local authorities for gas-works under similar circumstances was equal to about 30 to 31½ years' purchase; whereas the price obtained for the Skipton works was equal to about 33½ years' purchase. He thought this was very good. The shareholders had had previously distributed to them a large proportion of the purchase-money, on the basis of £252 for every £100 worth of 9 per cent. stock, and £210 for every £100 worth of 7½ per cent. stock. The cost of the parliamentary and arbitration proceedings, winding up, &c., was £3000 (a portion of which was recoverable from the District Council); and there remained at the bank a balance of £1023, to which was to be added about £19, since received—making a sum of £1042 at the disposal of the shareholders. The Chairman added that there were certain persons to whom he thought the shareholders might grant an *honorarium* for their services—mentioning the Manager (Mr. J. H. Woodward), the Secretary (Mr. J. Haigh), both of whom had done a great deal of work, and Mr. Henry Cowman, who had been a collector for about twenty years. He also alluded to the services of the Directors, all of whom had, he said, paid very careful attention to the interests of the shareholders, and, as a result, had maintained the works in such a state of efficiency as to contribute towards the successful negotiations which had been made with the town. The Directors then left the room while the shareholders discussed the subject of the disposal of the balance. Various suggestions were made; and it was subsequently decided that the Chairman should have £100, the Vice-Chairman (Mr. F. W. Thornton) £30, and the other Directors and each of the three officers £10 each—making £200 in all; the remainder to be distributed among the shareholders. This will amount to about a half-year's dividend as usually paid. A vote of thanks to the Chairman, officers, and Solicitor (Mr. E. Wood) concluded the business, and also the existence of the Company.

### WEST BROMWICH GAS DEPARTMENT.

#### The Dellwik-Fleischer Water-Gas System to be Introduced.

A Special Meeting of the West Bromwich Town Council was held on Monday last week, under the presidency of the Mayor (Alderman S. Pitt), for the purpose of considering certain recommendations from the Gas Committee for the extension of the works. Mr. Bushell submitted the report of the Gas Committee, some extracts from which were given in the "JOURNAL" last week. The Deputy Town Clerk read the letter from the Local Government Board, referred to therein, containing their refusal to sanction the loan for the water-gas plant. They stated that a Departmental Committee were appointed in 1898 to inquire into and report upon the following matters: (1) The extent to which water gas and other gases containing a large proportion of carbonic oxide were manufactured, used for heating, lighting, and other purposes; (2) the danger attending such manufacture and use; and (3) the means by which such dangers might be removed or diminished, either by the discontinuance of the use of such gas or gases or otherwise, and what regulations for the prevention of danger should be established. As that Committee's report and recommendations were under consideration, the Board were not prepared at the present time to entertain this part of the application. Mr. Bushell, in moving the adoption of the report, urged that the Corporation could defray the cost of the water-gas plant out of the revenue account, which he felt would be to their financial interest. He pointed out that the Committee had given much thought to the question of extending the gas-making plant. The works had been established twenty years; and in this time the output of gas had rather more than doubled. The Committee had kept pace with the growing demands of the district by modernizing the plant from time to time; thus enabling them to get

a much larger production of gas from practically the same area. In the winter, the capabilities of the works were severely taxed; and if a succession of dark and foggy nights were to occur, the entire plant would be altogether insufficient to cope with the demands, and they would have no margin or reserve in case of a breakdown or accident. Therefore it was imperative that some extension should be made; and the Committee considered that, as a water-gas plant would be sufficient for their requirements for some time to come, it would be better to spend about £4000 in laying down this system than in adopting a coal-gas plant, which would cost £16,000 or £17,000. The Committee recommended the introduction of the water-gas apparatus for many reasons. They intended to use it in conjunction with the ordinary plant, and proposed a maximum admixture of one-fourth in bulk with the coal gas. This would produce a gas which the experience of other works proved to be in every way satisfactory. Alderman Rollason seconded the motion. Mr. Lawley, in supporting it, mentioned that the Committee had seen water-gas plant in working order, and the rapidity with which the gas was generated was simply marvellous. He considered the Corporation would be taking a very wise step in introducing it. Mr. Browne objected to so important a matter being rushed, and proposed, as an amendment, that the recommendations be referred back to the Committee. He thought the time was very inopportune, with the present expensive electric light undertaking on hand, to launch out into a further scheme. Mr. Keys seconded the amendment. Mr. Newman thought, before going in for extensions of their gas-making plant, they should wait and see what effect the electricity supply undertaking would have upon the gas-works. Mr. Bushell said they expected that West Bromwich would be able to support both concerns. The Mayor said he thought they should take every precaution to protect the workmen engaged in the manufacture of water gas and also the burgesses from any deleterious effects of the gas. Eventually the recommendations were agreed to; only four members voting against them.

### THE PUBLIC LIGHTING AT DEVONPORT.

A Special Meeting of the Devonport Town Council was held last Thursday, for the purpose of considering the report of a deputation who visited Liverpool to inquire into the question of street lighting, and particularly the preference given to incandescent gas lighting by a Corporation possessing their own electricity works. A summary of the Committee's report was published in the "JOURNAL" for the 12th of June (p. 1561). It recommended the Council to light seven of the principal streets with electric arc lamps, and all the other thoroughfares with incandescent gas-burners in specially constructed lanterns. In order to carry out their recommendation efficiently, the Committee advised the Council to purchase the pillars and brackets from the Gas Company, and take over the lighting and maintenance of the lamps. The Committee's estimate of the cost of the improved lighting, including capital charges, was £3068, as compared with £2632 paid to the Gas Company in 1899.

Mr. WHITBY moved that the report be adopted, and negotiations opened with the Company, with a view to giving effect to it. He said the object of the deputation to Liverpool was to ascertain how far it would be desirable for the Corporation to supply themselves with electricity for street lighting, or whether they should renew the contract with the Gas Company. The Liverpool Corporation owned electricity works, but most of the thoroughfares were lighted with gas on the incandescent system—the supply being furnished by the Gas Company. If the whole town were lighted on the incandescent system, the Committee's estimate was that it might be done for £2357 per annum, or £275 less than the present charge. He believed, however, that the saving was very much underestimated. As the mantles would probably be supplied at 6d. instead of 1s. each, there would be a difference of £111, and the sinking fund and interest, which were estimated at £390, would not, he believed, exceed £300. The Gas Company imposed an extra charge of 5s. per annum for incandescent burners; but the opinion of the deputation was that, instead of being increased, the price should be largely reduced.

Considerable discussion took place as to the streets included in the electric lighting area. One of the members suggested that wherever the tramways were laid the electric light should be provided. This meant, he said, that all the main thoroughfares would be so lighted. Other members pleaded for the inclusion of certain streets in the list.

Mr. STANBURY said the Gas Company had provided a light which did not satisfy the town at a cost which, it seemed, could be considerably reduced. He did not, however, see in the report any provision for a sinking fund. As to the suggestion that electric lighting should be provided everywhere, it was a fact that electricity could not compete in cost with incandescent gas lighting.

Dr. MAX remarked that members advocated the lighting of their own wards irrespective of the general good. He was glad to see incandescent gas lighting recommended, as electricity was twelve times more costly than gas. Speaking amid considerable interruption, he said he was not against the use of the electric light, if they could afford it; but an incandescent gas-light cost £1 8s. 3d., whereas an electric light cost £17 17s. 1d. Would the electric lamp give twelve times the amount of light to be obtained from the incandescent gas-burner?

Mr. STANBURY said Dr. MAX had taken as the basis of his remarks 2s. 5½d. per 1000 cubic feet as the price of gas, whereas in Devonport it was 3s. It would be impossible to get from gas-lamps the same light as from electric arc lamps.

The TOWN CLERK (Mr. A. B. Pilling) said the report as it stood committed the Council to an increased expenditure of £436 per annum. The Committee took the view that electric arc lighting was a luxury; but if the Council liked to assume the responsibility of increasing the £436, the Committee had no objection.

The ELECTRICAL ENGINEER (Mr. Furness) replying to questions, said the more arc lamps the Committee ordered the more would the first cost be proportionately reduced. The electric light undertaking was their own property, and the more they paid to it the less they paid to the owners of the gas undertaking, which was not. But they must draw the line somewhere.

It was decided to add one street (Albert Road), to the list of those to be lighted by electricity; and with this alteration the report of the Committee was adopted.



## PROVINCIAL GAS AND WATER COMPANIES.

## Gas Companies.

At the half-yearly meeting of the Altrincham Gas Company on the 24th ult., the accounts submitted showed that the sale of gas in the six months ending June 30 produced a revenue of £10,327; that of residuals, one of £3256—the total receipts being £14,016. The expenditure on the manufacture of gas amounted to £6826; on distribution, to £300; and on management, to £822—the total expenditure being £8305. The balance carried to the profit and loss account was £5711, as compared with £4255 in the first half of 1899—an increase of £1456; and the amount available for distribution was £5891. Out of this, the Directors recommended the payment of the full statutory dividends, and the transfer of £1000 to the reserve fund. The quantity of gas sold in the past six months was 74,364,537 cubic feet, as compared with 63,418,574 cubic feet in the first half of 1899—an increase of nearly 11 millions, or more than 15 per cent. The present satisfactory position of the Company is due principally to the improved method of carbonizing brought into use by the Manager (Mr. J. E. Lamb) last winter. No increase in price is to be made on account of the enhanced cost of coal; and had it not been for this additional burden there would have been a reduction.

The Cork Gas Consumers' Company will hold their 63rd ordinary general meeting to-day, when the accounts presented will show that in the six months ending June 30 the revenue from the supply of gas amounted to £19,744, and from the sale of residuals to £7975; the total receipts being £27,728. The expenditure having been £22,260, there was a balance of £5468 to go to the profit and loss account. The sum available for distribution is £4400, which will be insufficient by £1251 to pay the usual dividend. This amount will be taken from the reserve fund. The Directors report that coal and freights had increased; but, on the other hand, the receipts from residuals were in excess of the corresponding period of 1899. The Engineer (Mr. T. P. Travers) states that the new retort-house is practically complete, and preparations are being made to put it to work immediately. The buildings and plant have been maintained in good working order.

At the half-yearly meeting of the Douglas Gas Company yesterday week, it was stated that the profits for the half year amounted to £3617, which was slightly less than in the corresponding period of last year—the decrease being attributed to the increased cost of coal. The Chairman (Mr. J. Kaye) stated that the Directors had been approached by other Gas Companies in the island with a view to forming the Company into a limited liability concern; but they considered there was not sufficient reason to justify the change. A shareholder expressed regret at the decision, and thought the shareholders should be relieved of the anxiety which an unlimited liability entailed upon them. He hoped the Directors would reconsider the matter, and register under the Limited Liability Act, as the Castletown Gas Company had done.

At the half-yearly general meeting of the Eastbourne Gas Company on Monday last week, the Chairman (Dr. G. A. Jeffery, J.P.), in moving the adoption of the report, which was noticed in the "JOURNAL" for the 21st ult., expressed the pleasure he and his colleagues felt at being able to present so satisfactory an array of figures as the proprietors had before them in the accounts. The quantity of gas sold had been 142,801,100 cubic feet; being an increase of 14,454,000 cubic feet, or upwards of 11 per cent., on the sale in the first half of last year. The profit was £7967, against £6187—an increase of £1780. Coals had cost £2558 more; but residuals had brought in £2073 extra, which had really recouped the Company to a great extent for the exorbitant price they had to pay for their raw material. The income from gas supplied, &c., was greater by £2296. The dividends required £6783; and the surplus, after paying these, was £1184. The gas produced was 151,593,100 cubic feet, against 134,509,000 cubic feet last year. The leakage was 4.63 as compared with 3.45 per cent., which was rather higher; but, taking the average of the years, it was very good. The plant and machinery were in capital working order. The new tank and holder were nearly finished. When completed, the holder would have a capacity of 2 million cubic feet. The new plant erected by Messrs. Humphreys and Glasgow was finished, and was giving every satisfaction. There was only one blot upon the fair chapter of the Company's history, and that was the high coal bill; and the question arose as to whether or not they should increase the price of gas in consequence. They had discussed the matter with their Consulting Engineer (Mr. H. E. Jones), with their Manager (Mr. J. Hammond), and with their Auditor (Mr. Worley), and they believed the present exorbitant price of coal was only temporary—that it would soon come down again. They knew what their coal bill would be to the end of 1901; and, believing as they did in their good management and in their capabilities, they had decided not to raise the price of gas. But, of course, if coal went up, they must increase their charge to safeguard themselves. Mr. J. Farncombe, in seconding the motion, remarked that the Company had been paying large dividends for many years, and it was natural that the consumer should think that when they had a severe time a little consideration should be shown on both sides. As there was to be no increase in the price of gas, he thought they had nothing to complain about. Should the time come when the price of coals would be so great that the Directors must raise the charge for gas, he thought the shareholders would be quite prepared to meet them half way, and take a little less dividend. Mr. A. W. Oke, referring to the decision of the Directors as to not raising the price of gas, said the consumers ought to be very grateful, and show their appreciation by an extremely large increase. He went on to remark that there were one or two very hopeful signs in connection with gas companies. One was the increase which seemed to be going on throughout the country, and which was in many cases large. It was very steady. There was also a point which was of vast importance to gas companies, and that was the tendency to return to the 14-candle standard. The victory achieved by the South Metropolitan Gas Company on this point was one which was likely to have far-reaching effects; and perhaps it would do more to produce gas at a low price, and therefore benefit the consumers, and eventually the shareholders, than anything else that had been done by the Legislature for years past. The motion was carried unanimously. A vote of thanks having been accorded to the Chairman and Directors, Dr. Jeffery, in responding, proposed a similar vote to the Manager, of whose services to the Company he spoke very highly. Mr. Towner, in seconding the motion, bore out the observations of the Chairman. The motion having been heartily carried,

Mr. Hammond, in acknowledging the compliment, said he had always endeavoured to do his duty loyally.

The half-yearly general meeting of the Enfield Gas Company was held at the Company's offices last Tuesday—Colonel Somerset in the chair. The sale of gas during the half year ending the 30th of June, shows an increase over the quantity sold in the corresponding period of the previous year equal to 14.83 per cent. The profit amounted to £3194. Of this the fixed charges would absorb £309, and the dividend on the consolidated preference stock would take £630. Out of the remaining £2255, the Directors recommended the declaration of a dividend of 5 per cent., amounting to £2091, which would leave £164 to be added to the undivided profit accrued from previous years. The Chairman, in moving the adoption of the report and accounts, referred to the progress made by the Company during the last ten years. Mr. A. L. Ford seconded the motion, and it was carried. The dividend recommended was then declared. Mr. Ford remarked that the increase in the sale of gas during the half year had been really enormous; and he attributed it to the growth of the town and the increased price of coal. His opinion was that the latter circumstance had been an advantage to them rather than otherwise, as it had enabled them to sell their coke at a higher figure. A question having been asked as to whether American coal was equal to that which was being used at the present time, Mr. Ford replied that he remembered reading a statement to the effect that big companies never found it a success; and therefore it would be better for Enfield not to try it until they knew more about it. A vote of thanks was accorded to the Secretary and General Manager (Mr. C. W. Offord) for his services, which he suitably acknowledged, and the proceedings closed.

At the annual meeting of the Falmouth Gas Company, on Monday last week, the Chairman (Mr. J. Mead), in moving the adoption of the report, said that, with all the competition coming from other forms of illumination, the consumption of gas in the past year was unprecedentedly large. When coupling with this fact the circumstance that they were working very largely under the incandescent system, it would be seen that the real increase must have been, at least, at the rate of 10 or 12 per cent. Coal had risen in price to such an extent that the Company were compelled to put up the price of gas to 4s. 2d. per 1000 cubic feet. At present, coal was costing them 100 per cent. more than it did last year; and in the future there would be a difficulty in making both ends meet. Of the 10 or 12 per cent. advance in consumption, barely 1 per cent. was attributable to the Corporation for public lighting. He believed that their works were among the best in the West of England. This year they were spending over £900 in plant, notwithstanding the large outlay of twelve months ago. It was an interesting fact that in the last ten years the consumption of gas had increased more than 50 per cent. Mr. W. N. Carne seconded the motion. Mr. W. Rowe, in supporting it, mentioned that this year they had purchased coal at 16s. and 17s. per ton, which was a very advantageous contract, seeing that on the previous Saturday it was quoted at 20s. in Newcastle. The Chairman further remarked that the rise in the price of coal would increase the Company's expenses by about £1800; while the advance in the charge for gas would be a bare £1200. It was hoped to meet the deficiency of £600 without lessening the dividends. There was still something in the reserve fund; and he trusted this would help them through. Referring to the supply of water gas, he stated that in the past year only 13 per cent. had been used. Mr. W. Rowe mentioned that complaints about water gas were received at a time when the Company were actually not making it.

Considerable progress in the business is reported by the Directors of the Gloucester Gas Company. In the half year there has been a large addition to the number of prepayment meter consumers, and also a good demand for cooking-stoves; resulting in a great increase in the sale of gas. This, coupled with the advance in the receipts from residuals, has considerably improved the revenue. The expenditure for coal has increased; but during the half year the Company have not been seriously affected by the generally advanced price. Contracts have, however, been arranged for this year at much higher figures, in consequence of which the Directors felt obliged to advance the price of gas by 3d. per 1000 cubic feet from the commencement of the current half year. To meet the continually increasing consumption of gas, it has been decided to erect an additional gasholder, which work is now in progress. During the half year £5000 of new consolidated stock was sold by auction, realizing an average of £125 per cent. The net profit for the half year, after providing for interest on mortgages and other charges, is £4705, from which the Directors recommend the payment of 5 per cent. per annum upon the consolidated ordinary stock. This will absorb £3928, and leave £777 to be carried forward.

The annual meeting of the Hartlepool Gas and Water Company was held last Thursday, under the presidency of Mr. W. H. Fisher. He congratulated the shareholders on the satisfactory report presented, although the surplus a year ago had been entrenched upon by the large increase in the cost of coal, which had been equivalent in that period to £15,000, or 10d. per 1000 cubic feet on the cost of gas. They had hoped by the improved price of residuals to counterbalance this; but it only amounted to half the additional cost. Still, the Directors had decided to raise the charge for gas only 5d. per 1000 feet from July 1 last. The year's revenue was £30,071, which, owing to the higher cost of coal and the advance in wages, left a decrease of £1827 in the net revenue. The Directors recommended a dividend at the rate of 10 per cent. per annum on the "A," 7½ per cent. per annum on the "B," and 7 per cent. per annum on the "C" and "D" shares for the last half year, in all cases clear of income-tax. The Bill for the consolidation and conversion of the Company's share capital into a 5 per cent. maximum ordinary stock, and for power to raise additional money, received the Royal Assent on the 30th of July, and would come into operation on Jan. 1, 1901. There was an increase of 28 million cubic feet in the consumption of gas in the twelve months. The report was adopted.

In the report which the Directors of the Hastings and St. Leonards Gas Company will present to the proprietors at the half-yearly meeting on Thursday, they express their pleasure in again being in a position to announce a satisfactory increase in the Company's business; the quantity of gas sold in the six months ending June 30 being 10.4 per cent. more than in the corresponding period of 1899. Unfortunately, the coal market, instead of becoming easier, advanced very much during the half year; and the Directors, finding that the cost of coal would be increased by 80 per cent. over what had been paid during the last two years (equal to



about 9d. per 1000 cubic feet), and that other materials had also increased in price, gave notice that the charge for gas would be advanced 4d. per 1000 cubic feet from the commencement of the present half year. They much regretted the necessity for taking this course, in the interests of both consumers and shareholders; and they hope the advance may only be of short duration. Large extensions of mains were made during the half year; an additional lift is being added to one of the gasholders, and increased purifying and boiler power is being also provided for. The accounts accompanying the report show that the sale of gas for public and private lighting produced a revenue of £32,941; the rental of meters brought in £2112; and the sale of residual products, £8971—the total receipts being £44,173. The expenditure on the manufacture of gas was £27,489 (coal, oil, &c., costing £18,516, and the coal duty paid to the Corporation of Hastings amounting to £2003); on distribution, £2683; and on management, £1824—the total expenses being £34,158. The balance carried to the profit and loss account is £10,015; and the amount of net profit available for distribution is £51,678. The Directors propose to pay a dividend at the rate of 6½ per cent. per annum on the converted 5 per cent. stock, and one of 5 per cent. per annum on the 3½ per cent. converted stock, both less income-tax; carrying forward the balance. Under the supervision of Mr. Charles E. Botley, M.Inst.C.E., the Company's Engineer and Manager, 16,578 tons of coal, 252 tons of cannel, and 126,227 gallons of oil were employed in the production of 223,127,000 cubic feet of gas (including 49,661,000 cubic feet of oil gas), of which 212,538,000 cubic feet were sold and 214,769,200 cubic feet accounted for. The estimated quantities of residual products were: Coke, 10,355 tons; breeze, 1088 tons 15 cwt.; tar, 175,961 gallons; and ammoniacal liquor, 321,830 gallons.

The report presented by the Directors of the Normanton Gas Company at the recent half-yearly meeting showed that the amount available for distribution was £3146, out of which the payment of dividends of 5½ per cent. on the original and 4 per cent. on the additional stock was recommended. The Chairman (Mr. E. Mitchell, J.P.), in moving the adoption of the report, said that in the six months ending June 30 coal had cost £1191—a rise of £291 on the corresponding period of 1899 for the same quantity; £200 of this amount being due to the advanced rate. There had been an increase in the cost of carbonizing, in consequence of an advance of wages. Recently, the Directors made a new arrangement with the men on the bonus system, which promised to work well. They made the men partners to some extent in the success of the concern. Up to the present the scheme had worked very satisfactorily, and had resulted in a considerable increase in the wages of the men. It was the best scheme they had adopted since he had been connected with the Company. They had always had more or less friction; but if the scheme worked as well in the future as it had done during its short existence, he believed they would get rid of this trouble. The total income was £3651, and the expenditure £3157. There was a balance for the half year of £1244, against £1179 in the corresponding period of 1899; being a net increase of £65. Referring to the price of coal, the Chairman said the Company would have to bear an advance of 5s. per ton; but they hoped, by the higher price they obtained for residuals, to nearly make it up. They had just accepted contracts for coke for the ensuing twelve months, at a price which was a very considerable advance on last year's figures—something like 5s. per ton more. They could all form their own opinion as to the probability of the price of coal keeping up. Speaking as one intimately connected with the trade, he could not see that it would go down for some time—perhaps not in twelve months. The price would harden in the coming autumn, and perhaps on the 1st of October. The report was adopted, and the dividends recommended were declared.

At the Northwich Gas Company's half-yearly meeting on Wednesday, it was reported that the sales of gas for the half year ending June 30 exceeded the corresponding period of last year by 10 per cent. There was also a marvellous increase in the prepayment meter system. It was resolved to pay an interim dividend of 4 per cent., and to carry forward £213. It was reported that the distribution system was being extended to the village of Barnton.

The half-yearly general meeting of the Portsea Island Gas Company was held on the 25th ult., under the presidency of Alderman Sir John Baker, M.P., J.P. The report for the half year ended the 30th of June, which was taken as read, showed that the consumption of coal in that period had been 40,521 tons of common coal and 1940 tons of cannel; the figures in the corresponding period of last year having been 35,978 and 1933 tons respectively. The quantity of gas manufactured had been 440,536,000 cubic feet—an increase of 36,259,000 cubic feet; the quantity sold, 412,682,600 cubic feet, or 40,699,400 cubic feet more; and the quantity not accounted for, 24,205,100 cubic feet, which was less by 4,113,500 cubic feet. The half-year's income had been £71,700—an increase of £12,620; and the expenditure had been £58,914, against £44,826. Altogether, there was an available balance of £35,232, from which the Directors recommended the payment of dividends at the rate of 13 per cent. per annum on the "A" and "B" shares, of 12 per cent. per annum on the "C" shares, and of 5 per cent. per annum on the stock (less income-tax); leaving a balance of £23,039 to be carried forward. The Chairman, in moving the adoption of the report, referred to the troubles in South Africa and in China, and to the social disturbances caused by the unsettled condition of the labour market. He congratulated the proprietors on the fact that, as a Company, they had been exempt from the effects of difficulties which, as a consequence, might have fallen upon them, especially with regard to their supply of coal; for, owing to prudence and foresight, their contract for coal, as he explained at their last meeting, was secure until next June, by which time he trusted there would be a relaxation of that stringency of circumstances which had fallen upon the country, and they would be carried over the troubles. He thought he need not say very much as to their works, at which the plant had been very considerably increased. With regard to revenue, the meter and stove rentals alone had risen by £700; and the other sources of income had also improved. The Vice-Chairman (Alderman Sir W. D. King) seconded the motion, and it was unanimously agreed to. The payment of the ordinary dividends was next sanctioned. The meeting was then made special, and it was resolved that debenture stock to the amount of £25,000, at 4 per cent., should be raised by the Directors in such manner and in such amounts as they thought fit.

At the recent meeting of the Salisbury Gas Company, the Chairman

(Mr. G. Fullford), in moving the adoption of the report and accounts, and the payment of the usual dividends on the various classes of shares, ranging from 5 to 10 per cent. per annum, observed that the results of the past year's working were satisfactory. The sales of gas and residual products had been well maintained, and showed a good advance. He congratulated the shareholders on the continued prosperity of the undertaking. In common with all users of large quantities of coal, iron, &c., the Company had experienced a considerable increase in expenditure; but, on the whole, they could look favourably on the past year's working. The works, mains, and plant belonging to the Company had been maintained in excellent order. The motion was carried unanimously. A vote of thanks having been accorded to the Chairman, Directors, and officers of the Company, the Chairman, in acknowledging it, expressed their indebtedness to the Manager (Mr. N. H. Humphrys) and the staff generally for their services. Mr. Humphrys, in responding, said the past twelve months had been eventful in many ways. Apart from the excitement due to the war, there had been difficulty in getting coal, though he was glad to say there was plenty of it now. They had done their best to keep up to the times, and avail themselves of all modern appliances.

The Sunderland Gas Company will hold their annual meeting tomorrow, when the Directors will present accounts showing that the revenue from the sale of gas and from meter-rents in the twelve months ending June 30 amounted to £79,326; and from the sale of residuals, to £38,989—the total revenue being £118,352, as compared with £105,211 in the preceding year. On the expenditure side of the revenue account, coals, lime, &c., cost £51,831, against £39,699; and the total expenses were £105,770, as compared with £89,686. The balance on the year's working is £12,582. In their report, the Directors state that the additional cost of coals, other materials, and labour of £16,083 was reduced by an increased revenue of £13,140 from gas and residuals. They hoped that, before the arrival of the time for entering into new contracts, coals would have resumed their normal price. So far from this being the case, they have had to purchase at an increase of 6s. per ton; involving an additional cost, on this head alone, of £30,000 for the year now current. Under these circumstances, and as the price of residuals, which has been the saving feature of the past year, cannot be expected to increase to any appreciable extent, the Directors, in common with other companies and municipal corporations, were compelled to advance the price of gas. An interim dividend was paid in March last; and by drawing upon the reserve balance, the Directors are enabled to recommend the payment of a like dividend of 5 per cent. on the original stock, and of 4½ per cent. on the additional capital stock of the Company (less income-tax).

The Tonbridge Gas Company held their half-yearly meeting on Monday last week. The Chairman congratulated the shareholders on the successful working of the undertaking in the past six months. He remarked that, although there had been an increase in the cost of coal, the profit was considerably in excess of that realized in the corresponding period of last year; and they were able to pay full dividends under the sliding-scale, and carry forward a very substantial sum. The increase in the consumption of gas was 12·16 per cent. Gas cooking and heating appliances were still in demand. The profit was £2000; and the amount available for distribution £5402. The receipts for gas and residual products exceeded those for the corresponding period of last year by £1113; while the expenditure was £744 more. The Directors regretted to announce an increase of 4d. per 1000 cubic feet in the price of gas. Carburetted water-gas plant, of a capacity of 300,000 cubic feet per day, was being erected by the Economical Gas Apparatus Construction Company, Limited, and would be in operation in about two weeks. The business terminated with a vote of thanks to the Directors, and also to the Engineer and Secretary (Mr. James Donaldson).

The shareholders of the Worthing Gas Company held their half-yearly meeting on the 25th ult., under the presidency of Mr. H. H. Gardner. The report presented showed that the Company's capital is now £88,197, and that during the six months covered by it £1277 had been spent on extensions. It would, however, require another £1000 to be laid out before the whole scheme already agreed to would be complete; but when it was, the Company hoped to be in a position to comply with the requirements of the district for some few years. On the revenue account, there was a substantial improvement all round—the increase on the sale of gas having produced £826, and on meter and stove rentals £73; while £537 had come in from coke, and £94 from the sale of breeze and tar. The net increase had been £315, notwithstanding that the higher cost of everything had raised the expenditure by £1206. The report was unanimously adopted; and the Directors expressed the hope that the additional 3d. per 1000 cubic feet of gas which they had had to put upon the price would be sufficient to meet the increased cost of coal.

The Chairman of the Wolverhampton Gas Company (Mr. Henry Ward) had a very pleasant account of their operations to lay before the shareholders at their meeting yesterday week. In moving the adoption of the report and accounts (which were noticed in our last issue), he congratulated the shareholders on the fact that, owing to successful work, they were able not only to pay the usual dividend, but to carry forward a good balance. They had been able to contribute considerable sums towards the replacement of the retorts which had been abandoned now that the old works at Horseley Fields had been finally closed. As regarded the accounts, it was proof of the successful expenditure of capital that the proceeds from gas were £2236 more than they were twelve months ago. This was evidence that they were making a great saving in the leakage, which had for so many years been their misfortune. There was no doubt that it would have paid them to have taken up many of the mains years ago; for he did not think that there was hardly a gas-works in the kingdom where the loss from leakage had been so great as in Wolverhampton. With less gas made, they had been able to sell many million feet more; for whereas the leakage last year averaged from 15 to 20 per cent., they had brought it down this year to 12 per cent., and hoped to do even better than this. With respect to the cost of coal, they were fortunate in having bought pretty well last year; and their contracts would carry them fairly well into next half year. Whether the additional 3d. per 1000 cubic feet they had imposed on their customers would cover the extra £15,000 required for the increased price of coal, was uncertain; and gas companies held different views as to the amounts which would be realized from the sale of coke. It was a matter of opinion whether the price of coal would keep up or go down; but he did not think they would see much reduction



before March or April next. The sale of residual products, such as coke, tar, and liquor, returned about £5370 more than a year ago. The bulk of this was due to the increased price of coke; for on the sales of tar they had had to make little concessions. So far, they felt that the large expenditure of capital on new mains had well repaid itself; and they were going to finish the works at Stafford Road according to the original design of Mr. George Winstanley, of Coventry. When these were finished, he thought they would not require further capital outlay for some years. The report was adopted, and the dividends declared. A resolution was then passed increasing the capital by the creation and issue of £30,000 of new ordinary stock, entitled to a standard rate of dividend of 6 per cent. The Chairman explained that the £30,000 was not all required at once; and not more than £10,000 or £15,000 would be offered for immediate sale. If the present high price of coal continued, it might be necessary for them to erect a water-gas plant; but this was not in contemplation at present.

Water Companies.

The Barnstaple Water Company held their half-yearly meeting on Monday last week. The Directors recommended that out of the disposable balance of £1630 a dividend of 10s. per share on the "A" shares and of 7s. per share on the "B" shares should be paid. This would absorb £880, and leave £750 to be carried forward. The recommendation was agreed to.

The half-yearly general meeting of the East Worcestershire Water Company was held last Thursday—Lord Windsor presiding. In moving the adoption of the report, noticed in the "JOURNAL" for the 21st ult., the Chairman said the demand for water during the six months ending in June had been on the increase; but it had been satisfactorily met by the Company. The new works at Washingsstocks were still in progress. The first borehole had been sunk to the full depth of 307 feet; but during the sinking Mr. Marten, the Engineer, found that the soil was scarcely suitable for the foundations of the engine-house and chimney it was proposed to erect, and consequently another site was selected, and the sinking of a second hole had been commenced. The work at the first hole was not stopped because the Directors thought it was important, considering the increased demand, and the fact that the driest part of the summer was approaching, that the hole should be completed so that the water might be available at the earliest possible moment. Complaints had been made that the pressure in the main from Bromsgrove was not sufficient. This was due to the largely increased demand on the part of Droitwich. In one week, something like 130,000 gallons per day were taken by Droitwich, although the original contract with that town was only for the supply of 50,000 gallons per day. The temporary pumping plant erected upon the first borehole, however, enabled them to overcome the difficulty. The main was connected with the Bromsgrove main, thereby increasing the pressure and the supply; and the complaints from Bromsgrove were ended. Experience showed that they must be prepared to meet the extra demands that were made upon them; and he believed the steps taken to enlarge their equipment would be completed before next summer. In accordance with the resolution

passed in February, a *pro ratâ* allotment of shares at a premium of £2 10s. each was offered to the shareholders; and of the 617 shares authorized 447 had been allotted. The premiums received, amounting to £1117 10s., had been placed to the credit of a reserve fund, apart from the fund for depreciation of plant. Mr. C. P. Noel seconded the resolution, which was carried; and a vote of thanks to the Chairman for presiding terminated the meeting.

The report presented to the shareholders of the Exmouth Water Company at the half-yearly meeting on Tuesday last referred to the passing of the Act conferring upon the Urban District Council power to purchase the undertaking. Notice has already been given by the Council of their intention to carry out the purchase; and it is anticipated that the arbitration to determine the price to be paid will be held before the end of the year. The accounts showed that the sum of £1090 was available for distribution; and the Directors recommended payment of the maximum dividends—leaving a balance of £18 to be carried forward.

At the half-yearly meeting of the Maidstone Water Company last Thursday, the Chairman (Mr. H. W. Tyrwhitt-Drake) alluded in feeling terms to the loss the Company had sustained by the death of Alderman C. Ellis, to which reference is made in our "Obituary" column, who had been a Director for many years, and had done exceedingly good work on the Board. He then referred to the resignation by Mr. Marsham of the chairmanship of the Company, and to the honour conferred upon himself by selecting him to fill the position thus rendered vacant, expressing the hope that, with the assistance of the Board and the indulgence of the shareholders, he would be able to carry out the policy of his predecessor—namely, that of supplying the town with the best water, at the same time carefully looking after the interests of the shareholders. He moved the adoption of the report, which was noticed last week. He said the amount of interest was the same as for the previous half year, but was an increase on that for the first six months of 1899. This, he thought, showed a slight progress. Mr. J. Etherington seconded the motion; and it was carried unanimously. The Chairman next offered a few remarks on the subject of the works, and read the results of the chemical analysis of the water by Professor Gregory, which showed that it was of exceedingly good character. He went on to say that Dr. Sims Woodhead had been down to Maidstone and had prepared a voluminous report. He said the East Farleigh filters were in good condition and working well, and that the water passed through them was of a good bacteriological quality and satisfactory in every way. At Boarley, he was much pleased with the arrangements made for the protection of the collecting wells against contamination, and found the water very good. The springs at Cossington were well protected, and the water of very good character from a bacteriological point of view. Their new borehole at Forstal furnished water of excellent quality. He congratulated the Directors on the capital arrangements made for the sufficient supply of water of great purity. A vote of thanks was accorded to the Directors and officials, and the proceedings closed.

The report which was presented at the half-yearly general meeting of the South Staffordshire Water Company last Thursday was noticed in the "JOURNAL" for the 14th ult. In moving its adoption, Mr. Frank

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 575.

Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.															
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18½-19½	..	5 7 8	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	18½-19½	..	5 3 5	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	103-103	..	6 10 3
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	1	Do. 4 p.c. Deb.	99-101	..	3 19 3
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	Stk.	Apl. 11	8	San Paulo, Ltd.	11½-12½	..	6 8 0
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	135,000	Stk.	Mar. 14	10	Sheffield A.	245-247	..	4 1 0
270,000	"	"	9	Do. New	177-182	..	4 18 11	209,730	"	"	10	Do. B.	244-246	..	4 1 4
50,000	"	"	5	Do. 5 p.c. Pref.	140-145	..	3 9 0	447,427	"	"	10	Do. C.	244-246	..	4 1 4
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop. 4 p.c. Ord.	127-129	+1	4 2 7
220,000	Stk.	Mar. 14	10½	Brighton & Hove Orig.	225-235	..	4 5 1	1,520,000	Stk.	July 12	3	Do. 3 p.c. Deb.	94-97	..	3 1 10
226,320	"	"	7	Do. A. Ord. Stk.	155-165	..	4 4 10	380,940	Stk.	May 16	5	Southampton Ord.	115-120	..	4 3 4
1,009,500	Stk.	Feb. 23	5	Bristol, 5 p.c. max.	125-130	..	3 16 11	70,825	Stk.	July 12	4	Do. 4 p.c. Deb.	117-122	..	3 5 7
420,000	20	Mar. 29	10	British	39-41	..	4 17 7	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	102-107	+2	5 12 2
60,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	250,520	"	"	4½	and B. 3½ p.c.	80-85	..	5 6 11
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	61,550	"	June 14	4	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	83-94	..	6 9 9	182,350	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	8½	Do. 4 p.c. Deb.	98-100	..	4 0 0	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	28-25	..	6 12 0								
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13-14	..	5 14 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55-57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock.	270-280	..	4 16 5								
236,425	"	"	10½	Do. New do.	205-215	..	4 17 8								
288,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	158-163	..	5 10 5								
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	780,404	Stk.	June 28	11	Chelsea, Ord.	295-300	+7	3 13 4
51,600	Stk.	Feb. 23	14	Croydon A 10 p.c.	335-340	..	4 2 4	150,000	"	"	5	Do. 6 p.c. Pref.	155-160	..	3 2 6
178,400	"	"	11	Do. B 7 p.c.	265-270	..	4 1 5	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
655,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	167-172	..	4 13 9	175,785	"	Mar. 29	4½	Do. 4½ p.c. Deb.	145-150	..	3 0 0
60,000	"	"	5	Do. 6 p.c. Pref.	180-185	..	3 14 1	1,720,560	Stk.	Apl. 11	7	East London, Ord.	190-195	+5	3 11 10
486,090	10	July 27	11	European, Ltd.	19-20	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	147-152	..	2 19 3
854,060	"	"	11	Do. £7 10s. paid.	14-15	..	5 10 0	890,000	"	"	3	Do. 8 p.c. Deb.	96-98	..	3 1 3
14,993,075	Stk.	Aug. 15	4½	Gas 4 p.c. Ord.	97-99	+1	4 8 10	700,000	50	June 14	7½	Grand 10 p.c. max.	107-110	..	3 8 2
2,600,000	"	"	3½	light 3½ p.c. max.	92-94	..	3 14 6	810,000	Stk.	Mar. 29	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
8,799,735	"	"	4	and 4 p.c. Con. Pref.	114-117	..	3 8 5	708,000	Stk.	Aug. 30	14	Kent	290-300	+2	4 13 4
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	93-95	..	3 8 2	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	+3½	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	13½-14½	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	282-287	-1	3 13 2
3,900,000	Stk.	May 16	10	Imperial Continental	200-205	..	4 17 7	406,200	100	"	8	Do. 7½ p.c. max.	205-210	-2	3 16 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	99-101	..	3 9 4	850,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.	128-132	..	3 0 7
75,000	5	June 14	6	Malta & Medn., Ltd.	43-5	..	6 0 0	500,000	100	Aug. 15	14	New River, New Shares	410-415	+2	3 7 6
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb.	107-110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	124-134	..	3 0 2
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	106-108	..	4 3 4	902,300	Stk.	June 14	7½	South- work 7½ p.c. max.	182-187	..	4 0 3
541,920	20	May 31	3	Monte Video, Ltd.	10½-11½	..	6 1 8	126,500	100	"	7½	and 5 p.c. Pref.	155-160	..	3 2 6
667,946	Stk.	Aug. 20	9½	Newcastle & Gateshead Con.	210-215	..	4 6 1	489,200	Stk.	"	6	Vauxhall 4 p.c. A Deb.	129-134	..	2 19 9
299,855	Stk.	June 28	8	Do. 8½ p.c. Deb.	104-107	..	3 5 5	1,019,555	Apl. 11	4	West Middlesex	272-277	..	8 12 3	
150,000	5	May 16	8	Oriental, Ltd.	72-73	..	5 3 8	1,155,065	Stk.	June 14	10	Do. 4½ p.c. Deb.	140-145	..	3 2 1
135,000	5	"	8	Do. New, £4 10s. pd.	6-6½	..	5 10 10	200,000	"	"	4½	Do. 8 p.c. Deb.	98-100	..	3 0 0
15,000	5	"	8	Do. do. 1879, £1 pd.	12-12½	..	4 11 6	200,000	"	Mar. 14	8				* Ex div.

Next dividend will be at this rate.



James said that, like all other companies consuming coal, they had to regret that what individually he should call its insane price had, during the period covered by the report, made itself considerably felt in the expenses they had incurred. The engine charges were £9115, against £7224 during the preceding six months, and £6021 in the first half of last year. It would be seen, therefore, that coal had cost them half as much again. He did not mean that the full amount of the increase was due to the higher price. The extra quantity of water pumped had made the bulk of coal consumed greater. The increased price was responsible for £1244, and the additional pumping £1700. He could not hold out any hope that during the next six months they would receive any advantage from lower prices. They were obliged to meet the demands for water, and, therefore, it was impossible to work from hand to mouth with regard to coal. They must contract ahead, and, in addition, keep a stock for fear of accidents. Maintenance of works had cost £6350, against £3953 in the corresponding period. The total balance carried down was £25,551, against £26,537. On the other side of the account, there was a considerable increase in water-rates, which amounted to £54,175, against £51,408. The total result of the figures was that having £25,551, with the balance of £9722 brought forward, they paid the same dividends as last year, though this really meant that they paid a little more, for the dividends were free of income-tax, which was now 1s. instead of 8d. in the pound, and they carried forward £7701. He did not know whether the price of coal was going to reduce their dividends; but certainly it would reduce the amount of their balance. As to the capital account, they had been busy, having spent upwards of £50,000 on an addition to one of their pumping stations and on two new ones, independent of the ordinary main laying. There had been 2176 houses added during the half year, and the tendency was in the same direction during August. With regard to capital, they had come to the limit of their parliamentary power, and either at their next meeting or before the Directors would have to get permission to apply for power to increase it. Sir Henry Wiggin seconded the motion, and it was carried. The dividends recommended were declared; and the proceedings closed with the usual compliment to the Chairman.

The ordinary half-yearly general meeting of the Woking Water and Gas Company was held last Tuesday, at the London Offices, Great Winchester Street, E.C.—Mr. R. Hesketh Jones, J.P., presiding, in the absence of the Chairman (Mr. Charles Horsley, J.P.) through indisposition. In moving the adoption of the report and accounts, noticed in the "JOURNAL" for the 21st ult., he remarked that there was a balance of £2226 to the credit of the profit and loss account, and it was proposed to pay a dividend at the rate of 4½ per cent. per annum, less income-tax, which would absorb £1919, and leave £307 to be carried forward. He said he was pleased to inform the shareholders that the quantity of water pumped during the past half year had been 66½ million gallons, as compared with 57 million gallons for the corresponding period of 1899. There had been laid 6088 yards of new mains; and 181 new services had been connected, the full benefit of which had not yet been realized, but would show itself in the current six months. The supply to the district had been satisfactorily maintained. At the last two August meetings,

they had had to apologize for having had to curtail the supply; but this year there had been no occasion to restrict it, and this must be regarded as very satisfactory. Negotiations were practically complete for the acquisition of the site on the Thames for the new-works authorized by the Company's Act of last year, and their construction would be proceeded with at an early date. The Company were in a much stronger position now than they had ever been; and he hoped that at their next August meeting it would be the pleasure of the Chairman to announce that the consumers were being supplied with water from the Thames as well as from the existing sources. Sir John Baker seconded the motion; and it was carried. The dividend recommended was then declared; the Chairman remarking, in acknowledging the vote of thanks to the Directors, that the proprietors must not expect a higher rate than 4½ per cent. for some time to come, owing to the heavy expenditure that was being incurred.

#### SHIPLEY GAS-WORKS PURCHASE QUESTION.

##### The Provisional Agreement—Bill to be Promoted.

At the Meeting of the Shipley District Council last Tuesday, the Finance Committee presented minutes which contained the recommendation that "a Bill be promoted in Parliament in the ensuing session, asking for powers to acquire the undertaking of the Shipley Gaslight Company, for borrowing powers, and for other purposes."

Mr. J. ROBERTS, in moving the adoption of the minutes, explained the steps which had led up to the provisional purchase of the gas-works. He said the question had been considered several times by the members of the old Local Board and the present Council. In May last the matter was discussed, and a Sub-Committee was appointed. The Sub-Committee had several interviews with the Directors of the Company, who received the representatives of the Council in a businesslike and courteous manner. Eventually, the terms of purchase were arranged. The price was to be £228,000; being on the basis of thirty years' purchase of the profits. In addition, the Council would have to pay the Company £3904, the amount to the credit of the reserve fund, and £559, the amount standing to the credit of the profit and loss account at June 30, 1899. The Council would also have to pay the costs incidental to the agreement, £105 to the Solicitors for their costs, and one-half the cost of the winding-up of the Company, providing the sum did not exceed £250. The Company were to be entitled to pay the same salaries to their officers, and the same fees to the Directors, up to the completion of the purchase, which was to be effected as soon after June 30, 1901, as possible. The Secretary of the Company (Mr. J. W. Wilcock) and two clerks were to be retained in their offices at present salaries, or to be compensated for loss of office or income. With regard to the price to be paid, Mr. Roberts held that it compared favourably with other similar purchases in recent times. The Ilkley Council paid at the rate of 31 years' purchase, the Morley Corporation at the rate of 32½ years, the Bradford Corporation bought the North Bierley works at the rate of 31 years, and the More-

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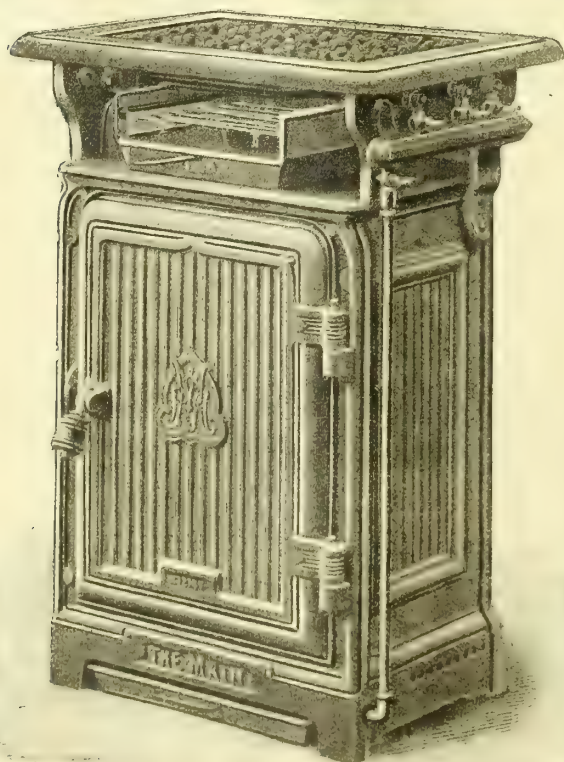
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cambe works had, it was said, been sold at the rate of 31½ years. Probably none of these Companies was in as strong a position as the Shipley Company. Replying to suggestions that it was strange to be buying gas-works and commencing electricity works at the same time, Mr. Roberts said that experience proved that, where electricity works had been started, the production of gas was not decreased. They had to provide for electric traction on the tramways from Bradford; and he thought they would probably have to extend them towards Bingley, and perhaps Baildon or Charlestown. The Council would no doubt give more facilities for the use of gas for cooking purposes than had hitherto been the case. This had been done in other districts with excellent results. He was not sanguine of being able to reduce the rates from the profits on the gas undertaking. Indeed, he did not think it would be desirable. It would be better to sell the gas at something like cost price.

Mr. A. W. STEVENS seconded the motion, which was adopted.

### ELECTRIC LIGHTING NOTES.

A notification by a Syndicate to the Goole District Council, that they intend applying for an Electric Lighting Order to supply the town, has moved the Authority to take steps to secure powers themselves. They already own the gas and water undertakings; and they do not view favourably the advent of a stranger in their territory.

The Ripon City Council last Thursday considered a recommendation that they should apply for a Provisional Order under the Electric Lighting Acts for the supply of electricity in Ripon, and that Messrs. G. Harrison and Co. be appointed Consulting Engineers. The Mayor (Mr. R. Wilkinson) stated that they been forced into this action through the steps taken by the North British Electricity Supply Company, who now wrote stating that, in technical undertakings such as that, it was better that a company should have control in the early stages; the local authority having an opportunity to purchase when a fair degree of success had been obtained—the price being fixed by an independent arbitrator. The Mayor said the Corporation were bound to protect their rights; and the Council endorsed the recommendation of the Committee.

The analysis of the accounts of the Halifax electricity works for the past financial year shows that, on a revenue of £16,069, there was a gross profit of £9001; and after payment of all charges, including interest and sinking fund, there was a surplus of £5489. Of this sum, £3489 was carried to a renewal account, and £2000 to the credit of the rates. The surplus in the previous year was £1862; so that there is an increase of £3627. The present charge is 5d. per unit for lighting and 2½d. for other purposes, subject to discounts varying from 5 to 15 per cent. But the tramways are only charged 2d. per unit, and for public lighting the charge is 3d. The effect is to slightly favour the ratepayer who does not use electricity. The tramway supply brought in a revenue of £7459; public lighting, £1027; and the private supply, £7333.

The Yeadon District Council have made known the result of the plebiscite taken on the electric lighting question. In the compulsory

area, 890 papers were distributed. Only 510 were returned to the collectors, and of this number 337 were blank; while of the remaining 173, 98 were in favour of the adoption of the electric light, and 75 against. At the meeting of the District Council, when this result was made known, the Chairman proposed that the Council recommend that the Provisional Order be transferred to a syndicate, provided reasonable terms could be arranged. This was seconded; but on being put to the meeting, only the mover and seconder voted for it. As there were also two against it, the Chairman declined to give a casting vote. The question is therefore at a deadlock, which is a sorry result after the immense amount of time the Council have given to the matter.

We have had occasion recently to call attention to the troubles of the Hanley Electric Lighting Department; and each time we have had to do so, the situation seems more serious than before. A very grave state of affairs was revealed by Alderman Hammersley at the meeting of the Council last Tuesday. In moving that application be made for sanction to borrow a further sum of £7000 to meet the needs of the town in regard to electricity, he mentioned that from January to July they had generated at the electricity works 473,000 units, and the output—that was, what their customers had been charged for—was 311,000 units only. They were exceedingly anxious to find out where the leakage could be; and in their estimates they were trying to prevent leakage. It was possible there might be some at the markets, the Victoria Hall, and other public buildings. In connection with domestic lighting, it was found that the consumption in many cases had been so small that the meters would not register it. This was a thing the Committee hoped to remedy. And no doubt the ratepayers hope with equal sincerity that they will be able to do so.

When political matters are not to the fore in Dublin, electric lighting questions (as our columns have testified) occasionally come in to relieve the monotony. This has been the case just recently; and it came about in this way. The Local Government Board have given the Corporation sanction to borrow £254,500 for the purpose of extending the electric lighting system, on lines laid down by Mr. Robert Hammond. In the natural order of things, they advertised for, and secured, tenders for parts of the work, amounting to roughly £46,000. Then, at the eleventh hour, the Tramways Company stepped in with a proposal to take over the "assets, liabilities, and obligations" of the department on certain terms. This was followed by a long discussion in the Press; and, finally, the whole matter was submitted to the City Council yesterday week. The great interest taken in the matter is shown by the fact that one paper (we have not seen others) devoted no less than half-a-dozen columns to the debate. The Lord Mayor (Alderman J. Cummins) put the whole question before his colleagues in a very exhaustive speech; but space will not permit us to enter into the matter here at the length we should have to do to place his Lordship's arguments fairly before our readers. Suffice it to say that he regarded the Corporation scheme as worthy of acceptance; and he moved the adoption of the Committee's report. Amendments were put forward, but they were cast out by 38 votes to 14; and the original motion was adopted by a similar vote.

The Sheffield Corporation electric supply station has become inadequate

# JOSEPH AIRD GREAT-BRIDGE.

## STAFFORDSHIRE.

# TUBES

## AND FITTINGS

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to meet the constantly increasing demands of the public; and the Electric Lighting Committee and the General Manager (Mr. S. E. Fedden) have been considering the question of extended equipment. It will be remembered that last year Mr. Fedden's predecessor and Mr. Robert Hammond submitted exhaustive reports to the Committee on the question; and now Mr. Fedden has given his views. We find that to a large extent he is in accord with Mr. Hammond, whose conclusions were these: "(1) That in view of the present large capital expenditure, and the amount of interest and sinking fund payable thereon annually, it would be unwise to make any complete change in the system of supply. (2) That on the whole that system can be relied upon to give an efficient and economical service. (3) That the direction in which future economies can be effected is in the cessation of expenditure on further alternating plant, and the feeding of the central district by low-pressure continuous current. (4) That in all extensions of the low-pressure distributing system, whether alternating or continuous, the three-wire system should be adopted. (5) That it would be an advantage to the undertaking to obtain powers to supply any fairly contiguous districts lying outside the borough, where a good demand for electrical energy could be relied upon." With only suggestion No. 3 does Mr. Fedden disagree; he being convinced that the economies in view can be better effected by other means. He concludes that the development of the undertaking, as far as the principle is concerned, must be on the lines of extending the system already in existence. To make the system more suitable for motive power, he recommends the reduction of the "periodicities" from 100 to 50. To enable the alteration to be carried out, Mr. Fedden says it will be necessary to order two sets of plant (alternating 50 period), say each of 1000 kilowatts, to be delivered, if possible, before March, 1901; and, when these are installed, to gradually transform the present plant set by set. The cost of altering the existing system to 50 periods will be about £9400 (including alternators, motors, meters, and arc lamps). To carry out these recommendations, he estimates the following further expenditure for the year 1901: Additions and alterations in boiler-house, £3500; 200 kilowatts of new plant complete, £22,000; additional feeders, £5000; and contingencies (say) 5 per cent., £1995—making a total of £41,895. If carried out, this scheme will completely fill up the existing space; and Mr. Fedden recommends that a new and larger station should be steadily proceeded with without delay. Upon this, he proposes to present a full report at an early date. The report is to be referred to Mr. Hammond; and meanwhile a deputation of the Committee are going to the Paris Exhibition and to Frankfort to make "inquiries and examinations" as to what is best and newest in the way of electrical machinery.

**A Town Without Water.**—Owing to a breakdown in the pumping machinery at the water-works, the town of St. Ives (Hunts) has been without water for more than a week. The townspeople, who have no access to private wells, have been compelled to obtain water from the River Ouse.

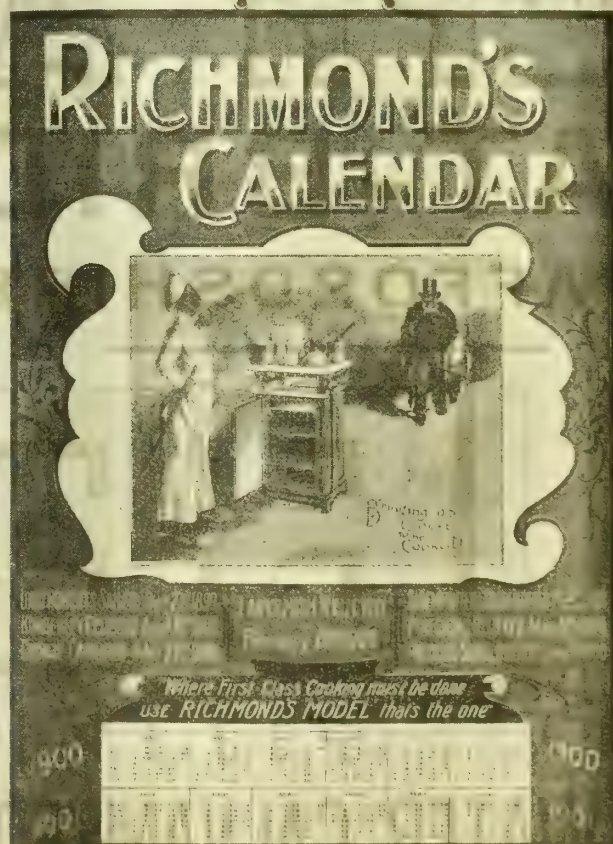
## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Greenock Gas Trust on Tuesday of this week discussed the subject of the gas managership. The Gas Committee recommended that a manager be advertised for. Upon this, it is said, there was a good deal of discussion; the question being whether they should have a manager only, or a manager who would be engineer as well. They have had experience—a satisfactory experience—of an engineer and manager; yet the Trust resolved, by twelve votes to eight, to have a manager only. This decision, I suspect, was influenced by the question of salary, which the Trust then proceeded to consider. The process of fixing the remuneration of the manager to be appointed they reduced to almost a fine art. Provost Black moved that it be £400 a year, with free house, coal, and gas; Mr. M'Innes moved that it be £400, without free house; Bailie M'Millan moved that it be £400, with a free house, but without coal, gas, or taxes; Mr. Nicolson moved that it be £300, with free house, &c.; and Provost Black homologated Bailie M'Millan's motion. The Trust then proceeded to vote upon the various proposals; and, by a process of exhaustion, the motion of Bailie M'Millan became the finding of the meeting, by twelve votes to nine. The Trust thus stand committed to the policy of having a man to conduct the gas-works, and, whenever any new works or extensions are necessary, the employment of a consulting engineer—in fact, the decision of this week almost involves the appointment of a permanent consulting engineer. Unless that be so, the Trust must be held to have adopted the course of appointing a manager with the intention of getting engineering work out of him. I daresay this is not an uncommon situation; and while we can understand a rising man undertaking such employment, it is not to the credit of a wealthy body like the Greenock Gas Trust that they should put their Manager into such a position. Stated in plain language, the resolution of the Trust is that they propose to take services which they are not prepared to pay for. I do not think, however, that they intended to do that; for I believe they rather stumbled to the conclusion they did, than arrived at it with intelligent deliberation. They have Mr. Samuel Stewart, who will be available to them as Consulting Engineer at any time they wish his services. But Mr. Stewart will require to be paid for anything he may do; and I cannot help entertaining the idea that the Trustees, in fixing the salary they are to offer for a manager alone, have forgotten that that will be a very considerable item of outlay year by year.

Mr. Forbes Waddell, of Forfar, has been appointed Manager of the Broughty Ferry Corporation Gas Undertaking, in succession to his brother, Mr. A. Waddell, who has been transferred to Dunfermline. The Gas Commissioners met on Tuesday night and made the appointment. Voting in the usual way, the short list of five were reduced to two—Mr. Lighbody, of Renfrew, and Mr. Waddell. The final vote was: Waddell, 9; Lighbody, 3. The appointment was then made a unanimous one. It is a promotion for Mr. Waddell from a 32 to a 44 million cubic feet annual





output; but in money the promotion is more pronounced, being from £150 to £200, with free house, coal, gas, and taxes. It was, therefore, worth his acceptance. Mr. Forbes Waddell learned the business of gas making at Dawsholm, Glasgow; and has held the appointment of Gas Manager at Tain, Blairgowrie, and Forfar. In all the places he has, by engineering skill, been able to greatly reduce the price of gas. In Forfar, where he has been since 1894, the reduction has been from 4s. 6d. to 3s. 9d. per 1000 cubic feet. He found the whole undertaking in a most unsatisfactory condition, both materially and financially. He has remained in Forfar long enough to see the material condition of the works improved and modernized so as to make them a capable instrument in the hands of a skilled man, though still far from being perfect works, and in a position to establish the undertaking on a sound financial basis. It has been uphill work; but he has faced the opposition bravely, and lived down the critical suspicions of some of his Commissioners. The gas-works have been largely transformed—a new retort-bench and new purifiers having been erected; but more important than all, in the matter of working, has been the erection of a new gasholder of large capacity. These works have been accomplished without adding much to the capital of the undertaking, which is the best tribute that can be adduced to the good management of Mr. Waddell.

Though Mr. Waddell was scarcely ever out of trouble with his Commissioners—which was due to causes for which he was not responsible—he made many friends in Forfar. At a meeting of the Corporation on Wednesday, Mr. Waddell's resignation was intimated. Provost M'Dougall said he rose with mingled feelings in connection with the resignation, because, in Mr. Waddell he was losing a personal friend, and the Corporation were losing a very trustworthy servant. He would have liked if they could to have had Mr. Waddell's services during the coming winter. They had entered upon a year's working with very high-priced coal and other materials, and they were to supply gas at last year's prices. But he did not in the least doubt that, with the knowledge their Convener had of the business, and the position the works were now in, they would be able to tide over the winter. He was pleased that Mr. Waddell had got into a better position than they were able to offer him; and they were all glad that he had obtained the appointment. He moved that the resignation be accepted. This was agreed to. The Commissioners then met in private, and resolved that the salary of the manager to be appointed should be, as at present, £150 a year, with free house, coal, gas, and taxes. In his new situation, Mr. Waddell will have less arduous duties to perform, and will work under more harmonious conditions.

In the Police accounts for the City of Edinburgh for the year ending the 15th of May last, I observe that the charges for public lighting were—for gas £9006, for electricity £10,386, and for maintenance of electric lamps £2373. Thus, for the first time, the charge for electricity exceeds that for gas, and this by a considerable amount, although only a small area of the city is as yet lighted by electricity. The Corporation give a very poor light in the streets which are lighted by gas; but when the electrician gets his hand in, they become lavish. The total charge for public lighting is over £21,000. A dozen years ago it was £14,000.

Gas is largely used in the lighting of the estuary of the Clyde.

The works for the manufacture of the gas are in Port-Glasgow; and there are numerous buoy and stationary lights in the Firth. The annual inspection took place this week of the works and the lights, all of which were found to be in good condition.

The Aberdeen Corporation electric light accounts for the past year show that the total revenue was £14,211, and the expenditure amounted to £6062; leaving a balance of £8149 to be carried to net revenue account. From this, £2343 was paid as interest on mortgages and other loans, £2438 has been set aside for depreciation, £1336 has been placed to sinking fund, and £2487 of the balance is carried to the reserve fund, which now stands at £2609. The general balance fund amounts to £100,727. During the year 1,005,505 Board of Trade units of electricity were generated and sold, as against 279,950 in 1899, which was for seven months only. There are 76 public arc and 80 incandescent lamps. The amount of capital authorized to be borrowed is £82,000; and this has been exercised on mortgage to the extent of £81,953.

The accounts for the past year of the Aberdeen Corporation Water Department show that the revenue was £28,064, and that the expenditure included £8844 for maintenance of works and £5912 for interest. The sinking fund absorbed £9149, and £2000 was set aside for the renewal of the aqueduct.

During the last eighteen months, considerable alterations have been effected at the Perth Corporation Water-Works. The building has been greatly enlarged, and entirely new and modernized plant has taken the place of machinery now no longer sufficient to meet the demands of the city. So inadequate was the old plant that the Water Manager, Mr. A. Davidson, felt it absolutely necessary that more up-to-date machinery should be introduced, as under the old state of things they never knew when a breakdown might occur; and had such a calamity happened, the water supply of the whole city would have been seriously affected. With the introduction of the new plant, such a disaster is completely averted, as the new triple-expansion engine is capable of doing the work of the old four-beam engines, with 25 per cent. added. By its use great economy will be gained, as little more than half the amount of fuel is required. Its working capacity is 200 gallons per minute at high level, 868 gallons per minute at mid level, and 810 gallons per minute at low level. It is of the direct acting, inverted, surface condensing type; and can maintain the delivery of the above-mentioned capacities of water for 18 hours. At the inaugural ceremony of the new plant, Lord Provost Macgregor said that Perth was very well off with its water supply in these days. Not so long ago it was most defective. In the adjoining room was the tank or reservoir which did duty in their fathers' days in supplying the city. New engines had to be added; and they had in turn provided the Wellshill, Athol Bank, and Burghmuir reservoirs. At present, a large reservoir was in course of construction at Muirhall to supply Scone and the higher parts of Kinnoull. They had in the rich treasures of the everlasting hills, and the great floods which lay between, an inexhaustible storehouse of the precious fluid of life. For the very satisfactory condition of their water-works they were largely indebted to the Manager, Mr. Davidson. He had proved to be one of the most competent Water Managers that ever Perth possessed.

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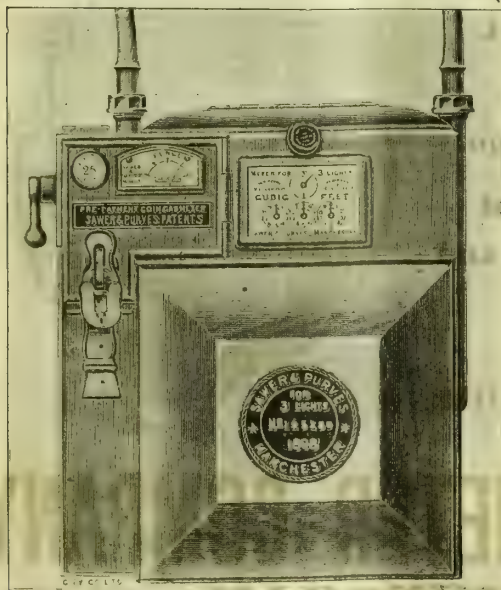
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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 1.

**Sulphate of Ammonia.**—There is, so far, no recovery from the depression experienced during the past month; the tendency of prices being still in buyers' favour, and the closing quotations being £10 15s. to £10 17s. 6d. per ton, delivered f.o.b. at the ports. Shipments continue on a fairly satisfactory scale; but the business was done some time since, and consumers are postponing further purchasing as far as possible. On the other hand, the larger makes were mostly sold in advance; so that the quantity offering has been small and chiefly absorbed for covering sales for August delivery. In the forward position, there has been considerable inquiry; but the firmness of makers still stands in the way of business—£11 5s. per ton for October-March, and about £11 2s. 6d. for October-December delivery being required f.o.b. Leith. There has, however, been some speculative selling abroad, at below the equivalent of these prices.

**Nitrate of Soda** is firm at 8s. 1½d. to 8s. 4½d. per cwt., according to quality, on spot.

LONDON, Sept. 1.

**Tar Products.**—Benzols continue fairly steady; but there is not the same keenness at the moment to purchase. This is largely due to the higher price being asked by makers. Pitch is firm, and shipments are recommencing; but the higher freights now quoted for this article seriously affect it, and fuel makers bitterly complain that with high prices for small coal and pitch there is little or no profit. Carbolie acid is better, with a strong inquiry for forward delivery. Cresylic acid is also participating in the higher values. Anthracene continues about the same; but there is not much business being done. Makers are accepting rather low prices for creosote and tar oils, doubtless with a view to getting their store-tanks cleared out before the season of large production. Solvent naphtha is slightly firmer; but other naphthas are weak.

The average values during the week are as follows: Tar, 17s. to 25s. 6d. Pitch, east coast, 37s. 6d.; west coast, 32s. 6d. Benzols, 90's, 9½d.; special qualities for gas, 10½d.; 50's, 11d. Toluol, 1s. 3d. Solvent naphtha, 1s. 3d. Creosote, 2d. Heavy oils, 3d. Carbolie acid, 50's, 2s. 4d.; 60's, 2s. 10d. Naphthalene, 75s.; salts, 50s. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—The market has been extremely erratic this week, but is now steadying down at about £10 15s. per ton, less 3½ per cent. at all ports.

## COAL TRADE REPORTS.

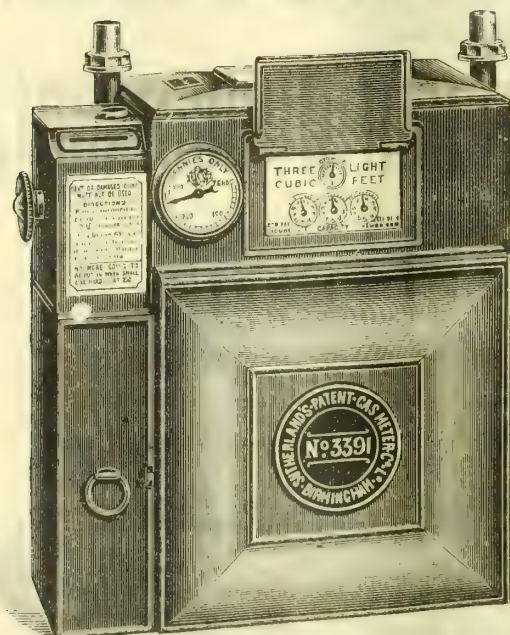
From Our Own Correspondents.

**Lancashire Coal Trade.**—The most noticeable feature during the past week in the coal trade of this district has been an extra pressure of orders coming forward for shipment, as a result of the South Wales railway dispute, which, for the time being, has forced up prices to special figures for

prompt cargoes—as much as 22s. 6d. to 23s. per ton having been got in exceptionally urgent cases, while 18s. to 20s. has been a very general quotation for steam coals, delivered at ports on the Mersey. With the settlement of the railway dispute, however, prices will no doubt speedily get back to something like their normal level; and with regard to other sections of the coal trade, the position has undergone no very material alteration. The better qualities of round coal have perhaps not been in quite such pressing request for house-fire purposes; and collieries are beginning to get straighter with the arrears of deliveries on their books. But there is still an absence of anything going into stock; and the demand continues in excess of what is usual at this time of the year. The result is that prices remain exceedingly firm at the full list basis; best Wigan Arley being quoted at 16s. 6d. to 17s. per ton at the pit, Pemberton four-feet and seconds Arley 15s. to 15s. 6d., and common house coal 14s. to 14s. 6d. The lower qualities of round coal have necessarily been drawn upon largely for shipping purposes, wherever collieries have been able to avail themselves of the exceptional prices that have been obtainable at the ports; but the home demand, although generally active, is not quite so brisk as it has been for iron-making, steam, and general manufacturing purposes. For the present, however, prices continue exceedingly strong, with 12s. 6d. to 13s. per ton the minimum quotations for steam and forge coals at the pit. The pressure for shipment has also had some effect on engine classes of fuel, as a good deal of through-and-through coal has been sent away to the ports, thus taking off a fairly large quantity of slack; and, consequently, surplus supplies have not been quite so plentiful on the market. The holidays, which have largely affected the requirements for engine fuel in the manufacturing districts, are now approaching a close; and this will also have some influence upon the slack market. Lancashire collieries still hold firmly to their basis rates of 10s. 6d. to 11s. per ton at the pit, according to quality, for slack; and they seem to anticipate some improvement in the market before very long. But cheaper supplies are still obtainable from some other districts. Lancashire coke makers are holding pretty well to late rates; but furnace cokes coming in from Yorkshire continue to ease down, and during the past week contracts in this immediate district have been placed at as low as 20s. per ton at the ovens.

**Northern Coal Trade.**—The coal trade of the North has been made irregular and excited by the effect of the stoppage in Wales, and by the many rumours as to its duration. Coal, and especially steam coal, has been forced up to high prices; but it needs to be borne in mind that only small quantities are sold at any such rates, and that the great bulk of the coal is delivered on contracts that are uninfluenced by the stoppages, and are at comparatively low prices. Bearing this in mind, it may be said that best Northumbrian steam coals have been sold at 24s. to 25s. per ton f.o.b.—a very sharp advance. For steam smalls, the price is from 12s. 6d. to 13s. per ton. The household coal trade is unchanged. In gas coals, there have been higher quotations in sympathy with the price of other coals, and 18s. to 19s. per ton f.o.b. has been frequently named; but the sales at such rates are very doubtful, and the quotation may be considered a nominal one. The gas coal collieries seem to be working better, and the output is well taken up; the deliveries to the

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large companies increasing with the incoming of September. There is some speculation as to the next contracts for the South Metropolitan Gas Company; but, as far as we can learn, it is entirely premature. Coke is very steady, and best quality for export is from 32s. to 34s. per ton f.o.b., while blast-furnace coke is about 28s. free at the furnaces. These prices, of course, have their influence on those for gas coke; but there is no variation this week in the latter. There is an increase in the output; but it is readily taken up, and the stocks are generally small. As to fuel of all kinds, it must be expected that the settlement in Wales will make coal cheaper, and in a day or two lower prices will become general; but now irregularity and weaker rates are the chief features.

**Scotch Coal Trade.**—The coal trade is in an excited condition; the tendency being to still higher prices. There is no slackening of the demand, which, both for home and foreign consumption, is quite abnormal. The quotations may be given as: Main 16s. 6d. to 17s. per ton f.o.b. Glasgow, ell 17s. 6d. to 18s. 6d., and splint 17s. to 17s. 6d. The shipments for the week amounted to 250,168 tons—an increase of 6677 tons upon the previous week, and of 49,633 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,915,485 tons—an increase upon the corresponding period of last year of 1,232,769 tons.

**Advances in Bradford Gas Workers' Wages.**—At a meeting of the Gas Committee of the Bradford Corporation last Friday, Alderman Aykroyd presiding, the applications for increased wages made by various grades of the workmen were considered. It was decided to grant the following advances, which are equivalent to about £1600 per annum: Stokers, from 5s. to 5s. 2d. per shift of eight hours; purifier men, 6d. to 6½d. per hour; yardmen, 5½d. to 5¾d. per hour; and foreman stokers, 40s. to 42s. per week. The men engaged in laying gas-mains are to be granted advances in their pay per hour as follows: Men at 22s. per week to have 5¾d.; at 23s. per week, 6d.; at 24s. per week, 6½d.; and at 25s. per week, 6¾d.

**Mr. Livesey on the Growth of the Slot-Meter Business in South London.**—The Assessment Committee of the Wandsworth Union have been asked to reduce the assessment of the works belonging to the South Metropolitan Gas Company in Battersea, Clapham, and Streatham from £25,000 to £15,200, on the ground that the profits last year were £2000 less than those realized in 1894, and that they were, in fact, only just sufficient to pay the dividends. The Committee do not seem disposed to make the concession; but a conference is to take place between them and the Company's representatives, with a view to a compromise. In the course of an interview which Mr. Livesey had with the Committee last Tuesday, he offered a few observations on the remarkable growth of the slot-meter business. He pointed out that it had taken the Company 80 years to get 100,000 ordinary gas consumers, while it had only taken them eight years to get an equal number of working-class penny-in-the-slot meter customers. These slot meters were being supplied at the rate of 300 per week, and the fittings of each cost about £6. They were now fixing meters and fittings in lodgers' rooms in houses.

**Local Authorities as Colliery Owners.**—Mr. N. W. Hubbard, the Chairman of the Asylums Committee of the London County Council, has put forward a suggestion that the Council should seriously consider the advisability of securing a municipal coal mine, by purchase, renting, or on royalty. Curiously enough, Mr. Hubbard is a coal merchant, and his suggestion has been made in consequence of a proposal that the Council should secure a wharf and do their own distributing. At a meeting of the Gas Committee of the Manchester Corporation last Friday, a member gave notice that he would bring forward at the next meeting the question of buying and working a mine to supply the Corporation gas-works with coal. The Committee, it is interesting to note, have received an offer of coal from America; and although they are unable to accept it, owing to the present contracts, it is intended to make inquiries with a view to comparing prices.

**Dorking District Councils and the Water-Works.**—At the meeting of the Dorking Urban District Council last Thursday, the Chairman (Mr. J. W. Palmer, J.P.) called the attention of the members to the fact that he had placed upon the agenda a notice of his intention to move—"That the necessary steps be taken for carrying into effect the powers conferred on the Council for acquiring the undertaking of the Dorking Water Company." He quite understood that he had nothing to do but to submit the resolution; but he had since been informed that this was not the case. Certain legal difficulties presented themselves; and it would be necessary for him, or some other member of the Council, to give formal notice, and that such notice be given at least 10 clear days before the motion was adopted, after which the resolution had to be advertised in the local papers. Under the powers conferred upon the Council and the Rural District Council by the Dorking Water Company's Act of the past session, they had the option of applying to Parliament either during the ensuing session or in that of 1902. He thought they would agree with him that if any action was to be taken it should be commenced at once. It was not fair to the Company that the matter should hang up for an indefinite period; and he therefore gave notice of his intention to move at the next meeting—"That, in the opinion of this Council, it is desirable to apply for powers to take over the Dorking Water Company's undertaking at the earliest possible moment; and that the Clerk be directed to take such steps as may be necessary for promoting a Bill in the next session of Parliament, either in conjunction with the Rural District Council, or, in case the Rural District Council is not willing to co-operate, then on behalf of this Council alone, for the purpose of taking over the undertaking of the Dorking Water Company, pursuant to powers conferred upon this Council and the Rural District Council by section 26 of the Dorking Water Company's Act of 1900." A meeting of the Joint Committee, consisting of three members of the Council, and three of the Rural District Council, had been held that morning, when, after some discussion, it was unanimously resolved—"That, in the opinion of this Committee, it is desirable that a Bill should be promoted in the next session of Parliament for taking over the undertaking of the Dorking Water Company under the powers conferred on the respective Councils by section 26 of the Dorking Water Company's Act of 1900." These are decided indications of a wish to purchase.

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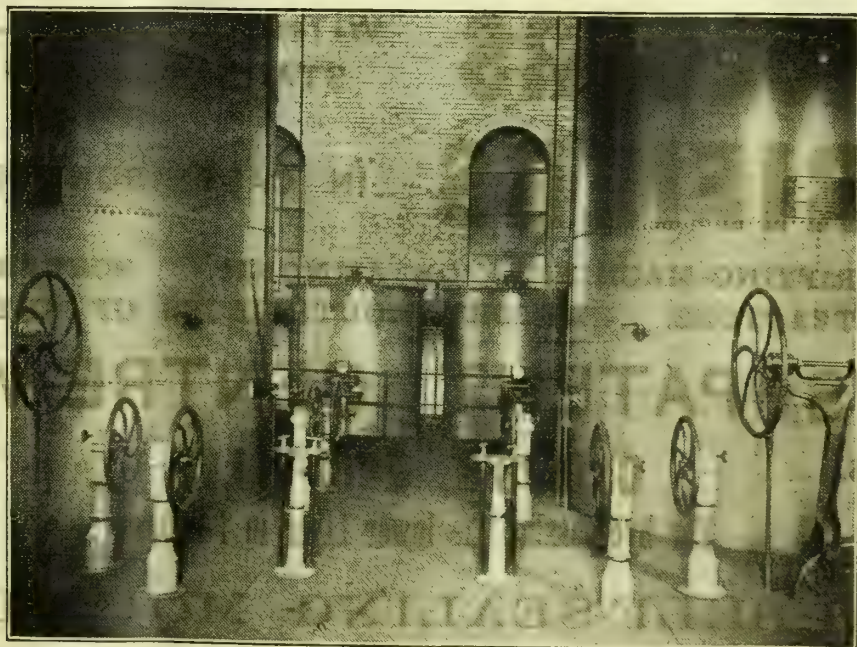
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**The Labour Trouble at the Doncaster Gas-Works.**—We learn that the dispute which led the stokers at the Doncaster Gas-Works to hand in their notices, as mentioned in the "JOURNAL" last week, has been settled on terms which are favourable to the men.

**New Holder for the Reigate Gas Company.**—Messrs. Westwood and Wrights are erecting a holder for the Reigate Gas Company to the designs and under the superintendence of Mr. F. S. Cripps. It is telescopic, of 200,000 cubic feet capacity. The guide-framing consists of light well-braced framework, which, owing to the disposition of the material in proportion to the strains, is very strong. All the wearing parts of the holder are extra strong and durable.

**Scheme of Water Supply for the Easingwold District.**—Last Thursday, an inquiry was held at the Town Hall, Easingwold, by Mr. W. A. Ducat, an Inspector of the Local Government Board, in regard to an application by the Rural District Council of Easingwold for power to borrow £16,000 to supply eleven villages with water—Carlton Husthwaite, Husthwaite, Raskelf, Tholthorpe, Flawith, Alne, Youlton, Aldwark, Tollerton, Huby, and Sutton-on-the-Forest. The supply is to be obtained from springs near the Hambleton Hills; and the scheme has been projected on account of a report made by Dr. Barry, one of the Local Government Board Inspectors, a few years ago, which commented very adversely on the water supply of these villages. It was stated that the water would be taken from Cragg Hall and Roulston Scarr springs, near Kilburn, and there was an abundant supply. Pipes will have to be laid for 28 miles to serve the villages. At the conclusion of the inquiry, which lasted three hours, the Inspector and others went to the Hambleton Hills to see the springs.

**"Borrowing" Money from a Prepayment Meter.**—At the Strange-ways Police Court, Manchester, last Thursday, a married woman named Catherine Pryer, living at 145, Stockport Road, Levenshulme, was charged with having extracted 6s. 2d. from a penny-in-the-slot meter. Police-Sergeant Gill was informed of the matter, and arrested the prisoner. Mr. J. K. Gardener, a meter inspector of the Corporation, stated that at 1, Egerton Road, Levenshulme, there was a meter, which he found had been opened, and had only 1s. 3d. in it. The gas registered showed that 7s. 5d. should have been in the box. The house was empty at the time. Mrs. Broady stated that the prisoner gave her 5s. 5d. to put back in the meter. Sergeant Gill stated that the prisoner, when charged, said she had not taken 6s. 2d., but only 5s. 5d., and she had been told that the inspector would take the money from her and say nothing. Mrs. Broady had a key which would unlock the meter, and the accused asked her to lend it to her. She took out 3s. 8d. one time and 1s. 8d. the next, intending to put it back. The Magistrate said that was not stealing money. Mr. Gradwell said he had investigated the case, and found that the prisoner had removed. He traced them, and when he spoke to them about the money, they all began to charge one another with the theft. They were not allowed to interfere with the meter in any way. His Worship remarked that that was an offence against the Gas Acts, and not theft. The woman was released on her own recognizances, and protested that she did not intend to steal the money.

**Sales of Shares.**—At a sale by Messrs. Hollis and Webb at Leeds last Tuesday, some old shares of the York Water Company realized £28 each, *ex div.* On Thursday, Mr. Walter Cox disposed of two parcels of £50 and £25 of consolidated stock of the Maidstone Gas Company at £101, £100, and £51 respectively.

**The Costs of the Derwent Valley Water Act.**—At a meeting of the Derwent Valley Water Board, held at Leicester last Thursday, the following costs, as allowed by the Taxing Master of the House of Commons, were presented to the Board and ordered to be paid: The Corporation of Sheffield, £25,223 16s. 7d. and £804 3s. 1d.; Derby, £1804 3s. 1d.; Leicester, £1804 3s. 2d.; Nottingham, £1304 3s. 1d.

**The Suggested Coal Inquiry.**—The "Iron and Coal Trades Review" says a great deal of disappointment has been expressed in some quarters at the failure of the Government to appoint a Royal Commission to inquire into the whole question of the present scarcity and cost of fuel in relation to exports, domestic consumption, and other collateral issues. Our contemporary adds: "There is a growing feeling up and down the country that such a Commission is wanted, and that we shall not fathom the true causes and prospects of the present situation until it has been closely investigated by such a body of experts. But for the moment the matter appears to be shelved, although the high price of coal is a problem that demands the most searching inquiry in regard alike to the prospect of its permanence and its influence on the trade and commerce of the country."

**The Proposed Gas-Works Extensions at Carlisle.**—At the last meeting of the Carlisle Town Council, the question of the extension of the coal-gas plant was referred back to the Gas Committee for further consideration, with instructions to call in Mr. Corbet Woodall to advise upon the best means of augmenting the gas supply, either by the introduction of carburetted water-gas plant or the extension of the present system. Since the meeting the Committee have had an interview with Mr. Woodall, who advised them verbally as to the course to be pursued; and it was agreed that, before taking action, he should submit a report in writing setting forth his suggestions. We learn that Mr. Woodall indicated that, in his opinion, there was too little room on the Viaduct site for such an extension of the coal-gas plant as is desirable, but that it would be possible to introduce plant to produce (say) 600,000 cubic feet of carburetted water-gas daily. If the views of the Committee were in favour of an extension of the coal-gas plant, he would advise the Council to leave the Viaduct and go to Boustead's Grassing, or even farther away from the city if possible, and put up their works there. A local paper says that, judging from the feeling of the Committee, it is very likely, if an extension of the coal-gas plant should be decided upon, Boustead's Grassing, which belongs to the Corporation, and on which there are already works, railway sidings, &c., would be made the site of the gas-works of the future. The introduction of carburetted water-gas plant to the extent above mentioned would stave off the day of the removal of the gas-works from their present site; but, having regard to the increased consumption and to its probable further increase, this removal seems to be a contingency which may be looked upon as inevitable.

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# EDITORIAL NOTES.

The Paris International Gas Congress—The Poverty of the English Gas Profession in the Higher Branches of Research.

THE great International Gas Congress in Paris—to which gas engineers of several countries have been looking forward for months past, and upon which many minds have been more or less concentrated in, as it were, drawing together the threads to ensure completeness—has come and gone; and it has supplied us with not the least interesting chapter in the history of the gas industry. To describe it as an unqualified success is not applying to it an adulatory term. And we are not by any means envious of that success; on the contrary, we (and we believe every English-tongued individual who was present at the Congress will unite with us in this) ascribe, with the utmost freedom and goodwill, to M. Th. Vautier and to his coadjutors upon the Commission d'Organisation all honour and glory for their great achievement. In the history of the gas industry, such a gathering as this has been is unique. Never before has there been a meeting of gas engineers and managers of an international character—never before have members of the gas profession from different parts of the globe met on common ground to discuss and take counsel with each other on questions of common import, and (unconsciously, it may be, but inevitably) to tighten those bonds of friendship which a community of interests engenders among men, no matter what their nationality. Both place and time were meet for a great international gathering of the kind. The grand, though ephemeral, Exhibition of our neighbours made Paris an appropriate *rendezvous*; and, as to time, what could have been more apposite than that the century within which the gas industry has grown from an infantile to a gigantic state should be crowned by the meeting and mutual intercourse of many of the men of different countries who have assisted in its strengthening.

It could not be expected—however much desired—that all the leading men of the industry in all the great countries represented could attend. For instance, nothing would have more gladdened the hearts of the little body of English engineers who were present than to have had among them on this exceptional occasion such prominent men as—well, some dozen and more who might be named, were it not for the danger of doing an injustice by unintentional omission. But it was fit that the heads of the two leading gas organizations of the country should be there, and that they should receive the honour their positions merited. As Presidents respectively of the Institution of Gas Engineers and the Gas Institute, Mr. J. W. Helps and Mr. T. O. Paterson were nominated as Honorary Presidents of the Congress; and, for a brief space during the sittings, they (with the other foreign Presidents) assisted M. Vautier in the conduct of the proceedings. Distinction was also conferred upon the immediate Past-Presidents of such Associations as had rendered aid in the preparations for the Congress; they having been elected Honorary Presidents of the Organization Committee.

We have said that the Congress was "an unqualified success;" and we abide by that. It was a success in numbers; it was a success in its truly international character; it was a success in the dissemination of a more general knowledge of the work of several countries on lines of present-day interest; and the quality of the major part of the papers (we must refrain from saying "all") left nothing to be desired. But a few hypercritical attendants may be disposed to question our measure of the Congress upon the ground that on some of the papers (and those not the least important ones) there was little or no discussion, and that on those which did excite debate the variety of language precluded a really intelligent following of the arguments adduced. But what else could be expected in an assembly constituted such as this? When the discussions are all converted into French, and published (as we hope and believe they will be) in volume form, it will be found an instructive record of the current opinions of many men of different countries on many current gas topics. It will, in short, mark the position of gas affairs at the close of this century.

In the subject-matter of the papers, in the exhaustive method of treatment, and in the character of the compositions, most of the writers showed that they had fully and correctly gauged the quality of matter that the importance



of the occasion demanded. The tone of the communications was, in most cases, carried to a higher pitch than would be expected (although we hold every man should always strive to give of his best) of, say, a contribution to an ordinary Association meeting. Some of them were voluminous disquisitions, and might, if only the purposes of the Congress and debate were in view, have been curtailed with advantage. But as records for study and consultative purposes, they are better as they stand. Many of the papers dealt with the higher branches of the *technique* of the industry. Mere administrative matters found no place in the programme; and, indeed, their presence would have been to a great extent superfluous and wasteful of time in an audience composed of representatives of different countries and of different peoples, in which, and among whom, questions of administration and policy must inevitably defer to their own peculiar conditions and circumstances. But the gas engineer and the gas technician of every country delve in common ground. There is no demarcation to the work of the investigative or studious gas engineer and scientist of any one nation represented at the Congress. Their work does something more even than overlap. In whichever country it is carried on, it is part and parcel of the same irresistible progress of development; and therefore every man's work, no matter where his location, must have a universal interest among the thoughtful and studious of his many compeers wherever they may be. Whether the worker be French, German, American, English, or of any other nation, his labour has only one object, and that is the advancement of knowledge—knowledge of the best means and methods of gas manufacture or its utilization, of the plant and appliances connected therewith, and of the processes for securing the most beneficial results, both for mankind and the industry itself, from the bye-products of that manufacture.

Therefore, we hold that the subjects introduced to the mixed assembly at the Congress were eminently appropriate. Many of them, as we have said, ran among the higher branches of gas technics. As one sat listening to the reading of the papers in the Congress Hall, and noted the interest which the great gathering of Continental gas engineers—both of large and of small works—took in the scientific questions discoursed upon, the truth was demonstrated, perhaps more forcibly than ever before, that every gas-works, whether great or small, is an entrance to those large fields of research upon which several of the papers threw light. Want of time and ability, however, may be barriers to the prosecution of investigation. The former may be (and we will admit is, in many cases) a good reason for leaving such work to others; but to the latter—the want of ability—few men will confess. With the opening before him, if a gas engineer has the ability, if he has the aptitude, if he has the time, and if he does not take up some line of research connected with his profession—well, then, he does an injustice to himself and to that profession. Looking round at our own Associations at home, in nearly every one we can pick out men—but, alas! the percentage is small—who have pursued, and are pursuing, original research in some branch of their work; and it would not be difficult, did it come within the province of a journalist (and we are glad it does not) to pick out other men just as favourably placed whose contributions to the profession have either been *nil*, or have lacked the stamp of originality or personal inquiry. Why is it? Have gas engineers on the Continent more time than our engineers at home, or have they more ability? We are certainly not going to admit that they have either; and yet their productions, as the result of personal investigation, clearly put our records to shame. Where, may we ask, did England stand at the Congress in the matter of contributions? A great country, with a great gas industry; and yet only two Englishmen subscribed written matter for the proceedings! And, moreover, those two Englishmen were associated with Continental (not purely British) gas undertakings. Let those who will be proud of the position England occupied at this Congress; we are not. "We were once the teachers in the gas industry; now we are the taught." This, in effect, is what Mr. Helps felt constrained to confess, before a large number of Continental gas engineers in Paris only ten days ago. What an admission for the President of the Institution of Gas Engineers to have to make! May this Congress be the turning-point. Let all who have the ability be up and doing, and not leave the prosecution of research to the few; and let the technical

literature of the country bear witness that the gas profession of Great Britain does not intend to take a place behind other countries in the matter of investigation in the higher branches of its work. Over this let one and all ponder.

We started with the intention of writing about the Congress; but our thoughts have run into another channel. Before concluding, however, one thing must be here acknowledged—the exceeding great kindness, courtesy, and hospitality which the Société Technique du Gaz, the Paris Gas Company, and many others in the city, showed to their guests throughout the past week.

#### Coal Exports.

THE Board of Trade returns of the coal exports during the month of August afford one explanation of the continued hardness of the market, and are not good reading for the coal buyer. The total quantity exported—including coal shipped for the use of steamers engaged in foreign trade—was 5,140,235 tons, as compared with 4,811,290 tons last year, and 3,979,646 tons in August, 1898. The increase of 328,945 tons for the month over the shipments in 1899 brings the total increase in the exports this year, as compared with last, up to 1,161,270 tons. The quantity shipped in the first eight months of 1898 was nearly 8 million tons less than during the same period of this year. France is far and away our biggest customer, and also the one whose imports of our coal have increased most heavily; she having already taken well over 1 million tons more this year than last, and nearly 2½ millions in excess of the quantity bought from us in the corresponding period of 1898.

The increased requirements of France afford, indeed, a striking proof of the activity of trade in that country, which, coupled with labour difficulties, have made her a pressing customer in the coal market. This, as we all know, has caused a lot of excitement in the heads of those who fill the columns of the "Yellow Press;" and it has been sought to represent that France is now sucking us dry of coal in order to be able successfully to swoop upon us on some day—we forget the exact date—in November next. As France is importing at the present time as much coal in one month as our own Navy uses in twelve, the theory that her purchases are solely intended for use in times of war scarcely bears examination.

Another large and increasing customer in the English coal market is Germany. Indeed, if coal imports be a safe guide as to the warlike intentions of our European neighbours, France, Germany, Russia, and Italy are all preparing to pounce upon us; each of them having bought over half a million tons of coal last month. It has, unfortunately, to be added that there appears no immediate prospect of a material reduction in the demand from the Continent. Only last Friday the Prussian Ministry—"in view of the growing scarcity and dearth of coal"—resolved to reduce the railway carriage rates on foreign coal, in order to render more easy its importation from England and Belgium; while Russia's needs for fuel continue so great—a railway nearly 4000 miles in length involves a heavy fuel bill in its construction, and in the maintenance of the service over the completed sections—that the Government there have recently prolonged the suspension of the duty formerly imposed on coal imports.

We have all been and are looking to the intervention of American coal to relieve the situation; but the threatened great strike of miners in Pennsylvania—the number is put at 100,000, equivalent in the States to an output of nearly a million tons a week—will, if it become an accomplished fact and be prolonged for any considerable length of time, naturally tend to upset these calculations. On the other hand, the stoppage of the Lancashire cotton mills for two or three weeks (owing to a dearth of the raw material) will have a considerable effect upon the engine fuel market in that part of the kingdom; the effects of the Taff Vale strike will soon have disappeared; and the rush to buy household coal is dying away. The uncertain factor is the output; and here everyone is really in the dark. No returns are available as to the tonnage raised each month; so that it is impossible, until the figures for the year are published—about next February, perhaps—to say to what extent the statements constantly made by coal owners and factors as to the bad working of the men, are accurate or exaggerated. The probabilities all lie in favour of slacker working; but (bearing in mind that, in spite of similar asseverations by the colliery proprietors, the output per man last year proved to have been heavier than previously) we should like to have definite figures to go upon. The Board of Trade could not



do any greater service to the industrial community than by arranging to procure and publish every month the actual quantity of coal brought to bank in this country. That would be a service which the coalowner would by no means appreciate, while the coal buyers—which is to say the community at large—would do so very greatly.

#### The Trade Union Congress and the Law of Picketing.

OF all the many and various disillusionments which the experience of a lifetime brings to everyone, that which proceeds from the discrepancy between profession and practice, between the name and the thing, is perhaps the one most constantly surprising as it is perhaps the most familiar. One is always being disappointed at discovering some example of this disconformity of promise and performance; and yet it is what one expects, as a matter of course. The world of politics, using the word in the wide sense, is full of these discrepancies. The Progressive turns out to be the most obstinate of obstructionists; the Moderate, the fiercest of partisans. The Free Trader often practises the strictest Protection whenever he has the opportunity; and the firmest believer in direct taxation levies all the indirect duties that he can manage to stick on under some other name. The representative of Labour does no manual work; the professing Practical Man is the craziest of theorists. And so on. The Trade Union Congress is not good for much; but it is a splendid example of what we have just sketched out. Here is a gathering of people regularly accredited as delegates from the Societies supposed to represent the thought and the aspiration of the followers of the trades after which they are called. These delegates are free men, in a free land. They have it in their power to meet wherever they please, without asking anybody's permission; and to say the thing they will, in spite of everybody. In theory, these are ideal conditions for the cultivation and advancement of that sound counsel which is supposed to originate in free discussion. Surely, it might naturally be thought, these practical men, these horny-handed sons of toil, will be as businesslike and effective in counsel as they are in their places at the loom or the forge. The workman needs but few words in his employment. Hour by hour, as he toils in silence, his mind may be revolving the things most nearly influencing his daily life and the conditions of his calling. Once a year, at least, as the scheme of the Trade Union Congress seems to provide, the great mass of silent workpeople shall, however, be given voices, and the opportunity for making them heard. The rest of the world is pompously bidden to listen to this Parliament of Labour; and politicians and newspapers duly bend to hear what the free and independent workman has to say for himself. One has but to look at the theory of the Congress in this light to perceive how ludicrously short the realization falls of the ideal.

This year, all these practical men (numbering some 400) went to Huddersfield, and presumably enjoyed themselves thoroughly in talking and listening to many vaguely Socialistic speeches which they all knew to be so much empty sound. The President of the Congress was a local Trade Union magnate, who entertained his supporters to a literary feast in the shape of a scholarly (of a sort) exposition of the "scientific and philosophical aspect" of the "Labour Movement." This was sufficiently fantastic; but it was distinctly funny to note how easily this philosophic and scientific Trade Unionist led his argument from the conditions of life upon the earth during the glacial epoch to a fervid denunciation of the present "unholy war." After this, it was but natural that the first "business" transacted by the Congress should be the passing of a resolution protesting against the suppression of the late Boer States as "a blow against the independence of South African labour, and those principles of national freedom which have characterized the history of the closing century." This performance has been cited, with much force, as likely to awaken the ordinary newspaper reader to a correct perception of the degree in which this egregious Congress accurately mirrors the feeling of the working classes of the country. Like the circus manager of the old story, however, the real wire-pullers of the Congress soon "cut the cackle, and brought in the 'osses," by concentrating the attention of the delegates upon the state of the law as regards picketing.

Here we feel upon sound ground. Philosophical and scientific justifications are all very well so far as they go. But they do not win strikes; while picketing, properly done, does. That is all about it, to a true Trade Unionist.

Men like "Mr. Jones (Upholsterers, London)," who moved a resolution relating to this subject, and Mr. Bell, of the "Railway Servants," know that, as the law stands, it interprets the Conspiracy Act in a sense which is, as Mr. Jones's resolution put it, "a danger to the operations of the Unions." Consequently, Mr. Bell's Society have determined to carry their case to the House of Lords, so as to get a final decision as to the law of "watching and besetting." In the same boat are the Belfast Butchers, who have vainly spent £600 in law-costs with the object of defending the legality of the action of their Society in asking a firm not to buy meat from a particular salesman while they had a dispute on. The Congress has commended the Belfast Butchers to the good offices of English Trade Unions.

Meanwhile the Railway Servants have been placed in an admirable position for approaching the House of Lords; an injunction having been granted against the Society, as well as against the officials Bell and Holmes individually, at the instance of the Taff Vale Railway Company. This is the first time that a Trade Union has been held liable for such acts as picketing. The judgment is of enormous importance, not only upon the main issue, but also on the preliminary question of the responsibility of a Trade Union for the acts of its officials. Mr. Justice Farwell has just decided that, in an action in tort, such a Society is liable. In future, therefore, whoever suffers from the "operations" of a Trade Union will be able to seek his legal remedy against the Society itself, and not against the individuals—usually men of straw—who acted as its agents. Well may the Trade Union Congress decide to support Mr. Bell's Society in contesting this judgment to the uttermost Court of Appeal. If it is upheld, the Trade Unions will have to rely more than has been their wont upon philosophy and science, and less upon brickbats.

This is, speaking generally, the only question of practical politics for the Trade Unions of the country to deal with at present; and a Congress is not the proper arena for settling a matter of this kind. So arrangements have been made whereby it is hoped less scope will be allowed for mere purposeless talking. Hitherto the Chairman of the Congress has been the most prominent Society man in the town visited; and this has placed the gathering at the mercy of any empty talker who happened to dominate the local "Labour platform." Consequently, year after year, the men who are the real wire-pullers of the Trade Union movement have been compelled to sit still while local nobodies vapoured away on the well-worn generalities of Collectivism, which neither hurt nor advantage anybody. This is to be changed; and the Chairman of the Parliamentary Committee—the real Executive of the Associated Unions—is to be Chairman of the Congress also. The change is in the direction of practicality; but we doubt if ever the Congress will become a body to be taken seriously.

#### The Address of the President of the British Association.

THE meeting of the British Association at Bradford is naturally attracting much interest. It is a great relief to turn from the empty verbiage which ordinarily fills the newspapers at this season, to the solid columns which at least once a year record the gains of science. After all, science is only a short name for accurately known facts, properly understood. The name of science has been much blown upon in consequence of the unscientific behaviour of many who profess and call themselves scientific men. There is still a good deal of human nature in man, as the humorist has observed; and it is in consequence of this that many a man who should have remembered that he is nothing if not strictly scientific, has turned his chair into a pulpit or an electioneering platform. This weakness on the part of some professors has tended to bring science itself into disrepute as a way of mental culture. It is when the scientific man sticks to his science that he dignifies himself and ennobles his profession. The British Association presidential address this year is a shining example of this truth. The President is Sir William Turner, F.R.S., perhaps the most distinguished of living English anatomists. His address, we observe, has been unfavourably commented upon in some quarters, because it was confined to the speaker's speciality, and did not give a popular summary of the progress of science in all departments for the year. Readers of the "JOURNAL," who have an exceptionally intimate acquaintanceship with presidential addresses, of which class of technical compositions we report very many every year, are aware that we hold this



*omnium gatherum* description of address in the liveliest horror. It is scarcely ever well done; and there is the special objection to the style for a scientific man's address, that he is obliged to give most of the story upon hearsay testimony. There is no Science of Universal Information. A true man of science will shrink, as from a deadly sin, from telling anything except as he knows it.

For this reason we very warmly applaud the discretion of Sir William Turner in speaking of the matter of his own science, which is concerned with the structure and organization of the bodies of man and animals. There is, of course, nothing for the "JOURNAL" in this special portion of the address; but there is much instruction for every humble follower of the scientific method, which is of general validity in the deep and broad foundations of this masterly composition. What is the scientific method, by which alone can the amount of positive human knowledge be increased? It begins with Gibbon's requirement of "diligence and accuracy" on the part of an historical writer. No student can make progress without exercising these qualities. But much more is needed to the successful and profitable prosecution of research. Diligence and accuracy must be supplemented and governed by judgment and insight. They require to be practised by a man who has the superior capacity to discriminate between what is or is not worth doing or knowing. For the power to value facts and to decide on their true significance, a well-balanced mind and the exercise of prolonged thought and reflection are needed. The possession of this power distinguishes the wise man from the pedant.

Sir W. Turner, in the course of his address, drew from biological science his illustrations of the need of this combination of observation with meditation. But he was quick to point out that the same conjunction influences and determines progress in all the sciences. And when this is associated with the indefinable something which Sir W. Turner was content to call "a sufficient touch of imagination"—by which he meant the power of seeing conjoined with the power of foreseeing, of projecting the mind into the future—we may expect something more than the discovery of isolated facts. Their co-ordination and the enunciation of new principles and laws will necessarily follow. "Scientific method consists, therefore, in close observation, frequently repeated so as to eliminate the possibility of erroneous seeing; in experiments checked and controlled in every direction in which fallacies might arise; in continuous reflection on the phenomena observed; and in logically reasoning out their meaning. Were the method followed out in its integrity by all who are engaged in scientific investigations, the time and the labour expended in correcting errors would be saved, and the volumes devoted to scientific literature would be materially diminished in size. Were it applied, as far as the conditions of life admit, to the conduct and management of human affairs, we should not require to be told, when critical periods in our welfare as a nation arise, that we shall muddle through somehow. Recent experience has taught us that wise discretion and careful prevision are as necessary in the direction of public affairs as in the pursuit of science; and in both instances, when properly exercised, they enable us to reach with comparative certainty the goal which we strive to attain." These words, which every worker who is not a mere drudge should take to heart, would alone redeem an address from all reproach of emptiness. There are many others of like quality which cannot be reproduced here.

#### The Question of Compulsory Arbitration.

REFERRING to the Taff Vale strike, one of our contemporaries remarks that its occurrence "must hasten the time when, in the interests of commerce and of humanity, the possibility of compelling recourse to some tribunal of compulsory arbitration will have to be decided by public opinion." This, it is true, is a very tentative and non-committal reference to compulsory arbitration as a means for settling trade disputes; but, as other more definite proposals for the adoption of such methods have been made in connection with recent labour troubles, and as attention is being called to the fact that the colony of New South Wales is about to legislate on the question on lines similar to those of the New Zealand Act—the author of which has been recently blowing its trumpet in the Daily Press—it may be as well to remind our readers of some of the results arising from the working of compulsory arbitration in the last-named colony. Those results were described at

some length in the "JOURNAL" last October, in a notice of an article in the "National Review" by a member of the Legislative Council of New Zealand—an article which, as we said, contained a whole armoury of weapons wherewith to defeat any proposal, were such ever seriously made, for introducing a scheme for the compulsory settlement of labour disputes in this country.

The results of the working of the New Zealand Act have been, briefly, as follows: First, it has led to the manufacture of disputes upon trivial points, raised by the Unions—not, in most cases, by the men themselves—in order to bring employers before the Court of Arbitration for the purpose of dictating to those employers, through the medium of the Court, as to the management of their business; the awards of the Court being enforceable by fine or imprisonment. One such award, it may be remarked, was to the effect that the employer was to give preference to members of the Union over non-unionists. The second result, consequent upon the first, has been that of immensely strengthening the Trade Unions, and making them virtual masters of the trade of the country. This has, naturally, led to a third result—namely, to embittering instead of improving the relations existing between employers and employed. The Trade Unions have, in fact, been enabled, by a clever handling of the Act, to largely get the upper hand; yet not so thoroughly as to satisfy them, for they have been agitating for an amending Act, one of the provisions of which would have made it a breach of duty for an employer to discharge a workman for being a member of a Union, and would have laid upon the employer the onus of proving that the discharge of any workman was not due to such cause!

We have thought it well to recall the results of the New Zealand Act, as described by an observer living in the colony, at a time when labour troubles are in the air, and when well-meaning individuals (who are often unconsciously very ill-doing) are certain to make plausible proposals which would be admirable, and would largely advance the Millenium—were human nature not human nature, and Trade Unions what they might be and not what they are. "If," observed the writer to whom we have just referred, "the New Zealand system can be said to have any value to other countries, it is as a beacon warning of danger, and not as a pattern to be imitated." Fortunately, as the proceedings at the recent Congress demonstrated, the Trade Unions of this country do not appear to be greatly enamoured of the proposed method of settling disputes; for a resolution in its favour was defeated by a large majority. Employers will not quarrel with that vote.

#### The Lighting "Interests" of Dublin.

THE observations and reflections on the remarkable history of electric lighting enterprise in Dublin which constituted our last week's "Electric Lighting Memoranda," have not proved palatable to certain personages who are more or less responsible for the state of things described. They were not meant to be. The strange jumble of influences which eventuated in making the proposal to further encumber the estate of the ratepayers of Dublin to an unknown amount—beginning with a "twopenny-halfpenny" job of a quarter of a million or so—a test of the practicability of Home Rule, does not make a satisfactory story. For this, not the narrator but the author is responsible. The most objectionable aspect of the tale is the predominant part played by various "interests," and the consequent subordination of merits to partisan influences. For pointing this out, we have been condemned in the usual strain by the "Freeman's Journal." It is no concern of ours which or whose interest this particular Dublin newspaper has defended throughout the negotiations that preceded the recorded result. Let it be granted that the "Freeman's Journal" is the freest and most independent of the numerous organs of Dublin opinion. It is certainly free enough in imputing special interest to the "JOURNAL," which it alleges to be "terribly perturbed" by the decision of the Dublin City Council on the electric light question. It goes on to remark that, "when the matter was under discussion, the public was assured that the gas interest was all in favour of the Corporation proceeding with the scheme. But now the organ of the gas interest denounces the whole scheme, and bewails the fact that the Corporation would not accept the Tramway Company's offer. . . . This disinterested criticism now reveals upon which side lay the hopes of the gas monopolists in the recent controversy." The imputation here is



plain enough. We have no objection whatever—quite the contrary, indeed—to any newspaper regarding the “JOURNAL” as the organ of the gas interest. The word “industry” would be preferable, in this connection, as possessing a wider and purer significance; but that is a question of taste. For us, the gas industry is the gas interest; and to this cause the “JOURNAL” is devoted. Otherwise, it would have no reason for continuing to exist. But the Irish newspaper now under notice does not understand the words it uses in this general sense. For it, the gas interest is the interest of the “gas monopolists” of Dublin—that is to say, of the Alliance and Dublin Consumers’ Gas Company. It is accordingly insinuated that the words of the “JOURNAL” upon the Dublin Electric Lighting Question are those of the Dublin gas proprietary and their officers. More—the asserted circumstance of our last observations on the subject being incompatible with some assurance at one time accepted as stating the views of the Dublin Gas Company on the same matter, is cited as furnishing proof of there having been some dark double-dealing in this regard. As we remarked in the article complained of, all this is Irish to the core. In justice to the Dublin Gas Company it should be stated in the plainest terms that the “JOURNAL” does not belong to them. Our views on the electric lighting of Dublin may be just or ridiculously mistaken; but they are at least not inspired by the Gas Company. We have criticized this Dublin affair on the merits. The view we took was that of the Select Committee of Parliament which investigated all the schemes. The victory of the Dublin Corporation was brought about by one of the most shameless political jobs in Irish history, which is saying much. If the “Freeman’s Journal” can delete the record from the Parliamentary Votes, then we will retract the statement; otherwise the evidence stands in our favour.

#### A New Discovery in Ventilation.

As all the world knows, Sir Benjamin Baker is an Engineer in the highest sense of the word—that of a man who can do things. Necessarily, he is able to do things, because he knows a very great deal about the capabilities of other things in general. A notable example of the connection in Sir Benjamin Baker’s mind between knowledge and power may be found in a letter of his to “The Times” on a subject which appears to have considerably exercised the popular mind—the thought of what might happen to a trainload of passengers in one of the new underground railways, if the motive power broke down and the ventilation simultaneously failed. Suffocation in more than Egyptian darkness seems the result generally expected. Such fears are, one is glad to think, groundless. To explain them away, Sir B. Baker published a statement which makes the strict chemists’ view of what is good air for breathing look rather ridiculous. Our readers will perhaps remember that we recently had a small controversy on this head with a chemist correspondent. It may also be remembered that some authorities on sanitary science have recognized the fact that mere superfluity of carbonic acid, as it exists in the air of carbonic acid gas-works, does not appear to materially affect the health of those who breathe the mixture. Sir B. Baker has now capped these facts with the declaration that the quality only too well known as an “oppressive condition of the air” is due more to temperature than to chemical composition. He says: “It has been practically demonstrated by physiological and chemical experiments that a live man might be sealed up in a lead coffin for half-an-hour without any resultant feeling of oppression—I say nothing of depression—provided he were treated as frozen mutton in a cold store, so that the air he breathed, though astoundingly foul from repeated breathing, might still remain cold.” This frank statement puts a fresh aspect upon the problem of ventilation. If for “pollution of the air” one is to understand “undue raising of the temperature,” it clearly follows that one’s ideas of what to do and what to avoid in the ventilation of gas-lit and other apartments must be reconsidered.

**Herr Dicke on Water Gas: A Correction.**—We regret to find that in the article by Herr H. Dicke on “Water Gas as a Remedy for the Prevalent Scarcity of Coal,” in the “JOURNAL” for the 28th ult. (p. 522), the estimated production of steel in Germany at the present time was inadvertently stated as 200 million instead of 2 million tons annually. The production in 1896—viz., 1,543,100 metric tons—was correctly given in the article.

## THE INTERNATIONAL GAS CONGRESS IN PARIS.

### PROCEEDINGS IN THE PALAIS DES CONGRÈS AND ELSEWHERE.

SEPT. 3 TO 8, 1900.

M. THÉODORE VAUTIER, PRESIDENT.

#### A REVIEW OF THE PROCEEDINGS.

THERE was quite a bustle in the precincts of the hall of the Palais des Congrès on Monday morning of last week just before the early hour of nine o’clock—the time fixed for the commencement of the great International Gas Congress, organized by the Société Technique de l’Industrie du Gaz en France. In the annexe to the hall were ranged long tables, on which were piles of the papers to be read, and large sheets of paper carefully ruled into divisions and headed for the reception of the signatures of the delegates from the various Gas Associations of the world. Looking down these lists afterwards, we saw the signatures of men whom we and the gas profession at large delight to honour—men whose lives seem to be (and manifestly are) devoted to the profession of which they are leaders, and which they have assisted to raise from a mere rule-of-thumb practice to a scientific and intellectual level. We would suggest to the Société Technique that the interesting sheets bearing their signatures, and of all the men gathered together at this the first great International Gas Congress, should be preserved as a memento of the occasion; and upon this record will gaze, with respect and admiration, future generations of gas men who have followed and filled the places of those who will, in time to come, be known only by their work. Walking among the large crowd assembled, the multifarious languages which greeted one’s ears were almost confusing. It was quite a study, however, to watch and listen to these many men who are working at the same profession the world over. In action and words, and on countenances, were excitement and pleasure expressed. Old acquaintances—some probably who had been separated for years—met and renewed their friendly relations; introductions were made; and new friendships were formed, which, though distance perhaps so soon as to-day has placed a broad gulf between them again, will ever remain dear. If the Congress results in nothing else than the drawing of the gas profession of different countries together, a not unimportant work will have been accomplished. Knowledge of a man creates a greater interest in his work; and what a Bunte, a von Oechelhaeuser, a Vautier, and many other men are doing will now to many excite a greater personal interest in England, America, Austria, Italy, and the other countries mentioned below.

Faithful to their promises, few of the “foreigners” (which description applied to our own English party sounded strange) who had promised attendance failed to put in an appearance; but a considerable number neglected to append their names to the roll. According to the latest returns just before the Congress, England had promised to contribute 70, Germany 110, America 40, Austria 30, Belgium 29, Holland 60, Italy 60, Russia 10, Switzerland 35, and divers 20—making a total of 460. But the signatures which appeared on the presence-sheets of the first day’s meeting were approximately a score from each of the countries excepting England, who subscribed something like fifty. When the bell rang announcing that the President (M. Th. Vautier) was prepared to commence the proceedings, there filed into the hall nearly sufficient to fill it—of course, the members of the Société Technique du Gaz being in evidence in preponderating numbers. But even when the room was fairly well packed (which was only once during the whole of the sittings, and that was during the delivery of the President’s “allocation”), there was nothing like the 1100 which the President had anticipated. But there were a great number who only paid fitting and periodical visits to the *séances*, and a few who, though in Paris, did not—we regret exceedingly—trouble to attend at all. But the bell had been rung, and the hall was filled; and on the raised platform were the President, with the General Secretary, M. Ph. Delahaye (to whom be all praise for his indefatigable exertions in making the Congress a success), the Honorary Presidents (who had received this distinction as Presidents of the foreign societies represented), the recording Secretaries of the different countries who had, as mentioned last week, engaged to prepare summaries of the proceedings, the Secrétaire-Archiviste (M. F. Villeneuve), and some of the members of the Organizing Committee. The Honorary Presidents who took their places at different periods on the platform were: Mr. James W. Helps, of Croydon; Mr. T. O. Paterson, of Birkenhead; Mr. George G. Ramsdell, of Philadelphia; Mr. William M’Donald, of Albany (U.S.A.); M. E. Beer, of Berlin; M. D. J. Cramer, jun., of Rotterdam; M. Victor Krafft, of Naples; M. Hubert Nachtsheim, of Vienna; M. Rothenbach, of Berne; and M. Verstraeten, of Brussels.

Of course, the central figure on the platform was M. Vautier,



whose industry and natural aptitude for leading and controlling had brought about the Congress; and if anything was wanting in the course of the proceedings which would have enhanced their value, it cannot be charged to any lack of exertion or aforethought on the part of M. Vautier. A few words will make him better known to our readers. In the columns of the "JOURNAL" his name has been brought intimately before the gas profession of this country; and several English engineers can claim a personal acquaintance, through the very graceful reception of, and courteous address to, the members of the Gas Institute on the occasion of their visit to Paris in the early part of the summer. In scientific circles of France, M. Vautier holds high rank. He is a Civil Engineer, a Doctor of Physical Sciences, Professor of Science at the University of Lyons, President of the Société Technique du Gaz en France, and holding that position he has presided over the work and deliberations of the Organization Commission for the Congress. Such being his qualifications, he was eminently fitted to occupy the distinguished position of President of the Congress. With regard to M. Vautier's connection with the gas profession, he is so placed that he has obtained a peculiarly wide acquaintance with the gas industry of countries in the south of Europe. In Lyons, he directs an office which centralizes the administration of a large number of Companies (some of whom are suppliers of both gas and electricity) in France, Italy, and Spain. M. Vautier is a Director of these various Companies; and he succeeded in these duties his father, M. Emile Vautier, who took a leading part in the foundation of the Companies in Lyons about the year 1840. M. Vautier's name is a prominent one in the transactions of the Société Technique, to which he has contributed the results of his study of several subjects—notably on the enrichment of poor gas by acetylene; on the mixing of acetylene and ordinary gas; on the photometrical measurement of different incandescent burners; and, as our columns have not long since testified, he has published a learned disquisition on the photometrical methods employed in France and other countries. In the domain of Physical Science, M. Vautier is the author of several experimental researches, the most important of which are memoirs on the flow of viscous liquids, and on the propagation of sound in cylindrical conduits of great length. In this last work, he was associated with M. Violle, a Member of the Institut de France.

This then was the man who by every right—as scholar, investigator, engineer, and President of the Société Technique—took his position as the head and conductor of the proceedings of this the first International Gas Congress. In his demeanour throughout, he exhibited a coolness, gravity, and proper conception of his duties which fitted his dignified position and the occasion. As soon as the hall was filled, he was on his feet, the little bell again tinkled, and the hub-bub caused by numerous voices and moving feet quickly subsided and quietness reigned, but only for a moment. The promiscuous assembly of gas engineers of nearly a dozen countries recognized that before them stood the man who had been the active spirit in bringing them together, and with one accord they blended their voices in hearty greeting, which caused M. Vautier's ordinarily demure countenance to relax with the liveliest gratification. Silence was again restored, and a multitude of faces were expectantly upturned to the President. M. Vautier had prepared his Inaugural Address; and, presumably in view of the vast amount of matter which had to be dealt with within the three days allotted to the sittings, he had kept his oration within reasonable bounds. Yet before such an audience, and with such an opportunity, it would have been pardonable if he had entered with freedom into the subjects of which he is a master, and absorbed a greater amount of time; but he refrained. An indication of the lines upon which the address ran is given in the *résumé* of the technical proceedings which follows this review. The composition and subject-matter of the address were enthusiastically approved; but having honoured the President to this extent, something like a third of the delegates unceremoniously made their exit from the hall, and many of them during the sittings did not again see its interior—in fact, the main design of their visit to Paris was forgotten in the seductive counter-attractions of the vast exhibition and the beautiful weather. So that, from this point (although there was always a very fair attendance, and many were punctilious and observant in their following of the proceedings), the numbers present rose and fell hour by hour with a fickleness equal to the barometrical inconstancies which we have been experiencing at home during this summer.

Again the bell rang, and again order was restored; and the President called upon Dr. H. Bunte, of Carlsruhe, to read the first paper, on "Incandescent Gas Lighting." Revered by all gas men not only for his great erudition and research in gas technics, but for his innate personal charms, his appearance on the platform was signalized by a spontaneous greeting which few men could have expected to receive in an audience of such heterogeneity. But having introduced the papers, it is convenient here to turn for a moment from the course the proceedings took to say that the order in which the papers were disposed of was determined at the Committee meeting held on the preceding Saturday. In all there were 29 papers; and in the three days 26 of them were read, or their contents described—the other three being taken as read owing to the absence, temporary or otherwise, of their authors. In addition to the address, four papers were read on Monday morning, and six in the afternoon; four on

Tuesday morning, and an equal number in the afternoon; five on Wednesday morning, and four in the afternoon. With such a bulk of material to present, little time could be wasted; and when there was any hesitancy in commencing discussions, after invitations had been addressed to the audience in (in some cases) two or three languages, it was taken that the Congress were in full agreement with the author, and the next paper was at once presented. In this way, the full programme, as settled by the Committee, was duly completed in the time allotted. On Dr. Bunte's paper there was no discussion; and the next paper by Messrs. Stoecklin, Rieder, et Cie. was taken in hand. It dealt with a kindred subject to that dwelt upon by Dr. Bunte—viz., "The Photometry of Incandescent Mantles;" and it culminated in the appointment of an International Committee who are charged with the duty of examining info, and establishing, a set of conditions for the regulation of the photometry of gas-mantles. On the Committee four English representatives have been nominated—Messrs. T. O. Paterson, J. W. Helps, C. C. Carpenter, and Professor Lewes. Germany, France, Belgium, Italy, Holland, Switzerland, and the United States are also to have representatives. Dr. Bunte and M. Vautier are among those already chosen to serve; and, as students of this particular subject, their assistance in arriving at definite conclusions will be invaluable. The wide separation of the Committee, and the inconvenience of leaving work and travelling long distances for consultative purposes, will, we fear, operate somewhat against this well-meant effort; but, with many others in the gas industry, we hope to see it bear good fruit. No words are required to emphasize the importance of the subject; the arguments in favour being all self-evident. If in any way the "JOURNAL" can be of service to the Committee, its columns are at their disposal. It may be mentioned that the Secretary to the Committee is M. Delahaye, of the Société Technique du Gaz.

During the Congress, the English party received many little tokens of the regard and friendliness of their French compeers; and it was with much appreciation that they heard M. Vautier call upon Mr. J. W. Helps, the President of the Institution of Gas Engineers, to succeed him in the chair before the third paper was read. This paper was by Mr. C. E. Brackenbury; and it dealt with a subject upon which the author can speak with some authority, and upon which he not long since made some remarks of sufficient effectiveness and poignancy to attract attention. But that is a bygone; and, while perhaps the chief disputants have not receded one jot from their positions, the Paris meeting has at least had the effect of bringing about their better acquaintance. This, however, is merely by the way. Mr. Brackenbury read his contribution on "Inclined Retorts" in French with a fluency which at once provoked the admiration and envy of his compatriots. The communication gave rise to a splendid discussion; and among others it brought into prominence the inventor of this system of carbonizing—M. Coze—who, on being announced, received the plaudits of the meeting. It is to be regretted that not a single English gas engineer spoke on the paper. The next paper was likewise related (as were the following two) to the carbonization of coal. M. Eichelbrenner was not present to read his contribution, which recorded his experiences on the question of "Independent Producers for Retort-Benches"—an interesting topic upon which, had it been open for debate, Mr. C. C. Carpenter might well have added his views. "The Measurement of High Temperatures" was the next subject to claim attention; and it was treated upon by Mr. Alten S. Miller, of New York. English speakers alone took part in the discussion, which was not altogether favourable to the instrument described.

The honour of directing the proceedings in the afternoon of Monday fell upon M. E. Beer, the President of the German Gas and Water Association. M. Euehène opened the sitting by discoursing as entertainingly as the subject would permit on "The Thermic Reactions in the Carbonization of Coal, and the Recording of High Temperatures." Contributions on water-gas questions came next from M. Sospizio and Herr A. Dicke. They were of a character which admitted of joint discussion, in which Mr. A. G. Glasgow, Dr. Leybold, M. Vautier, and M. Salomons were prominent. How to prevent naphthalene obstructions (which subject has been a standing dish ever since gas engineers first met in conference) was told by Dr. Bueb, of Dessau; and the same author dilated on the question of the manufacture of cyanides. A cognate subject was handled by Dr. A. Smits, of Amsterdam; but he was not present to read the paper. There was a good discussion—among the speakers on the first-named subject being Mr. J. P. Leather, who testified to his successful experience at Burnley; and on the latter M. Salomons and Mr. William Foulis subscribed useful information. Herr von Oechelhaeuser was also well in evidence on these and other subjects.

Tuesday morning saw England again honoured by the installation of Mr. T. O. Paterson, the President of the Gas Institute, in the central position on the platform. A splendid auditory had assembled to hear Mr. F. D. Marshall's paper on the "Mechanical Handling of Coal," which paper he had prepared in English. "For in spite of all temptations to belong to other nations, he remains an Englishman." (*Vide* the Centenary of Gas Lighting cartoon.) But very kindly, as the subject has already been dealt with by Mr. Marshall before the Institution of Gas Engineers, M. Krafft, of Naples, converted the paper into French, and himself read it to the meeting. Large



diagrams, some of which have seen service before on this side, were exposed to illustrate the plant described. We understand that it was Mr. Marshall's intention to contribute a paper on inclined retorts; but it was by the special request of the Committee that he dealt with the subject laid before the Congress. But when Mr. Marshall wants to relieve himself on the question of inclined retorts, there are the "JOURNAL" columns or one of the meetings of the Institution of Gas Engineers in or at which he could usefully do so. A companion paper to Mr. Marshall's was contributed by M. Louvel. It explained methods and plants adopted at the works of the Paris Gas Company for dealing with coke; and he went to great pains to let his audience gain a clear understanding of the plant. He was rewarded at the close by considerable applause. Again there was a change in the presidential chair; Mr. G. G. Ramsdell, of the American Gaslight Association, being desired by M. Vautier to take the honourable position. By this time, however, the attendance had appreciably thinned; and when Mr. Frederick H. Shelton, of Philadelphia, rose to explain the results of his experience and study of the question of "Reducing the Cost of Distribution by the Use of High Pressures," he had not such a splendid audience as his predecessors in the morning's programme. This was a pity, as the matter is one which bids fair to receive extended and serious attention. However, the author had the satisfaction of hearing a far better discussion on his effort than had many of the previous contributors to the proceedings. When the next paper was called, dealing with the subject of "Diminishing the Loss of Gas in Distribution," the author, Mr. P. H. Gibbons, also of Philadelphia, was absent; and consequently, Mr. Ramsdell gave place to M. Rothenbach, the President of the Swiss Gas and Water Association. Under his chairmanship, M. Weiss, of Zurich, described a paper, a large part of which consisted of tabular information concerning the operations of different works in Switzerland. Plans of the new gas-works at Zurich and of the works at Winterthur and Geneva were also explained. In connection with the Zurich works, M. Weiss asserted that they did not experience any trouble from the slipping of the coal charges in inclined retorts; and the point produced some interesting remarks. But some trouble was experienced in eliciting all the information which M. Weiss could have afforded on this and other points, if he could have comprehended the questions put to him in divers languages. Owing to this, not only with reference to this paper but others, there is no doubt that much that would have been valuable and instructive was lost during the Congress.

The President on Tuesday afternoon was M. Verstraeten, of the Belgian Society; and while he was in the chair there were some interesting communications. In M. Witz's contribution on "Gas-Engines and their Gas Supply" suppliers and users of gas-engines will derive some very serviceable knowledge; and the papers which followed, dealing with gas lighting from different aspects, will be found very informative. The authors were MM. Salzenberg, Himmel, and Lecomte. M. Lecomte is an earnest student of all matters affecting burners and lighting; and he delivered himself on this occasion (almost without a reference to his print) with a volubility, readiness, and a display of cognition which caused those to marvel who had not before heard him on his favourite topic.

During the afternoon, there was a little break in the proceedings, to enable M. Brix to give some particulars as to a special gas and water exhibition which it is proposed to hold in Vienna next year; and he expressed the hope that many of the members of the Congress would make an effort to be there. In a pamphlet dealing with the projected exhibition, it is stated that the Committee's idea is to celebrate the hundredth anniversary of the general use of gas for lighting purposes, and they have settled upon the city of Vienna as being the most suitable—first, because it is the place chosen for the next meeting of the German Gas and Water Association; secondly, because Vienna possesses one of the largest of recently constructed gas-works; and, lastly, but not least, because Vienna was so intimately associated with the invention of Dr. Auer von Welsbach.

Allied to some extent to the last subjects considered, was a proposal that a movement be set on foot among makers of gas-fittings with the object of producing more artistic patterns, "combining æsthetics with the advantages of incandescence by gas, account being taken of its lighting intensity, and of the smaller sizes of pipes which will henceforth suffice for obtaining a determined illuminating power." The Congress decided to invite Gas Associations to institute competitions on these lines, and to communicate to each other the results arrived at. Not long since, we saw some beautiful examples of artistic gas-fittings for incandescent lighting at the Royal Aquarium Exhibition; but at the same time there is no reason why competitions should not produce something of superior merit. Therefore we commend the suggestion of the Congress to our own Gas Associations.

The morning sitting on Wednesday contained a great deal of interest for English engineers. The honour of presiding was divided between Mr. W. McDonald, the President of the Western (U.S.A.) Gas Association, and M. D. J. Cramer, of Rotterdam. A paper on "The Educational Fund of the American Gaslight Association," written by Mr. Alfred E. Forstall, of New York, was successful in drawing a good discussion, in which Mr. J. W. Helps and Mr. Charles Hunt commented upon the "Gas Manufacture" examinations of the City and Guilds of London Institute. Their

remarks (the principal points in which we publish in our *résumé* of the technical proceedings) may induce the proper authorities to give some attention to this matter; for of our own knowledge, through verbal and written communications, there is not any very general satisfaction with the present examinations, even among candidates who have passed successfully through them. Succeeding Mr. Forstall's paper was one by M. Hedde, of Paris, on the question of interesting gas stokers in their work; and this gave Mr. C. E. Botley an opportunity of relating how he has accomplished the gaining of the interest of his men by a very simple process. The next paper was by M. Bouvier on "The Comparison of the Usual Methods of Lighting;" and incandescent lighting came out remarkably well. A question which has been troubling our own Gas Associations—viz., the standardizing of the threads of screws for gas-fittings—was introduced by M. J. Bengel, of Paris. France seems to be a great sufferer in respect of the variation of screw-threads; and the Congress decided to supplement the already difficult task with which the International Committee on the Photometry of Incandescent Burners are charged by deputing them to use their best efforts to bring about harmony in respect of screw-threads. Not the least interesting communication of the morning was a paper by M. Bolsius on "Prepayment Meters in Holland;" and, by figures, he disclosed the wisdom of pursuing an enlightened and liberal policy in connection with the system.

M. Krafft, the General Secretary of the Italian Gas Association, was the occupant of the chair on Wednesday afternoon; and at the commencement an extremely long paper on intensified lighting and cooking and heating by gas in Paris was summarized by M. Lévy. The brilliant examples of incandescent gas lighting which are now to be seen in Paris, through the energy and enterprise of the Paris Gas Company, invested the first part of the paper with considerable interest; and, in due course, we shall present our readers with a fuller notice than we are able to do in our *résumé* of the paper which appears elsewhere to-day. In two papers, M. Bigeard and M. Asselbergs expounded their views on the well-worn subject of consumers' wet and dry gas-meters; and the discussion which followed indicated that on the Continent opinion is as divided as to the relative merits of the two classes as it is in this country. If not instructive, the final paper, from the pen of M. Guichard, was interesting in that it described difficulties of a kind with which fortunately we are not so well acquainted in this country, in connection with the use of incandescent mantles for public lighting in Guayaquil, a town in Ecuador. Torrential rains and the invasion of insects are the two great enemies against which the mantles have to be protected.

The technical proceedings finished, there was a charming exchange of courtesies between M. Vautier on the part of the hosts and Dr. Bunte, as a chief among the visitors. In the success of this Congress, M. Vautier saw a happy augury for the future; and consequently he would not say "*adieu*" to his visitors, but only "*au revoir*." In appropriate phrase and words, which were punctuated by the approbation of all the visitors present, Dr. Bunte thanked M. Vautier and the Société Technique both for the cordiality with which they had received their visitors and the perfect arrangements they had made for the Congress. We may add the hope that these *réunions* will become a periodical institution.

There are a few matters of interest which occurred outside the Palais des Congrès to which reference must be made in order to complete this review of the week's proceedings. On Monday evening there was a reception of the delegates and their lady friends by the President and the Société Technique at the Hotel Continental; and it was a most brilliant affair. M. Vautier very courteously received his visitors, shaking hands with each, in the beautiful saloon in which the entertainment of the evening was provided. The programme of music and dance, which commenced about 9 o'clock, did not conclude much before midnight. The character of the music and dancing was charming, refined, and graceful. Refreshments were also served; and one and all left the hotel filled with the enjoyment of the evening, and impressed with the view that in Paris they know how to do these things, and that niggardliness is an unknown quantity when the pleasure of guests is in question.

During the midday adjournment on Tuesday, M. Vautier entertained the Honorary Presidents, members of the Organization Committee, Secretaries, and others to luncheon; and, in turn, the latter invited M. Vautier to dinner on Wednesday night at the Restaurant Voisin, Rue St. Honoré. M. Krafft, of the Italian Gas Association, was in the chair; and M. Vautier occupied the place of honour on his right. The greatest cordiality prevailed. Speeches were made by Mr. Marshall, Mr. Helps, Herr von Oechelhaeuser, Mr. W. T. Dunn, of the Gas Institute, a representative of the Paris Gas Company, and others. The value of such gatherings was pointed out as a means of bringing engineers more closely into personal contact, and also from an international point of view. Cordial thanks were expressed to the Société Technique and to the Paris Gas Company for their great hospitality. M. Vautier and others made appreciative speeches in response. M. Delahaye supplied a feature of the evening. In responding to the toast of his health, he gave the Sovereign or President of each country represented at the Congress.

On Tuesday evening, a visit was paid by members of the Congress to the show-rooms of the Paris Gas Company, 28, Rue du Quatre-Septembre, where a great variety of gas burners and



other apparatus were on view. The many forms of incandescent lighting exhibited were a striking feature; and a horizontal type of burner (the "Héliogène") with fringes of asbestos, claimed some attention. Perhaps most interesting of all was the Scott-Snell-Phillips self-intensifying lamp, of which details were given in the "JOURNAL" for Aug. 14. Gas engines and compressors, manufactured by the Company, were shown at work. The visitors were very generously entertained by their hosts.

Interesting mementoes of the Congress were photographically secured on Thursday morning. Near the Palais des Congrès, as many members of the Congress as could make it convenient to attend assembled; and a photograph was taken first of the President (M. Vautier) and all those who had been officially identified with him, and then of the whole body. In the afternoon, by invitation of the Directors of the Paris Gas Company, a number of the delegates proceeded, by saloon steamboats, to the Clichy Gas-Works. This event is noticed at greater length after the *résumé* of the technical proceedings.

Of course, during their stay in Paris the delegates spent their time liberally in viewing the Exhibition and the Gas Pavilion; and very greatly admired were the displays in the grounds of intensive incandescent lighting by the Paris Gas Company.

Gathered together under such genial circumstances, and having the strong position of the Société Technique du Gaz brought into comparison with their own respective conditions, it was not surprising that the members of the Institution of Gas Engineers and the Gas Institute should take the opportunity of informally talking over matters affecting the question of amalgamation; but no suggestion, so far as we can learn, was made which in any way has advanced the solution of the difficulty that blocks the way to the much-desired end.

By the end of the week, most of the English delegates had left Paris; and many of them have brought back recollections, which will be of an abiding character, of the kindly and courteous treatment of which they were the recipients at the hands of their colleagues across the Channel.

#### RESUMÉ OF THE TECHNICAL PROCEEDINGS.

To-day we give a *résumé* of the technical proceedings, and the text of two of the papers. In due course we shall publish the most interesting of the communications which were submitted to the Congress.

##### THE PRESIDENT'S ADDRESS.

The Congress was opened by the President with an address of some length. He called to mind the origin and general organization of the Congress, which was due principally to the Société Technique du Gaz. He traced the progress made in the gas industry generally during the latter part of the century, and more particularly since the year of the last Exhibition in Paris in 1889. He then proceeded to classify the papers which had been prepared for presentation, which, as already announced, cover a considerable amount of technical ground, commencing with the mechanical apparatus for handling coal and coke in gas-works, the carbonization of coal in inclined retorts, and the great utility of registering high temperatures by means of a pyrometer, and passing on to the means employed for purifying the gas, and taking out the cyanides by means of different processes. The various methods of burning illuminating gas came in for a large amount of consideration—the incandescent mantles of Dr. Auer von Welsbach receiving extended notice. Referring to this subject, the President alluded to the proposal to establish an International Commission for inquiring as to the advisability of universal conditions being adopted for testing the illuminating power of incandescent burners. The utility of employing water gas as an auxiliary to coal gas was also noticed; and the advantages gained from the use of such a gas for heating and cooking purposes was dwelt upon. The competition which illuminating gas had to face at the present time was mentioned; and the papers read at the recent Congress of Electricians were commented upon—the studies of Mrs. Ayton and M. Nernst being especially mentioned. As regards examples of practical gas lighting, he directed attention to the interesting displays in the Exhibition itself—gas under pressure being consumed in the avenue from the Trocadéro to the Château d'Eau, and the Gas Pavilion being arranged so as to show the best possible means of using gas to the greatest advantage in various ways. The future of the gas industry, looked at from the rapid review made by the President, appeared to afford every confidence as to its general prosperity.

A commencement was then made with the technical papers—those dealt with on the first morning being entirely from other than French authors.

##### INCANDESCENT GAS LIGHTING.

The first paper taken was by Dr. H. Bunte, of Carlsruhe.\* It dealt with a subject which was continually in prominence before the Congress, and which is indeed of paramount importance to the gas industry—that of the consumption of gas by incandescent burners. In opening, the author remarked that the success of incandescent lighting being removed beyond all doubt, the lighting power of gas was no longer an essential feature, but that it was of more importance to regard its calorific effect. There was

consequently considerable interest shown in the actual quality of the mantles employed; and for this reason the German Association of Gas Engineers, on the invitation of the author, had examined the question, and arrived at certain results. The point considered was what constituted, under normal conditions, the effective working of an incandescent mantle. The reply showed that from a carefully made mantle, under a pressure of 30 mm. ( $1\frac{1}{8}$  inches) of gas, and during 300 hours of combustion, an average intensity of 70 German or 56 English candles was given with a consumption of 120 litres of gas per hour. These results, compared with mantles made five years ago, showed a considerable amount of progress both as regards the economy of gas consumed and intensity of the lighting power developed. Whereas before, after 300 hours' service, the larger part of the mantles employed returned only 40 German or 32 English candle power (or a reduction of 45 per cent.), the present mantles, after the same length of time, showed a diminution which varied from only 12 to 20 per cent. The saving in money by the present mantles, compared with those formerly manufactured, was shown by the figures quoted of 3'43 c. per 100 German candles, as against a former 16'6 c. The author referred to the excellent lighting of the Champ de Mars, and congratulated the Paris Gas Company on the practical exhibition of incandescent lighting there offered to the public. Dr. Bunte then gave results from his own experiments with incandescent burners using various gases mixed with coal gas. While the latter *per se* gave a result of 70 German candles, when mixed with 20 per cent. of water gas the result was 105 candles. Thus, by the introduction and adoption of incandescent burners, there was open for the gas industry a very wide and active field of progress, which could not but prove exceedingly remunerative to those interested.

##### THE PHOTOMETRY OF INCANDESCENT MANTLES.

The paper that followed also dealt with the subject of the photometry of incandescent gas-mantles, and was contributed by MM. Stoecklin, Rieder, et Cie., of Mulhouse. It was remarked that up to the present the means of measuring the illuminating power of incandescent gas-mantles was very vague, and the instructions given by the German Gas Societies were rather incomplete. It was suggested that it would be useful to determine the required conditions to establish a definite standard for comparison of the results from mantles. The particular points on which a decision was necessary were the mesh and height of the mantle, the height of the chimney, the pressure of the gas, and the consumption per hour. It was suggested by the authors that the pressure should be fixed at 40 mm. or 1'575 inches, the consumption at 110 litres, or 3'885 cubic feet, and the height of the mantle at 75 mm., or 2'953 inches.

In connection with the subject under review, the President proposed the nomination of an International Committee to establish rules to settle the best means of regulating the photometry of gas-mantles. After M. Lecomte, of Paris, had drawn attention to the difficulties in connection with the subject, and the mistakes to be guarded against, it was put to the meeting and carried—"That, considering the universal interest, both for manufacturers and consumers of gas, in the exact understanding of the best means of utilizing incandescent gas-burners, an International Committee be appointed to determine the rules to be followed in the photometrical observations of the same, and that the Committee of the Congress be authorized to proceed with the organization of such an International Committee."

It may be conveniently remarked here that, during the afternoon of the following day (Tuesday) a Committee meeting was held, when four representatives each from England, Germany, and France were nominated, and one from each of the other countries represented at the Congress. The English names suggested were: Messrs. Paterson, Helps, Carpenter, and Professor Lewes—Germany being represented by Dr. Bunte, M. Krüss (Hamburg), and Dr. Schæfer (Dessau), and another; while only two names were decided on at the time to represent France—those of the President (M. Vautier) and the Secretary (M. Delahaye). Belgium also had a representative suggested in M. Verstraeten, Italy in M. Kraft, Holland in M. van den Horst, and Switzerland in M. Weiss; while the representative of the United States is yet to be appointed. It was decided that the secretaryship should be confided to M. Delahaye, of the Société Technique du Gaz, and that the first meeting of the Committee should be held in Zurich, unless otherwise arranged.

Although the names forming this International Committee give every confidence for the adequate examination of the subject, and although it may be hoped that their efforts will prove sufficient to give an impetus to the systematic testing of incandescent gas lighting, there are many pitfalls in their way to be avoided; and it is to be desired that the result of their labours will not be diminished by lapse of time and extraneous causes, as is often the case with similar commissions of inquiry.

##### INCLINED RETORTS.

The first paper dealing with gas manufacturing plant was that on "Inclined Retorts," by Mr. C. E. Brackenbury, of London. At this stage, the President of the Institution of Gas Engineers (Mr. J. W. Helps) had the honour of succeeding the President in the chair. The paper by Mr. Brackenbury, which was given in the "JOURNAL" last week (p. 580), provoked an adequate discussion, led by M. Victor Kraft, of Naples. He

\* A translation of this paper appears on p. 642.



called in question certain figures cited in the paper; basing his remarks upon the total capital expenditure on this means of carbonizing as given in the author's introduction. He overlooked the fact that these were more or less round figures, which explained the slight divergencies in the cost of the make per 1000 cubic metres. M. Coze, of Rheims, supported the author; and M. Bermejo, of Malaga, described an installation of four arches of nine inclined retorts which he had put up, and which had proved eminently satisfactory. He confirmed also what Mr. Brackenbury had replied to M. Ancel, of Lyons, regarding the illuminating power of the gas being the same from inclined retorts as from horizontal ones. The Secretary of the Union des Gaz in London (Mr. F. W. Himing) followed, and pointed out the enormous advantage which such labour-saving appliances as inclined retorts gave to the management of gas-works in respect of the control of the stokers. Both M. Weiss, of Zurich, and M. Kohler, of Metz, described their respective installations, and confirmed generally the working results of inclined retorts as set forth in the paper. Mr. Brackenbury, in reply to the discussion, said the figures given by him were the average of a great number of installations actually at work.

#### INDEPENDENT PRODUCERS FOR RETORT-BENCHES.

The next paper on the programme was not read; the author, M. Eichelbrenner, of Paris, being absent. Its subject is an interesting one, and one to which some prominence has been given of late—viz., the building of producers independent of retort-arches. The author described the peculiar situation of his works at Billy-Montigny. The site of the works was undermined by colliery workings, and in spite of well-made concrete foundations, the subsoil was found to give way continually. When rebuilding of the works was rendered necessary, the uneven settlement in the arches had therefore to be guarded against. For this reason, it was decided to separate the producers from the retort-arches and regenerators themselves. The former could be strongly built, and were little likely to be injured; while the latter might be easily damaged, and would be rendered useless by the slightest dislocation of the fire-clay blocks or the retorts. When the producers are separated from the carbonizing arches, it is an easy matter to shut off any arch that requires repairing, and the starting of another to replace it is much facilitated. The advantage of such a system consists principally in the fact that there is removed from the retort-house all accessory work, leaving it free for actual carbonizing operations; while at the same time the temperature of the subways in the retort-house is reduced, and the dust, &c., from clinkering is diminished. It makes possible, also, the use of an inferior quality of fuel, such as lignite and peat, which is of importance, considering the enhanced price of coal and coke. It further gives gas engineers greater freedom in the manipulating of the units of the retort-house. In water-logged soil, such as has often prevented the adoption of regenerative furnaces, the system is of utility in allowing generators to be placed on the most suitable site possible to be found. The principal objections urged against the arrangement described by the author are an increased first cost of the plant, and less economy in fuel, owing to the loss of heat by the travel of the producer gas. With regard to the latter, the author pointed out that it was of importance to distinguish between the difference of economy in weight and the economy in money. He found, with the average length of mains required to lead the producer gas to the regenerators, provided that ordinary care be taken, the loss of heat would be very slight. It was highly important to protect the producer-gas main as thoroughly as possible; and in the case illustrated, the sides were built in thick fire-clay, and banked all round with dry earth. The author's conclusion was that, as regards fuel consumed per cent. of coal carbonized, there was hardly any difference compared with that of the ordinary system. There was undoubtedly an increased cost of construction, which amounted to 8000 frs. or 9000 frs. (£320 to £360) on the ten arches constructed, or about 8 per cent. over the more usual arrangement. Remembering, however, the many advantages accruing from the adoption of separate generators, it was believed these were not purchased at too high a price.

#### MEASUREMENT OF HIGH TEMPERATURES.

The next paper was an American one, by Mr. Alten S. Miller, on the "Measurement of High Temperatures." He described the instrument he had been testing for some time past, and which seemed suited to the measurement and recording of temperatures of above 1000° Fahr. The author submitted that the advantage of an instrument recording high temperatures accurately was self-evident; and at present it was necessary to depend largely on the eye and memory. By the instrument described (see p. 643), the author said the required heats could be ascertained, and the necessary instructions given to those in charge of the gas-making plant not to let them vary from the temperature desired. With such an instrument, Mr. Miller thought that interesting information could be obtained of the temperatures developed during the carbonization of coal. It was obviously important to ascertain accurately these temperatures in the manufacture of gas.

The Chairman (Mr. J. W. Helps) thanked the author for introducing the subject, and remarked that a reliable pyrometer was especially of value in the manufacture of water gas. Mr. J. P. Leather, of Burnley, did not think the instrument described

by the author would really be a very accurate one. He (Mr. Leather) had obtained an instrument, with which he had not yet had much experience, invented by Professor Callandar, of Cambridge. This instrument, he explained, measured and recorded the electrical resistance of a platinum coil. It recorded on a scale of 1° Fahr. per millimetre. Consequently, the scale was a large one, and indicated practically to 1°. The superior limits of the instrument were something about 2000° Fahr. He quite believed the instrument to be a trustworthy one, both for low and high temperatures. It was remarked by Mr. A. G. Glasgow that an interesting point brought out in the communication was the fact that it was found impossible to calibrate the instruments scientifically—that was to say, by calculation. He referred to certain discrepancies, and then said that for practical purposes, it was, however, sufficient to know that this simple and ingenious instrument, when once calibrated, remained constantly correct. With reference to the use of the pyrometer, there was sometimes a disposition to think that, having once placed a pyrometer in a heated vessel, one was relieved of the care of constant watching and supervision. This view of the case had never appealed to him; for it was much more difficult to maintain a proper distribution of heat throughout a vessel of any size than to keep a practically constant temperature at any constant point. He did not, however, mean to belittle the advantages to be derived from the use of a pyrometer, continually measuring and recording high temperatures.

#### THERMIC REACTIONS IN THE CARBONIZATION OF COAL, AND THE RECORDING OF HIGH TEMPERATURES.

On re-assembling in the afternoon, the first paper taken was on the "Thermic Reactions in the Carbonization of Coal, and the Recording of High Temperatures." This was an "Official Paper of the Paris Gas Company," and was reported by M. Euchène. It was essentially one for study, running as it did into 180 pages, and containing innumerable tables of great value, and meriting minute examination. Apart from the length of the paper, respect for the enormous amount of work entailed in its compilation must, of necessity, have silenced any possible criticisms or remarks, except of a most general and unimportant kind, until time had allowed of its careful perusal. By this it is not meant in the slightest degree to detract from the valuable data and information thus given to the gas and chemical world by the Paris Gas Company. On the contrary, the warmest thanks are due to them for the magnitude and generosity of their intellectual gift. The paper is certainly one that will be referred to again and again in the future; and it may be expected to be regarded as a highly authoritative statement on a vastly important subject. The communication, as verbally given by M. Euchène, partook of the nature of a lecture, illustrated as it was by practical experiments. The first part dealt with investigations into the varying caloric conditions involved in the carbonizing of coal; while the second part treated, naturally enough, with the different ways and means of determining high temperatures. In the introduction, there was noted the difference in the point of view of the practical gas man who wishes to obtain merely the requisite heat for carbonizing by the smallest expenditure of fuel, and that of the scientific investigator who, ignoring the variations in the character of the plant employed, knows that the amount of heat required for decomposing a given quantity of coal is invariable. There followed an examination of the thermic developments and the loss experienced in distillation; and many valuable comparisons were made between the different qualities of coal, and between the results obtained, for instance, from the Siemens furnace and an ordinary one. Room for further investigations on similar lines was illimitable; and the opinion was expressed that the gas industry could not but profit by all that was attempted in this direction, because it was now confronted by rival industries, both young and eager, against which it must fight with all the arms of modern science. There was no discussion on the paper.

#### WATER-GAS QUESTIONS.

The next paper taken was by M. Henri Sospizio; and it was on the subject of carburetted water gas, and its use in coal-gas works. At this stage, M. Beer, of the German Association of Gas and Water Managers, was installed in the chair. It is to be regretted that M. Sospizio did not in his paper make the most of his opportunities. It would have been of considerable interest (as foreshadowed in the "JOURNAL" for the 28th ult.) to know how carburetted water gas could be beneficially adopted when hampered by enormous customs duties on the import of the oil required. Instead of dealing with this question fully, the author contented himself with giving merely a historical and recapitulated account of present water-gas processes. The author referred to the generally increasing importance of producing a gas of heating quality, rather than one for illumination—at all events, during certain hours of the day. It was also essential to make gas and sell it as cheaply as possible; and the production of it should therefore be more perfect than was at present the case, when only 16 per cent. of the coal was gasified, whereas with certain processes it was possible to obtain 60 per cent., or nearly 85 per cent. of the heating power from the coal. After referring, with patriotic satisfaction, to the work of Felix Fontana, the author proceeded to classify in two categories water-gas apparatus—the first, that in which water gas only is produced, being carburetted separately; and the second, that in which



the water gas is carburetted directly in the plant used for its production. As illustrating the former, the apparatus of Strache and that of Dellwik-Fleischer was described, and the composition of the gases made was given. In the latter class, the apparatus of Messrs. Humphreys and Glasgow, the Economical Gas Apparatus Construction Company, and Messrs. Cutler was mentioned. The description and the figures given in connection with these plants were merely a repetition of what has already been fully described, and are generally well known—indeed, the paper does not contain anything in the way of novelty. A compliment is paid to England for the severity of its hygienic rules as applied to carburetted water gas; but the observations on this point were only what Professor Lewes had already said in his report on the subject to the Corporation of Birkenhead. Apart from a solitary sentence in which the author remarks upon the customs duties which have prevented the general European adoption of water gas, and the advisability of the Governments concerned showing their wisdom by modifying these, he does not refer in any way to the particular point of view which one would have thought, from his position as Engineer of the Trieste Municipal Gas-Works, would have especially appealed to him.

Taken in conjunction with the preceding paper was one, under the title of "A Note on the Water-Gas System of Dellwik-Fleischer," by Herr H. Dicke, of Frankfurt-on-Main. In comparison with the other paper, it had the virtue of brevity; but it was perhaps rather too detailed in mentioning the various uses to which the process had been applied. The author followed rather closely the information on this system already given to the gas profession by Professor Lewes. The water gas produced on this method was practically identical with that obtained by similar processes. These, however, the author said, raised only 2473 calories per kilo. of carbon, as compared with 8080 calories from the Dellwik-Fleischer generators—the quantity of heat usable for water gas being three times as great as formerly. Twenty-five per cent. of this gas had been mixed with that from the carbonization of coal, with the advantage that the quantity of coal carbonized was reduced, and considerable economy was secured. There were three different methods of mixing the gas—firstly, by storing the water gas in a separate holder, and mixing it with the coal gas after purification, and carburetting it as required either at the inlet or the outlet of the main holders; secondly, storing the benzolized water gas in its separate holder; and, thirdly, leading the uncarburetted water gas from its gas-holder into the hydraulic main or the condensing apparatus. The last method was found more than usually advantageous, owing to the coal gas taking up part of the benzol from the coal-gas tar; thereby effecting an economy in the benzol used. Such was the process as it was adopted at Königsberg—the first town to install a Dellwik-Fleischer apparatus.

For the purpose of discussion, the two water-gas papers by M. Sospizio and Herr Dicke were taken together. M. Bigeard remarked on the great utility there would be, as far as France was concerned, in employing such water gas when there were great difficulties in the way of procuring coal at reasonable prices. Mr. Glasgow entered at some length into the question; his remarks being directed more particularly to M. Sospizio's paper, and only touching lightly that of Herr Dicke. His criticism hardly bears upon the *résumé* that we have given; and therefore when the paper is published *in extenso*, we will take the opportunity of appending the full note of his remarks. He complimented M. Sospizio upon the fine qualities of style and thought reflected in the paper; but he regretted his inability to accept some of the most important figures presented therein. Having had to enter into the question of the adoption of water-gas apparatus, Dr. Leybold, of Hamburg, confirmed the figures of Mr. Glasgow; and he stated that, after careful consideration, he had adopted the apparatus of Messrs. Humphreys and Glasgow in preference to any other. He found that the guarantees given had been absolutely realized in practical working. He had decided upon the adoption of the Humphreys-Glasgow plant after seeing the Dellwik-Fleischer apparatus at Warstein with Herr Dicke, and after visiting England. It was found preferable, at Hamburg, to measure and store the water gas separately, and afterwards to lead it to the hydraulic main or elsewhere as desired. The ordinary proportion of water gas used was 20 per cent.; and it was found that the Auer and other like burners gave even better results with such a mixture than with coal gas by itself. In some subsequent remarks by Dr. Leybold (which were translated from the German into French by M. Bouvier), he stated that, of necessity, only German oil was used in the plants. The attempts to reduce the customs duty in Austria and Belgium had proved successful; and there was the curious result that oil could pass through Germany for use in Belgium, but could not be stopped *en route* for supplying the water-gas plants in the country. He was of opinion that, notwithstanding the recent increased price of oil, the accessory advantages of water-gas manufacture fully compensated for the outlay. M. Vautier seemed to think that some were in favour of superseding the distribution of coal gas altogether by water gas; and he did not believe that the manufacture of the latter would prove less costly than the former. It was also to be remembered that with water gas there were no bye-products, which were of such great consequence from the gas manager's point of view. M. Salomons, of Brussels, corrected the idea that it was intended to advocate the total substitution by water gas of that from coal;

but he recommended the adoption of water-gas manufacture as an excellent means of meeting strike difficulties, in addition to its other advantages.

#### NAPHTHALENE OBSTRUCTIONS—THE MANUFACTURE OF CYANIDES.

There then followed two papers by Dr. J. Bueb, of Dessau, which, as in the preceding case, were taken together for facilitating discussion. The first one was on the means to adopt for preventing stoppages from naphthalene. The author remarked that all attempts hitherto in this direction had been to the removal of naphthalene deposits already formed by mixing with the gas vapours of xylol on the system of Bunte and Eitner. The process brought forward by the author was one used at Dessau, which extracted naphthalene from the gas in a very simple and cheap way. The principle was to lead the gas to the outlet of a Pelouze and Audouin condenser into contact with a tar oil. Such an oil has the property of dissolving, according to its temperature, some 25 per cent. of its weight of naphthalene. It also, of course, absorbs a certain quantity of hydrocarbons; and the loss in the illuminating power of the gas that is thereby made is recouped by carburetting it afterwards with benzol. Two or three compartments of a "Standard" washer can conveniently be used, not only to extract the naphthalene, but at the same time for the absorption of cyanides.

This led up to the second paper by Dr. Bueb, on the manufacture of cyanides in gas-works. He mentioned the English practice on this subject. The main idea of the process described consisted in treating the gas with a concentrated solution of sulphate of iron. Thus was formed a salt of ferrocyanide of ammonia. The cyanogen in this case is also taken out in two or three of the compartments of a "Standard" washer; and there is the great advantage that this bye-product is obtained in a saleable form. The means described differed from all preceding processes, inasmuch as the ammonia in the gas was used for the taking out of the cyanides, whereby the simplicity of the system was increased. The manipulation of the arrangement could be undertaken by an ordinary workman. To some extent, the sulphuretted hydrogen from the gas was abstracted at the same time. It was further found that meter drums and gasholder sheets were not attacked in the same way as formerly—no doubt owing to the thorough abstraction of the hydrocyanic acid. The author stated that actual experience showed that English coals contained more cyanogen than others; and in a works where only English coals were carbonized, the amount of cyanogen obtained would correspond to 7·4 grains of yellow prussiate per cubic metre of gas. The coal used in France would give from 4 to 5 grains, and Silician coal perhaps 6 grains.

The next paper was by Dr. A. Smits, of Amsterdam, on the absorption of hydrocyanic acid by gas; introducing the question of the progress that has been made in the manufacture of gas as regards the production of yellow prussiate of potash by liquid means. In the absence of the author, the paper was not read; but it serves as a supplement to the preceding communications of Dr. Bueb. The author remarks that it is singular that it has been considered necessary to purify coal gas from its ammonia before treating it with carbonate of potassium, with the iron salt in solution for the absorption of hydrocyanic acid. He proceeds to give good reasons for holding such an erroneous belief, and describes the means by which he came to find out this fallacy. Quite independently, he came to the conclusions already arrived at by Dr. Bueb at Dessau. The net result of the progress made on this subject was, according to Dr. Smits, that by the dried process one can absorb only 50 per cent. of the cyanogen; whereas by the adoption of the liquid system, about 80 per cent., and even more, can be obtained.

All these papers being analogous, there was a general discussion. Herr Oechelhaeuser described how he had struggled against the two enemies of naphthalene and cyanogen; and then M. Salomons gave a description of the principal processes employed in England in connection with the recovery of cyanogen, and the more or less "secret process" adopted at Beckton, of which mention has been made in the "JOURNAL."\* Mr. J. P. Leather, of Burnley, offered a few remarks on the naphthalene paper of Dr. Bueb, because he had studied the question independently of him, and had arrived at similar conclusions. He had been some time washing the gas at the works under his charge, to extract the naphthalene, and was at present removing from the gas 10 to 15 grains per 100 cubic feet—250 to 300 milligrammes per cubic metre. If the gas was first cooled below 20° C., this was quite sufficient to prevent all deposits of naphthalene on the works and in the distributing-mains. With the method described by Dr. Bueb, there was no longer need for anyone to be troubled with naphthalene stoppages. Mr. William Foulis mentioned that at the Glasgow Gas-Works they had been practically, and on a considerable scale, extracting cyanogen from the gas in the form of ferrocyanide of sodium; and the process had been carried on with considerable success. There were two methods that he knew of in use in England—one, the process which they had adopted at Glasgow. This was the passing of the gas into a separate scrubber, in which there was a solution of an alkali (potash or soda). In this solution was kept suspended an iron salt. What they did use was a carbonate of iron in a very fine state of sub-division, which was, by

\* See "JOURNAL," Vol. LXXIV., p. 293.



mechanical means, kept in a thorough admixture with the alkaline liquor, so that the whole was utilized in the formation of ferrocyanide. The other process was the one which he believed was in use at the Beckton Gas-Works on a very large scale. In this, the cyanogen was extracted by adding a solution of sulphate of iron to the liquor in the ammonia scrubbers. From the experience he had had, he certainly preferred to treat the gas for the extraction of cyanogen in a separate scrubber. Cyanide of ammonia was not of commercial value in any large quantity, but must be converted into a ferrocyanide of sodium or potassium before it became saleable; and if they could make this directly, without having to convert it from ferrocyanide of ammonia, it seemed the most advantageous system to adopt. They wanted to get an article that could be sold in a crude condition to chemists, who worked it up into the final products, because he did not believe the making of cyanide of potassium or sodium was a process that gas manufacturers ought to take up at all. It was sufficient for them to make the crude material, and sell it to manufacturers, who were much more competent to work it up than were gas manufacturers. By the first-mentioned process, they had no difficulty in extracting the whole of the cyanogen contained in the gas. The temperature at which the coal was carbonized affected very largely the yield of cyanogen. The higher the heats, the greater the amount of cyanogen.

#### THE MECHANICAL HANDLING OF COAL.

The first paper on Tuesday morning was by Mr. Frederick D. Marshall, of Copenhagen, on the "Mechanical Handling of Coal." Before it was read, Mr. T. O. Paterson, the President of the Gas Institute, was invited to take the presidential chair. Mr. Marshall, speaking in English, apologized for having served up what was really a *réchauffé* of what had gone before. He had had the honour of presenting papers on the subject before the Institution of Gas Engineers; but the matter was of such universal interest that he thought it would be acceptable at this international gathering of gas engineers. The installation had been at work now for five years, with great success. He was very much obliged to M. Krafft, of Naples, for having translated the paper into French at a moment's notice. M. Krafft then read the paper, which described the plant at the Frederiksberg works of the Danish Gas Company, at Copenhagen. It was made up of two distinct parts—first, the discharging into the coal-sheds of boats bringing coal into the port of Copenhagen; and, secondly, the handling from the port of the amount of material required per day. The first operation was carried out by means of six steam-cranes and boom trucks, which deposited the coal into tanks, from whence small waggons conveyed it to the three stores, each of which contained about 10,000 tons. The outer walls of the stores were constructed in Monier cement work, resting on substantial red-brick foundations; the internal division walls were of timber. The second operation was effected by trains of ten to fourteen waggons of 10 tons each. The trucks, which were discharged through the bottom, emptied their coal into a hopper, from which it was elevated and conveyed to the stores above the inclined retorts by band conveyors. Only two men were required in the handling of 120 tons. The cost of the installation at the port amounted to £55,000; and that at the coal-stores and the apparatus at the works, to £3500. The cost per ton of coal into the hoppers above the arches came out at 2'44d. Before concluding the paper, the writer wished to show his appreciation of the work of others in the same direction. Mention was therefore made of Herr Posschl's splendid system at Hamburg; and the work of Messrs. Graham, Morton, and Co. was also noticed.

#### COKE-HANDLING PLANT AT THE WORKS OF THE PARIS GAS COMPANY.

A paper by M. Louvel, dealing in considerable detail with the mechanical arrangements for handling coke at the works of the Paris Gas Company, was taken in connection with the foregoing contribution. The author showed various models of the apparatus employed in Paris, some of which possessed considerable mechanical ingenuity. M. Louvel remarked on the humanitarian aspect of dealing mechanically with the manipulation of coke, which, in the case of the Paris Gas Company, amounts to something like 750,000 tons per annum. Among other novelties described, were an apparatus for raising sacks at the rate of 400 per hour, and from which they could be easily lifted by the men employed; a sack conveyor of 100 metres in length, and of an elevation of 20 metres; and an admirable service of tip-waggons which throw the coke on the heap as required. The paper was well illustrated by models, diagrams, and photographs.

#### THE REDUCTION OF THE COST OF DISTRIBUTION BY THE USE OF HIGH PRESSURES.

As the next paper to be taken was an American one, on the request of M. Vautier, Mr. G. G. Ramsdell, the President of the American Gaslight Association, occupied the chair. The paper was one by Mr. Frederick H. Shelton, of Philadelphia, on the reduction of the cost of distribution by the use of high pressures. It was printed both in English and French, and was read in the former. The author remarked upon the increased yield and efficiency of retort-benches, and on the improvement that has taken place of late in the manufacturing departments of gas-

works, in contradistinction to the lack of progress in the distribution of gas, which is now practically what it was even twenty years ago and more. The consumption of gas had increased in enormous proportions; and there was necessity for ever enlarging the diameters of mains, which were more and more difficult to place owing to the many services for which room had to be found beneath the roadways. He suggested it would be advantageous, instead of placing larger pipes, to increase very considerably the pressure at which illuminating gas was distributed. The existing mains could be made to deliver from ten to fifteen times the volume of gas now carried; and would this not prove to cheapen the cost of distribution? The author did not deal with the financial aspect of his proposal, as he assumed the saving to be so obvious that the exact degree of gain was not the first consideration. Instead, he described several installations, on such lines as he suggested, that had been carried out in the United States with apparently satisfactory results. The chief points requiring attention were durability of the street mains and thoroughly tight joints, reliable machinery for compressing and pumping, proper regulating main governors and service-regulators reducing the high to the low pressure, and other appliances for the general safety of the working. He described how the towns of Phoenixville and Royersford, near Philadelphia, each with a gas-works, were connected together by a high-pressure main, so that the smaller gas plant of the two could be put out of action. At the end of this main, some 5 miles in length, two governors were placed for the reduction of several pounds pressure to that in the existing mains—viz., 2'7 inches. Thus gas was supplied to a town a considerable distance off without the use of a gasholder or storage plant. Sceptics predicted that the candle power of the gas would be reduced, that the governors would not prove reliable, and that there would be many dangers and inconveniences from the adoption of such a high pressure; but the author stated that none of these forecasts proved correct, although it may be remarked that no close photometrical observations have been made. The author illustrated the various appliances employed for safety-seals, house-service regulators, meters, and gauges. He thinks, from this rough beginning of high-pressure distribution, further developments may take place.

Considerable discussion followed the reading of this paper. Dr. Leybold remarked that wrought-iron pipes placed under the roadway where electrical tramways were running were deteriorated in a few months by the return current; and a considerable number of leaks and other inconveniences were caused thereby to the gas-mains. M. Marchal, of Nantes, confirmed this, and called to mind a paper written in 1893, by M. Gaston Gautier, on the subject of electrolysis. Mr. Charles Hunt, of Birmingham, was desirous of knowing whether Mr. Shelton had considered how far the saving to be effected in the cost of mains and services was counterbalanced by the increased cost of regulators needed for all consumers, and of high-pressure meters, assuming these to be also necessary. An inquiry was made by Mr. J. A. Norcross as to whether Mr. Shelton had seen this high-pressure system experimented with in the case of coal gas. In looking through the paper, he noticed the towns mentioned were using carburetted water gas or oil gas of some description. The means suggested by the author were very practical and simple, and would reduce the capital cost; but if it was necessary to use carburetted water gas in order to adopt the high-pressure system, it might in some instances prevent people trying it. There was a singular point in regard to that in the case of coal gas. The new methods of manufacture, such as inclined retorts and machine stoking, involved an increasing capital cost, which was the reverse of the object of Mr. Shelton's high-pressure system. If coal gas, on account of naphthalene depositing in small pipes, could not be used with the high-pressure system, then it necessitated the employment of carburetted water gas, which, instead of increasing the capital cost of the producing plant, reduced the outlay. So that in such a case the adoption of a capital saving in the distribution system also required the adoption of a capital saving in producing plant. Mr. S. Simmelkjör, of London, stated that about nine years ago he had occasion to provide a supply to a quarter of Buenos Ayres which had sprung up about 7 kilometres from the gas-works. He decided to use a high-pressure main, without a gasholder; but he determined to employ regulators on the way to the different consumers, and so on. This did not answer; and there was continual bother about it. He therefore decided to erect a gasholder, and had done away altogether with district regulators. He pumped the gas up to the holder, and from there distributed it to the district at the usual pressure of 1½ to 2 inches. He did not find any difference in the expenditure, and was satisfied the gasholder was the better plan. Replying, Mr. Shelton said the additional cost of taking care of each consumer was about \$2 to \$3; but then he had no additional outlay for pipes. The idea was to keep down capital investment, and get good results for half the cost of the ordinary amount of capital involved. The operating cost was perhaps ½d. or 1d. per 1000 cubic feet. He would not hesitate to compress coal gas just as easily and satisfactorily as he would water gas. Mr. Norcross seemed apprehensive of naphthalene troubles with coal gas. Some of the greatest troubles he had seen in this way had come from water-gas works. No inconvenience had been experienced in regard to electrolysis; and in this connection, he referred to the satisfactory experience of the natural gas people of America,



One engineer connected with the natural gas distribution in the Pittsburgh area had stated that, after twenty years' experience, he liked nothing better than wrought-iron pipes, and that they lasted a great deal longer than their enemies said they would.

#### DIMINISHING LOSS OF GAS IN DISTRIBUTION.

The paper by Mr. P. H. Gibbons, of Philadelphia, entitled "In What Manner can the Normal Loss of Gas in Distribution be Most Largely Diminished?" was, in the temporary absence of the author, taken as read. The great importance of reducing as much as possible loss of gas in the distributing-mains was emphasized. The choosing of a suitable site for a gas-works affected this; and the different causes of leakage, not only in the gas apparatus on the works, but in the joints of the mains and service-pipes in the town, were dealt with. There is nothing calling for great attention in the paper, as it dealt with a large number of small details. One point may be noted, and that was a suggestion that in the laying of pipes a record should be kept of the kind of earth in which they were embedded, as it was well known that the character of the soil had a considerable effect on the life of the pipes. For instance, pipes which had been laid for forty years were still found in a fair state of preservation; while others after a lapse of only ten years were utterly useless.

#### STATISTICAL AND OTHER INFORMATION CONCERNING SWISS GAS-WORKS.

The chair having been vacated by Mr. Ramsdell in favour of M. Rothenbach, President of the Swiss Gas and Water Association, statistical information regarding the operations of different gas-works in Switzerland was presented by the Swiss Society. These were of some interest to those connected with the working of Continental gas undertakings, and were ably summarized by M. Weiss, of Zurich. The general success of the works concerned was attributed to the reductions in the price of gas, to facilities given for its use for heating, the free fixing of service-pipes up to the meter, and in many cases no meter charges. In consequence of increasing demands, many expenses had had to be incurred at the Zurich and other gas-works. Inclined retorts, automatic handling of coal, De Brouwer coke-conveyors, and fuel boilers for burning dust were among the improvements adopted. It was mentioned that wear and tear expenses in connection with conveying plant for inclined retorts were found to be very small. As the motive force, electrical energy was used—5-horse power being required for every 15 tons hour. Several interesting drawings of portions of the Zurich plant were exposed for the information of those present.

In the discussion, Mr. Marshall said he understood that the transporter at the Zurich works was on the shuttle principle; and he inquired whether the wear and tear on the shuttle was not great. Also whether M. Weiss found that the shuttle, by jumping the coal forward, did not reduce it to fine particles, because it had been his (Mr. Marshall's) experience that all the trouble with the slipping of coal in inclined retorts was due to its fineness, and not so much to any special coal. Owing to the exigencies of the language, it was not found easy to continue the discussion at this stage, as English, French, and German were being used somewhat indiscriminately. After explanations, however, M. Weiss made it clear that slipping of the coal during carbonization was altogether unknown at Zurich, and that the coal used being German, and having been previously washed, there was little or no coal dust. Both Herr von Oechelhaeuser and M. Godinet, who had visited the works at Zurich, confirmed the regular working, and the small amount of coal dust made by the conveying apparatus. They also remarked upon the moderate amount of electrical force required for driving the plant. M. Rothenbach (*filis*) having added a few remarks, Mr. Marshall again observed that he understood the German coals were all washed; and this would account very much for what he had mentioned. But, all the same, he should like to ask M. Weiss whether he had his coal specially prepared, because it seemed so strange that in England, Germany, and Denmark gas engineers should experience the trouble of the coal running down to the mouthpieces, while another man with the same apparatus should be perfectly free from this nuisance. Mr. Helps, who said he had visited Zurich, complimented M. Weiss on the general arrangement of the works, which he considered were splendidly designed. But he thought that the amount of capital that had been spent there must be something enormous. M. Vautier asked Mr. Marshall to give a description of the conveyor he used into and out of the coal-stores. Complying with the request, Mr. Marshall stated that the conveyors were made of ordinary cotton bands about  $\frac{1}{4}$  inch thick, and perhaps 18 inches wide. These bands were started in 1894. Up to date, they had conveyed 240,000 tons of coal; and the wear and tear was practically *nil*. He believed the bands would go on for another three years without any repairs whatever; and when they did require repairing, it would only be a question of piecing in small strips. The bands would then be almost as good as new. The installation, as he had said, had been working since 1894; and he supposed the repairs to the machinery, and on the installation generally, had not cost 1000 marks in the six years.

#### GAS-ENGINES AND THEIR GAS SUPPLY.

On reassembling on Tuesday afternoon, M. Verstraeten, the President of the Belgian Association, was called upon to

preside. M. Aime Witz, of Lille, opened the proceedings with a paper on "Gas-Engines and their Gas Supply." He remarked that gas-engines possessed one general merit—viz., that they could be accommodated to all kinds of gas—the richest as well as the poorest, from acetylene down to blast-furnace gases. A gas-engine of 1000-horse power—previously a vague dream of engineers—was now an accomplished reality; and such a motor was to be seen in the exhibition in the Belgian section, by the John Cockerill de Seraing Society. Its cylinder was 1'300 metre diameter, and a 1'400 metre stroke. It developed from 560 to 670 effective horse power with blast-furnace gas of 985 calories per cubic metre. The practical utility of using blast-furnace gases for gas-engines was placed beyond all doubt; and similar success might be expected in employing gas from coke-ovens. Dowson, Gerdie, Lencauchez, Deutz, Pierson, Fichet et Heurtey, Bénier, and others, had contributed to this triumph of the gas-engine by their different systems of producer gases, of which some particulars were given. It was surprising that the Paris Gas Company in 1899 only sold  $\frac{1}{3}$  of their production (or 3 per cent.) for the use of gas-engines; while in Germany there were certain works which sold not less than 17 per cent. of their gas for motive power. Acetylene gas had been tried for use in gas-engines; but it had not fulfilled expectations, notwithstanding that it gave 14,000 calories per cubic metre, comparing with 900 calories for blast-furnace gases. M. Lencauchez had shown that the thermic efficiency of gas-engines did not vary to any extent with the richness of the gas used.

M. Marchal, of Nantes, commenced the discussion by complaining that, in the comparison of gases used for motive power, the price of coal gas was always exaggerated; while the price of producer gas was minimized. M. Witz remarked that the price of gas varied very much between one place and another, and that it was not easy to definitely state the exact value of each gas. Herr von Oechelhaeuser congratulated M. Witz on the work he had accomplished in this way. He himself wished the gas industry to consider favourably gas-engines using producer gas, because it reacted on the demand for coke. The President of the Union des Gaz in Paris (M. Salanson) had made experiments on gas-engines varying the richness of the explosive mixture. He had always found that the efficiency of the motor increased as the mixture became poorer. He thus confirmed, in part, the observations of the author on the efficiency of gas-engines for inferior quality gases.

#### COMPETITIONS FOR ARTISTIC PATTERNS IN GAS-FITTINGS.

Herr von Oechelhaeuser called attention to the above question, and submitted a resolution to the following effect, which was unanimously passed: "In view of the great importance attaching to the appliances used in the consumption of gas for lighting purposes, this Congress consider it to be absolutely necessary that a movement should be set on foot among makers of these and like appliances in all countries, with the object of producing chandeliers, brackets, &c., of more artistic patterns, combining æsthetics with the advantages of incandescence by gas, account being taken of its lighting intensity, and of the smaller sizes of pipes which will henceforth suffice for obtaining a determined illuminating power. The Congress therefore invite the various Associations of Gas Managers to institute competitions, on the lines above indicated, with prizes adequate in number and value, and to communicate to each other the results arrived at in their respective countries."

#### "LA LUMIÈRE BOULE."

The remaining papers taken during Tuesday afternoon dealt with different burners for illuminating gas. The first one was entitled "La Lumière Boule," and was written by Herr Salzenberg, of Crefeld. The title—"The Globe of Light"—was taken from the name given to the particular process of the author. He called to mind the different efforts put forth for increasing the intensity of the gas or air, the principal systems of which were named and described. For his own arrangement, the author claimed certain advantages. First, on the point of economy; the consumption of gas being 1 litre per candle, including the gas for the compressor. He also claimed an exceedingly uniform diffusion; and the colour of the light he described as sunlight yellow. There were two types of the burner—the "Universal" and the "Standard." Incandescent gas-burners, with compressed air, did not, in his opinion, show better results than the ordinary Auer burner. Further, it was found almost impossible to regulate the two supplies of gas and air; while with the author's arrangement this regulation was very effectively accomplished.

M. Lecomte questioned the statements of the author of the paper, and the advantages accruing from compression—the difficulty being in obtaining the proper proportions of air and gas for the mantles.

#### LIGHTING HIGH GAS-LAMPS.

M. Himmel, of Tubingue, followed with a short paper on the "Automatic Lighting of High Gas-Lamps." By means of a complete model, the author made clear the clever mechanism adopted, whereby gas-flames at a height of 8 to 10 metres could be easily lighted and turned off from the ground. The arrangement described was to be seen close to the Palais des Congrès.



A fuller description of the arrangement will be given when we publish a translation of the paper.

#### COMPETITIVE SYSTEMS OF GAS LIGHTING.

The concluding paper on Tuesday was one of considerable length, on "Competitive Systems of Gas Lighting" by M. A. Lecomte, of Paris. The author is a recognized authority on the subject, and has frequently contributed papers to the proceedings of the Société Technique du Gaz. He gave a *résumé* of the present paper, speaking first of experiments made as regards the heating power of various hydrocarbons, and their evaporation either heated or not. An injection of oxygen in the flame raised the temperature, and in certain cases its illuminating power; and it might be possible to obtain an efficiency without a mantle almost equal to that with incandescence. For obtaining a good illuminating effect from petroleum vapour, the high temperature of 300° C. was required, or double the temperature of volatilizing it. But it also caused trouble from choking up. The system shown in the Exhibition necessitated frequent cleaning, and the replacing of the small vaporizing-pipes every week. Alcohol had been tried in Germany for incandescent lighting; and a mixture of benzene with it gave very interesting results. A lamp had been brought out for burning this mixture, and was to be seen at the Gare de Thomery. At the close of the paper, M. Chevalet pointed out that the question of lighting by means of alcohol had been recently brought before the notice of the Congress of Applied Chemistry.

#### THE EDUCATIONAL FUND OF THE AMERICAN GASLIGHT ASSOCIATION—ENGLISH GAS ENGINEERS ON THE CITY AND GUILDS OF LONDON INSTITUTE GAS MANUFACTURE EXAMINATIONS.

On the third and last day, Mr. W. McDonald, the President of the Western (U.S.A.) Gas Association, took the chair at the commencement of the proceedings.

The first paper was by Mr. Alfred E. Forstall, of New York, on "The History, Character, and Results of the 'Educational Fund' Created by the American Gaslight Association for the Professional Instruction of Employees in Gas-Works." The paper was presented in both French and English; but it was read in French to the meeting by M. Godinet. The origin of the fund referred to was due to Mr. Walton Clark, the President of the American Association in the year 1895. He desired to see systematic aid given to young workers in the gas industry, so that those wishing to improve their knowledge and position could have every assistance afforded them. There were no gas textbooks, as such; and the only work of the kind proposed to be introduced was carried on by the City and Guilds of London Institute. The matter was taken up, and a Committee appointed; and in March, 1896, a class was started with a membership of 76. Four lists of questions were sent out every year, covering the practical duties of a gas superintendent. It was believed that from the answering of such questions the students would be familiarized with the books referred to, and that they would probably get the greatest good of all from the clear expression of their ideas in writing. Prizes were first of all given; but this idea was dropped, so that the average number of 100 students were kept together merely by a desire on their part for increasing the knowledge of their work. The author rightly remarks that it will not be necessary to labour the argument that so increasing the efficiency of young workers must prove eventually of value to the industry itself. He hoped that the example set by the Trustees of the Educational Fund would be followed with equal success in other countries.

The paper gave rise to a fairly good discussion; the first of the speakers being Herr von Oechelhaeuser. He prefaced his remarks with the observation that certain things might be very good in America, and yet prove the reverse in other countries. He then proceeded to describe what had been done at different places in Germany, and mentioned the report of the German Technical Commission held at Mayence during the present year. On the suggestion of M. Vautier, Mr. J. W. Helps gave some particulars of the working of the City and Guilds of London Institute, which had been referred to in the paper. This he did in English, which was very cleverly translated into French, sentence by sentence, by Mr. Walter B. Brady, the Assistant Secretary of the European Gas Company. It is unnecessary here to follow Mr. Helps's explanation; but towards the close of his remarks, he said it could be easily seen that the system had some weak points, especially in regard to the gas industry. Although Polytechnics and Educational Institutions were now rapidly growing in our country, it was not every town which, although it might possess a gas-works, was large enough to get sufficient students for a class in connection with the gas industry; and, therefore, those engaged on the gas-works in that town had no opportunity of getting the necessary instruction. It was in this connection that he could not help thinking that the plan drawn up and worked in America had much to commend it. Another point in connection with the Gas Manufacture Examinations was that the whole of the papers were set practically by one engineer, selected by the City and Guilds Institute. He could not help thinking that more value would be placed upon these examinations if the papers were set by some properly organized body of gas engineers; and it seemed to him that more value would then attach to the certificates awarded. From a competitor's point of view, and from the point of view of the manager, there was not the slightest

doubt the plan that had been suggested had many advantages. Anyone who had had the trouble of selecting a competent foreman must know what a difficult matter it was. Sometimes they could get a good organizer—a good man who was able to look after his workmen—but he had no technical ability; and if they had some plan whereby general education could be given to the employees of a gas company, this difficulty would, he thought, be to a great extent overcome. It was impossible for Mr. Helps to clearly state his views in the disjointed fashion necessitated by the translation of his remarks. M. Vautier thanked Mr. Helps for the information he had given, which, he said, had interested him very much. He then himself supplied an account of the lectures given at Lyons to the men employed in the gas-works there. Mr. Charles Hunt, of Birmingham, as a former Examiner of the "Gas Manufacture" section of the City and Guilds of London Institute, had found that the whole of the students who presented themselves for examination were drawn from the employees of gas-works, or from industries immediately connected with them; and they bore little or no evidence of having attended classes specially designed for their instruction. The questions were invariably put to test their practical knowledge, and not their theoretical knowledge only. He thought it was to be deprecated that any attempt should be made to convert a practical examination into a theoretical one. Mr. Helps appeared to think that greater value would attach to these examinations if they were conducted by a body of engineers rather than by an individual. He quite agreed that, if the examinations were in the hands of a body, as in America—such as the Institution of Gas Engineers or the Gas Institute—they might possess greater value; but beyond this he was not prepared to go. He had had some experience of attempting to frame questions with a colleague, and he found this difficult enough. He thought it would be still more difficult to frame questions by means of a Board, and that it would inevitably devolve upon one person to set them. He went with Mr. Helps to this extent—that the certificates would be of greater value if given by the Institution rather than by the City and Guilds of London Institute. Mr. Ramsdell pointed out that, when the educational work was first taken up in America, it was placed in the hands of a Committee; and they found more or less difficulty in the matter of preparing the questions, and particularly in handling the answers. They could not note the progress of a certain individual where different engineers were taking his answers, nor could they give them their proper ratio of merit.

#### INTERESTING STOKERS IN THEIR WORK.

The next paper was a detailed account of the systems adopted in various gas-works for interesting the stokers in their retort-house work—the author being M. I. Hedde, of Paris. The importance of the question was first dwelt upon; and a well-deserved tribute was paid to the Société Technique, who, as long ago as 1877, instituted the prizes that are annually given to deserving foremen and others engaged in French gas-works—see last week's "JOURNAL," p. 583. They had also obtained from the Government medals of honour to be given to the most worthy servants of gas-works in France. The author's examination of the various methods adopted for interesting stokers in their work, was divided into three parts. The first dealt with the custom of giving small additions to salary for increased make of gas and economy of fuel; the second with the foundation of clubs and institutions; and the third with benefiting the workmen and their families in old age. The last part of the paper was taken up with the discussion of the various means described; and certain suggestions were made. The author strongly held the opinion that it was not enough to merely pay a stoker the amount of wages due to him from time to time, but that it was also wise to assure him of assistance during time of trouble.

There was considerable hesitation shown in commencing the discussion on the paper. Ultimately, however, M. Rieder, of Mulhouse, said no doubt the silence of the German members of the Congress was to be attributed to the fact that the Government had centralized their work in this respect. M. Krafft mentioned that at Naples they had tried the method of sharing among the stokers 25 c. per day for each man according to the proportion of gas made per retort. This was in addition to their wages of 3.50 frs. per day; and a meal was also served to the men at the works which they would not otherwise have. Mr. C. E. Botley, of Hastings, remarked that, like the last speaker, he had for some years encouraged the stokers by giving them an extra amount of money in consideration of the work they did. A certain amount of work was put for the men to do, and a certain quantity of gas to be made; and after they had done this they were paid 2½d. for every 1000 cubic feet produced beyond the regular quantity. This was divided among the whole of the stokers. They had worked on this plan for many years past, and it certainly had resulted in them getting better work. He also found that, if the men got a bad fireman or a bad stoker, they very soon called attention to it, because they lost their extra money. He spoke very highly of the way his men had taken the matter up, and said undoubtedly it was a great assistance in securing good men.

#### COMPARISON OF THE USUAL METHODS OF LIGHTING.

M. D. J. Cramer, jun., of Rotterdam, occupied the chair for the remainder of the morning sitting. The paper which was



first taken under his presidency was by M. Bouvier, of Lyons, on "The Comparison of the Usual Methods of Lighting Explained by Diagrams." The author alluded to previous works on the subject which summarized, in addition to his own personal experience, experiments made by numerous specialists on the usual methods of lighting, so as to complete preceding papers presented to the Société Technique du Gaz. M. Bouvier sought to establish by means of diagrams a comparison between the principal means of illumination—how many litres of gas were necessary for an ordinary burner, an incandescent burner, by gas under pressure, &c., how much ordinary petroleum, and what electrical current ought to be consumed to obtain a given quantity of light. Several interesting tables of comparison were made from the point of view of the cost of the various illuminants—taking, for example, the town of Lyons. An ordinary burner for one carcel hour cost 2.5 c.; an Auer burner, 0.36 c.; incandescent gas under pressure, 0.2 c.; and acetylene, 1.5 c. The progress of incandescent gas lighting which was inaugurating the Twentieth Century was certainly, the author pointed out, one of the most salient features of the gas industry, and would no doubt contribute largely to its continued prosperity.

There was no comment on this paper; and the next one was immediately proceeded with. It discussed the question of

#### THE ADVISABILITY OF STANDARDIZING THE THREADS OF SCREWS FOR GAS-FITTINGS—A REFERENCE TO THE COMMITTEE.

The author was M. J. Bengel, of Paris; and he stated that, at the commencement of the industry of gas apparatus and fittings, Paris was the only maker of such; and naturally there came to be adopted the Paris system of screw threads. At Lyons, very shortly afterwards, there sprang up a similar industry; and the manufacturers there, in turn, adopted their screws. This inconvenience had developed to a considerable extent with the growth of the work to be done; and at the present moment in the Lyons district alone there were no less than six different screws or threads adopted. In addition to this, in France, there were the Rouen screws, the Nantes, and many others. Therefore, he suggested that it might be advisable for the Société Technique to nominate a Commission to undertake the study of the question, and to adopt a certain number of threads for gas-fittings—and the fewer the better.

Discussing the question, M. Lacaze confirmed the variations as quoted by the author, and added that such differences not only varied with the locality, but even the same firm in different years manufactured different threads. Some time back the Paris Gas Company initiated a thread that they tried to make national under the title of the "Type Parisienne," in the hope that, after becoming national, it might possibly become international. Some useful work on similar lines was attempted in Holland in 1898. It was mentioned by Herr Silbermann, of Berlin, that German manufacturers had already endeavoured to standardize the pitch of the screws used for gas-fittings.

In connection with this question of the standardizing of threads, in the afternoon of the same day, the Congress unanimously adopted an expression of opinion which was conveyed in the following form: "Considering the interest involved in the interchangeability of apparatus used in the distribution and consumption of gas from the point of view of the gas consumers, the opinion is expressed that gas companies might take the initiative, in conjunction with the manufacturers of meters and gas-fittings, to arrive at the general adoption of a uniform thread for each type of apparatus; and the 'International Committee on the Photometry of Incandescent Burners' is deputed to unite the various discordances, so as to adopt a standard thread and to prepare a report to this end, which will be communicated to all those interested."

#### PREPAYMENT METERS IN HOLLAND.

Time was approaching for the close of the morning sitting, when M. Bolsius, of Bois-le-Duc, commenced reading his paper on results obtained in Holland with prepayment meters. The number of members present at this stage reached the lowest point during the Congress—certainly not more than 50 then being in attendance. The paper, however, was a very conscientious and interesting one, containing a considerable amount of useful information on the subject. In his introduction, the author brought forward the claims of Minckelers in anticipation of Murdoch and Lebon for the discovery of illuminating coal gas. Proceeding, he said that within five years following the adoption of prepayment meters in Holland, out of about one hundred gas-works, both large and small, 43 had placed them at the disposal of their clients. From a summary of the figures for each of the works in question, it seemed that those adopting this means of paying for gas consumption were charged a fairly high price in consequence of the free installation of the apparatus required. By Jan. 1 this year there had been placed 27,785 prepayment meters, with an average annual consumption of more than 400 cubic metres each. After having reviewed the difficulties found in starting the system, principally in Amsterdam, it was recommended that the extra charge made should be fixed at 2 c. to 3 c. per cubic metre—say, 8d. per 1000 cubic feet. The gas-works at Amsterdam passed, on Aug. 10, 1898, from the control of the Imperial Continental Gas Association to that of the town; and there were on that date 915 prepayment meters in use. At the end of the same year, there were 934; and by the end of the following year, the number had increased to 1869. At the present time, installations were being made at the rate of

about one hundred a week. A detailed description followed of the organization of the service at Amsterdam; and the author expressed the opinion that wise and liberal measures in the direction of the prepayment system proved of great benefit to a gas undertaking, and gave considerable advantages to the small householder at a reasonable cost, tending thereby to an amelioration of his social condition. The author acknowledged his indebtedness to Mr. George Livesey, of the South Metropolitan Gas Company, for figures which he had been good enough to supply to him; and the paper included figures referring to the working of the system by that Company.

M. Salomons, of Brussels, called in question several of the figures given by the author, and said that, on the first adoption of prepayment meters at Amsterdam a little before 1895, the additional charge made represented 5 per cent. on the price of the gas sold. M. Vautier asked what was the cost of the installation of such a meter. The author replied that it had been approximately 100 frs.; but to-day, owing to the increase of prices all round, it was rather more. M. Krafft, of Naples, said that in his town prepayment meters had rendered great service to the Company. They placed one free burner with each meter.

#### INTENSIFIED LIGHTING AND COOKING AND HEATING BY GAS IN PARIS.

On re-assembling in the afternoon, M. Krafft, the General Secretary of the Italian Gas Association, occupied the chair.

The third paper contributed by the Paris Gas Company to the Congress was proceeded with. It was divided into three parts, describing the intensive lighting in the Champ de Mars, and the heating and cooking apparatus adopted by the Company. This paper of 90 pages was ably summarized by M. Lévy. The Company, it was stated, had considered it would be advisable to give to the general public a practical example of the best means of street lighting; so they made arrangements for the illumination of part of the Exhibition of 1900, as they had previously done in 1889. A historical review was next given of the application of intensive burners for public lighting; and burners known under the names of the "Quatre-Septembre," "Schülke," and "Giroud," and the Auer burners, No. 1 giving 4 carcels from 80 litres of gas, and No. 2 6 carcels from 120 litres as adopted by the Company since 1893, were mentioned. After this, gas-burners under a pressure of 1.50 metres of water gave 1 carcel light with a consumption of 12 litres of gas. These burners, however, were unsatisfactory on account of the noise they made; and the mantles were not durable. The first Denayrouze burner of July, 1896, and the Welsbach model of 1898 were referred to. For the Exhibition the Paris Gas Company employ gas under pressure rather than air, so as to avoid the necessary services for the latter. They burn the gas under a pressure of 200 mm. in Bandsept burners, consuming 1350 litres, and giving 35 carcels. The compression installation for the Champ de Mars was also described. The modifications made to the lamps were mentioned, so as to permit them to have burners of 300 to 1750 litres. To advance still further in this direction, the Company had devised lamps for ten mantles, of 350 litres each, and even more. The gas lighting under pressure was used for the main avenues from the Eiffel Tower to the Château d'Eau. There were 4676 mantles, which gave altogether 90,000 carcels. The duration of those working under pressure was 42 days, and those in the ordinary lamps was about the same. An interesting comparison was made between the lighting of this quarter of the Exhibition by electricity in 1889, and that now carried out; the result being that the illumination was 4.7 times greater in the present Exhibition than in that of eleven years ago.

M. Krafft complimented the author on his interesting paper, especially on account of the great effort put forward by the Paris Gas Company in regard to the lighting of the part of the Exhibition referred to.

There being no remarks on this part of the paper, the second section of it was proceeded with, dealing with heating by gas. It was remarked that in recent years considerable progress had been made in this department; and the Company had conducted careful experiments from the point of view of the hygienic conditions involved in the construction of the heating appliances—the verification of complete combustion, the calorific efficiency, and the general good working of the stoves. Detailed figures and results of the examinations on these points were given.

The third part of the paper—cooking by gas—was next considered. It was observed that the gas-flames for this purpose could be either white or blue; the former being an illuminating flame, without previous mixture of air, while the latter was non-luminous, and had been so mixed. Each had its advantages in certain cases. At Paris, in one of the large restaurants on the Boulevards, it was reckoned that 1300 grammes of coal were consumed per meal, or with gas 200 to 250 litres.

M. Daudy, of Angers, inquired as to the best means of cleaning kitcheners, which were often returned in an exceedingly deplorable state. The author replied that the Paris Gas Company were occupying themselves with this question, and were organizing a special service in connection with it. M. Krafft remarked that it was not every small family that wished for a few thousand cutlets per meal, such as could be cooked by the large stoves described in the paper; and he gave an account of a simple little gas-cooker that he had introduced for the Neapolitans.



## CONSUMERS' WET AND DRY METERS.

The subject of consumers' meters next came in for treatment; two papers having been prepared by M. Bigeard, of Angers, and M. Asselbergs, of Bergen-op-Zoom. The authors showed unanimity in connection with the respective merits of wet and dry meters, favouring on the whole the latter. Their conclusions were, however, strongly combated by MM. Rouget, Lacaze, and Chamon. The former of the two authors referred to a discussion on the question by the Eastern Counties Association in 1891, and also pointed out some inconveniences of wet meters when placed with new consumers belonging to the working class. Since the introduction of the dry meter, several improvements had been effected in construction; and it seemed to be rapidly growing in favour in certain countries. In order to judge the respective merits of the two systems, the author recently established at his own works a special installation fitted with two meters—one dry and the other wet—registering successively the consumption of gas; and it was interesting to note that the indices were practically identical. Wet meters often gave trouble from frost (and the straining of parts resulting therefrom) and faulty diaphragms; and frequent examination was occasioned. Therefore the author asked whether it would not be useful first to obtain their official stamping, and to establish a laboratory for the testing of meters on the two systems. It was observed that in all European countries, except France, the exact registering of consumers' meters was under the control of the weights and measures regulations.

The second author—M. Asselbergs—in his more detailed examination of the subject, referred to the work done by English gas engineers, mentioning a meeting in London in 1884 at which the opinion was expressed that the dry meter registered too little. In opposition to this, German gas managers had stated that the reverse was the case. Eight reasons were advanced by the author for favouring the adoption of dry meters, and each was treated in turn.

Discussing the papers, M. Rouget defended the use of wet meters, which, by the test of years, had been found more practical. He maintained that the faults noticed by the authors of the papers were easily remedied. The proof of the superiority of the wet meter, he thought, was to be found in the fact that the official verification of them in Switzerland extended to double the time allowed for dry ones. M. Lacaze proceeded to confirm what the previous speaker had said; and M. Chamon followed on the same lines. He considered the superiority of the wet meter was acknowledged by the fact that a greater tolerance was admitted for dry ones. M. Weiss, of Zurich, stated that, according to the new federal regulations, the inspection of dry meters had to be made every ten years; while that of the wet ones was carried out every twenty years. But in Switzerland generally, and in Zurich in particular, they were gradually replacing wet by dry gas-meters, owing largely to climatic conditions. M. Salomons said he thought the discussion undoubtedly showed the wet meter was the more exact of the two, but that the dry had advantages in certain localities, and its mechanism was very simple. When the prepayment system was first introduced into Amsterdam, the form of meter adopted in connection with it was the dry one; and dry ones were demanded by new consumers. M. Rothenbach confirmed what had been stated by M. Weiss, and explained his reasons for preferring dry meters.

## DIFFICULTIES IN THE PUBLIC LIGHTING OF GUAYAQUIL.

The last paper submitted at the Congress was one by M. Guichard; and it described certain points in the public lighting of Guayaquil—a town in Ecuador. The paper was interesting, inasmuch as it showed the special means to be adopted in special cases. The difficulties in the one described were the result of torrential rains and various insects, which attacked the incandescent mantles employed. On the morning following the placing of 60 of these mantles in the public lamps, 50 were entirely destroyed by these insectile attacks. Protection was given by adding a glass, 7 c.m. diameter and 16 c.m. high; and the lamps were hermetically sealed to ward off the heavy rains. Suitable means were adopted for lighting the burners, and the difficulties encountered were successfully overcome.

## PRIZE FOR IMPROVEMENTS IN THE AUTOMATIC LIGHTING OF INCANDESCENT BURNERS.

The end of the technical part of the Congress having been reached, M. Vautier again took the chair. He brought to the notice of the assembly the prize competition of the Société Technique du Gaz (open to inventors of all countries) for improvements in the automatic lighting of incandescent burners. They had, he said, set apart for the purpose 5000 frs., which would be distributed among the successful competitors.

## THE CLOSING SCENE—"NOT ADIEU, BUT AU REVOIR."

M. VAUTIER, again rising, said: Gentlemen, we have now arrived at the end of the technical meetings of the Congress. The Committee, as a whole, thank you for having made their task so easy, and so agreeable. I shall keep, for my own part, in perpetual remembrance the honour I have had in presiding over the first International Congress of our industry. I am glad to say our meetings have been a great success; and I congratulate you on so satisfactory a result. This has been due to

the number and importance of the papers read, to the sustained interest in the discussions, to the perfect courtesy that has reigned among us, to the charm of the acquaintanceships that have been made and been renewed, and, finally, to the presence of considerable numbers of members of different countries, among whom we have had the privilege of counting many of the greatest authorities of our industry. It does not devolve upon me to say that this Congress will be followed by others; but I see in this connection a happy augury for the future in the result we have obtained, and in which one of the most satisfactory features is the undoubted manifestations of cordial agreement between the Technical Societies who have come to assist at the Paris Congress. The "International Commission on Incandescent Photometry" which you have formed will leave behind it a practical mark and a moral tie between all. I hope, then, in conclusion, we can say not "*adieu*," but "*au revoir*."

Considerable appreciation of the President's remarks was manifested; and, stepping to the front of the audience (most of whom rose),

Dr. BUNTE said: The first International Gas Congress is at length finished; and I am convinced it has faithfully fulfilled the good hopes that we entertained in regard to it. We do not wish to leave without expressing to the Committee of the Congress, and to the members of the Société Technique, our sincerest thanks for the initiative they took in this undertaking, and especially are we obliged to the President, who has had the trouble of directing the meetings. I mention the name of M. Vautier, to whom we offer our warmest thanks for the charming manner in which he has conducted the affairs of the Congress. I ask you to join in an expression of approval, and to show honour to M. Vautier, the President of the first International Gas Congress.

Loud applause followed these remarks; and then the members dispersed. Thus ended the main part of the programme of the conference.

## SUPPLEMENTARY MEETINGS IN THE GAS PAVILION.

After the official termination of the technical proceedings of the International Congress, there were held on the three following days—Thursday, Friday, and Saturday—what were called "Conférence-Causeries," or informal meetings on different subjects of interest to the gas industry. The gatherings took place in the saloon of the Gas Pavilion, and were organized by M. Mallet, a Past-President of the Société Technique du Gaz. It may perhaps be doubted, however, whether such additional meetings were altogether well advised, considering the amount of work that had already been crowded into the three days of the official programme. There was an attendance varying from 30 to 50, which, under the circumstances, was as large as could reasonably be expected.

The opening address was by M. Godinet on the subject of the "Utilization of Natural Forces." These he cited as wind, tides, and sea waves, which might be expected to be largely used in the future as sources of energy. How to calculate the horsepower of waterfalls was then shown, and hydraulic mechanisms, wheels, and turbines were described, with the means of driving dynamos therefrom. There followed a survey of the arrangement of hydro-electrical works; and figures were given as to their cost. After considering the financial and technical aspect of high-power electrical stations, and the conveying of current long distances, the speaker concluded by indicating the effect such competitive sources of supply as those mentioned might have on the gas industry.

On Friday morning, M. Euchène, of the Paris Gas Company, lectured on "Thermic Reactions in Gas Furnaces," summarizing again his valuable paper on the subject read before the Congress, as already reported. His remarks were closely followed, and were illustrated by several interesting experiments. Various laboratory appliances, used for the valuation of the heat made and absorbed in gas-furnaces, were employed, and an actual experiment on a sample of coal was successfully carried out. M. Hovine followed on the familiar subject of "Inclined Retorts." He had, however, little of novelty to add to the subject; and his remarks were to some extent a repetition of the Congress paper of Mr. C. E. Brackenbury, to whom he very heartily expressed his acknowledgments. M. Hovine questioned the advisability of adopting retorts 20 feet long, as he thought that the length affected the regularity of the depth of the charge. He also advocated the bygone use of telescopic charging shoots, instead of the now general separate ones. Re-assembling in the afternoon, the Diesel petroleum-engine was described in detail by the aid of diagrams by M. Malle. Either oil or gas could be used as the motive power of the engine; but the former was found the more economical. An exhibition of Holophane globes brought the afternoon to a close.

At a much later hour on Saturday morning than was announced, M. André explained different stoves used for heating and cooking by gas. The latter were put into actual service during the afternoon by a well-known French chef, M. Driessens, who practically exhibited the use of "Gas in Culinary Art." After remarking on the general advantages of gas in the kitchen, being more hygienic, clean, and convenient than coal, he stated



that there were some things that it was absolutely impossible to cook to perfection except by gas. He proceeded, with masterly ability, to give positive proof of the fact; the results being tested by his interested audience.

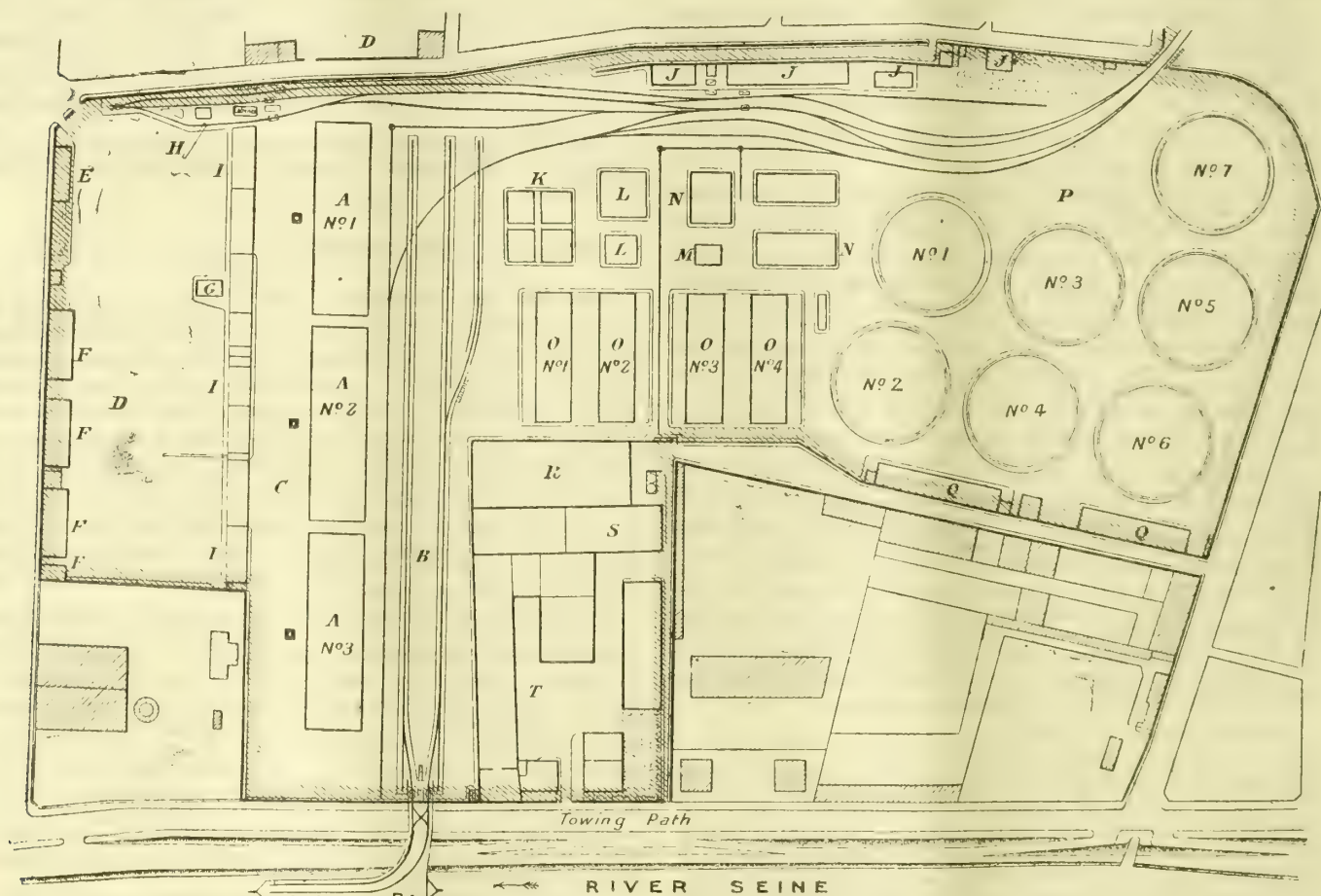
Thus were terminated, in a practical manner, the informal meetings of the International Gas Congress.

#### THE VISIT TO THE CLICHY WORKS OF THE PARIS GAS COMPANY.

It was glorious weather on Thursday afternoon when rather more than 200 of the delegates, accompanied by a few ladies, embarked at the Pont de la Concorde on two steamers which had been chartered by the Paris Gas Company for the purpose of enabling the visitors to see the Clichy Gas-Works—the largest of the Company's stations. The Board of Directors (to whom the delegates were much indebted for their exceedingly handsome treat) and the engineering staff were strongly represented, and one and all laid themselves out to interest and please their guests. The trip up the river, through the Exhibition and some of the most beautiful of the environs of Paris, was much enjoyed. Through the unpunctuality of a few of the visitors at the start, time was getting short when the works were reached; and the inspection had to be made rather hurriedly. By the courtesy of the chief officials, we are enabled to give a short description of

the works, which will be of interest in connection with the plan which we reproduce, and copies of which were distributed among the party.

The Clichy works, which cover a superficial area of 17 hectares, consist of the gas-works proper; a building for the preparation of the coke, with mechanical appliances for its classification, transport, and stacking, together with a drier (about which some information was given at the time the Gas Institute visited the works in June last); sulphate of ammonia works; and works for the manufacture of carts and waggons required for the transport of material. The works are connected with the Seine by an elevated railway and staging 17 metres high, on which there are three cranes for the raising of coal from barges. Two of these cranes work by steam; and the other is manipulated by a gas-engine of 16-horse power, which allows of 240 tons of coal being raised in ten hours. The works are also connected by a siding with the Western of France Railway. The average annual gas production of these works is 100 million cubic metres—a little more than one-third of the total production of the Company; and the maximum daily production is 400,000 cubic metres. The total quantity of coal carbonized is 320,000 tons. The works are equipped with 1440 retorts in three separate houses, containing in all fifteen benches of twelve settings of eights. The ovens are back to back in pairs; and the retorts are singles. They are 3 metres in length, 65 c.m. wide, and 35 c.m. high. The generators are on the Siemens system, with recuperation by



A. Retort-Houses. B. Coal-Yard. C. Coke-Yard. D. Coke-Stores. E. Coke Sale Office. F. Stables and Farriery. G. Bagged-Coke Drier. H. Coke-Heaping Platform. I. Retort-Stores and Workmen's Lavatories and Dressing-Rooms. J. Offices, Warehouse, &c. K. Pipe Condensers. L. Exhausters. M. Pelouze and Audouin Condensers. N. Pumps and Water-Tank, Smithy, and Store for Purifying Material. O. Purifier-Houses. P. Gasholders. Q. Station Meters and Warehouse. R. Chemical Products Store. S. Sulphate House. T. Wheelwright's Shop and Wood-Stores.

inversion. The coal is carbonized in four-hour charges. Scoop charging is adopted at the rate of two per retort, or 150 kilos. of coal per retort, which gives a total charge of 900 kilos. of coal per retort in 24 hours. The consumption of fuel is 15 kilos. of coke per 100 kilos. of coal carbonized. The stokers are paid by piece, at the rate of 3'30 frs. per 1000 kilos. of coal. For fulfilling certain conditions, they also receive a premium of 50 c. per day, and another of three hectolitres of coke per month, and a gift of about 30 c. per day taken from the profits of the Company. The gas on leaving the retorts passes into sheet-iron hydraulic mains; and thence into long sheet-iron condensers, 1850 square metres in superficial area, in which cooling of the gas commences—an operation which is completed in vertical pipe condensers, of 7225 square metres superficial area, and cooled by water in summer. It then goes into the piston exhausters (six in number), with three horizontal cylinders joined together, each capable of exhausting 84,000 cubic metres of gas per 24 hours. The speed is governed by bell regulators. From the exhausters, the gas flows into Pelouze and Audouin condensers (eight in number), which take out the last trace of tar. It next travels into "Standard" washers—four in number, operated by a gas-engine and Laval

steam-turbines—for the absorption of the ammonia. The gas then flows into small purifiers, 124 in number, filled with Laming material—a mixture of oxide of iron, sulphate of lime, and sawdust. This retains the sulphur and the cyanogen in the condition of prussian blue. After purification, the gas passes through ten meters, each of which is capable of measuring 36,000 cubic metres of gas per day, and it then goes into store. There are seven single-lift gasholders, as shown on the plan, having a total capacity of 215,000 cubic metres. The gas leaves the works by three pipes, each 1 metre in diameter. The gas is enriched by cannel coal or benzol. The corrugated retorts on the works are still under trial. Their average thickness is  $4\frac{1}{2}$  to 5 c.m. (instead of  $6\frac{1}{2}$  to 7 c.m., as in the ordinary retorts). This decrease in thickness enables them to transmit more rapidly the heat to the interior, and to carry a larger charge of coal. The result is a diminution in the consumption of fuel for the carbonization of a given quantity of coal.

On the return journey to Paris, refreshments were liberally provided, and thanks were tendered to the Paris Gas Company for the interesting and enjoyable visit, and for their generosity. M. Gigot, the Chief Engineer of the Company, remarked on the



pleasure it had been to them to receive guests of so many nationalities. The scientific attainments of Germany were well represented; the practical constructional engineers of England were also well to the front; and America, with its perfect mechanical appliances, had its representatives. Other countries were also mentioned. M. Beer, of Berlin, responded on behalf of the German section; M. Godinet expressed the thanks of the members of the Société Technique, who had enjoyed the Company's hospitality; and Mr. C. E. Brackenbury, of London, as Acting-Secretary of the Institution of Gas Engineers, expressed the acknowledgments of the English contingent, as well as a general feeling of thanks for the sustained kindness and habitual courtesy shown by the French. M. Sospizio, of Trieste, spoke of the indebtedness of the Italians. The party reached the landing-stage at about 6.30, having spent a very enjoyable afternoon.

**Intensified Gas Lighting.**—The Intensified Gas-Light Company, Limited, have recently completed, for the Strand Board of Works, an installation of their high-pressure system of incandescent gas lighting in the large refuge-lamp immediately opposite the Law Courts. The bronze lamp-column is a very handsome one, carrying five large lanterns, hitherto fitted with seventeen flat-flame burners, having a total consumption of 170 cubic feet, and giving the light of (say) 500 candles. The Company have substituted eleven intensified burners, having a consumption of 110 cubic feet of gas per hour, and an illuminating power of 3300 candles. The compressor is fitted up in the lavatory beneath the refuge.

**German Acetylene Association.**—The second general meeting of this Association will be held at Düsseldorf from the 13th to the 16th inst., under the presidency of Professor O. Diefenbach, of Darmstadt. The following are the chief technical communications which will be presented at the meeting: "The Utilization of Blast Furnace Gas for Motors in relation to Carbide Manufacture," by Herr Neumann, of Cologne; "The Cost and Prospects of Carbide Manufacture by the Aid of Blast-Furnace Gas," by Herr F. Liebetanz, of Düsseldorf; "The Influence of Temperature on the Yield of Carbide and the Different Types of Furnaces," by Herr E. Grauer, of Lauffen (Württemberg); "The Market for and Prices of Carbide," by Dr. Münsterberg, of Berlin; "The Methods Adopted by the Association for the Analysis of Commercial Carbide," by Dr. E. Cederkreutz, of Hämeoski (Finland); "The Economical Importance to the People of the Carbide and Acetylene Industries," by Dr. A. Frank, of Charlottenburg; "How have Central Acetylene Supply Works Answered in Practice?" by Professor J. H. Vogel, of Berlin; "Advances in Railway Lighting by Means of Acetylene," by Herr Herzfeld, of Augsburg; "Mains and Services for Acetylene," by Herr D. Bernát, of Vienna; and an Experimental Lecture by Dr. H. Goldschmidt, of Essen, with a practical demonstration of the welding of gas-pipes. An excellent programme of festivities and social functions has been provided.

**Interesting Presentations to the Late Gas Engineer at Derby.**—Mr. Charles Taylor, Assoc.M.Inst.C.E., who recently retired from the position of Engineer and Manager to the Derby Gas Company, was made the recipient of two beautiful presents from the employees on the 31st ult. The gifts consisted of a silver salver, which had been subscribed for by the staff and the men at the Cavendish Street works, and a very fine carriage clock from those at the Litchurch works. Both bore suitable inscriptions. The presentations were made in the Board-room of the Company—Mr. H. Swinger, the Chairman, presiding—by Mr. W. Edge and Mr. T. Mason, the foremen at the two works, who referred to their long association with Mr. Taylor, and expressed the regret of all that the time had come for the severance of their connection with one who had always shown himself to be an upright, honourable, and straightforward gentleman. Mr. Taylor, on rising to acknowledge the gifts, was very heartily received. He said he should treasure them not only on account of their value, but more especially because of the good feeling which prompted the givers. Such gifts, such kindnesses, and such feelings were almost beyond the power of thanks; but he could assure those from whom they had emanated that they would remain with him and in his memory as long as he lived. The occasion was an opportune one to name another pleasing incident, and it was that the Chairman had sent him from London a silver inkstand, with the following words attached: "With kind regards as an expression of good feeling to Mr. Taylor on his retirement, H. Swinger, July 3rd." He could assure the Chairman that this kind act would long be remembered, and that his pleasing gift was very highly valued. Referring to his successor, Mr. J. Ferguson Bell, he expressed the hope that the men would work pleasantly under him; and he wished Mr. Bell success, prosperity, and happiness in the work which he had undertaken. Mr. Bell, moving a vote of thanks to Mr. Swinger for presiding, congratulated Mr. Taylor upon the pleasant feeling that existed between him and the workmen, and said he hoped that, as time went on, this feeling would continue. That trust and confidence should exist between the Manager and the men was of the highest importance; and it was his earnest wish that the employees of the Derby Gas Company would long remain a happy, united, and contented body of workmen. Mr. H. Bullivant (the Secretary) briefly seconded the motion, which was unanimously carried, and acknowledged by Mr. Swinger.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 654.)

THE week just closed on the Stock Exchange was quite the counterpart or continuation of the preceding week, so entirely did the characteristics of the one resemble those of the other. Business was, of course, on the most moderate scale—quite at holiday low pressure—and that was the only unfavourable feature about it. Business hours, too, were curtailed by the closing of the Exchange on Saturday. But in spite of this, the cheerful feeling which had brightened the previous week was undiminished; all the influencing factors being propitious. So prices all round looked up; Consols and the gilt-edged division leading the advance. The Money Market was easier, though there was a slight disposition to fluctuate. In the Gas Market, there was some show of a disposition to renewed activity, though naturally, at this time of year, there could be no expectation of a marked tendency. But, better than that, was the evidence of recovery from the low figures to which some issues had recently been put down, and the precise reason for which has never been quite clear. Thus changes in quotation, though not numerous, are in the upward direction without exception. In Gaslight issues, very fair business was done in the ordinary almost daily at steady prices within the quotations; and the secured issues were fairly brisk at the old figures. But neither showed any tendency to push higher. South Metropolitan was little dealt in; and the prices at which it changed hands gave no particular indication of any tendency. A little was done in Commercial at middle prices. The transactions in the Suburban and Provincial group were extremely scanty; but some nice advances in value were made—Tottenham and Edmonton and Crystal Palace having a good rise. The Continental Companies were extremely quiet, but strong; Union and Imperial advancing. Nothing observable occurred among the remoter undertakings, beyond a slight advance in River Plate. Business in Water was much the same as usual; and the favourable tendency continued, Chelsea and East London advancing.

The daily operations were: Monday opened with moderate business in Gas issues—chiefly Gaslight and Tottenham. Prices were good; and Tottenham "A" rose 3. Transactions were more limited on Tuesday; but prices were on the rise. Imperial and Tottenham rose 2 each, Crystal Palace 1, and River Plate ½. Wednesday produced no greater activity; but prices were firmer, and Union rose 2. In Water, Chelsea advanced 2. Thursday's operations were on a par with the previous day's, and nothing moved. A quiet day on Friday closed a quiet week. Tottenham "A" advanced 3, and Crystal Palace 2. In Water, East London rose 2, and Chelsea 1.

### MR. A. D. PROVAND, M.P., ON THE COAL PROBLEM.

LIKE the oysters in the pathetic story of "The Walrus and the Carpenter," articles on the coal problem "follow thick and fast." Last week we dealt with Mr. Benjamin Taylor's paper in the "Nineteenth Century;" to-day we have to notice a contribution on the subject to the "National Review," by Mr. A. D. Provand, M.P., who took a leading part in bringing the question before the House of Commons during the past session. The letters in which he urged upon the Government the need for a new Royal Commission to inquire into the many aspects of our coal resources and consumption, were dealt with in the "JOURNAL" at the time of their publication. As our readers know, Mr. Provand was not successful in his efforts to obtain the appointment of a Commission. He now renews his plea and repeats his arguments, dealing, moreover, with the question more fully than he could do in the course of his correspondence with Mr. Balfour, though, as he remarks, his present article "is necessarily incomplete—a volume would be required to treat the question with adequate fulness."

Mr. Provand naturally begins with an account of the causes which, in his opinion, have led up to the state of affairs that has prevailed during the greater part of the past year. Over most of that ground we need not now travel; but we may recall a point made more than once in these columns, and noted by Mr. Provand—namely, that the effect of a small excess of demand over supply is, in the case of an article of prime necessity to the whole community, altogether disproportionate to that excess. "When, of any necessary article, such as food or firing, there is only enough to supply twenty, and there are twenty-one who desire to be supplied. . . . the advance will not be merely 5 per cent., but several times as much." The excess of requirements over output in the case of coal has certainly not been more than 5 per cent.—equal to 11 million tons—but the price has gone up anything between 50 and 100 per cent. The moral, of course, is (and it is worth emphasizing, for the encouragement of the pessimistic) that a 5 per cent. increase in the output, or a similar shrinkage in demand, would have a correspondingly disproportionate effect on the market in the opposite direction.

Mr. Provand seeks to minimize the amount of importance to be attached to the influence of the increase in the exports of coal in helping to bring about the present high prices; but we cannot say he is successful in the attempt. In fact, we entirely fail to



see the point—we were almost going to say the sense—of his argument. He says: "The exports and the coal shipped for the use of steamers taken together (making all that went abroad) were, for the first seven months of last year, 31,973,484 tons, and for the same period this year, say, to 1st July (*sic*), 32,805,809 tons, making an increase of only about 2½ per cent., or, actually, 832,325 tons. There was nothing in this extra export which would have affected the price." Here we may remark that Mr. Provand appears to have forgotten his previous statement, that a small difference between demand and supply may have a large effect on the price of coal; and it will be seen that the increased demand in question is equal to about ¾ per cent. on the total output for the period. He proceeds: "Indeed, if the export by itself had been likely to affect prices, these would have advanced in 1898, *instead of last year*; for while the increase of shipments for the first seven months of this year is very small, the increase of 1899 over 1898 was about 17 per cent.—say, 6 million tons. Moreover, the whole of this increase was between January and August last year; but there was no general movement in prices until September."

We have italicized words in these sentences, because they appear to us nothing less than absurd. How in the world could an increase of exports in 1899 of 6 million tons compared with those in 1898 affect prices in 1898? As to the argument that the sending of an additional 6½ million tons of coal out of the country in the early part of last year cannot be said to have been in any way responsible for the advance in the price, because that advance did not become fully developed until later in the year, we need only ask whether it is seriously suggested that the fact that, on the approach of last autumn, stocks of coal throughout the country were at a minimum and, but for the aforesaid increase in exports, would have been several million tons heavier, had no share in bringing about the scarcity and dearness of coal during the ensuing winter. No one has argued that the increase of coal shipments has been the sole cause of the high price; but the suggestion that the reduction of the quantity available for home consumption by 6½ million tons did not play an important part in the enhancement of market rates, is made for the first time by Mr. Provand, and is hardly worthy of one who comes forward as an expert in the coal question.

There are one or two other blemishes in an otherwise valuable article. Mr. Provand says that the principal cause of the higher price, "is undoubtedly the largely increased consumption of coal in our manufacturing and metal industries, which altogether consume 60 per cent. of our production." His own figures show that the percentage does not exceed 50—a difference of over 20 million tons. Again, Mr. Provand says that the Royal Commission of 1871 estimated that our consumption of coal in 1901 would be 162,400,000 tons. He omits to say that the Commissioners gave more than one estimate, and that the one to which they appeared to attach most importance put the production in 1901 at 203 million tons. The quantity of coal available was reported by the Commission as 146,480 million tons; Mr. Provand speaks of 146,680 millions. The last is a small mistake; but the others should not have been made in an article which is intended to provide the public with accurate information.

Mr. Provand estimates the increase in the average price of coal over that for the first nine months of last year at the moderate figure of 6s. a ton, which, on an output of 220 millions, amounts to an increase in cost to consumers at home and abroad of £66,000,000 per annum. Of this sum, he assigns 11½ millions to the miners, or 6s. 3d. per week per man; the balance he assumes to go, in indeterminate proportions, to the mineowners and the middlemen or coalfactors. It is only fair to these two last named to say that some portion of the 54½ millions has gone in extra cost of materials and higher freights—perhaps the odd 4½ millions. A round £50,000,000 is, however, a goodly sum whereout to lay by for a rainy day.

Emphasis is strongly laid on the great extent to which the trade of this country and the maintenance of her population depend upon coal. This dependence has increased with great rapidity; the coal raised per head of the population having risen from 52 cwt. in 1858, to 108 cwt. in 1899. Mr. Provand points out that we import nearly four-fifths of the wheat and rather more than two-fifths of the meat we consume, besides very large quantities of other kinds of provisions. To pay for this, we have to export manufactured goods (which are dependent upon coal for their production) and coal itself. "All the money in the country would not pay for six months' supply." It is, therefore, essential to our existence as a nation that we should have coal available at a price which will enable our exported goods to hold against all comers the foreign markets from which we obtain our supplies of food and raw materials. The two comers chiefly to be feared are, of course, Germany and the United States.

The competition of the former is not likely to be so formidable as that of the latter. Like our own country, Germany "has had many industries largely stimulated by the expenditure of taxes. She has problems to face in regard to labour, which will come in demands for higher wages, shorter hours, and in other ways; and the perennial conflict between the agrarian and commercial interests will always create serious difficulties. Her coal output is less than half as much as ours, the quality inferior, and the price higher. . . . There is nothing to fear from her competition which we may not overcome by education and industry."

It is from across the Atlantic that the most severe competition will come, and will be widely felt. "The basis of American success will be that, excepting tea, coffee, sugar, and a few minor articles, they produce all, and in some articles more than, they can consume, and have, therefore, large quantities of food, cotton, and other products to sell to the world. Their resources of cheap coal and iron-ore are almost without limit." Whereas the average value of coal at the pit in England has ranged from 8s. 3d. in 1890 to 7s. 6d. in 1899, and the yearly average never fell in that decade below 5s. 10½d., the price at the pit-head in America has fallen from 5s. 2½d. in 1890 to 4s. 8½d. last year, and never exceeded 5s. 4½d. in the interim. Yet up to 1889 the cost of coal in the States was always appreciably higher than in this country. These are facts pregnant with future influence on British trade, and not creditable to British enterprise.

In this connection, we may quote Mr. Provand's remarks as to the cost of railway transit of coal in this country, made in reference to the suggestion of the railway companies that they should raise their coal-carrying rates in view of the increased cost to them of coal. In Mr. Provand's opinion, these rates ought rather to be lowered, and could be if only the companies would provide improved rolling-stock for goods traffic, such as that used in America, where carriage is only a fraction of what it is here. "The difference between the American rates and ours are (*sic*) better understood when we say that a 150-mile haul with us would add fully 7s. per ton to the cost of the coal, whereas in the United States it would only add about 2s." There is no room for doubt that John Bull has got to bestir himself, if he does not want Cousin Jonathan altogether to "wipe his eye" in commerce. "Mr. Punch's" cartoon last week was decidedly *à propos*. Mr. Provand has no good word to say for the proposal to clap a 5s. duty on coal exports. "The expediency of such an import will not, I believe, bear examination, and the general public have probably little knowledge of the results which it would produce. . . . We should. . . . add to the cost of that which is indispensable to the maintenance of our commercial position—namely, food and raw materials."

Finally, the case for a Royal Commission, with widely-drawn terms of reference, is put before the public; the need for careful consideration of all possible means for economizing the consumption of coal being especially and wisely urged. "I am confident," says the writer, "that in many cases those who use coal for steam raising are unaware of existing inventions and methods which would enable them to work with increased economy." As to the general questions involved—"A large mass of accurate information is now in possession of the Geological Survey, of mining engineers, of merchants, and of others, which would be available for a Royal Commission. Whether the conclusions of a Commission would be favourable or otherwise to our commercial prospects, measured by our coal power, is quite beside the point. What is required is a knowledge of the facts so far as it is possible to procure them, in order that we may prepare for the future and avoid being taken by surprise." We hope that after the General Election such a Commission as that for which Mr. Provand pleads will be appointed. Meantime, Mr. Provand has done much to inform the public, and to stimulate their interest in a question of tremendous national importance.

#### THE CONSTRUCTION AND CARE OF GAS-ENGINES.

THE increasing popularity of the gas-engine as a convenient supplier of motive power, claims for any additions to the literature connected with it some notice at the hands of those whose duty it is to record the progress of the industry which is so intimately bound up with the success of this engine. We therefore direct attention to two books which have lately reached us dealing with the subjects referred to in the head-line.

The larger work is a joint production, which, although professedly a practical treatise on gas-engine construction, is concerned mainly with the design and building of one of half-horse power.\* The authors acknowledge that there are in existence many good books on the theory, design, and form of the gas-engine, but none furnishing instruction as to how to make one, and moreover to make it well. It is to the task of supplying this want that they have applied themselves, and they have produced a book of 282 pages of text, with a very large number of illustrations. The scheme of the work, as explained in the preface, is to give an amateur a broad and thorough knowledge of the principles of various forms of gas-engines, to show him how to make one by practical shop methods, and furnish him with a set of modified rules for designing similar engines. In the elaboration of this scheme the authors spent an entire year; and they confess that they will be well rewarded if their labour has the effect of advancing the standard of amateur workmanship, and aids the student to find in the construction of the model gas-engine "a useful, practical, and pleasant mechanical exercise." In their opening chapter, they explain clearly how a gas-engine works, and go on to describe the four classes of explosion engines. Then they enter upon the real subject-matter of their book—the design of a gas-engine to meet the requirements of the amateur who needs small power, and who wishes to build his

\* "Gas-Engine Construction, for the Student, the Scientific Investigator, and the Amateur Mechanic." By Henry V. A. Parsell, jun., and Arthur J. Weed. London: Sampson Low, Marston, and Co.; 1900.



own engine. The next four chapters deal with patterns and tools; and then the constituent parts of the engine are fully described. The "amateur" will not be justified in complaining that the subject has been superficially treated, for it is not until the twenty-first chapter that he is shown how to put his engine together. In the concluding chapters, hints are given on regulating and starting, on the construction of a gasoline carburetter for use where coal or natural gas is not obtainable, and on the design of engine details. At the end of the text is an annotated bibliography of gas-engine books and periodicals published in the English language; and there is an index. We do not wish to depreciate in the least degree the authors' work, or to deter any intelligent amateur who may have the time and patience, from trying to make a gas-engine. But we cannot help thinking that he would acquire the necessary skill far more quickly, and produce a better result, by taking a turn in "the shops." However, Messrs. Parsell and Weed have endeavoured to give him the benefit of their assistance in the form of a book of which the general get-up leaves nothing to be desired. The question is whether it will be bought by a sufficient number of amateurs desirous of constructing their own gas-engines to bring an adequate return for the outlay attending its production.

The other work which has lately come to hand must not be dignified to the extent of being called a book, inasmuch as it is simply a trade pamphlet of 40 pages stitched in a wrapper; but it offers some excellent advice on the care and management of gas-engines.\* As the author was for some fifteen years with a firm of gas-engine makers whose name is known the world over for the excellence of their productions, he may claim to know a little about this class of motor; and in the pamphlet he has issued he has endeavoured to give, briefly and clearly, such general directions for their management as are likely to be of service to users. He has been careful to avoid all technicalities, in the hope that the directions given will be sufficiently explicit to enable the engine attendant to undertake small adjustments and repairs when they are required. The general arrangement of the engine-house is appropriately dealt with in the first chapter; then comes some good advice as to keeping the engine clean. It has been too frequently stated as a recommendation of a gas-engine that it requires "no attention." This statement, as the author points out, is unfortunately interpreted too literally by many users. He insists that it does need attention; and if it does not get it, trouble and extensive renewals are sure to be necessitated. Having properly cleaned the engine, the next thing is to start it; and some useful hints are given on this matter. But the best-conducted engine will occasionally go wrong, through leaky valves, missing fire, insufficient or improper charge, or some other cause. Useful remarks are offered on these various matters, and the author then takes up the subject of renewals and repairs. He next deals with the recent improvements which have been made in gas-engines, and shows how increased power may be obtained. The pamphlet contains information which an engine-minder might find useful to have close at hand. Everybody who has had to depend upon power for keeping his works going knows how inconvenient it is to have to stop for hours while outside "expert" help is obtained to repair what is really only slight damage. The presence on the premises of an intelligent man capable of carrying out the directions given by the author, would in all probability allow of such help—which is in too many cases a hindrance—being dispensed with.

**Edison's Latest Wonder.**—According to a "Daily Express" telegram from New York a few days ago, Mr. Edison has perfected apparatus for "producing electricity in quantities of commercial utility by a device much like the familiar thermopile." He is said to apply heat to the junction of two pieces of metal, the composition of which is a secret, and thus set up a flow of electric current.

**Waverley Association of Gas Managers.**—The 79th half-yearly meeting of this Association will be held in the Cross Keys Hotel, Dalkeith, on Thursday. There will, as usual, be a short address by the President of the Association—Mr. William M'Giffen—and an informal discussion; the places for next year's meetings will be fixed; and there will be a midday dinner. In the afternoon, the members will drive to the Newbattle Collieries, and examine the electrical and coal-cleaning plant on the surface. Opportunity will be afforded for descending to the workings, and inspecting them under the guidance of the colliery officials.

**Eastern Counties Gas Managers' Association.**—The 24th general meeting of this Association will be held on the 19th inst., in the Council Chamber, Spalding (by permission of the Council), under the presidency of Mr. J. G. Hawkins, the Gas Engineer. According to the programme issued by the Hon. Secretary and Treasurer (Mr. J. H. Troughton, of Newmarket), the members will assemble at the gas-works, where the President will invite them to partake of luncheon; and the business will be subsequently transacted. In addition to the Inaugural Address, there will be a paper on "The Working of Inclined Retorts at Cambridge," by Mr. R. Brown. At the close of the proceedings, there will be a visit to Ayscoughfee Hall and Gardens. Early in the evening, the company will dine together at the White Hart Hotel.

\* "The Care and Management of Gas-Engines." By Henry Booth. Hull: James Plaxton and Co.; 1900.

## OBITUARY.

The death is announced of Mr. J. N. FORSTER, Engineer and Manager of the Skegness Gas-Works. Deceased had held this position for about twenty years.

The death is announced of Mr. JAMES WATSON, who for about a quarter of a century was Manager of the Rye Gas Company—a position which he relinquished three years ago on account of ill-health. Deceased was in his 79th year.

As will be seen by an intimation which appears elsewhere, the Sheffield Gas Company are requiring a Superintendent of Mains. This position has become vacant by the death, from an attack of typhoid fever, of Mr. S. H. BRADSHAW, who had been with the Company eight years; having gone to them from Salford. His loss is much felt by the Company; and unfortunately he leaves a widow and two children.

Mr. RICHARD CLARKSON SMITH, who in July retired from the directorate of the Devonport Gas Company, on which he had served for more than half-a-century, died on Tuesday last, at the age of 89. Deceased, who was a native of Devonport, spent a life of much usefulness and activity in the town. He formerly carried on business as a stationer and dealer in fancy goods; and at one time edited and published a weekly newspaper. For many years he occupied a seat in the Town Council; and for two years, 1865-6, he was Mayor. He also had a seat on the Magisterial Bench, and attended with much regularity; while his interest in some of the educational and philanthropic institutions of the town was marked and continuous. As Chairman of the Gas Company for more than forty years, he had a thorough knowledge of the working of the undertaking, and was constant in his attendance at the works until failing health confined him to the house. Out of respect to his memory, the municipal flag was hoisted at half mast; and at the Police Court the Mayor spoke in sympathetic terms of his public work.

## PERSONAL.

Mr. W. M'AULIFFE, of Port Chalmers (N.Z.), has been appointed Manager and Secretary of the Lyttelton (N.Z.) Gas Company, Limited.

Alderman HIGGINBOTTOM, the Chairman of the Electricity Committee of the Manchester Corporation, has accepted the office of Lord Mayor of the city for the coming municipal year.

Mr. JOSEPH HAWKSLEY has been appointed Manager to the Great Yarmouth Water-Works Company, in succession to Mr. John Ayris, M.Inst.C.E., whose resignation of the position has been mentioned in the "JOURNAL."

The marriage is announced of Mr. ARTHUR VALON, eldest son of Mr. W. A. M'Intosh Valon, of Ramsgate, to MARY GERALDINE, youngest daughter of the late Mr. J. Ashcroft Noble and Mrs. Noble, of Clapham Common. The happy event took place on the 5th inst., at St. Luke's, Battersea. With his large circle of friends in the gas profession, we congratulate Mr. Arthur Valon, and wish him all happiness and prosperity.

At the recent half-yearly meeting of the Sutton (Surrey) Gas Company, it was decided, on the suggestion of the Directors, to recognize the completion by Mr. STEPHEN CARPENTER of 25 years' service as Manager of the works, by presenting him with a gold watch and chain suitably inscribed. The appreciation by the shareholders of the value of Mr. Carpenter's work was evidenced by the cordiality with which the suggestion was adopted.

Mr. C. JEFFERY, Manager of the Portland Gas Company, whose undertaking is about to pass into the hands of the District Council, has been appointed, out of 79 applicants, Manager and Collector to the Ware Gas Company. Mr. Jeffery had practical training at the Cowes Gas-Works for about six years, and from there went to New Westminster (British Columbia), as Manager of the gas-works—a position he held for about four years. He has been Manager at Portland for seven years, for the last three of which he has had the collecting under his control. During his management the consumption of gas has nearly doubled.

Among the prizes proposed by the French Société d'Encouragement pour l'Industrie Nationale, is one of 2000 frs. for a motor weighing less than 50 kilos. per horse power developed, another of 1000 frs. for the utilization of any waste product, and a third for a method of purifying water for domestic use. All papers are to be in French, and sent in before Dec. 31.

An automatic check-valve used in the Geneva Water-Works is described in the "Génie Civil." The essential feature is a concave valve balanced to keep it lifted as long as water is on both sides of it. The surplus weight is proportioned to the maximum speed at which the water is to be taken off at the lower end of the pipes. If a pipe should burst, the pressure on the valve overcomes the balance-weight, and the valve closes. When once closed, it cannot again be opened until the pipes are full of water, for which purpose a bye-pass is provided. A hydraulic brake on the dash-pot system prevents the valve from closing too rapidly.



## TECHNICAL RECORD.

## INCANDESCENT GAS LIGHTING.

By Dr. H. BUNTE, of Carlsruhe.

[A Paper read before the International Gas Congress in Paris.]

Incandescent gas lighting, as opposed to the older lighting by means of flat-flame and argand burners, during the past decade has assumed the predominant position in Germany. The Welsbach light is now the recognized form for both public and private use; and the older types of flame lighting are continually losing ground. It has thus effected a complete revolution, not merely in regard to the illuminating effect and the economy of gas lighting, but even the fundamental factors by which gas is valued, and the properties and methods of manufacture of gas, have been entirely altered.

Formerly "illuminating power" was regarded as the principal criterion of the value of gas. Now by far the greater part of the gas, whether it is used for lighting or for heating, is first of all mixed with air in the bunsen burner. By this means the illuminating constituents of flames are completely destroyed, and the heating effect of the blue bunsen flame alone comes into play. The quantity of light yielded is, in incandescent lighting, no longer directly dependent on the quality of the gas as made on the works and distributed to the consumer. It is primarily dependent on the nature of the mantle which is brought to the luminous state in the bunsen flame. It is, therefore, a matter of prime interest to the gas industry to follow the improvements in the manufacture of Welsbach burners, and constantly to obtain a true conception of the efficiency of the mantles which are on the market.

Notwithstanding that numerous photometric trials have been reported in periodicals and circulars during the last ten years, it seemed very desirable—in view of the extraordinary development of the Welsbach light in Germany—to make exhaustive and systematic researches on the efficiency of the different mantles at present on sale. At the suggestion of the author, the German Association of Gas and Water Engineers put itself in communication with the Imperial Physical-Technical Institute at Charlottenburg, in order to secure from the outset the highest attainable degree of precision and reliability in these researches. With the co-operation of Herr Drehschmidt, of Berlin, Dr. Krüss and Dr. Leybold, of Hamburg, and Herr Schäfer, of Dessau, a scheme of work was arranged with the Imperial Institute. By this scheme, the mantles most generally used in Germany were first to be examined at Berlin, Charlottenburg, Dessau, and Carlsruhe according to uniform methods. This work was carried out or commenced last winter.

Dr. Liebenthal, on behalf of the Imperial Physical-Technical Institute, reported on this first series of researches at this year's meeting of the German Association of Gas and Water Engineers at Mayence.\* The researches dealt with five descriptions of mantles from the most renowned factories, by which about three-fourths of the mantles used in Germany are produced. The results of these researches, which are being continued, can only be regarded as provisional; but they offer a valuable comment on the question as to, "What is the duty afforded at the present time by a mantle of average composition under normal conditions of use?" The researches referred to would suggest the following as an answer to this question: A carefully incinerated incandescent gas-mantle affords, on the average, an illuminating power of 70 Hefner units (61 English candles) for 300 hours, at a consumption of 4.24 cubic feet of gas per hour under a pressure of about 12-10ths. This is equivalent to a consumption of 0.07 cubic foot of gas per candle-hour. At first the illuminating power generally exceeds 80 Hefner units (70 candles), and after 300 hours' use falls to not less than 60 Hefner units (52½ candles); but after still longer use, it does not recede appreciably further.

On comparing this conclusion with the result of a photometric investigation of 14 descriptions of mantles carried out in the winter of 1895, and published by the author in the "Journal für Gasbeleuchtung" (see "JOURNAL," Vol. LXVI., p. 180), considerable improvement is noticeable both in regard to economy, and even more in regard to the constancy of the illuminating power, or the uniformity of the light emitted on protracted use. At that time, after 300 hours' use, the greater number of the mantles had dropped to less than 40 Hefner units (35 candles); and even the best showed a diminution of 45 per cent. in illuminating power after that period of use. The best of the recent descriptions of mantles show only an average falling off of about 12 to 20 per cent. in illuminating power; and this falling off is not considerably increased on yet longer use.

Incandescent gas lighting has thus fully substantiated the claim that it affords the brightest and cheapest light; and it has again considerably improved its advantage over other competitive methods of illumination both in economical and hygienic aspects. With gas at a price of 4s. 6d. per 1000 cubic feet, the cost of a light of 100 Hefner units (87.7 candle power) value amounts, on the average, to only ½d. per hour, compared with about 1.6d. for the old flat-flame and argand burners. In like

ratio at least have the hygienic conditions improved; as for the same illuminating value, only about one-fifth part as much heat and products of combustion are emitted into the room which is lighted by the gas.

The efficiency here given of the incandescent gas-burner, in reality, indicates merely the lower limit which is attainable by a proper choice of burners and mantles without more ado, wherever ordinary coal gas is available under the customary pressure.

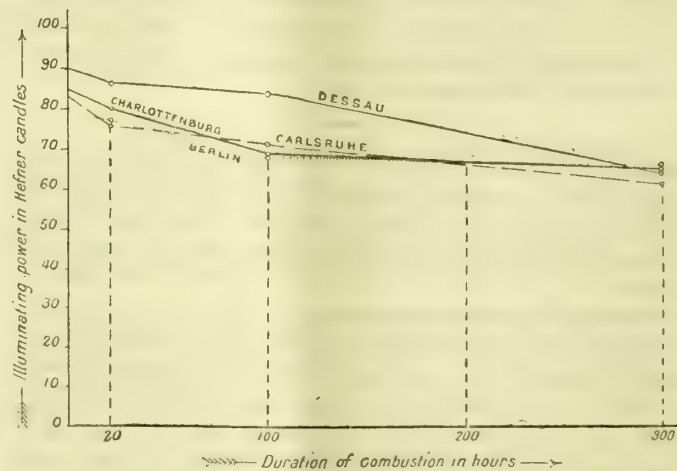
Far greater illuminating effects can be secured if gas is consumed under enhanced pressure in special burners (Bunte and Eitner, "On the Illuminating Power and Colour of the Kügel Light," see "JOURNAL," Vol. LXXV., p. 265). The duty then becomes increased to about 25 candles per cubic foot of gas consumed per hour; and powerful sources of light of several hundreds or even thousands of candles in value can be produced. These rival in brilliancy and economy the electric arc light. What brilliant illuminating effects are obtainable by means of high pressure gas is shown by the successful lighting of the Champ-de-Mars at the Paris Exhibition by the Paris Gas Company, which has thereby done a great service by introducing to the general public the high-pressure incandescent gas light for public lighting.

The illuminating effect obtained by the use of the incandescent light is independent (within a wide range) of the quality of the gas; and is dependent more especially on the method of combustion and the composition of the mantle used. These important facts, which have been pointed out previously (by Herr von Oechelhaeuser, see "JOURNAL," Vol. LXXIV., p. 764, and by the author in a paper only recently published), were demonstrated likewise in the above-mentioned systematic researches carried out in collaboration with the Imperial Physical-Technical Institute.

Photometric measurements made at various places in Berlin, Charlottenburg, Dessau, and Carlsruhe served to determine whether the quality of the gas used at each place of observation had any effect on the duty afforded by the mantle, and the magnitude of the effect if any. For this purpose, simultaneously with the photometric tests of the mantles, there were made determinations of the illuminating power of the gas in similar specially selected flat-flame burners, and of the calorific power of the gas by means of Junkers' calorimeter. The illuminating power in a 5 cubic feet batwing burner, at a rate of consumption of 5.3 cubic feet per hour, and the calorific value of the gas used in the different places where the observations were made, were found to be as follows:—

Illuminating Power—Hefner Units.	9.4	8.8	11.6	12.4
[English Candles]	8.2	7.7	10.2	10.9
Calorific Value. Calories per cubic foot	146	142	148	141.5

Notwithstanding this relatively great divergence in the illuminating power of the gas in a flat-flame burner, no difference is to be detected in the duty obtained from the mantles. The results obtained at the different places were instead closely concordant, as is indicated by the annexed diagram, which shows the average duty of the mantles at the several places of observation:—



AVERAGE ILLUMINATING POWER OF INCANDESCENT MANTLES DURING 300 HOURS.

In order to pursue further the study of this highly important technical question, and to determine what influence greater changes in the chemical composition of the illuminating gas have on the development of light by the Welsbach burner, artificial mixtures of coal gas with hydrogen, carbonic oxide, water gas, marsh gas, ethylene, and benzene, were made in the author's Institute; and the illuminating power afforded by these mixtures was observed and compared with that of unmixed coal gas in the Welsbach burner. The results of these researches with mixtures of gases are given in the table on p. 643.

It should be observed, with reference to this table, that the values given can indicate only the probable proportionate effect of the several admixtures on the development of light in the Welsbach burner. Every change in the composition of the gas, strictly speaking, demands an altered method of combustion,

\* An abstract of Dr. Liebenthal's report will be given in the "JOURNAL" shortly.—ED. J. G. L.



	ILLUMINATING POWER.			
	In a Flat Flame Burner at a Consumption of 5'3 Cubic Feet per Hour.		In the Welsbach Burner.	
	Hefner Units.	English Candles.	Hefner Units.	English Candles.
Coal gas . . . . .	15	13'2	70	61
Coal gas mixed with :—			Illuminating Power of the Unmixed Coal Gas in the Welsbach Burner taken as 100.	
20 per cent. of hydrogen . . .	7'3	6'4	100	
20 " " carbonic oxide . . .	3'0	2'6	85	
20 " " marsh gas . . .	12'5	11'0	88	
20 " " water gas . . .	3'1	2'7	105	
25 " " ethylene . . .	40'3	35'3	136	
Coal gas carburetted with benzene . .	25'0	21'9	108	
" " decarburetted by paraffin oil .	6'2	5'4	93	

especially in respect of the quantity of air admitted to the bunsen burner. In these researches, however, this circumstance has been in the first place ignored, and attention has been given rather to the immediate practical object of ascertaining how the same Welsbach burner utilizes unmixed coal gas and mixtures of gases showing considerable differences in composition. It will be seen constantly, that great changes in the composition of the gas, which reduce the illuminating power in flat-flame and argand burners by more than one-half, or considerably increase it, and likewise greatly alter the calorific value of the gas—such changes as the admixture of hydrogen, marsh gas, and ethylene effect—produce only relatively small differences in the illuminating duty with the Welsbach burner.

The explanation of such a remarkable fact is to be found in the peculiar conditions of combustion in the bunsen burner. The gas, as is well known, prior to its combustion has added to it in the mixing-tube of the bunsen burner a quantity of air insufficient to effect its complete combustion. But, on the other hand, there is sufficient to bring about complete disillumination of the flame. As soon as this mixture of gas and air, issuing from the tube of the burner, is brought to the temperature of ignition by the hot flame which encompasses it, incomplete combustion ensues, and, in a measure, combustion of air in an excess of gas. This is what happens in the inner green cone of the flame. By this means, almost all the so-called heavy hydrocarbons are decomposed and partially burnt; and the products of the incomplete combustion, in addition to carbonic acid and steam, are carbonic oxide and hydrogen, with residual portions of marsh gas (which is only decomposed and burnt with difficulty), and a little acetylene. The hot gases which issue from the green core of the flame of the bunsen burner on to the interior of the mantle consist in all cases essentially of carbonic oxide and hydrogen, whether either rich or poor illuminating gas is used. These gases are burnt in the outer zone of flame which is delimited by the meshes of the mantle, by means of air which enters from outside it. They thus yield carbonic acid and water vapour; and the combustion raises the meshes of the mantle to an intense white incandescence. The combustion around the mantle thus is with all gases—even of very diverse composition—essentially combustion of carbonic oxide and hydrogen. Thus it is evident that the duty afforded by the mantles is affected only to a comparatively small degree by changes in the composition of the gas used.

Observations and experiences up to the present do not furnish sufficient information for a more exhaustive analysis of the phenomena of combustion around the mantles, or for the solution of many other important questions of modern gas lighting, though recent years have witnessed the presentation of highly important communications on the cause of the light emission from the Welsbach burner. Among researches in this direction may be mentioned recent ones by Le Chatelier and Boudouard, and by Nernst and Bose, by which it was shown that the Welsbach light acquires its brilliancy from the high temperature of the skeleton, consisting of rare earths. The feeble thermic radiation of the skeleton permits the mantle to acquire rapidly and completely the high temperature of the flame gases, and the relatively great capacity of the mantle for radiation within the limits of the visible portion of the spectrum constitutes the great economy of the burner.

Whether the bunsen flame straightway has the high temperature required, in all parts of the mantle, in order to heat the ashy skeleton uniformly to the most intense white incandescence, or whether the process of combustion is stimulated by catalytic action of the material of the mantle and the uniformly intense incandescence of the mantle thus brought about, has not yet been decided. In any case, experiments made some time since at the author's instigation in his Institute by Herr Luggin have proved that the Welsbach material can be brought by catalytic action on a cold mixture of gas and air, as it issues from the bunsen burner even without flame, to a state of full luminescence.

Bearing in mind that the incandescent gas-light owes its illu-

minating power and brilliancy entirely to the high temperature of the flame, the grounds on which the properties of illuminating gas are estimated, and the methods used in its manufacture, must be modified, because since the introduction of the Welsbach light the production of light has resolved itself simply into a question of heating.

Under the former régime of flat-flame and argand burners, the greatest value attached to the production of a gas rich in the so-called heavy hydrocarbons, ethylene and benzene; as the lighting effect of the flame depended entirely on the presence of these constituents. Regard for securing and preserving these illuminants determined both the selection of the raw material and the choice of the method of gasification. For coal gas, a particular and uncommon gas coal is needed; and this coal consequently is costly. The distillation of the coal, in gas-works of all sizes, can be conducted only in comparatively small retorts, which must be drawn and re-charged about every four or six hours. Thus a great expenditure of labour and wages is required. When larger distillation chambers, and longer periods of working off the charges, are adopted, the heavy hydrocarbons are to a great extent destroyed; and the illuminating power of the gas is thereby considerably depreciated.

But as incandescent lighting and the use of non-illuminating gas for heating and lighting continue to spread, these illuminants, which were formerly so essential and were obtained at such cost, become less and less valuable. For the determination of the quality of gas a photometric test of the illuminating power with a batswing or argand burner can no longer form a proper criterion. It is the calorific value of the gas which now plays the most important part.

But when the gas industry is freed from the antiquated control of tests of lighting value in flat-flame and argand burners, it at once acquires a freedom in the selection, both of raw material and of methods of manufacture, which is of supreme significance in respect not only of its whole future development but also of the supply of towns with light, power, and heat by means of gaseous fuel.

Under such circumstances, gas manufacture is no longer restricted to the use of a special gas coal which is scarcely obtainable in sufficient quantities even at a very high price; but selection may be made from an enormously wider range of raw materials, and their employment is considerably facilitated. In the manufacture of gas, there is no longer the restriction to a tedious and costly distillation in small retorts, with a short time for carbonization. Instead, large chambers, like coke-ovens, may be used according to the extent of manufacture; and these can be attended to, by mechanical means, considerably more easily and cheaply. Other methods of gas manufacture also acquire greater importance, as well as the distillation process. The water-gas process, either with or without oil-gas production or carburetting with benzene vapour, by means of which the calorific value as well as the illuminating power is controllable, could serve as an auxiliary to the coal-gas process, especially in times of scarcity of coal. It would render great service to the industry by facilitating the production of such a mixed gas.

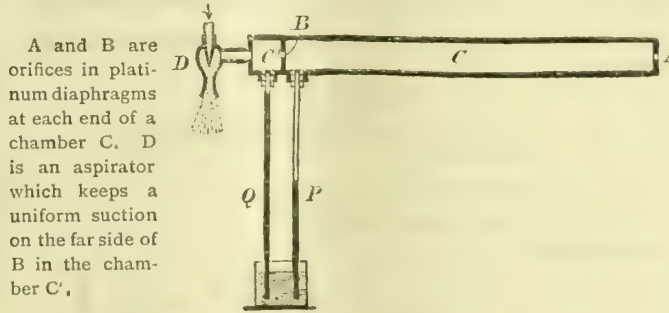
Under the domination of the incandescent gas-light, there is thus opened out wide scope for activity and advance both in the processes of gas manufacture and the descriptions of apparatus used; and scientific investigation, as well as practical inventive genius, has in this direction a subject which will well repay attention devoted to it.

THE MEASUREMENT OF HIGH TEMPERATURES.

By ALTEN S. MILLER, of New York.

[A Paper read before the International Gas Congress in Paris.]

Up to a comparatively recent date, no instrument had been invented that would enable one to easily and continually measure temperatures of 1000° Fahr. or over. You are all familiar with the air thermometer, thermo-couple, platinum resistance coil, fusible alloys, and other methods that have been used to measure high temperatures; but none of these are suitable for ordinary



continuous working. They lack the element of continuity, are too delicate for ordinary work, are inaccurate, or lack in some other way the qualities necessary for accuracy and ease of manipulation. It is my intention to describe an instrument which I have been testing for some months past, and which seems



to be eminently suited to the measuring and recording of temperatures below that at which platinum begins to soften. The principle of its operation is illustrated by fig. 1.

Air will be drawn through B by the suction in C', and a partial vacuum will be created in C, which will cause air to flow through A. In a few seconds equilibrium will be established, and the amount of vacuum in C and C' will be measured by the water-gauges P and Q respectively. If the air entering at A is heated, the temperature at B and the vacuum in C' being kept constant, the vacuum in C will increase. The height of the water in P therefore indicates the temperature of the air entering at A.

Fig. 2 shows how the foregoing principles are applied in practice. To maintain a uniform vacuum, C' is a vessel partly filled with water into which runs the tube n n'. If the vacuum is greater than the depth of the lower end of the tube below the surface of the water, air will come down through n n' and reduce the vacuum. In practice, a small amount of air flows through n n' when the apparatus is in use, and the suction is kept

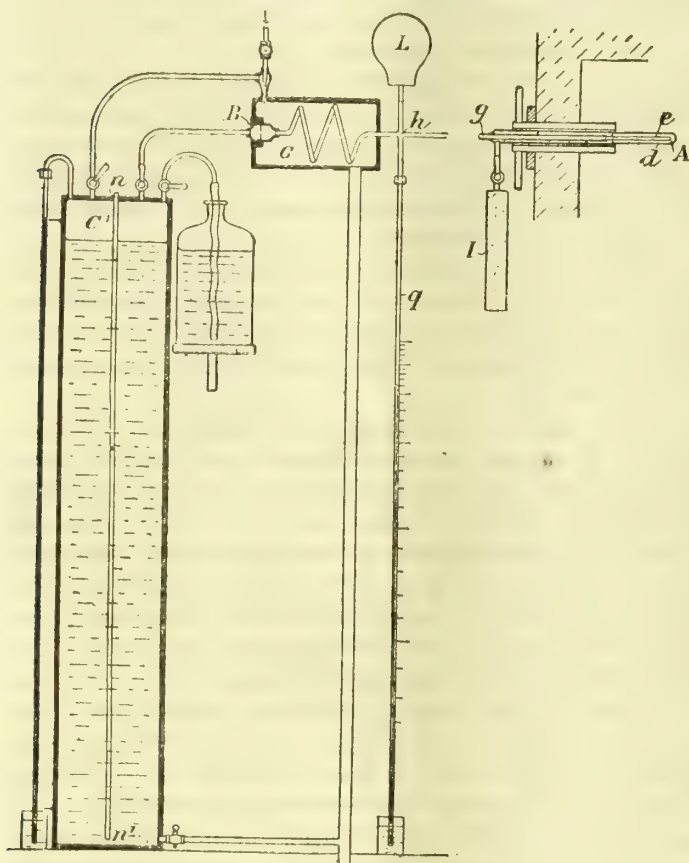


FIG. 2.

constant. In order to keep the temperature at B constant, the latter and a portion of pipe through which the approaching air reaches the aperture are enclosed in a vessel through which the steam exhausted from the aspirator is passed. The air flows slowly enough to take the temperature of the steam before reaching the aperture B. The vacuum is measured by the water gauge Q (fig. 2), and by a recording gauge L.

The entering air first goes through a filter of raw cotton I, and thence to a platinum tube d, where it reaches the temperature of the surrounding medium. The aperture A is in a second platinum tube e, which is inside d. Where the tube e is outside the influence of the greatest heat, it is attached to a copper tube g, which is surrounded by a water-jacket. The tubes g and h may be connected by a tube of any length; but it is preferable to keep the diameter small, as the lag of the pyrometer is in a measure proportional to the volume of air contained in the pipe between A and B.

The calibration of this apparatus would seem to be a very simple matter.

$$C = \frac{\text{area A}}{\text{area B}}$$

$b$  = barometric pressure in inches of mercury.

$b'$  = pressure in C.

$b''$  = pressure in C'.

$t'$  = absolute temperature at A.

$t''$  = absolute temperature at B.

Theoretically—

$$b' = \frac{b'' - C^2 \frac{t''}{t'} b}{2} \pm \sqrt{\frac{C^2 t'' b^2 + \left( b'' - C^2 \frac{t''}{t'} b \right)^2}{4}}$$

Experimentally, it has been determined that  $b$  is much lower for any given temperature than the above formula would indicate; so, instead of being able to calculate the scale of each instrument, it is necessary to graduate each one separately, using a standard pyrometer for this purpose. The standard is

checked from time to time with a platinum ball calorimeter, to ensure its accuracy. On this subject, I quote from a letter of Mr. Alfred Steinbart, a member of the firm who make the pneumatic pyrometer:

The theoretical curve is considerably lower than the practical. For instance, for a temperature of 1000° C. the instrument would show for  $b'$  only 758° C.; in other words, the theoretical curve reads, at 1000° C., 242° lower. This, in my opinion, is due to the contraction of the jet of air flowing through the apertures. This contraction depends upon the shape of the hole, so that we can easily make an instrument read 200° Fahr. high or low at will, by changing the shape of one aperture without changing its area. It is also possible to make an instrument read right with the scale at 212° Fahr., but high or low 200° at 2000°. I have used two apertures of as near the same dimensions as I could get them, and heated both one time to 212° Fahr., and the other time both to 100° Fahr. The water column in the instrument showed the second time 0.28 inch higher than the first time. This was several times repeated with the same result. In the formula—

$$b' = \pm \sqrt{\frac{C^2 t''}{t'} b^2 + \frac{\left( b'' - C^2 \frac{t''}{t'} b \right)^2}{4}} + \frac{b'' - C^2 \frac{t''}{t'} b}{2}$$

if we insert for the temperatures  $t'$  and  $t''$  the same value,  $C$  cannot change, as the openings are of the same size and material,  $\frac{t''}{t'}$  will be equal to 1. So the formula gives the same value for  $b'$  each time; while in practice there is a considerable difference for as small a change as 112° Fahr. This, to my belief, is due to the change of contraction through the temperature.

As the tension of the air in C is not what it is calculated to be by assuming the form of *vena contracta* to be the same at all temperatures, tests were made with a platinum ball to see whether the instruments as sent out were properly graduated, and whether they varied after being exposed to heat. These tests, extending through a series of months, indicated the graduations to be commercially accurate. They showed further that the instruments did not change, but that the pressure in the intermediate tube C always indicated correctly the temperature at A.

A fall in the barometer would tend to decrease the value of  $b - b'$  which is measured on the gauge P. On the other hand, the lowering of the boiling-point of water due to the fall in the barometer would tend to increase  $b - b'$ . Both of these influences are very small, and in practice they so nearly neutralize each other that the instruments are not appreciably affected by a change in the barometer.

The advantage of an instrument that will record high temperatures is evident. At present, it is necessary to depend in a large degree on the eye and memory. After experimenting for a period, we decide that certain heats are about right in the various parts of a bench or water-gas apparatus, and instruct those in charge of the gas making not to let them vary from the determined point. It is almost impossible to keep a constant heat when dependence is placed upon the unaided eye and upon memory; so it is important to eliminate these two sources of error, and to get absolute records. It will also be very interesting to note the temperatures in the retort during the carbonization of coal. With one pyrometer in the centre of the charge of coal and the other above it, records could be made that would be very valuable.

I will not take up more of your time in suggesting uses for a pyrometer. As our business is chiefly with heat and high temperatures, the importance of being able to measure these temperatures is too obvious to need further comment.

#### PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(Continued from p. 527.)

A lecture on "Some Chemical and Physical Characteristics of California Petroleum," prepared by Mr. A. S. Cooper, State Mineralogist of California, was read by his Assistant, Mr. C. G. Yale. These characteristics varied greatly, not only in different oil fields in the State, but even in the same strata. At a short distance apart, there may be considerable differences; and the first yields of a well were often lighter than those obtained after pumping for some time. The Californian petroleum contained unknown combinations of carbon and hydrogen, together with minute quantities of sulphur, oxygen, and nitrogen. The presence of these three elements, if only in traces, had a marked effect on the boiling point, melting point, and the character of the distillates. They were mixtures of a large number of hydrocarbons, with sulphur, oxygen, and nitrogen compounds, of which the sulphur compounds usually predominated. When exposed to the air, the petroleum absorbed oxygen, and would also do so when heated with peroxides. A similar action took place when they were exposed to vapours of sulphur or heated with persulphides. Fractional distillation did not give a true index, and ultimate analysis was worthless as a test of the character or composition. Like coal, the petroleum was constantly giving off carburetted hydrogen; and this was probably due to acids, alkalis, and other oxidizing agents which formed oxygen compounds with the bitumens. Decomposition might also be caused



by sulphurizing agents forming sulphur compounds with the bitumens; and both these reactions took place within the earth, leading to the production of natural gas. One of the reasons that California petroleum had such a high specific gravity was the fact that the formation in which they occurred was tilted and broken, which permitted the escape of the gases; and if the process of evaporation continued long enough, solid asphaltum was formed. The evaporation from an underground oil-tank was much less than that from a tank above ground and exposed to the sun; and, therefore, if the store-tank could not be below ground, it should be shaded from the sun and whitewashed, to decrease the absorption of heat. If petroleum of 40° B. specific gravity was exposed to the sun for a short time in a shallow pan, it would decrease 20 per cent. or so in volume; and the portion so lost was more valuable for gas manufacture than the remainder. Fresh supplies should be admitted to the bottom of the store-tank and not at the top. Attention to this point would secure a considerable saving as regards loss by evaporation. The asphaltum remaining after distillation contained 5 to 9 per cent. of sulphur; and it could be adopted for any purpose where a plastic and unalterable cement was required. Some wells in California yielded oils containing paraffin; and these were so valuable as a source of illuminating oil, that their use for gas making had been prohibited. At Baku, in Russia, a tract of less than 20 acres of land produced in twelve years 35 million barrels of oil, and was still producing 12,000 barrels per day. In Santa Barbara County (Cal.), there were large tracts of bituminized sand; and in any one of several 20-acre lots at this place, the area of sand exposed would show that it contained 8 million barrels of heavy petroleum of the consistency of molasses, representing before evaporation eight times that quantity of ordinary petroleum. So that, on each 20-acre tract, there were the remains of 64 million barrels of oil; showing that in California, as in Russia, very small areas might yield immense quantities of petroleum. Bitumens occurred in all the geological formations of rock, and were found saturating layers or seams of sand or shale; as many as ten of these seams being discernible on the eroded sides of some of the anticlinal ridges of the coast range. The sand beds were very irregular as regarded thickness—ranging from a few feet up to over 500 feet—and when several seams were to be seen on the side of a mountain, or traced by their outcrop on the surface, the bitumen, if present at all, would generally favour the geologically lower beds; and when a sand contained bitumen, the underlying sand beds were also liable to contain it. At present, nearly all the wells that were being bored were in the vicinity of surface indications—such as gas blows, oil seepages, or outcrops, of bituminous rock; but the day was not far distant when oil territory would be selected by geologists irrespective of surface indications. At present, the wells are shallow; but they would then be much deeper, and would yield lighter oils. Owing to the large area (about 40,000 square miles) and thickness of the unaltered rocks, and the great number and thickness of oil-bearing strata, the yield of oil in future would be enormous. But so long as coal maintained its present value, it could not be expected that the oil would fall in price. In several ways it was a most desirable substitute for coal. In 1899, the import of coal into the state was about 1½ million tons; and to replace this, nearly 7 million barrels of oil would be required. As the supply became more permanent, there would be a large and increasing demand for fuel oil. The removal of the gasoline and illuminating oil left a residue having a high flash-point and free from water, and therefore more suitable for use as fuel than the crude oil. The asphalts in the crude oil were objectionable to the gas maker; partly because they evolved large volumes of sulphuretted hydrogen at gas-making temperatures, and also because they led to the formation of carbon and heavy pitch. The large percentage of sulphur was also an objection to the use of asphaltum as a fuel. But apart from this, the market value of the asphaltum was too high to admit of its being used with economy either for gas making or fuel. So it was evident that crude oil should not be used for either of these purposes, but that it should be separated by distillation into various qualities. In treating of the distillation of the crude oil, it was remarked that in Pennsylvania the upper half of the still was left exposed to facilitate decomposition; but there must be a great loss of heat. During the first distillation of crude California oil, decomposition should be avoided; and therefore the stills should be completely bricked in, and generally the whole process of treatment should be different from that practised either in the States or in Canada. Most of the crude Californian oils should be distilled twice to reduce the proportion of sulphur compounds, which could be eliminated to a great extent by repeated distillations. A distillate of a certain density, distilled under ordinary atmospheric pressure, may contain large quantities of sulphur. But a similar distillate, obtained *in vacuo*, may be comparatively free from sulphur. Probably in the first case a higher temperature was required, and the additional heat decomposed the sulphur compounds. And if a current of hydrogen at a high temperature was introduced into the vapours of the light hydrocarbons during distillation, the sulphur compounds would be taken up by it and carried away from the still. At ordinary temperatures petroleum would not absorb sulphuretted hydrogen; and it was supposed that in the crude state, the lower hydrocarbons in the California petroleum did not contain sulphur compounds, but were sulphurized during distillation, by such compounds evolved from the higher hydrocarbons. At 60° Fahr., the action of hydrogen on the sulphur compounds was

slight; at 200° Fahr. it was rapid; and at higher temperatures still more so. A fair average result from the distillation of a crude oil would be 3 per cent. of gasoline, at 75° Beaume; 4 per cent. benzene, 63°; 13 per cent. illuminating oil, 45°; 8 per cent. mineral sperm, 38°; 21 per cent. gas distillate, 28°; 27 per cent. lubricating oils, 26° to 15°; 11 per cent. asphalt; and 13 per cent. loss. Over a number of first distillations, the products ranged from traces up to 15 per cent. of naphtha at 150° C., from 6 to 27 per cent. illuminating oils at 300° C., 16 to 30 per cent. gas distillate at 350°, 20 to 52 per cent. lubricating oils, and asphalt and loss 7 to 25 per cent. Distillation by means of a current of steam injected into the liquid itself would probably give better results than dry distillation; and certain gases that were not condensable and not likely to react chemically (such as hydrogen or carbonic acid) might probably be as effective as steam. The production of petroleum in the States was steadily advancing.

Replying to questions, Mr. Yale said that the present production of petroleum was only about one-third of the quantity required to supplant coal. There were only two wells in the State yielding petroleum having a paraffin base; and their production was small. But the quality was excellent—being almost a pure lubricating oil, which was worth 16s. 8d. per barrel, or four times as much as the asphalt-base oils. By the expression "base," he referred to the residue after distilling off the lighter constituents. There was a large demand for asphalt—the local prices being about £5 5s. per ton, and in New York as much as £7 10s.; and this of itself rendered the fractional distillation desirable and profitable.

Mr. John A. Britton, of Oakland (Cal.), read a paper on "The Best Methods of Introducing Gas-Stoves." He advocated selling gas-stoves at cost, or even less, and said that the maintenance of a high price for gas was the cause of failures to establish profitable sales of gas for fuel. They were also provocative of dissatisfaction and competition. Larger sales would reduce the expenses of maintenance and general charges on the plant; and increased consumption invariably followed a decrease in price. Fuel gas should in any case be supplied through a separate meter, so that the consumer could tell how much was used by the stove, and how much for light. If the gas-bill was high, the stove got the blame, and was frequently dispensed with. It was also very desirable for the manager to know how much gas was used for lighting and how much for fuel. Where the price of gas exceeded 4s. 2d. per 1000 cubic feet, he advocated special rates for the stoves. The manager should not lose sight of a stove directly it was sold, but care for it just as he did for his mains and services, and inspect and repair it, if necessary, every six months. Some time ago, he observed that out of 2200 stoves, some 400 showed no consumption. He employed a competent person to canvass these 400 delinquents. The defect was discovered in each case, and remedied by the Gas Company. Within 18 months they had only 15 stoves showing no consumption; and the 400 averaged nearly 2000 cubic feet of gas per stove per month. Then there must be continual advertisements, not circulars and pamphlets only, but constant newspaper advertisements. In his experience, selling the stoves for cash was preferable to renting or hire-purchase. Demonstrations given in the household by a competent person were worth a thousand fancy demonstration lectures on dishes rarely used in ordinary life. The best consumers were the middle classes, who readily recognized the speed, reliability, cleanness, and cheapness thus secured. Hot plates stopped the sale of many a cooker, and he fervently wished there were none in existence.

Discussion being invited, Mr. Jones described the demonstration cooking lessons as conducted at San Francisco. The whole town was covered, by female canvassers, who took a district each week; and the lectures were carefully adapted to ordinary everyday requirements. Neatly printed invitations with a good gas-stove advertisement were issued, also printed recipes, &c.; and every care was taken in making these announcements really attractive. There were nearly 14,000 gas-stoves in use in San Francisco. Mr. McNeil favoured selling the stove right out at cost. When a customer bought an article, he took care of it; but if provided free, it was not valued. At one time he gave away £200 worth of gas-stoves, and found absolutely no benefit. Dr. Powers said one thought occurred to him on hearing the paper. The author advocated going to a great expense, and all to get a sale at a cheaper rate. Might not the reduced price and the special expenses swallow up all the profit? If the same energy was applied to extending the sales of illuminating gas, might not the result be more profitable. Before going to large expenses in pushing gas-stoves, he would like to know something about the actual profit on them, as distinct from the lighting. He could quite see that the consumption would be largely increased; but after paying all the extra expenses, there might be no increase in profits. He hoped some enterprising gentleman would determine what the actual profit on the gas-stove business was. Mr. Aldrich did not believe in going to the expense of advertising a thing, and then selling it at less than cost, but in selling at a fair profit. Nor did he believe in separate meters. He wanted to sell gas, no matter what it was used for, and therefore preferred a scale of discounts according to the quantity used, and a further discount for the use of gas-stoves, all subject to prompt cash payments. Many would not be in sympathy with him; but he would add that he paid 6 per cent. on his preference and 5 per cent. on his ordinary stock, in face of the cheapest electric light and power in the United States. With regard to dirty gas



stoves, he did not propose to start a mission in favour of ordinary cleanliness; but he took good care that the stoves on show at his office were as neat and clean as possible. Hot plates were no use as regarded increasing the sales of gas; and he agreed with the author that they would be better without them. He believed in a good show-room, and had one 100 ft. long by 25 ft. wide filled with the best collection of stoves he could get together; and in that room cookery lessons were given from time to time. This was the best means of advertising. Newspaper advertisements were no use. He paid £250 per annum or so for a 6-inch space, and could not trace any benefit from it. If it was desired to attract ladies of the middle classes, there was nothing like advertising cooking lessons. With regard to getting out stoves, he ventured to assert that the only way of placing any quantity was to let them on hire at moderate rents—say 2s. 1d. per month. He was open to sell on immediate or deferred payments; but, where he sold one stove, he rented 20. The sum received for rents in 1899 was nearly £500. Mr. Valentine remarked that he had done fairly well in placing stoves, with a uniform rate of 7s. 3d. per 1000 cubic feet for gas, and selling at a trade profit. Mr. Keyes spoke in favour of a minimum charge—say not under 4s. 2d. per month—to each consumer. If companies would try it, they would be surprised to find how little objection was made. Out of all his customers, there had not been one who complained. All paid freely, even if they had only used 200 or 300 cubic feet of gas. In special cases, he would waive the minimum charge by arrangement. In reference to Dr. Powers' remarks, Mr. St. Clair cited the case of Bakersfield, where they had lost nearly all the illuminating business owing to cheap electricity. It would have been utterly useless to try to push gas for lighting; but they had established an excellent and a profitable stove business.

Mr. Britton, in replying, said that Mr. Aldrich's experiences differed from his own, which showed that the question was to a great extent a local one, and that it was not safe to tell a gasman what he ought to do in his own district. In reply to Dr. Powers, he might say that up to two years ago he had very little success in the stove business. He had only placed about 1500 in 15 years; and the gas consumed by them was about 24 million cubic feet per annum. Now he had nearly 4000 stoves out, using 75 million cubic feet per annum; and this had been achieved by the means indicated. The total cost of advertising, canvassing, expenses of show-room connections, new services, and everything incidental to the stove business was about £2000 per annum; and for that he sold 50 million cubic feet of gas. No one would make a mistake in reducing the gas to the lowest possible point and in selling stoves for cash. After trying rental for many years, he found it a dead loss and no help to consumption. To put the thing another way, the average total outlay per stove was about £3 6s. 8d., and the sales averaged 14,500 cubic feet per stove per annum. So the cost of introduction was recovered in two years. He was strongly in favour of water-back stoves in preference to separate heaters, and put in two water-back stoves to one without a water back.

Mr. L. P. Lowe, of Pasadena (Cal.), read a paper entitled "The Synthesis of Commercial Gas," which was really a kind of popular lecture on the chemistry of coal gas and the properties of the principal constituents. He illustrated his remarks by several experiments, using samples of hydrogen, methane, ethylene, and carbonic oxide.

The Editor of the "Wrinkle" Department, Mr. G. H. Hollidge, of Mered (Cal.), submitted a report including illustrated descriptions of twelve different subjects. In one of these it was stated that after long experience with oil pipes it was found that heated oil rapidly corroded brass stopcocks, and iron ones were therefore used in preference. Another subject was "An Air Trap to Assist the Correct Registration of Oil-Meters." The author remarked that when once bubbles of gas or air found their way into the cylinders of the oil-meter, they could not escape, and they lessened the capacity of the cylinder and caused incorrect registration. As close as possible to the inlet of the meter he placed a small tank or cylinder, 6 in. diameter and 36 in. deep, into which the oil was admitted from the top, and drawn off from the bottom. Any gas or air present in the oil accumulated at the top; and a gauge glass was provided to show when this had occurred to any extent. The air or gas was blown off once or twice a day, as was found to be necessary, by opening a valve provided on the top for the purpose.

(To be concluded.)

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Allowance to be Made for Fast and Slow Meters.

SIR,—I understand it is the custom, when testing a gas-meter, to pass (say) 100 cubic feet through the test meter, and if the other meter registers 112 cubic feet, it would be called 12 per cent. fast. Then, for example, if the quarter's or half year's consumption was (say) 126,500 cubic feet, 12 per cent. thereon is 15,180 cubic feet—say, 15,200 feet—which would be credited; leaving 111,300 cubic feet to charge.

Now, the proper way to make the calculation is by the rule of three thus: Taking the above figures for example, if 112 = 126,500, what does 100 equal? This will give what the consumption would have been had the meter been correct. Thus:

$$\text{As } 112 : 100 :: 126,500 \text{ (i.e., } 126,500 \times 100 \div 112) : 112,900$$

which the consumption should have been. Now deducting 112,900 from 126,500 leaves 13,600 cubic feet to credit, and not 15,200 cubic feet as arrived at by the customary method.

On the other hand, if the test meter registers 100 and the other meter only 88, this meter would be 12 per cent. slow; and if the consumption for the quarter or half year were 126,500 cubic feet, then by the usual method 12 per cent., or 15,200 cubic feet, would be added—making the total to charge 141,700 cubic feet, whereas it should be calculated as follows:—

$$\text{As } 88 : 100 :: 126,500 \text{ (i.e., } 126,500 \times 100 \div 88) : 143,700$$

which the meter would have registered had it been correct, and consequently is the quantity to charge.

In the case of the meter 12 per cent. fast, it is 12 in every 112 incorrectly registered; and in the case of the meter 12 per cent. slow, it is 12 in every 88 incorrectly registered. Herein lies the error in the customary method of calculation, as in each case it is taken as 12 in every 100. A little reflection over the following figures will easily explain the matter: The test meter registers 100, while the incorrect meter registers 112, which is 12 per cent. fast. Now, 12 per cent. on 112 is 13.44, which would be taken off according to the customary way of calculation; whereas it can be seen at a glance that only 12 should be deducted. GAS-METER.

Sept. 6, 1900.

### Slot Consumption where Meters and Fittings, Etc., are Supplied.

SIR,—I have read with very great interest the communication from Mr. George Helps, of Nuneaton, in your issue of the 28th ult., on the above subject. The whole article bears the imprint of practical experience and careful consideration. It certainly serves to emphasize the fact that the consumption of automatic installations where cookers are not supplied is scarcely worth having, and should result in those gas companies who have not yet adopted the supply of a gas cooking-stove as an integral part of the installation, reconsidering their position.

The average consumption of a gas cooker with a 12-inch oven and two burners on the top may be safely taken to average 8000 cubic feet per annum. A 14-inch by 12-inch oven, with three burners on the top, will consume, on an average, from 10,000 to 12,000 cubic feet per annum.

Taking the cost of the smaller cooker, with 12-inch oven, at an average (say) of 30s., the profit Mr. Helps estimates as between the cost price of 2s. 6d. per 1000 and the automatic meter price of 4s. 2d. per 1000 will realize a gross profit per annum of . . . 12s. 0d.

And accepting his estimate of the amount required for depreciation at 10 per cent., this stove will cost per annum 3s., add (say) 5 per cent. per annum for interest on capital (1s. 6d.) . . . 4 6

Leaving on the small cooker a net annual profit of . . . 7s. 6d.

Taking the cost of the larger cooker, with 14-inch by 12-inch oven, at (say) 40s., and reckoning the estimated increased consumption at (say) 11,000 cubic feet, the profit on the same basis—viz., 1s. 8d. per 1000—would be a gross profit per annum of . . . 18s. 4d.

With depreciation on the same basis (10 per cent.), the stove will cost per annum 4s. Adding (say) 5 per cent. per annum for interest on capital, or 2s., we get . . . 6 0

Or on the larger cooker a net annual profit of . . . 12s. 4d.

These profits may be taken to be well within the mark, as they do not provide for any extra profit which might be fairly attributed to the use of the cooker in the daytime, and they are arrived at after allowing 5 per cent. interest on the full cost of the stove, which with the 10 per cent. depreciation would become, after ten years, additional profit.

That the sum of 7s. 6d. and 12s. 4d. per annum profit should remain after deducting 10 per cent. for depreciation and 5 per cent. for interest on the full cost, disregarding the effect of the 10 per cent. depreciation, is, I think, sufficient justification for abolishing all stove-rentals.

No better proof that the estimates of these consumptions are reasonable can be found than the figures which Mr. J. Ferguson Bell, of Derby, gave in his Presidential Address to the Midland Association of Gas Managers last March, and which I referred to in your issue for the 20th of that month. Mr. Bell showed that he got at Stafford an average consumption from automatic meters without a cooker of 6366 cubic feet, and from automatic meters with a cooker of 18,783 cubic feet, or a difference of 12,447 cubic feet through the addition of the cooker.

If further proof is needed, the following extract from Mr. W. B. M'Lusky's (of Perth) Presidential Address to the Waverley Association of Gas Managers last April (see "JOURNAL," Vol. LXXV., p. 999) will supply it: "Coming now to coin meters, I find that our second year will account for a consumption of 676,000 cubic feet, against 508,000 cubic feet for the first complete year, being 168,000 cubic feet more—an increase equal to 33 per cent. Of 80 coin meters fixed, 20 (or exactly 25 per cent. of the total) have cookers attached; the balance have boiling-rings. An analysis of the accounts shows that the 20 cooker installations consume, on an average, 18,900 cubic feet per annum; whereas those without cookers consume an average of 4966 cubic feet each. Coin meters with cookers attached are, therefore, worth practically 14,000 cubic feet per annum more than ordinary coin meter installations. In other words, the 20 cooker installations give a return for the year of 378,000 cubic feet, and the 60 ordinary installations a return of 298,000 cubic feet." The advisability of supplying best-grade stoves to better class automatic consumers will, I believe, in time engage the attention of gas engineers. It has met with conspicuous success where adopted—such concessions made on a commercial basis are certain to benefit both gas companies and consumers.

I can only hope that the result of Mr. Helps's valuable contribution to your pages may be to convert those gas companies who have not yet adopted cookers with automatic installations, and to induce those who now charge a rental for cookers to abolish it. E. W. T. RICHMOND.

Sept. 6, 1900.



## MISCELLANEOUS NEWS.

### COALOWNERS, GAS COMPANIES, AND THE COAL QUESTION.

After the excitement caused by the arrival in the Thames of a cargo of American coal for the South Metropolitan Gas Company had subsided, there was a slackening of interest in the coal question. It has, however, revived again, owing to the publication of the accounts of "interviews" with Mr. Livesey and Mr. Rylatt, of New York—the former as the cause of the importation of the coal, and the latter as possible medium by which further supplies may reach us from across the Atlantic. The coal bought by the South Metropolitan Company has been under trial; and as soon as definite results have been arrived at, Mr. Livesey has promised to forward them to us for publication. In the meantime, the Company's Engineer (Mr. C. C. Carpenter) states, in the course of a letter addressed by Mr. Livesey's instructions to the Editor of "Sell's Commercial Intelligence," that the coal is "very decidedly superior" to that which the Company are in the habit of using, "notably in regard to the yield of gas per ton, the illuminating power, and the remarkably low quantity of sulphur." He adds that "the coke also is of very good quality." Should further trial verify the claim made for the coal, that it will yield 15,000 cubic feet of gas per ton, it will, Mr. Livesey says, be the cheapest for the Company at the present high price of English coal; and they will continue to use it if successful. The coal was put on board at less than the English figure; but the cost here is greater. It is, however, a question of quality rather than one of price. Freightage is at present the impediment to the free importation of American coal; and this is the difficulty which Mr. Rylatt and those with whom he is associated propose to surmount. According to the "Daily Chronicle," these gentlemen have gone carefully into the matter, and when once they have brought the cost of freight down to 10s. a ton, they believe they will be able to cut into the London prices, and offer coal at a much cheaper rate than the consumer is now paying—in fact, at less than 25s. a ton. If shippers decline to offer them the above-mentioned terms, they will procure transports of their own. Asked whether the result would not be that the British coalowners would reduce their prices to a point below that at which he could trade with a profit, Mr. Rylatt replied: "Whatever happens, the British consumer will get his coal cheaper. But I do not fear any action which the colliery owners here may take when once we get our freightage rates down to 10s. British coal is dear, not because the supply is short, but because the demand is heavy. The official returns show a very peculiar state of things. While in one sense coal is scarcer than it has ever been before, the past year's output is the largest on record. This simply means that the consumption of coal all the world over is going up by leaps and bounds. England has proved that, in spite of her unprecedented output, she cannot meet the growing demand without resorting to extortionate prices. Now America is coming forward as a great coal trading country; and the competition will keep British prices steady. For many years England was the largest coal-producing country in the world; but America has at last got ahead of her in total output, and our increase in proportion is at a higher rate than England's." On the subject of quality, Mr. Rylatt remarked as follows: "In the three chief kinds of coal—steam, house, and gas—we can hold our own with English supplies of the best. The very reason that prompted the South Metropolitan Gas Company to order their recent shipment from America was because of the superior gas-producing properties of American coal. As for steam coal, your own Admiralty is looking out for a supply from us; while only recently a contract was concluded for supplying a million tons for the French Navy. Russia is also taking large supplies from us for her Navy. In fact, it is said that the coal from the well-known Pittsburg seam, which is used in the United States Navy, is the best steam coal in use." Mr. Rylatt added that his chief orders at present are from Continental ports; but negotiations are pending with regard to supplies for London and Liverpool. Nothing, however, can be done until the freightage rates are reduced; and he is confident this will be done shortly.

A rumour having become current that the trial by the South Metropolitan Gas Company of the consignment of American coal recently received by them had not produced good results, and that the Company would be forced to buy 500,000 tons of coal in the home market, a representative of the "Daily Express" called at the offices to make inquiries on the subject. Mr. Livesey was away, but certain information was furnished, which we give below under reserve, in view of the promise made by Mr. Livesey, already referred to, to publish the results in our columns: "The details volunteered may be briefly summarized as follows: 'American coal for gas making is a failure. Its yielding powers are a long way behind Newcastle coal; and the experiments made by the Company bear this out. This is a fair statement; and Mr. Livesey is not afraid of the result of his trial being made known to the members of the coal ring. Nor does the question of the supply of coal cause Mr. Livesey any anxiety. Offers are constantly coming in from friendly firms and large contractors; and while such a supply is available, there is no possible chance of the coal ring forcing Mr. Livesey's hand to a contract for a six months' supply. It is true that between now and next March 500,000 tons will be required by the South Metropolitan Gas Company; but nothing in the way of famine has threatened the Directors.'"

Two of the Directors of Messrs. W. Cory and Sons, who have been interviewed by a "Daily Express" representative on this subject of American competition, declare the stories about coal being put on the London market at 25s. a ton to be without foundation. One of them went on to say: "The real *crux* of the question as to whether America will ever be able to compete is quite another matter. At present she has no ships, for she is not an importing country; and when an American merchant charts a vessel he has to pay a freight both ways instead of one. Boats have to go out there in ballast. To put it broadly, nine-tenths of the boats chartered do go out in ballast. The best steam coal costs 13s. a ton on board, and the American merchants want to put prices up. Add to this cost the freight charge of 21s. 6d. a ton, and you will at once appreciate whether or not it is possible to supply American coal at anything like 25s. a ton." The speaker expressed the opinion that in a few months we shall come back to normal times, and America will be ousted from the field. Colonel W. P. Rend, of Chicago, who is a big operator in the American coal market, has different views. He says that, from

inquiries he has made, he is more than ever satisfied that within a few years America will wrest from England the markets of the Mediterranean and the Far East. In his opinion, the advance in price is caused by the increase in English home consumption, and by the fact that the coal workings become more expensive each year. This, he says, is where America will reap its greatest advantage. Three tons of New River or Pocahontas coal can be produced as cheaply as one ton of Welsh.

A report reached England through the Central News Agency last Wednesday, to the effect that the Pittsburg and Baltimore Coal Company had accepted a contract to ship 75,000 tons of coal to this country; but on Friday nothing was known of the matter on the Coal Exchange. It was admitted that it was quite possible that one of the large railway or gas companies might have made such a contract; but it was agreed that it was not likely to affect London prices.

Since the possibilities of American supplies began to be talked about, the shipping companies have put up the freightage considerably, until now London merchants declare that it is absolutely impossible to trade for ordinary shipments. The South Metropolitan Gas Company were only charged 16s. per ton freightage for the cargo of coal. Supplies have also been received at Havre for some time past, with freightage at 17s. Now 21s. and even 26s. per ton are being demanded. The Liverpool correspondent of "The Times" says that, owing to the advance in the price of coal, the Canadian steam trade notify that they have arranged to make an advance of 10 per cent. on freight rates. This charge will be made on the bill of lading under the style of "coal primage, 10 per cent.," and was to take effect for all steamers leaving after the 8th inst.

The Birmingham correspondent of "The Times," writing on Friday, said: "Notices have been issued by the Cannock Chase coalowners of another advance in coal, to take effect from Monday. Manufacturing coal is to be increased 1s., and domestic fuel 1s. 6d. per ton. The announcement has occasioned much surprise among Midland ironmasters and manufacturers, who declare that in the present state of trade they are unable to obtain more money out of customers, and they will themselves have to bear the greater portion of the burden. Already one or two blast-furnaces in South Staffordshire have been damped down in consequence of the heavy prices of fuel and the resulting unremunerative business; and other ironmasters threaten to take the same course. It is argued by employers that a diminished demand is the only weapon that has the smallest prospect of success in fighting the colliery proprietors. An effort is to be made to secure united effort in bringing pressure to bear upon coalowners to compel them, if not to reduce their prices, to hold their hands a little. A very large number of householders are laying in stocks in anticipation of great scarcity during the approaching winter; but at present there is no cause for such an apprehension. The demand from iron-works is no doubt declining. Large consumers are reducing their purchases as much as possible; and, so far as demand is now concerned, it may be said that, in the opinion of those who should be able to judge, there is no real ground for the advances."

It will be of interest to hear what a colliery manager has to say on the question of the coal supply. The new President of the National Association of Colliery Managers (Mr. C. E. Rhodes, of the Rotherham Main Colliery), speaking at the recent annual meeting, said it had been stated that our coal was becoming rapidly exhausted, and that our children's children would feel the pinch; and, moreover, it had been suggested that the export of British coal should be stopped, or at least restricted. In his opinion, such a suggestion should never be entertained, except, possibly, with regard to Welsh smokeless coal, which was limited in quantity and invaluable for naval purposes. These collieries, he thought, should be purchased by the country. But to stop the exportation of other coal would be to reduce the means of livelihood of 600,000 persons.

Writing on Saturday, the Durham correspondent of "The Times" said: "Extending from Seaham Harbour along the Durham coast southwards about nine miles, close to Hartlepool, is an area of a rough triangular shape, some three or four miles wide at its broadest part, and enclosing what is practically the only portion of the Durham coalfield not opened up. Hitherto the great obstacle to the development of this district has been the lack of railway facilities; but the North-Eastern Railway Company have recently acquired powers for, and are pushing on, the construction of between nine and ten miles of line to be known as the Durham Coast Railway, from Hartlepool to Seaham. This has given great impetus to the preparatory work necessary to the opening out of collieries, with the result that the area indicated is now the field of great activity in mining operations—sinking of shafts, pumping, and the like. Several new shafts are in course of sinking, two of which are on Lord Londonderry's property, about a mile south of Seaham Harbour. They are close to the sea, are 20-foot shafts, and in all probability the workings will be chiefly under the bed of the sea. When completed, they will be very large collieries, with a considerable mining population. About three miles farther south, at Easington, very heavy sinking and pumping plant has been laid down; and over 100 workmen are actively engaged on behalf of the Easington Colliery Company, who propose to erect 1000 houses for pitmen and their families. Private enterprise will, no doubt, largely supplement this number as the collieries are developed. Here two shafts of 20 feet and one of 17 feet are being made; and as the situation is on rising ground within a mile of the seashore, this will not only be one of the largest collieries in the county, but probably one of the healthiest. Operations very similar in character and size are also being carried on a mile farther south, where the Harden Colliery Company have secured very extensive royalties. Practically in the same district, but some four or five miles north of Seaham, another new colliery is in course of formation at Hylton, near Sunderland. These various undertakings, when in working order (to attain which as rapidly as possible no effort is being spared) will, it is estimated, give a combined yield of about 5 million tons per annum—a very appreciable addition to the present output of the county of Durham. During the past week there has been a decided shrinkage in demand, as well as in price, for the classes of coal principally produced in Durham and Northumberland."

Mr. J. B. Fenwick, the Manager of the gas and water works of the Retford Corporation, has received an increase of £25 per annum in his salary in respect of each undertaking. The matter came before the Town Council at their last meeting, when Mr. Fenwick's industry and ability were strongly eulogized. The two Committees were quite unanimous in recommending the advance.



## THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

### The Constitution and Analysis of Ammoniacal Liquor.

In the notice of the last report of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter) which appeared in the "JOURNAL" for the 28th ult., we mentioned that he had given therein the results of examinations made in the past year on the constitution of various ammoniacal liquors from English and Scottish sources, in continuation of the series recorded in his three preceding reports. This part of Mr. Carpenter's work was left to be dealt with on a subsequent occasion.

### ANALYSES OF AMMONIACAL LIQUORS.

#### From English Works.

Liquor.	Degrees Twaddel.	Cyanide.	Chloride, calculated as HCl, per Cent.	DISTRIBUTION OF SULPHUR (PER CENT.).							AMMONIA.				CARBONIC ACID.		SULPHURETTED HYDROGEN.		Total Acids (B + C); H.E.	Difference of Acids (B + C - A) H.E.	Difference of Acids (B + C - A) NH <sub>3</sub> , H.E. = 100.	Per Cent. of Total Acids as H <sub>2</sub> S.
				As Sulphate.	As Sulphocyanide.	As Thiosulphate.	As Polysulphide and other Forms (by Difference).	As Sulphide.	Total Sulphur.	Sulphur to Ammonia.	Total—per Cent.	Fixed—per Cent.	Free. Per Cent.	H.E. A.	Per Cent.	H.E. B.	Per Cent.	H.E. C.				
Gas-Works.																						
1	5.25	Absent	0.684	1.05	10.27	5.15	4.54	78.99	0.7350	31.49	2.3340	0.4210	1.9130	112.53	1.843	83.78	0.6169	36.29	120.07	+ 7.54	+ 6.70	30.2
2	8.00	"	0.387	2.78	27.42	19.95	9.56	40.29	0.5252	18.40	2.8535	0.3825	2.4710	145.35	3.086	140.27	0.2354	13.85	154.12	+ 8.77	+ 6.03	9.0
3	8.75	Traces	0.568	2.43	25.33	15.79	4.01	52.44	0.5921	19.99	2.9623	0.4463	2.5160	148.00	3.058	139.00	0.3300	19.41	158.41	+ 10.41	+ 7.03	12.3
4	5.75	Absent	0.547	5.62	37.71	15.59	4.00	37.08	0.4840	24.02	2.0145	0.4420	1.5725	92.50	1.873	85.15	0.1908	11.22	96.37	+ 3.87	+ 4.18	11.6
5	5.75	"	0.952	2.64	27.80	18.92	9.48	41.16	0.4620	22.11	2.0893	0.6545	1.4348	84.40	1.705	77.50	0.2021	11.89	89.39	+ 4.99	+ 5.91	13.3

#### From Scotch Works.

Gas-Works.	3.50	Traces*	0.145	1.82	19.65	10.64	-21.77	89.66	0.0987	7.73	1.2540	0.1280	1.1260	66.24	1.294	58.82	0.094	5.53	64.35	-1.89	-2.85	8.6
Coke-Ovens—																						
(a)	2.00	"	0.113	4.26	3.32	12.23	1.04	79.15	0.1055	9.65	1.0931	0.0965	0.9966	58.62	1.0970	49.86	0.0887	5.22	55.08	-3.54	-6.04	9.5
(b)	2.75	"	0.153	8.28	3.27	24.44	-4.19	68.20	0.0978	9.65	1.0132	0.1190	0.8942	52.59	0.9416	42.80	0.0667	4.17	46.97	-5.62	-10.69	8.9
Iron-Works	2.50	Absent	0.010	..	..	70.97	..	..	0.0031	0.75	0.4138	0.0068	0.4070	23.94	0.6023	27.37	Absent	..	27.37	+3.42	+14.33	..

\* And faint traces of ferrocyanide. In all other cases the latter was absent.

Dealing with the conditions of oxidation of ammonium sulphide in liquors, Mr. Carpenter states that, by the courtesy of the Manager of the works whence sample No. 1 in the above table was derived, further experiments were made with the view of ascertaining, as far as possible, at what point in the process of condensing, washing, and scrubbing the oxidation of ammonium sulphide to thiosulphate proceeded with the greatest rapidity. He chose these works especially for study as he knew that for a great many years past air in a proportion limited to a volume not exceeding 2 per cent. of that of the crude gas was regularly mixed with the latter at a point preceding the washing and scrubbing apparatus, but subsequent to, or at the end of, the condenser. What condensers in the latter apparatus is called "virgin liquor;" and this, together with that resulting from the final operation of the scrubbers, fed with fresh water, is pumped on to the washers (which, with the exception of the exhausters, immediately succeed the condensers), in order to be raised up to the proper ammoniacal strength, and still further purify the gas from sulphuretted hydrogen and carbonic acid. The salient conditions in the condenser may be said to be high temperature and a minimum of oxygen, and in the washers and scrubbers low temperature and a maximum of oxygen. As the object of adding the air is to obtain continuous reinvigoration of the oxide of iron purifiers employed for final purification of the gas, any oxygen absorbed in the washers and scrubbers is, so to speak, put out of action. He also knew that the Manager obtained singularly successful results with his Claus sulphur-recovery process in connection with his sulphate of ammonia plant, and wanted all ammonia combined with sulphur as sulphide, and none in an oxidized form.

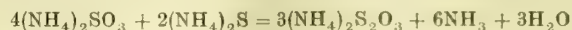
Samples of (1) virgin liquor, (2) scrubber liquor, and (3) store-tank liquor as flowing from the washers were sent to Mr. Carpenter, with particulars of the temperature of the gas at different points, and the relative volumes of "virgin" and scrubber liquor. The points requiring attention are set out in the following table:—

Liquor.	TEMPERATURE OF GASES.		LIQUOR LEAVING CONDENSER.		Remarks.
	Entering.	Leaving.	Thio-sulphate as Sulphur.	Sulphide as Sulphur.	
Condenser	Deg. Fahr. 110	Deg. Fahr. 60	Grammes per Cent. 0.064	Grammes per Cent. 0.165	"Virgin" liquor condenses here; 12 gallons per ton of coal carbonized.
Scrubber	60	60	0.034	0.736	Clean water feed; 13 gallons of liquor 2° Tw. per ton of coal carbonized leaves this scrubber.

Mr. Carpenter says the figures show that  $12 \times 0.064 = 0.768$  and  $13 \times 0.034 = 0.442$  give the comparative rates of formation of thiosulphate

All the liquors reviewed in the first portion of the following table were derived from gas-works; no English coke-oven liquor having been examined this year. Nos. 2 and 3 are strictly comparable—the scrubbing and washing apparatus whence No. 3 was derived being supposed to be the superior in efficiency; but in both of these works the strengthening of the liquor in percentage of ammonia by repeated passage down the scrubbers is considered of great importance. The high percentage of sulphur as ammonium sulphocyanide will not escape notice. In dealing with this general table, Mr. Carpenter says it is only necessary to direct attention to the large percentage of fixed ammonia, as chloride, in No. 5, derived from carbonization of coals of the Midland districts of England, Nottingham, North Derbyshire, and South Yorkshire. The second portion of the table deals with liquors derived from the distillation of Scotch coals.

at the condenser and scrubber; and that the ratio of what, in the absence of direct oxygen determinations, he must (provisionally only) assume to be oxidation in the condenser—i.e., the ratio of thiosulphate to sulphide—is 1 to 2.58, and in the scrubber 1 to 21.65. Temperature, therefore, seems much the more important factor, and very little action of the air has had time to take place in washers and scrubbers; the sulphur as thiosulphate in the final process only amounting in all to 5.15 per cent. of the whole. This investigation is, however, not complete; and Mr. Carpenter hopes to present more conclusive results from further investigations in the present year. In the two works whence samples Nos. 2 and 3 were derived, the influence of time on oxidation, even at low temperatures, is apparent. Mr. Carpenter was informed by the Manager from his works' records that the temperatures of the liquors vary from 62° to 74° Fahr.—not being sensibly different from that of the gas scrubbed. He says it is necessary to recognize as a possible reaction contributing to the general result that thiosulphate may be formed as follows:—



but it is not probable that during the charging of the retorts much sulphurous acid can be formed when the limited time of this operation is taken into account.

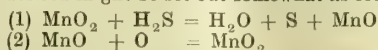
Passing on to the subject of the analysis of ammoniacal liquors, Mr. Carpenter points out that some account of the methods adopted in his laboratory were mentioned in his report for 1896. The experience since gained in the application of these methods to a variety of liquors from many sources has, he says, led to some modification of procedure, with increase of accuracy. In the earlier stages of the investigation, no method was known to him by which the sulphur present as thiosulphate in such liquors could be directly determined, as the colour end change with standard iodine was invariably masked by the organic matter present. A method of estimating thiosulphate by difference had therefore to be relied upon, which allowed no distinction to be drawn between the sulphur present as thiosulphate and that present as polysulphide or other forms. The difficulty has now, however, been satisfactorily overcome by the use of hydrochloric acid in place of acetic acid during the titration of the thiosulphate by iodine, by which means the action of the phenoloid bodies upon the latter is so far retarded as to allow the first appearance of the blue iodide of starch to be determined with approximate exactness. The thiosulphate figure so obtained must, however, he points out, be regarded as a maximum figure, since the reduction of the iodine by organic matter, though retarded, can never be entirely prevented, even by the presence of a strong mineral acid. The method is nevertheless sufficiently exact to allow interesting conclusions to be drawn from a comparison between the figure directly obtained in this way and that derived indirectly by the "difference" method already referred to. In general, it is found that while there is close agreement between these two figures in the case of coke-oven liquors and those derived from blast-furnace gases, marked divergence occurs when liquors from gas-works are examined; the "difference" figure being so constantly the higher of the two as to leave no room for doubt that sulphur is present in considerable amount, certainly as polysulphide, and possibly in oxidized forms other than those of thiosulphate or sulphate. Mr. Carpenter sets out the special methods now in use in these investigations, and concludes by saying that ammonia (free and combined) is determined in the usual



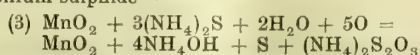
way by distillation; caustic soda being employed to liberate the fixed ammonia.

An interesting section in Mr. Carpenter's report to the Chief Secretary for Scotland is that in which he furnishes details of certain experiments carried out in connection with methods of treating foul gases evolved in the manufacture of sulphate of ammonia from gas liquor. He begins by reminding the Chief Secretary that, having regard to the differences of constitution and to the special difficulties presented by the nature and proportions of the foul gases evolved in the manufacture of sulphate of ammonia from liquors derived from the carbonization of coal in large or small quantities, he stated last year that his attention had been directed to other chemical methods than those in use in England for treating sulphuretted hydrogen. Laboratory experiments were made in the spring on the inquiry to which Mr. Curphey had directed his attention; being the application to ammoniacal liquors containing ammonium sulphides and hydrosulphide of the method of using binoxide of manganese and air in conjunction to decompose the sulphur compounds with separation of sulphur—the process being made continuous.

He expresses regret that, though conditions were varied greatly, and made as favourable as possible for the desired reactions, yet success did not attend his efforts. But as the history of failures is often quite as instructive as that of successes, he does not scruple to set out this particular one in a little more detail. In his report for 1898 he wrote: "The reactions desired might be set out somewhat as follows:—



And with ammonium sulphide—



an equation which must be only taken to indicate partial oxidation to thiosulphate and partial separation as free sulphur."

Being somewhat prepared beforehand for salts of ammonia exercising a retarding effect on oxidation, even with ample access of air to solutions in which precipitated protoxide of manganese is suspended, it was thought better to test separately the action on binoxide of manganese suspended in solution of (a) sulphuretted hydrogen in solution, air being supplied, but carbonic acid being absent; (b) sulphuretted hydrogen and carbonic acid in the gaseous state, together with air, in the proportions likely to occur in practice; (c) the same, with carbonate and bicarbonate of lime present in the converter with the binoxide of manganese; and (d) sulphuretted hydrogen in solution, air being supplied, carbonic acid being present in the converter in the form of various salts, manganese being present as binoxide and as carbonate. The reactions were so unsatisfactory as not to make it worth while to introduce the additional retarding agent ammonia.

Mr. Carpenter's assistant (Mr. Linder) devised apparatus of great ingenuity so as to test these reactions in every possible way, noting all factors that would be of importance in converting a laboratory process into a working method on the large scale. The apparatus consisted of a decomposer and a converter, and the results are set out as follows:—

- (a) *Absence of free lime.* Sulphuretted hydrogen in solution was run into the converter containing manganese binoxide in suspension in water through which a large excess of air was passing. Sulphide of manganese formed. At the conclusion of the experiment, the temperature of the liquor was raised to 55° C., and the current of air continued for 20 minutes, without causing any darkening of the sulphide.
- (b) *Carbon dioxide in the gaseous state.* A mixture of sulphuretted hydrogen and carbon dioxide was passed, together with excess of air, through manganese binoxide suspended in water. The binoxide was reduced to a white compound, very stable in presence of air, presumably carbonate of manganese; some manganese also being in solution. Sulphide of manganese separated on standing.
- (c) *Calcium carbonate and bicarbonate present.* A mixture of sulphuretted hydrogen and carbon dioxide was passed, together with excess of air, through water containing carbonate (and bicarbonate) of calcium and manganese binoxide in suspension. The binoxide was reduced to a white compound, very stable in presence of air, presumably carbonate of manganese; some manganese also being in solution. Sulphide of manganese separated on standing.
- (d) *Carbon dioxide in the form of various salts.* (1) Bicarbonate of soda in excess. Sulphuretted hydrogen in solution was run into a solution of bicarbonate of soda containing binoxide of man-

ganese in suspension through which a large excess of air was passing. A white residue was obtained, which resisted re-oxidation. No manganese in solution. (2) Manganese binoxide replaced by manganese carbonate. Sulphuretted hydrogen in solution was run into water containing recently precipitated carbonate of manganese in suspension through which a large excess of air was passing. The carbonate remained quite white. No manganese was found to be in solution. At the conclusion of the experiment, the current of air was continued for 35 minutes at the temperature of the laboratory without causing any darkening of the suspended solid.

- (e) *Free lime present—carbon dioxide absent.* Sulphuretted hydrogen with excess of air was passed through water containing free lime and binoxide of manganese in suspension. Oxidation of the sulphuretted hydrogen proceeded rapidly. It was easy to regulate the proportion of peroxide of manganese to protoxide in the solution by means of the air supply, no sulphide of manganese being formed.

In one experiment, a quantity of sulphuretted hydrogen equivalent to 1.89 grammes of sulphur entered a converter, containing 2 grammes of oxide of lime and 1.04 grammes of manganese binoxide, in 100 minutes. At the conclusion of the experiment, a sample of the contents of the converter was withdrawn for analysis. A current of air was then passed through the converter for a further period of 90 minutes. After 100 minutes, the liquor contained—

Sulphur as thiosulphate . . . . . 0.6304 gramme.  
" sulphuretted hydrogen . . . . . 0.0160 "  
Calcium sulphate and free sulphur not determined.

On continuing the air current alone for a further 90 minutes, the result was—

Sulphur as thiosulphate . . . . . 0.3000 grammes.  
" sulphuretted hydrogen  
(a) In converter . . . . . 0.0000 gr.  
(b) In iodine catch . . . . . 0.0024 "  
" sulphide of manganese . . . . . 0.0000 "  
" free sulphur . . . . . 1.3000 "  
" calcium sulphate (by difference) . . . . . 0.2876 "  
Total . . . . . 1.8900 grammes.

The preliminary experiments this year were made in the laboratory, allowing the liquors to descend a little scrubber maintained at a temperature of 125° Fahr., or thereabouts, by means of a warm water-jacket. Air in measured volume was aspirated through the scrubber; and after circulating the liquors for a definite period of time, a balance-sheet was prepared, showing (a) what change had taken place in the solutions originally employed, and (b) what proportions of sulphuretted hydrogen and of ammonia were found carried away by the current of air and arrested in the final catch-vessels.

Experiments were also made with liquors to which sulphurous acid solution in known quantity had been previously added; but as the introduction of this factor seemed distinctly to exercise on the ultimate oxidation of the sulphide a retarding effect, instead of accelerating it, these were soon discarded. Certain curious features were noted, however, in the disappearance of sulphur when the balance-sheet came to be made up. At the time these appeared unaccountable; but, as mentioned in Mr. Carpenter's report to the Local Government Board, a clue was found in the separation of sulphur from the polysulphide originally present. He hopes to say more about this reaction in next year's report. He found, however, that on the small scale of laboratory apparatus conclusions could not be drawn with sufficient accuracy as to the influence of the time factor on reaction. If left standing for any length of time, oxidation of liquor took place in the apparatus itself even when hermetically sealed; the volume occupied by the air being out of all proportion to that which would obtain in a larger scale experiment on a greater volume of liquor. On studying these preliminary results, he decided that no more definite progress could be looked for on these lines.

It then became Mr. Carpenter's desire to try the reactions on a small manufacturing scale with a scrubber or oxidizer of fair dimensions; allowing time for the descent of the liquor sufficient to observe results on one, or at any rate two, calculations. Through the courtesy of one of the leading gas-works engineers, plant was erected for him in the autumn, and every possible assistance was given to Mr. Linder in the experiments conducted by him with so much united skill and zeal. The liquor dealt with was, approximately of the constitution of the first sample given in the following table:—

TABLE of Inlet and Effluent Liquors.

Liquor.	Degrees Twaddell.	Cyanide.	Chloride calculated as HCl. per Cent.	DISTRIBUTION OF SULPHUR (PER CENT.).								AMMONIA.				CARBONIC ACID.		SULPHURETTED HYDROGEN.			Total Acids (B + C) ; H.E.	Difference of Acids (B + C - A) H.E.	Difference of Acids (B + C - A) NH <sub>4</sub> H.E. = 100.	Per Cent. of Total Acids as H <sub>2</sub> S.
				As Sulphate.	As Sulphocyanide.	As Thiosulphate.	As Polysulphide and other forms (by difference).	As Sulphide.	Total Sulphur.	Sulphur to Am- monia.	Total—per Cent.	Fixed—per Cent.	Free.		Per Cent.	B.	Per Cent.	H.E.	Per Cent.	H.E.				
													Per Cent.	A.										
Inlet liquor . . . 1 cubic foot of air and 1 gallon of liquor per minute.	3.5	Traces*	0.145	1.82	19.65	10.64	†-21.77	89.66	0.0987	7.73	1.2540	0.1280	1.1260	66.24	1.294	58.82	0.0940	5.53	64.35	-1.89	-2.85	8.60		
Effluent liquor . Temperature, 148° Fahr.	3.5	Absent	0.184	6.70	18.45	49.12	+24.20	1.53	0.0851	6.57	1.2390	0.1490	1.0900	64.12	1.107	50.32	0.0014	0.08	50.10	-13.72	-21.39	0.16		

\* Also faint traces of ferrocyanide.

† Negative signs mark the interference of organic matter with the estimation of sulphide and thiosulphate by iodine.

The results are given in gallons per minute flow down the scrubber, which was 3 feet in diameter and 12 feet in height, with an available scrubbing space of 78 cubic feet, filled with bundles of wood shavings so

packed as to present the greatest possible surface. The interior of the scrubber was provided with a coil of close steam-pipe in its lower area, so that cold liquor might be fed on the top portion, and reactions proceed,



if so desired, with a cold top zone and a hot bottom zone, and also for use as a regulator of temperature in all experiments if needful. Air was blown through a meter, and so measured in cubic feet per minute. When the conditions had become constant, the effluent gas was sampled for carbonic acid, oxygen, ammonia, and sulphuretted hydrogen. In one instance the oxygen was reduced per 100 volumes of escaping gas to 4.5—carbonic acid being 9.5 and sulphuretted hydrogen 0.3. As air contains by volume 21 per cent. of oxygen and 0.04 per cent. of carbonic acid, the reaction in abstraction of the former and addition to the latter is very notable. The change of darkening in colour in the liquor was marked; much oxidation of the organic matter taking place, as the abstraction of oxygen was decidedly greater in amount than that required for simple oxidation of the sulphur present combined with ammonia to the extent indicated by subsequent analysis. One reaction definitely suggested by these tests and experiments was that polysulphide of ammonium was present, from which sulphur separated in the free state. In large scale operations, sulphur has been found to deposit freely in the tubular liquor heaters when strong gas liquor is heated to a temperature of 170° Fahr., necessitating stoppage for clearing. This can only have come from decomposition of polysulphide of ammonium.

In translating these results into large-scale practice, it would have to be recognized that an acid ammonia catch would be needed to prevent loss of this body when carried away by the gases leaving the scrubber, and that these latter must be finally dealt with by an oxide of iron purifier, or by combustion, to destroy the last traces of sulphuretted hydrogen invariably present to some extent. Any gas-works engineer knowing the constitution of his gas liquor would, on the basis of these experiments, be able to construct a plant to make the oxidation of the sulphides in the liquor treated a continuous working process. Or if he chose to circulate given quantities of liquor—i.e., to prepare one day the liquors to be used for sulphate manufacture on the succeeding day—smaller scrubbing plant would be required; but very much more precaution would have to be used to prevent loss of ammonia from the circulated liquor, heated as it would be to a temperature of about 150° Fahr. The heat needed to raise the liquor to this temperature can easily be obtained from the sulphate plant condensers when sulphate manufacture is in progress; but it would have to be supplied from some other source were the two processes disconnected from each other.

The next proposal taken up was indicated in Mr. Carpenter's report for 1898—viz., to adapt the Claus sulphur-recovery method of treatment of the foul gases to Scotch conditions by supplying a jacket of waste heat to the kiln to promote reaction, or at any rate to prevent loss of heat by radiation, and so maintain a reaction once started. It was thought desirable to test this on a fairly large laboratory scale—the cylindrical jacketed Claus kiln being 13 inches in depth and 6 inches in diameter. Considerable thought and trouble were expended before a satisfactory apparatus was attained.

The heat-jacket was supplied by the products of combustion from a bunsen burner placed below the kiln. The direct action of heat on the bottom of the kiln could only affect the gases after these had passed the zone of reaction in the active portion of the kiln above the false bottom, 4 inches higher than the actual bottom. The diameter being 6 inches, the sectional area was 28.27 square inches. At first, the depth of material was 7 inches; the top 2 inches being fine material. The sulphiding of this, however, was so long a process that a start *de novo* was made with about 2½ inches, chiefly fine material—an available decomposing mass, therefore, of about 70 cubic inches. When sulphided, gas of about 8 to 12 per cent. sulphuretted hydrogen (the 92 to 88 per cent. being carbonic acid) was passed through with air in excess of that necessary for combustion to water and sulphurous acid, at the rate of about 600 cubic centimetres mixed gases per minute. The air was estimated at a minimum of five volumes of air to one volume of sulphuretted hydrogen—i.e., twice that necessary by theory to obtain separation of all the sulphur in the free state. This proportion was raised in subsequent experiments to frequently four times that required by theory, yet, in the case of manganese oxides, without increase of sulphurous acid when temperatures were kept low.

The temperature of the contact substance in the kiln was recorded on a thermometer specially constructed for use at the temperatures employed. The heat of the jacket required to replace that lost by radiation and that carried away by the gases was also regulated by observing this thermometer. Translating this rate of flow into cubic feet of gas per minute per square foot of area of contact substance, the figure 0.106 was arrived at. This was subsequently largely increased, both when oxide of iron was employed as the contact substance, and even more when oxides of manganese in the form of washed Weldon Mud were employed. As in some works using the Claus process broken brick in place of oxide of iron is employed—successfully, it is stated, if the temperature of the kiln is maintained sufficiently high—the experiments were extended to include broken brick as a contact substance. At low temperatures its efficiency is far inferior to both manganese and iron oxides; but this inferiority lessens as the temperature in the kiln is increased.

Mr. Carpenter sets out, in tabular form, the results of his experiments on the oxidation of gas liquor by air and on the reaction of dilute sulphuretted hydrogen with different contact substances, and then gives the following synopsis of conclusions drawn therefrom:—

#### A.—Oxide of Manganese as Contact Substance.\*

- (a) Rise of temperature (350° to 500° Fahr.).  
"Free sulphur" disappears, being replaced by sulphur in the form of sulphur dioxide.
- (b) Increased rate of flow (800 to 3000 c.c.).  
Causes little change in composition of exit gas.  
Reactions on the whole characterized—
  - (i.) At temperatures below 400° Fahr. by formation of "free sulphur."
  - (ii.) At temperatures above 500° Fahr. by formation of sulphur dioxide.

#### B.—Oxide of Iron as Contact Substance.\*

- (a) Increased rate of flow (1000 to 2000 c.c.).  
Distinct increase in percentage of sulphur as sulphuretted hydrogen in the exit gases.

\* Carefully sulphided before use.

- (b) Decreased air supply.

Distinct increase in percentage of sulphur as sulphuretted hydrogen in the exit gases.

Reactions on the whole characterized by formation of sulphur dioxide rather than that of "free sulphur."

#### C.—Broken Brick.

- (a) Increased rate of flow (700 to 2500 c.c.).  
Causes distinct increase in percentage of sulphur present as sulphuretted hydrogen in the exit gases.
  - (b) Rise of temperature (300° to 500° Fahr.).  
Causes distinct decrease in percentage of sulphur present as sulphuretted hydrogen, and increase of that present as sulphur dioxide in the exit gases.
- Reactions on the whole characterized by a large amount of sulphuretted hydrogen escaping unoxidized, and by formation of "free sulphur" in place of sulphur dioxide.

Mr. Carpenter hopes in the course of the current year to be able to see this reaction at work on the large scale at an important works in Scotland. Provision is being made for dealing with the sulphurous acid formed by means of a limestone tower in the way usual in the Claus sulphur process as applied in English gas-works—the tower immediately succeeding the sulphur catch chamber. Provision is also made for dealing with any unconverted or re-formed sulphuretted hydrogen, so as to prevent escape of this into the atmosphere.

Here we conclude our notice of Mr. Carpenter's report, which, as readers will have gathered, is full of varied and interesting matter.

### STATISTICS OF AMERICAN GAS UNDERTAKINGS.

The report of the United States Commissioner of Labour upon gas, water, and electric lighting plants for the past year has been issued, and is briefly noticed by our contemporary "Progressive Age." There are altogether 355 works dealt with, 11 of which are owned by municipalities. The following table shows the average cost of production per 1000 cubic feet of gas made. In its compilation, the value of the residuals has been deducted from the cost of the coal before calculating the averages. The fixed charges include depreciation, taxes, and the interest on the total investment.

Annual Output, Million Cubic Feet.	PRIVATE PLANTS.			MUNICIPAL PLANTS.		
	Number Reporting.	Excluding Fixed Charges.	Including Fixed Charges.	Number Reporting.	Excluding Fixed Charges.	Including Fixed Charges.
Under 2	10	\$1.86	\$3.71	1	\$2.26	\$3.34
2 to 5	69	1.18	2.17	2	0.69	1.18
5 " 10	63	0.98	1.84	2	0.82	1.51
10 " 15	43	0.79	1.44	..	..	..
15 " 20	45	0.78	1.52	2	0.60	0.96
20 " 25	23	0.78	1.35	1	0.68	1.03
25 " 50	38	0.8	1.25	1	0.55	0.91
50 " 75	17	0.65	1.14	..	..	..
75 " 100	9	0.61	1.06	..	..	..
100 " 500	18	0.45	0.92	2	0.44	0.63
500 or over	8	0.46	0.76	..	..	..

### MUNICIPAL FINANCE AT SALFORD.

#### The Accounts of the Gas, Electricity, and Water Departments.

The abstract of the municipal accounts for Salford for the year ended March 31 last has been prepared by Mr. John Elliott, the Borough Treasurer. The several revenue accounts show that five of the departments have a total deficiency of £33,645. Against this, other departments show a surplus of £45,110; leaving a net surplus on the year of £11,465. Of the trading departments of the borough the gas-works have, as usual, been the most satisfactory. As a result of the year's working, the Gas Committee have been enabled to hand over £32,153 in relief of rates; being £5686 in excess of the profits for the previous year. The receipts during the year from the sale of gas and the rental of stoves amounted to £152,447—an increase of £12,927 over the previous twelve months. The revenue from the sale of residual products shows a rise of £15,637; making a total of £28,564. Against this has to be placed an increase of £16,644 in the cost of the manufacture of gas, and of £6233 in depreciation, sinking fund, and miscellaneous charges. In the Electricity Department there is a loss of £2028 on the working for the year, mainly caused by the amount of interest on loans and sinking fund contributions, owing to the capital expenditure on works undertaken to supply the future requirements of the borough. These will be large, as shown by the fact that the revenue from the sale of electric current has increased by £2538, compared with the previous year. The Water Committee have placed £2201 to the credit of the district fund in aid of the rates as the result of the year's working, being a decrease of £1477 as compared with the surplus of the previous year. Salford is dependent upon Manchester for water supply, and during the past financial year the sum of £19,289 was paid to the Manchester Corporation for water supplied in bulk, ranging from 3d. to 9d. per 1000 gallons. Although there has been an increased payment to the city of £1447 for water supplied, the receipts on account of rentals have only risen by £734. The mortgage debt of the borough increased during the year by £179,510, and now stands at £2,186,307. The balance of assets over liabilities has gone up by £68,579; and the total now stands at £813,312.

The Directors of the British Gaslight Company, Limited, recommend a dividend at the rate of 10 per cent. per annum (free of income-tax) for the half year ending the 30th of June.



**MANCHESTER GAS, ELECTRICITY, AND WATER SUPPLY.**

At the Meeting of the Manchester City Council held last Wednesday, the minutes of the Gas, Electricity, and Water Committees were approved without discussion.

The chief items of interest in connection with the gas undertaking were the fact that the Finance Committee had instructed the City Treasurer to allocate loans to the amount of £100,000 to the gas account, and that plans of new offices, &c., for the foremen at the Rochdale Road station, prepared by the Engineer (Mr. J. G. Newbigging), had been approved—the work to be carried out by the Committee's own men.

Among the resolutions submitted by the Electricity Committee was a recommendation that a draft agreement be sent to the Urban District Council of Prestwich for transferring their Electric Lighting Order to the Corporation, and that the Town Clerk be instructed to take the necessary steps for obtaining the approval of the Board of Trade.

The minutes of the Water Committee contained a resolution approving of a report to the Thirlmere Sub-Committee by the Engineer (Mr. G. H. Hill), as to arrangements for laying a second pipe in connection with the Thirlmere aqueduct. From the experience of the working of the present syphons, which were 40 inches in diameter, and looking to the reduction in discharge by the pipes from sedimentation and increased friction as time went on, it was recommended that the second line of pipes should be 44 instead of 40 inches, and 40 inches where it is now 36 inches. By the adoption of this course, all contingencies would be fully provided for. Having been requested by the Committee to take into consideration the question of adopting steel instead of cast-iron pipes, the Engineer had thoroughly considered the matter, and had come to the conclusion that it was desirable to adhere to the use of the former material in preference to the latter. The cast-iron pipes for the portion of the aqueduct to be first commenced should be provided as soon as possible. In consequence of the present high price of iron, it would probably be desirable to let the piping in several contracts, as almost all pipe makers were at present very full of work, and might not be able to supply more than a limited quantity. Judging from the time taken for the delivery of the existing line of pipes, the Engineer thought the pipes now required, divided into four or five contracts instead of two, might be obtained in two years. When the preparations for the letting of the contract for the cast-iron pipes were completed, a separate one could be prepared for the steel pipes, which he recommended to be used in the subways and across some of the bridges. This would be a comparatively small contract. Experience led him to recommend that the same methods of inspection and supervision which were followed in the provision of the first pipe, and which were found to be eminently satisfactory, should be adopted for the second. The first pipe had proved to be an exceptionally sound one. Having discussed with Mr. Barnett (who was engaged on the construction of the works about eight years) the best mode of carrying on the work, he had come to the conclusion to advise the Committee to let the pipe-laying by contract; stringent provision being made in the conditions for the protection of the present pipe.

**GLASGOW CORPORATION GAS SUPPLY.****The Gas Accounts Adopted.**

At a Meeting of the Corporation of Glasgow last Thursday, Mr. R. M. MITCHELL, the Convener of the Gas Committee, moved the adoption of the annual accounts of the Department, a summary of which was published in the "JOURNAL" for Aug. 14, p. 422. He said that the increased price of coal involved an additional expenditure of between £140,000 and £150,000 for the quantity required for the year on which they were now entering. To meet this, an increase of 6d. per 1000 cubic feet in the price of gas would have been required, but for the fact that, during the past year, they had benefited by an advance in the price of coke, while they had also been receiving a very good return from their residual products. Accordingly, instead of asking the citizens to pay this year an increase of 6d., which might fairly have been imposed, the Committee had decided to fix the price at 2s. 6d. per 1000 cubic feet—an increase of 4d. as compared with last year. How they would come out at the end of the year it was too early to say; but perhaps after this year they might be able to get contracts for coal at something like the old figure, when the present exceptional circumstances had passed away. This was only the second time within 16 years that the price of the gas had been raised. In 1884, when he entered the Council, the price was 3s. 10d.; and since then, with one exception—in 1892-93, when there was an increase—it had been reduced every year till it reached 2s. 2d. Even with the present increase, it was less than half the cost when the undertaking was acquired by the Corporation. In these circumstances, he did not think the citizens had any great reason to complain; and at present—in view of the general prosperity which all classes had had for some time—they could well afford a small increase for one year in the price of gas. The new works were in a very satisfactory state, and they owed a great debt of gratitude to their Engineer, Mr. Foulis, for the excellence of the plans he had designed for their new undertaking. Mr. Foulis was a patient, hard-working, painstaking Engineer, who devoted his life to making his department a success; and in this he had succeeded. In conclusion, Mr. Mitchell formally moved that the price of gas be increased to 2s. 6d. per 1000 feet; and he expressed the hope that by-and-by they might be able to go back to something like the present price of 2s. 2d.

Mr. BATTERSBY said that, while the citizens were deeply grateful to the Committee for the very low figure at which they had kept the price of gas, and for the fact that the charge was lower than it was 16 years ago, still they had expected that, in proportion as the population increased, the price of gas should decrease—the same as was the case in regard to the charge for water. He noticed there was a leakage of 569 million cubic feet, or 9 per cent. of the gas produced. He wanted to know if nothing could be done to prevent this. He was inclined to think that the fact that an increase of 4d. was proposed in the price of gas hardly spoke for the skill, power, and penetration of the Committee.

Mr. STEWART said he understood that the Gas Committee were negotiating for a coal mine, and that a report on it was made to the Committee,

although the Council had not heard anything about it or given them any remit on the subject.

Mr. BURT thought it was a very serious matter that the citizens had to face an increase of 4d. in the gas-rate; but in the circumstances, he did not see how it could be avoided. However, he thought they should look a little forward. He believed a solution of the difficulty was to be found in a reduction of the candle power of the gas. The Corporation had not followed the examples of the English companies and corporations by adopting their standard, which was lower than the standard in Glasgow. The result of their maintaining the high quality was that it was necessary to purchase expensive cannel coal, which was being rapidly worked out, or was practically unprocurable except at a ransom price—a cost which was quite out of proportion to the value of the gas obtained. The citizens would have very much better value for their money if the candle power were lower. Another advantage of using a lower quality of coal would be that there would be a much better quality of coke. Coke in England brought a very much higher price than it did in Glasgow.

Mr. MITCHELL, in replying, said there was no doubt leakage took place; but it was being decreased as much as possible. When the Corporation took over the gas-works, the leakage was as high as 18 per cent.; now it was about one-half that. He was very glad the Committee had contracted for their coal so long ago as May; because they could not now buy the same quality except at an increased price of 1s. per ton. It was quite true that American coal could be brought to this country; but he did not think there was any chance of it competing in price with Scotch coal. In regard to what had been said about the candle power of Glasgow gas, Mr. Foulis had not thought it necessary to come before the Council with any proposal for a reduction. In course of time the Committee might be driven to make such a proposal, when the coal of which Mr. Burt spoke became more scarce, or even extinct. No doubt the gas would be cheaper for heating, and especially for motive power, in which Mr. Burt was interested. There had certainly been a proposal to acquire a coal mine. A self-constituted Committee (but an intelligent and reasonable Committee for all that) made a proposal, and had got a report from some mining engineers. After the reports were discussed by the Committee, it was thought desirable not to pursue the subject any further.

The accounts were then adopted.

**ABERDEEN CORPORATION GAS SUPPLY.****The Accounts for the Year.**

At a Meeting of the Aberdeen Corporation on Monday last week, Mr. Kemp, the Convener of the Gas and Electricity Committee of the Corporation, in submitting the gas accounts for the year ending the 31st of July, said: The revenue from the sale of gas has risen £3891; from coke, £2188; from tar and ammoniacal liquor, £2363; while that from cyanogen is at a standstill, owing to the war in South Africa. The amount received from house services is down by £797; but so is the corresponding entry on the other side. Revenue from gas-stoves is up £74; but, as will be seen from the other side, the expenditure is treated as the same amount, the balance being always written off as depreciation. Revenue from rents and feu duties is nominally down £32—the real revenue being practically the same as before; but there has been considerable exceptional outlay in putting a water service all through the grounds for the use of our tenants, the Gallowhill Plotholders' Association. The total revenue for the year has risen £7181. Looking at the expenditure, coal has risen by £8304, purifying materials by £286, salaries by £35, wages of stokers by £1541, and horse and stable account by £283; while maintenance of plant has fallen £349. The total expenditure in connection with the manufacture of gas has risen £10,259. Under the head of distribution of gas, there is an increase of £883. Rents, rates, and taxes are up £508; expenditure on management has risen £35; while general charges are up £127; discounts are up £262; and bad debts have increased by £130. The total expenditure has risen £11,352; and as the revenue only rose £7181, the balance carried to net revenue account is therefore £4171 less than that carried the previous year. Turning to net revenue account, payments of annuities are £165 down, interest and mortgages are £52 up, and sinking fund for redemption of mortgages is £90 up; the balance carried down being £489, as against £4138 the previous year. It is always interesting in dealing with accounts, especially those of a manufacturing concern, to compare them with the results of the previous year, and ascertain why these results are as they are, and not different. Reference to the former year's accounts will show that there was a net balance in the year 1898-99 of £4138. To this there fell to be added a balance of £5864 belonging to previous years' accounts, which the Committee of that day had kept in hand. These together give £10,002, as shown in this year's accounts. Now, alongside this apparent free balance of £10,000, there are several serious elements affecting it that cannot be readily got at otherwise than on an occasion like the present, when we are dealing with results and their causes. In submitting the accounts for last year, I reminded the Council that the former Committee had left the present Committee the following legacies: Coal contracts for this year's working at an increase in cost to the tune of £5500. They had also raised the wages bill of the employees, which I modestly stated then at £500, but which has turned out over £800. In addition to this, the former Committee, in the exercise of their judgment, and in the hope of a fall in the price, had under-contracted for some 3000 tons of coal; and on this quantity the present Committee had to pay an increase in price to the tune of 5s. 4d. per ton. This, again, represents some £800. Now, these obligations, left to us as a sort of *per contra*, come to some £7100; and, as the Council will remember, we gave the consumer a reduction of 1d., which equals some £2300. We have altogether absorbed some £9400 out of the surplus of £10,002 left to us from the accumulated balances of previous years. A word now as to the balance carried to next year in the accounts we are dealing with at present. If you refer to the general balance account, you will find it there stated at £10,491, which, of course, includes the £600 left of the previous Committee's balance. The revenue and fire insurance fund now stands at £22,789, an increase of £1165; while the balance at credit of contingent fund is £90, instead of £1287 last year, there being a considerable increase in the number of annuities purchased during the year. A look at the statistical table will show an increase of 4044 tons of coals used;



while the average price paid per ton is up 1s. 10½d. There has been 37,639,000 cubic feet of gas made more than in the previous year, while the percentage of loss has been reduced by 1.13. Turning, now, to the estimate for the current year, it is a matter of common knowledge that contracts have been entered into for coal and other materials at increased prices, expected to reach at least some £14,000 to £15,000 this year, which, if laid on the consumer, would represent a rise of over 6d. per 1000 cubic feet of gas. In view, however, of the splendid balance on the working of the year just closed, the Committee feel justified in only asking for 2d. of a rise in Aberdeen, as against a rise of 6d. in Dundee and 4d. in Glasgow. But for that balance, there must have been a very large increase in the price. The Committee are, however, hopeful that the present inflation of prices in coal is only temporary; and they prefer to use up the profit of last year rather than keep it in hand and raise the price abnormally high, even for one year. I need hardly say that, but for the increased price of coal, the Committee would have had the pleasure of intimating a reduction of probably 3d. per 1000 cubic feet on the present occasion. Apart from the accounts, there are just two points calling for remark. Slot meters have come to stay; there being 2600 meters already out, and the demand is still increasing. Notwithstanding the enormous increase in the amount of gas sold last year, this year is going to surpass it; the demand last month being 4,600,000 cubic feet greater than that of August last year.

Baillie HENDERSON said it was very satisfactory that the advance in the price of gas was not more than it had been on account of the price of coal. He supposed the report was agreed to.

Mr. JOHNSTON said he had a word to say in regard to that.

Mr. WATSON seconded Mr. Kemp's motion.

Mr. JOHNSTON said he had no amendment to move; but there was a statement made by Baillie Kemp, as Convener of the Gas Committee, which was a little astonishing. The statement was in regard to the old Committee's transactions. Last year they had a balance of £10,000; and, if it had not been the fact that they had this balance, no doubt the price of gas would have been raised considerably this year, because, according to the estimates, they only showed a balance of £970 for next year, while the balance for last year was only £400. Baillie Kemp referred to the coal they had to get last year. But the Committee estimated for coal the year before last on the same principle as the Committee had done last year. They estimated for that coal, at a certain figure, and he supposed the Gas Committee had done the same this year, and they had shown in their estimates that there would be a profit. In the year 1899, the Gas Committee showed a balance of £10,000, which reduced the price of gas to 3s. This balance had been absorbed this year; and the price of gas raised 2d. per 1000 cubic feet, and the estimates only showed a surplus of £970. He thought Baillie Kemp, in all fairness to the Committee of 1899, should say that it was on account of the balance of £10,000 that this year they had only required to raise the price of gas 2d. per 1000 cubic feet.

Mr. KEMP said he had purposely laid himself out to give the previous Committee every credit. Wages were raised by the previous Committee by £800. All these things, to the tune of some £7100, they had wiped out with the balance of £10,000; and with the reduction of 1d., absorbing £2300, they were left with, as he had said, some £600 of the previous Committee's balance.

The motion was then agreed to.

### LONGTON CORPORATION GAS SUPPLY.

#### The Profit on the Gas-Works—Increase in the Manager's Salary.

At the Meeting of the Longton Town Council last Thursday—the MAYOR (Alderman Edwards) in the chair—the minutes presented by the Gas Committee included the balance-sheet for the year ending the 30th of June. It showed that the sale of gas to private consumers produced a sum of £18,520, as compared with £15,991 in the preceding twelve months. Adding the public lighting made a total of £21,028, against £18,458. Residuals produced £6378, as compared with £3624. The total revenue was £27,559, against £22,144. The outlay on coal was £8507, against £6614; purifying materials and wages came to £295, against £586; carbonizing wages, to £1668, against £1868; repairs and maintenance of works and plant, to £1562, against £1078. The total expenditure was £17,489, as compared with £15,714; and the balance carried to the net revenue account was £10,070, against £6430. The profit on the year's working, after deducting interest and sinking-fund charges, with the balance brought forward, was £4075, of which £2000 was credited to the borough fund in relief of the rates.

Alderman BAKEWELL, in moving the adoption of the minutes, said he thought they might all congratulate themselves upon the very handsome results of the year's working. Taking into account the price of coal and the charge for gas, it was far and away the best report the Corporation had ever had from the gas-works—in fact, he could not find any balance-sheet from other works to beat them. This report proved beyond doubt that the plant adopted some years ago only required working upon the right principles to produce very good effects. Alluding to the manufacture of gas, which included the cost of coal, purifying, and wages, he said the increased outlay in this respect last year over the previous twelve months was a little more than £1300; but when they came to take items separately, coal had increased by £1700, while there had been a decrease in wages of £400, and this in face of the fact that a much larger quantity of coal had been handled, and a greater quantity of gas made. He might say, to give an idea of what good management could do, that if the wages last year had been at the same rate per 1000 cubic feet of gas as previously, the bill would have been £1000 more than it was in 1898-9. Therefore, by proper management, £1000 had there been put to profit. The Committee, he remarked, had not at all beggared the concern. They had kept everything in thoroughly good order—in fact, in many respects they had gone out of their way to put on the revenue account expenditure which they might very well have held over till another year. For instance, in regard to the maintenance of the works, the cost last year was upwards of £2300, whereas in the preceding twelve months it was not quite £1500; representing an increase of £850, which had been caused by the refixing—practically the renewal—of the new retorts, which had, through carelessness, been badly managed. Taking other

items on the debit side, Alderman Bakewell referred to stoves, and said that whereas many gas-works only wrote off 10 per cent. on their stoves, a Longton they depreciated them by 20 per cent., which was on the safe side. Turning to the receipts, he said the augmented consumption of gas was very satisfactory. He had occasion to tell the Council some time ago that through the winter months it went up for some time at the rate of 25 per cent.; but the increase for the whole year averaged 20 per cent., which was an extraordinary and very large rate. The residuals had realized a very great increase. Coke had resulted in an advance through the higher price of coal; but other causes brought about the general improvement in the amount realized from residuals. Coke, through proper firing, had been hard and of good quality, in contrast to the soft and friable coke of the previous year, which almost had to be given away. Speaking of the capital account, he said that at Longton it was 17s. 6d. per 1000 cubic feet of gas made; whereas the average of the Staffordshire gas-works in the hands of local authorities was 10s. 6d. There were two ways of reducing the capital account—by allowing it to decrease, and by increasing the production. This year, with the greater production of gas, Longton had been able to bring the capital down by payments which had reduced the amount from 17s. 6d. to 14s. 10d.; and if they could prevent the capital increasing, and pay instalments as they were doing year by year to the sinking fund, they would in a few years have the account in a very satisfactory state. He hoped the Council would encourage the Committee to do this. Alluding to a recommendation to increase the salary of the Engineer and Manager (Mr. W. Langford) by £100 per annum, he said they all knew that, however much a Committee strove, unless they had a good Manager, they could not get satisfactory results for the town. There was no doubt that in Mr. Langford they had an exceedingly good man, who was not only capable, but very industrious and plodding; and he had one of the qualities they had had the character of lacking very much in Longton—courtesy to customers. He (the Chairman) had received on all hands most satisfactory testimonials to Mr. Langford's courtesy. He hoped the Council would accord the increase of salary ungrudgingly, and show their appreciation of the Manager's efforts.

Alderman LEAK said he had no objection to the increase, if what had been placed before them was to be traced to more efficient management. But he thought the present satisfactory state of affairs was due in large measure to the increase derived from residuals, which amounted to £2754, and the rise in coke to £887—a total of about £3600 out of the £4011 of total net profit. However, he believed the works were being skilfully managed, and therefore he should vote for the increase. But he thought, seeing they were making the consumer pay more for his gas, they should let him have a little back in the way of reducing the rates, if feasible.

Mr. G. BLOOR moved, as an amendment, that the increase be £50 only, but he did not find a seconder; and the Committee's recommendation was carried.

### CARLISLE CORPORATION GAS AND WATER SUPPLY.

#### The Past Year's Working.

The statement of accounts of the gas and water undertakings of the Carlisle Corporation have been adopted by the Gas and Water Committee. The revenue account in connection with the gas-works shows that the total receipts amounted to £44,780, and the total expenditure to £37,689; leaving £7091 to be carried to the profit and loss account. From the private sale of gas there was received £30,111; and from public lighting, £3148—making together £33,259. Meter-rentals yielded £465; and residual products brought in £10,547—coke accounting for £5311, tar for £2698, and sulphate of ammonia for £2587. On the expenditure side, the cost of the manufacture of gas is put down at £32,010, made up of £22,876 for coals, £819 for purifying materials, £381 for salaries of Engineer, &c., £4039 for wages, and £3891 for repairs and maintenance of works and plant. The expenses of distribution came to £2711. In the profit and loss (net revenue) account, the Committee credit themselves with £15,849, consisting of £8758, the balance brought forward from the previous account, and £7091, the balance transferred from the revenue account. The net profit for the year is £4513. The quantity of gas made was 303,781,000 cubic feet; and the quantity sold, 285,041,600 cubic feet, of which 255,806,900 cubic feet were for private consumption. The unaccounted-for gas was 14,502,000 cubic feet. During the year 21,528 tons of common coal and 8764 tons of cannel were carbonized—a total of 30,292 tons. The coke made during the year was 14,096 tons; tar, 2106 tons; sulphate of ammonia, 296 tons. The coke used in the manufacture of gas was 4054 tons.

The revenue account in connection with the water-works shows on the credit side that the net amount of water-rents was £10,234. On the expenditure side, the account shows that maintenance absorbed £3802, and management £496; making the total expenditure £4298, and leaving a balance of £5936 to be carried to the profit and loss account. From this account it appears that the balance, added to that brought from the last account of £8358, with £50 interest, amounts to £14,344. On the other side of the account, it is shown that income tax came to £203; that the amount paid to the district fund was £5983; and that the remaining £8158 is distributed as follows: Amount retained by Water Committee under resolution of Council dated Oct. 25, 1887, £2374; and amount payable to the district fund, £5784, of which £4461 is the net profit for the year.

Last year the amount paid into the city fund on account of the gas profits was £8758, as compared with £6649 payable this year—a decrease of £2109. The net profit for 1898-9 was £6713, against £4513 now. The amount of the water profits paid into the district fund for 1898-9 was £5983, compared with £5783 this year—a decrease of £200. The net profit then was £4764, against £4461—a difference of £303. The quantity of gas made in 1898-9 was £297,742,000 cubic feet, which was about 15,000,000 cubic feet more than the production in 1897-8. The make this year is still higher, by more than 11,000,000 cubic feet. In two years, therefore, the additional quantity of gas made has been upwards of 26,000,000 cubic feet. Private consumption represents an increase this year of about 1,500,000 cubic feet; and upwards of 500,000 cubic feet more gas has been sold for public lighting. The quantity unaccounted for is, however, close upon 1,000,000 cubic feet more.



## PROVINCIAL GAS AND WATER COMPANIES.

## Gas Companies.

The half-yearly meeting of the Dover Gas Company was held yesterday week—Mr. Willsher Mannering presiding. It was resolved to declare the usual dividend of  $7\frac{1}{2}$  per cent. The increase in the sale of gas was reported to have been 10·8 per cent. as compared with the same period of last year. On the other hand, the expenditure showed an increase of £4946, which was mainly due to the additional cost of coal, higher wages, and the rise in values of nearly all materials used in the manufacture and distribution of gas.

The half-yearly meeting of the Farnworth and Kearsley Gas Company was held on the 30th ult. in the Board-room at the works—Mr. J. W. Watkinson in the chair. The report and statement of accounts showed that the total receipts on revenue account during the six months ending June 30 last amounted to £9484. The expenditure for the same period was £7081; so that there was a balance of £2403 to carry to profit and loss account, bringing it up to £5070, which sum was available for distribution. The Directors recommended the usual dividends for the half year—viz., at the rate of 10 per cent. on the "A" stock, and of 7 per cent. on the "B" and "D" stocks, less income-tax. The report was adopted. The quantity of gas sold during the six months aggregated 57,116,000 cubic feet, against 48,371,000 cubic feet in the preceding half year. The Company have 1260 penny-in-the-slot meters in use.

The half-yearly meeting of the Kingston Gas Company was held on the 30th ult.—Alderman Bedford Marsh in the chair. The Directors' report showed that the receipts for the six months ending the 30th of June last amounted to £40,297. The amount paid for rates and taxes (for the half year) was stated to be £1466. Reference was made by the Chairman to the new works in progress, which he stated were essential to an adequate supply of gas. The payment of the customary dividends was sanctioned. The thanks of the shareholders were given to the Board of Directors, the Manager, the Secretary, and the staff; and the Chairman, Mr. H. F. Packham, and Mr. J. A. Fricker suitably responded. An extraordinary meeting was then held, when it was resolved that the Directors be empowered to raise further capital under the new Act.

The report presented by the Directors of the Lewes Gas Company at the half-yearly meeting of shareholders last Wednesday was accompanied by accounts which showed that in the six months ending June 30 there was a profit of £1739. After providing for interest on mortgages, the balance of net revenue (as shown in the profit and loss account) was £3098. The Directors recommended that a dividend for the past half year should be declared at the rate of 5 per cent. upon the consolidated original capital stock, and at the rate of  $3\frac{1}{2}$  per cent. upon the additional capital stock. These dividends (after deduction of income-tax) would amount to £1422, and leave a balance of £1676 to be carried forward. The Chairman (Alderman Kemp), in moving the adoption of the report, said there had been an increase in the quantity of gas sold to the extent of 10 per cent., which was very considerable; and they had 450 penny-in-the-slot consumers. This was a comparatively new part of their business; and he was glad to know that it was a substantial part. He trusted it would increase. With regard to the coming half year, the advanced price of coal, of course, affected them very considerably. The Directors were very reluctant to raise the price of gas; but they did not think they could do other than follow the example of most gas companies in taking this course, because they were absolutely dependent for their dividend upon the price of gas and coal. If the latter advanced, the former must necessarily follow sooner or later. Of course, if the price of coal were lowered, that of gas would follow all over the country; and the Directors would be only too glad when this time arrived. The motion was carried; and the dividends recommended were declared.

At the annual general meeting of the Morecambe Gas Company, recently held, the report of the Directors noticed in the "JOURNAL" for the 28th ult., in which a dividend of  $1\frac{1}{2}$  per cent. was recommended, was adopted. The Chairman (Mr. W. C. Welch) expressed regret that they were parting with their undertaking, which had a good future before it, though they were not dissatisfied with the amount they had received for it. He spoke very highly of the way Mr. W. Duff, the Engineer, and his son, who assisted him, had discharged their duties.

The shareholders of the Richmond Gas Company held their half-yearly general meeting on the 30th ult.—Mr. T. J. Carless in the chair. In moving the adoption of the Directors' report, the Chairman stated that during the six months ending June 30 the total amount expended which was chargeable to capital had been about £460, for new mains, services, &c. The continued increase in the demand for gas had, however, now overlapped the producing capacity, and had necessitated the extension of the carbonizing plant. They had accordingly started on the erection of new retorts to fill up the existing space in the retort-house, the capital charges for which would fall upon the next half year. There was a considerable increase in the cost of coals to be noted—viz., £2470. The whole of this sum, however, was not attributable to the rise in price; 1000 tons more having been used to meet the growing demand for gas. But the remainder of the old contracts would have all expired in the current half year; and they would have to meet the most serious rise in price that had taken place since the coal famine of the early seventies. This had necessitated an increase in the price of gas, which a careful husbanding of resources in the past had enabled the Board to limit to 4d. per 1000 cubic feet. The increase in the sale of gas amounted to  $7\frac{1}{2}$  per cent.; and as during the corresponding period of 1899 he had to record an increase of  $4\frac{1}{2}$  per cent., they were evidently going ahead in a very satisfactory way, despite the competition of other illuminants. Cooking-stoves were largely in demand; and the prepayment meter system had become a profitable part of the business. The total extra sum received for gas, public lighting, meter and stove rents, &c., amounted to £1375, which unmistakably marked the growth of the Company's business. Residual products had also brought in increasing amounts; coke particularly showing the result of the general rise in the price of all fuels. It was well that it was so, or the Company would not have been able to restrict the advance in the price of gas to the modest figure already mentioned. The profit and loss account showed a balance of £8041, which would allow of the usual dividends, and a carry forward of £4061. Mr. Aldin seconded the motion, and it was carried. The dividends as recommended in the report were then declared—viz., 5 per cent. on the "A" and "B" stocks, and  $3\frac{1}{2}$  per cent.

on the "C" stock, for the half year. Mr. Aldin proposed a vote of thanks to the Directors for their services during the past half year. This was seconded by Mr. Grunhold, and carried. The Chairman briefly acknowledged the compliment, and moved that the best thanks of the meeting be given to the Engineer (Mr. T. May) and other officials.

The shareholders of the Sevenoaks Gas Company held their half-yearly general meeting on the 30th ult.—Mr. W. Hughes presiding. The Directors reported that the accounts were satisfactory, looking to the disturbed state of the coal market and other matters. The gross receipts had been £7689, and the expenditure £5620, leaving a profit of £2069. After providing for interest on debenture stock and other charges, there remained £4837 available for distribution; and the Directors recommended a dividend at the rate of 10 per cent. on the original capital, and of 7 per cent. on the additional capital (less income-tax). The Directors regretted that, through the increase in the price of coal, they had been compelled to raise the price of gas 6d. per 1000 cubic feet. Two additional beds of retorts had been connected up, and two other beds were in course of construction. The Chairman moved the adoption of the report. He said the quantity of gas made had increased about  $10\frac{1}{2}$  per cent., and the residuals were better. Mr. T. Hill seconded the motion, which was agreed to; and the dividends recommended were ordered to be paid.

The annual meeting of the Sunderland Gas Company took place last Wednesday—Mr. James Stokoe in the chair. In moving the adoption of the report, which was noticed last week, he said they had made 4 76 per cent. more gas during the past year than in the preceding twelve months. The total increase in the revenue was £13,140, against £16,000 additional expenditure; leaving a deficiency of about £3000 on the year's working, which had been taken out of the reserve fund. Mr. G. R. Booth seconded the motion; and it was carried. A dividend of 5 per cent. on the original stock, and of  $4\frac{1}{2}$  per cent. on the additional capital stock (less income-tax) was declared.

At the recent half-yearly general meeting of the Sutton (Surrey) Gas Company, the Directors reported that the balance available for distribution was £2884; and they recommended the declaration of dividends at the rates of 10 and 7 per cent. per annum respectively, on the original and additional capital, both less income-tax. The Chairman (Mr. F. Bugden), in moving the adoption of the report, said the shareholders might consider they had had a fairly prosperous half year. Even though there had been a rise in the price of coal—and it showed an increase of nearly £1500—their business had fortunately increased in proportion, and their profits had not suffered materially through the advance. On the contrary, their finances had augmented very considerably. The gas-rental was higher by £1031, or nearly 14 per cent.; the meter-rentals by £122, or 36 per cent.; and the returns from residuals had increased by the large sum of £1163, or 32 per cent. During the half year, there had been 42 new consumers, making the number 1560; and the slot-meter consumers had increased by 50, making the total 380. Mr. T. Charles seconded the motion; and it was carried unanimously. The dividends recommended having been declared, Captain Strong moved—"That, in consideration of the long and valued services of Mr. Stephen Carpenter, the Works Manager of the Company, a sum, not exceeding thirty guineas, be expended in the purchase of a gold watch and chain, with suitable inscription, to mark the occasion." The proposition was unanimously agreed to. Dr. Strong then moved a comprehensive vote of thanks to the Chairman, Directors, Secretary, and employees of the Company, for their valuable services during the past year, and it was carried, and briefly acknowledged by the Chairman.

The annual general meeting of the City of Waterford Gas Company was held on the 29th ult.—Mr. W. H. H. Shaw presiding, in the absence of the Chairman (Mr. R. Hesketh Jones). The Directors reported a profit of £2456; being £878, or  $1\frac{1}{2}$  per cent. on the consolidated stock, less than in the preceding year. This was due to an increase of £2445 in the cost of gas production; £1980 of it being for coals, and £107 for stokers' wages. There was, however, an increase of £1567 in the revenue to counterbalance the additional cost. Under these circumstances, they recommended the payment of a dividend of  $1\frac{1}{2}$  per cent., making with the interim dividend 4 per cent. for the year, as compared with  $5\frac{1}{2}$  per cent. in 1898-9. They gave notice of an increase of 3d. per 1000 cubic feet in the selling price of gas, as from the 25th of March last; and they expressed regret that, in order to ensure a supply of coals for the ensuing year to carry out their statutory obligations, they had been compelled to pay an increased price of from 8s. 6d. to 9s. per ton. During the past year coals cost 18s. 9d. per ton in Waterford. The coals to be received for the twelve months from the 30th of June last would cost not less than 25s. 6d. per ton. It would be necessary to further increase the selling price of gas by 3d. per 1000 cubic feet from the 25th of September next. This increased price would not yield sufficient to meet the increased cost of coal. The Directors, however, hoped that under the new Resident Manager (Mr. J. G. Tooms), who had just entered on his duties, the revenue account next year would show better results. The Directors went on to say that for the past two or three years the health of Mr. George Donaldson, the Resident Manager, had been failing, and they had reluctantly found it necessary to appoint a new one. They had agreed to grant Mr. Donaldson a pension during the pleasure of the Board. For the current year, this would be no burden on the profits, as Mr. Anderson had voluntarily offered to reduce his remuneration as Chief Engineer and General Manager by £100, and the Directors their fees by a like sum. The Chairman, in moving the adoption of the report, prefaced his remarks by apologizing for the absence of Mr. Jones, which he regretted to say, was due to a carriage accident. Having dwelt at some length upon the affairs of the Company in the past year, he alluded to the change in the management, and spoke in sympathetic terms of the retirement of Mr. Donaldson, who had proved himself to be a valuable and faithful servant for seventeen years. Their new Manager had shown himself to be very efficient in other places; and he (the Chairman) hoped he would take the same trouble in the management of the works that Mr. Donaldson had always done. Mr. Lynch seconded the motion; and it was carried unanimously.

The Wellingborough Gas Company, Limited, had their half-yearly general meeting on the 27th ult., on which occasion the accounts presented, covering the six months to the 30th of June, showed receipts to the amount of £9144, and expenditure totalling to £6635; leaving £2509 to go to the profit and loss account. The sum available for distribution was £4427; and the Directors recommended dividends of 6 per cent. on



† Next dividend will be at this rate.



that it would be satisfactorily settled. The matter could, however, be closed at any moment by their simply accepting the Welsbach Company's offer to provide trustees. Of course, the eventualities in which these trustees would have to act were rather far off. They would have to act in the event of default in the payment of the interest, or in the case of a reconstruction. It seemed to the Directors that, in either of these events, it would be well to have trustees who were quite independent of the Board of the Welsbach Company; but, at the same time, they were not prepared to say that there would be any particular danger in being represented by two of the Directors of that Company. One other matter he had to mention was the accident which happened at their offices on the 11th ult. On that date a fire broke out which damaged the greater part of their stock, as well as the furniture and fittings; and this, of course, to a large extent altered the complexion of the settlement with the Welsbach Company. Fortunately, they were pretty well covered by insurance; and he thought he might say that they would be able to get back—of course, for the Welsbach Company—practically the whole of the loss. Another difficulty in connection with the fire was that their books were for several days in the hands of the salvage corps; and, as a matter of fact, they only succeeded in getting a preliminary certificate from the Auditors (Messrs. Monkhouse, Stoneham, and Co.) on the previous Saturday. The Auditors had asked a fee of 100 guineas for a full audit of the accounts; and the Directors preferred to consult the shareholders before incurring this expense. They had already paid 25 guineas for the preliminary certificate; and it was for the shareholders to decide whether it was worth while spending another 75 guineas on the fuller audit to which he had referred. He concluded by moving that the Company be wound up voluntarily under the Companies Acts.

Mr. W. CONOLLY seconded the motion; and it was carried. It was next agreed that Mr. Frederick Belcher be appointed Liquidator for the purpose of winding up the Company.

The CHAIRMAN then referred to the proposed public issue of the stock to be received from the Welsbach Company. He said the shareholders were pretty unanimous in deciding that a public issue should be made; but there was a difference of opinion as to the terms. It would be inadvisable to discuss the conditions in an open meeting; and therefore he suggested that a Committee should be appointed to go into the matter. He proposed that the Liquidator be authorized to make a public issue of the stock.

This was agreed to; and a Committee consisting of the Chairman and four shareholders was appointed to confer with the Liquidator.

It was next resolved, on the motion of Mr. HOLMES, seconded by Mr. WETHERED, "that it be conveyed to the Welsbach Company as an expression of the wishes of this meeting that two of the Directors of this Company be appointed trustees for the debenture stock holders, at a remuneration of £25 per annum each payable, by the Welsbach Company, only in the event of the principal amount of the stock be coming due."

It having been agreed that the Auditors should be requested to supply a full audit of the accounts at an additional fee of 75 guineas,

The proceedings terminated with a vote of thanks to the Chairman.

## ELECTRIC LIGHTING NOTES.

The Yeadon District Council have decided to ask the Board of Trade to extend the time specified in their Provisional Order for electric lighting, on the ground that the depressed state of trade and the undeveloped condition of the town make it inadvisable to put down electric lighting plant at present.

The experiment of giving the artisan class an opportunity of using the electric light is to be tried in Portsmouth; and plans have been prepared for running the cables through a thoroughfare which is considered to be eminently adapted for the experiment. Alderman Ellis, the Chairman of the Electric Lighting Committee, who, in conjunction with a resident at Southsea, has invented a penny-in-the-slot meter, is sanguine as to the success of the experiment; and he would like to see the cables carried through every street in the borough. The slot instrument at present in use gives a six-hour 8-candle light for 1d.

Volumes of smoke issued from the entrance to the Bank Station of the City and South London Electric Railway, situated under the church of St. Mary Woolnoth, at the corner of Lombard and King William Streets, early last Thursday morning. The firemen from the nearest stations were summoned, and they broke open the iron gates and groped their way down the stairs and passages to a depth of 80 feet. In a chamber underneath the lift well several electric wires had fused and set light to the wooden beam to which they were attached. The outbreak was not subdued without considerable difficulty and danger.

Some months ago the Electric Lighting Committee of the Bath Corporation resolved upon a general reduction in the price of current to 4½d. per unit for ordinary consumers (public and private), to take effect in June. But in consequence of the great rise in the price of coal, the reduction was suspended. It was promised, however, that the Committee would as speedily as possible bring it about; adding whatever was necessary to ensure themselves against loss by reason of the enhanced price of coal. The Engineer, at a recent meeting of the Committee, reported that he had gone into the additional cost on account of the high price of coal, and he found, taking it all round, public and private, that the additional cost of production would be ½d. per unit. The Committee accordingly resolved that all consumers should be charged this sum above the figures fixed previous to the rise in the price of coal. Ordinary consumers, therefore, will pay, for the present, 5d. per unit; and consumers who have hitherto paid at the rate of 4d. will have to pay 4½d.

The subject of the increase to be made in the price charged for electric current came before the Worcester City Council at their monthly meeting last Tuesday. The Mayor (Alderman Millington) proposed that the Council direct that from the 29th inst. the charges for electric current shall be as follows: To private consumers, 6½d. and 3d. per unit; for the water-works motors 1½d. per unit; for the public arc lamps an additional £2 2s. per year for an all-night lamp, and an additional £1 1s. for a half-night lamp; and for the public incandescent lamps an additional 5s. per annum. He explained that the alteration was due to the great advance in the price of fuel, which, as far as they could see, would still go on.

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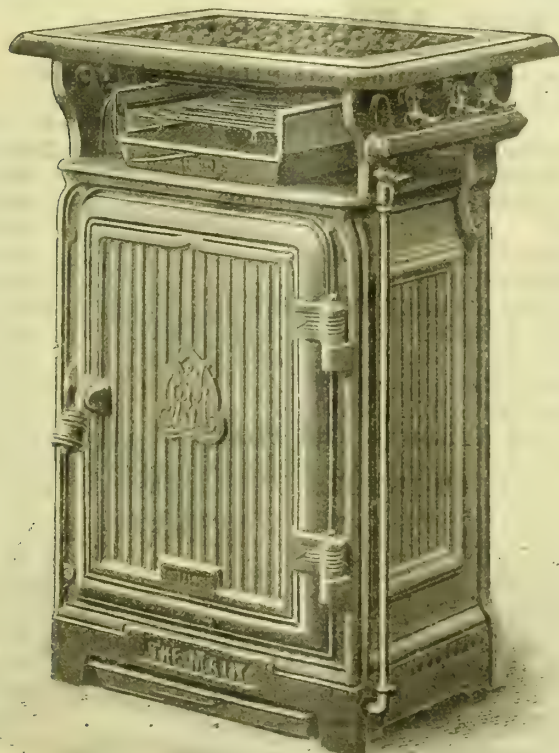
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He was only surprised that the Committee had not brought the proposition up before, because in their estimates for 1900 they included an extra sum of £1000 for coal. They had now taken the proper course; and if the Council agreed to the figures, he thought no one could possibly grumble. He pointed out that nearly all the gas companies had had to raise their prices. Alderman Higgs objected to the increase, on the ground that it was too large. To the first class of private consumers it was at the rate of 10 per cent., and to the second 15 or 20 per cent. He thought 5 or 6 per cent. would have been sufficient. Alderman Ernest Day remarked that the price of gas had not gone up very much, because the returns from residuals had gone up also, whereas in the production of electricity there were no residuals to dispose of. He regretted that the advance should come just now; but he hoped that it would soon be reduced. Mr. Fairbairn inquired how much the increase would add to the cost of public lighting. The Mayor replied about £100 a year. In answer to Alderman Higgs, the Mayor said the increase was only at the rate of 8 per cent., which was nothing compared to the increase of 45 and 50 per cent. in the cost of coal. The resolution was carried.

**The Hours of Labour at the Hartlepool Gas-Works.**—The stokers employed by the Hartlepool Gas and Water Company have decided to apply for a reduction of their working hours to eight per day; and Mr. H. Lynes, the District Secretary of the Gas Workers' Union, has been instructed to make the application.

**Gas v. Electricity for Infirmary Lighting.**—At the annual Court of Governors of Salisbury Infirmary on the 30th ult., the Committee of Management, in the course of their report, said: "The proposal to instal the electric light in the Infirmary has been fully considered. Three lights have been introduced into the Casual Department; but, after very careful inquiry, the Special Committee appointed for the purpose reported that they could not recommend the introduction of the electric light generally—it appearing, from the best information obtainable, that the cost of it is greatly in excess of that of gas. The Committee recommended that incandescent burners should be adopted throughout the building. This has been carried out by the Gas Company, who have undertaken to maintain each lamp at a fixed rate per annum."

**The Price of Gas in Newcastle-upon-Tyne.**—At the meeting of the Newcastle-upon-Tyne City Council last Wednesday, a letter was read from the Secretary of the Newcastle Gas Company (Mr. T. Waddom), referring to a previous letter intimating a proposed advance of 4d. per 1000 cubic feet in the price of gas. He said he had now the pleasure to inform them that the Directors had decided to only raise the price by 3d., to take effect from the June reading of the meters. The causes which had operated to enable the Directors to take this step were the enhanced value of residuals—particularly coke and tar—and a considerable increase in the sale of gas during the first half of the present year, as compared with the corresponding period of 1899. He pointed out, however, that these favourable conditions might not continue during the remainder of the period covered by the existing coal contracts, and in that case it might be necessary to raise the price at a future date.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen the last public references to the business of the past financial year, in the adoption of the gas accounts at Glasgow, Aberdeen, and St. Andrews; and the gas industry is now launched everywhere upon the business of the current year.

In Glasgow, the ruling principle in conducting the Corporation gas and other departments seems to be that the less the public know of the business the better. There is a good deal of sense in this view, because it is the results with which the public really have to do. At the same time, it has to be remembered that it is the business of the public which the Corporation manage, and that the public have an interest in knowing how the concerns are carried on. No one will say that Mr. Mitchell's remarks to the Town Council this week (which are given in another column) make anyone much the wiser as to what the Gas Committee are doing. He made no mention of revenue or expenditure, of capital outlay, of annuities, of borrowed money and the repayment of it, of the operation of the sinking fund, of the output of gas, of the competition with electricity, of the use of gas-stoves, or of the adoption of the incandescent system of gas lighting. All these have a bearing upon the finances of a gas undertaking; and they are all subjects which are dwelt upon, more or less, by the gentlemen who present the accounts of gas undertakings that are not a twentieth part the size of the mammoth one in Glasgow. The community of Glasgow have elected their Gas Committee; and they must take the doings of the Committee on trust. It must be admitted that there is good reason for asking them to do so—or perhaps it would be a more felicitous expression to say that the community have good reason to be content with the arrangement, for the business has been most admirably conducted all along. And, after all, it is simply a question of convenience how much the public are entitled to know. A population of nearly a million cannot all be admitted to the works, or look over the shoulder of the book-keeper so as to see what his entries are, even although it were politic to admit them, or any of their number, to do so. That is a work which must be done by proxy; and the proxies who do it are the members of the Gas Committee. If the Committee are satisfied that all is well, the community are in the happy position which is popularly described by the expression "where ignorance is bliss." But with all this, it is difficult to reconcile the fact of this being the business of the public with the practice of not letting the public know anything about it. It is true that the subject of publicity is not confined to Glasgow; only in Glasgow there is less known about public business than in most places. Perhaps the amount of business is so large that it would be next to impossible to give anything like a full account of the transactions which are made on behalf of the public. But this, of course, can be no answer to the abstract question of how far the public are entitled to know of affairs relating to what, in the ultimate, is their property. I do not forget that the Glasgow Corporation are most amiable in their treatment of the newspaper press; but, although I have strong newspaper proclivities, I cannot accept publication of such information.

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HALIFAX . . . . .	1,000,000	CATERHAM . . . . .	150,000
TORONTO . . . . .	250,000	LEICESTER . . . . .	2,000,000
OTTAWA . . . . .	250,000	ENSCHEDÉ (HOLLAND) . . . . .	150,000
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as a newspaper may care to give as being official or authoritative. It is undoubtedly the most efficient method of conveying information to the people to hand it to a newspaper; and newspaper proprietors are always grateful to those who entrust them with such information. But they do not take upon themselves the task of giving it out as from the furnisher; it is as from the editor, who becomes responsible for it. The whole subject of the extent of publicity is in a mixed condition. There are statutory provisions dealing with it, as in the Burghs Gas Supply Act; but notwithstanding these, nearly every body is, in this matter, a law unto itself. This, I suppose, is one of the glorious privileges of being independent, spoken of by Burns. Probably it is the best indication that the want of system works no harm, that the subject is seldom alluded to.

Having said this about the meagreness of detail in Mr. Mitchell's statement, I go on to note my sympathy with his policy. When the poor quality of the remarks which were made by the other speakers is considered, it must be admitted that there is good reason for not saying much. A profusion of detail might open the flood-gates of unintelligent criticism. Surely in an enlightened Corporation, such as Glasgow, something better might have been expected than the platitudes which were spoken about the reduction of leakage, the importation of American coal, and the acquisition of a coal mine. Knowing the speakers, I am not surprised at the quality of their remarks. To talk at large is an accomplishment which is easily acquired; but such frothy utterances do little good. It was so here; and the feeling arises that this year at least the gas accounts of the Corporation of Glasgow have not received a dignified treatment at the hands of the Council, either in presentation or in criticism.

The acquisition of a coal mine by a municipality is a fascinating subject to dangle before the electors; but it is not within the legitimate purposes for which municipalities are created. It is carrying municipal trading beyond the bounds of communal duty, which is all that a municipality can undertake; and the Gas Committee of Glasgow have arrived at a right conclusion in deciding not to proceed with the proposal.

An attempt was made again to raise the question of making the advance of the price of gas retrospective. The interrogator wanted to know what statutory authority there is for doing this. He was told, in reply, that his question was answered at the previous meeting; but he protested that it was not. Well, it was answered; but not in the way he wanted. There is, of course, no statutory authority for making changes in the price of gas retrospective. But there is no statutory provision against it; and the convenience is so great that it justifies the procedure.

The Aberdeen Corporation gas accounts were presented with more fulness, by Mr. Kemp, the Convener of the Gas and Electricity Committee. Without giving away Corporation secrets, he made a readable statement in explanation of the position of the undertaking. This is quite satisfactory, notwithstanding the circumstance that the Committee have adopted estimates which are based on a deficit being experienced, and its being met by accumulated balances from past years. Very probably their policy will be adversely criticized when the accounts come up next year, because the opportunity of having a dig at somebody is always appreciated by notoriety hunters, and a loss upon the gas undertaking is, at any time, a subject which can be so handled as to arouse discontent. But the Committee have discounted all this, and may be

relied upon to see their work properly carried through. Mr. Kemp had a little difference of opinion with Mr. Johnston, the previous Convener; but it was only upon the origin of the balance which is to be utilized. The origin of it was of little consequence; it was of more importance that the balance existed.

There have been mutterings in Dundee of late regarding the high price of the gas supplied by the Corporation. The charge, it will be remembered, was recently advanced by 6d., making it 3s. 10d. per 1000 cubic feet. What has, more than anything else, led to the rise of the present complaints, is the fact that in Broughty Ferry the Corporation have reduced the price of gas by 5d. per 1000 cubic feet, making it 2s. 6d. Broughty Ferry is an insignificant place when compared with Dundee, of which it is a suburb; and the expectation would be that circumstances should be the reverse of what they are. But in this instance the unexpected has happened. It is in the small place that the lower charge is made for gas; and the amount of the difference—1s. 4d. per 1000 cubic feet—is so large that it could not fail to attract attention. It has occasioned letters to the newspapers of late; and it was a subject of question in the Town Council on Thursday. In reply, the Town Clerk (Sir Thomas Thornton) explained that the Corporation gave too much for the gas undertakings, and that the annual payments they had to make were out of all proportion to the value of the works to the community. Mr. Ballingall followed with a statement to the effect that in Broughty Ferry they were enriching their gas with benzol, which was entirely an experiment; and, in his opinion, it was a very bold step to reduce the price of gas by 5d. To-day there is a letter in the "Dundee Advertiser" by Mr. J. R. Christie, the Convener of the Broughty Ferry Gas Committee, in which he controverts the statements of Sir Thomas Thornton and Mr. Ballingall. He denies that they are experimenting with benzol; the period of experiment being now past. He also points out that on the estimated output of gas in Dundee for this year—583 million cubic feet—the difference in charge to the community would be £38,866, and asks whether this sum, or anything like it, is laid aside in Dundee for capital purposes. The Broughty Ferry gas undertaking, he adds, is being financed on safer lines than is the Dundee one. I must say that the situation is an awkward one for Dundee, because the community will scarcely keep quiet if they are charged so much more for gas than are their neighbours. It is well known that the Dundee gas transfer was a very expensive one. Their water supply was also a most costly project. In these two most important municipal supplies, the former rulers of Dundee did not do good business. More than that, they have left, as a legacy to their successors, the clearing off of heavy capital which should have been reduced much more by this time than it has been. But, making full allowance for all these circumstances, the price of gas is still too high, when compared with what it is in Broughty Ferry. In this connection, the personal equation cannot be left out of account; and it must be freely acknowledged that Mr. A. Waddell, who has now gone to Dunfermline, has done remarkable things at Broughty Ferry. He has not been afraid to step out of the beaten track; and every time he has done so, his action has been to the benefit of the undertaking he managed. But then he has had Commissioners to deal with who supported him. Everyone has not that.



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"Hardware Trades Journal," Sept., 1900.

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"Hardware Trades Journal," Sept., 1900.



## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 8.

**Sulphate of Ammonia.**—There has been rather more buying during the week; but supplies have been sufficient to meet the demand, so that quotations f.o.b. at the ports remain £10 15s. to £10 17s. 6d. per ton. For the most part, makers are realizing as their production becomes available; but in some quarters there is a disposition to hold for better prices. In the forward position, the quotations are for October-December delivery £11 per ton, and for October-March £11 5s. per ton. But these prices are above buyers' ideas; and there is further speculative selling abroad at below the equivalents.

**Nitrate of Soda** is steady at 8s. 1½d. to 8s. 4½d. per cwt., according to quality, on spot.

LONDON, Sept. 8.

**Tar Products.**—Taking business all round, things are not moving to the satisfaction of makers. There is only a poor market for creosote. Anthracene is more or less unsaleable; and other products do not reciprocate in the improved values that are obtaining in other markets. Carbolie acid is fairly steady; and the production is taken up. At this time of the year, however, the quantity is small. Benzols are not quite so brisk; but few makers have any to sell. The value of tar has decreased; and it is more than likely to see yet lower prices, unless products improve in value.

Average quotations for the week are: Tar, 16s. to 25s. Pitch, east coast, 37s.; west coast, 33s. Benzol, 90's, 10d.; special qualities for gas, 11d.; 50's, 11½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 3d.; crude naphtha, 3½d.; heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 3d. Carbolie acid, 60's, 2s. 10d. Naphthalene, 75s.; salts, 50s. Anthracene, nominal, "A" 4d.; "B," 3d.

**Sulphate of Ammonia.**—Dealings have not been numerous; and the market appears to be entirely in the hands of buyers. Very little stuff is offering; and the average value in all positions is noted at about £10 15s. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—A generally active demand continues to be reported throughout this district for all descriptions of round coal; and rates are firm at the full quotations ruling last month. But there has been no further upward move, beyond a levelling up in prices at one of the principal Lancashire collieries where these had previously been below the general basis rates. For house-fire qualities, although there is not the pressure that recently prevailed, and collieries are now pretty clear of any deliveries in arrear on account of orders, they are still mostly moving away all they are raising; and practically nothing is as yet going into stock. For steam and forge coals, the demand is also well maintained; and there are no surplus supplies of common round coal on the market. For all descriptions of round coal, prices are strong, at about 16s. 6d. to 17s. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d.

for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house-coal, and 12s. 6d. to 13s. for steam and forge coal. Engine fuel, if anything, is rather easier; and the unsatisfactory outlook in the cotton trade does not tend to improve the position. At many of the Lancashire collieries, stocks have been accumulating recently; and to clear off these for shipment, prices below the inland quotations have been taken. But even on inland sales it is exceptional where more than about 10s. 6d. per ton at the pit is now being secured for slack. Cheap supplies also continue to be sent in from other districts; and altogether the quantity of slack offering on the market is just now considerably in excess of requirements. For shipment there is still a tolerably good demand; but prices are getting back to something like their old level, and it is exceptional where more than about 15s. 6d. to 16s. per ton is being obtained for ordinary steam coal delivered at the Mersey ports. For the better qualities of round coal there is an increased demand, owing to the house-fire coal shipping trade having been thrown back seriously as a result of collieries until recently being so exceptionally pressed for inland requirements—this bringing a good many shipping orders for the better qualities of round coal to the ports on the Mersey, with prices strong at full rates. Coke is without further material change; Lancashire makers still holding to late rates, with Yorkshire furnace coke offering at the reduced prices previously referred to.

**Northern Coal Trade.**—The coal trade is very active; but the prices are now dropping slowly to those that prevailed before the Welsh strike. There is thus difficulty in quotation, as there is an almost daily variation. Most of the coal, however, is being delivered at prices below the quotations, which are to a considerable extent nominal. Best Northumbrian steam coals may be quoted as from 20s. to 22s. per ton, for immediate delivery; but for forward delivery, lower prices are ruling—the end of the Baltic season having its effect on this branch of the northern coal trade more than on any other. Steam smalls are steady at about 12s. 6d. per ton. As to gas coals, the nominal quotations are returning to those that have been current for months—about 17s. 6d. per ton f.o.b. for best Durham gas coals. Sales at this price are very few, and for small lots; for the great bulk of the output is taken up by the heavy contracts that are running, and which are generally at about 16s. per ton f.o.b. No additional contracts are reported this week. In the coke trade, there is considerable briskness. For export, best coke is now 32s. to 33s. per ton f.o.b. For blast-furnace coke, the quotation is 28s. per ton at the furnaces. Gas coke is now in a little fuller production; but prices are irregularly high, and are difficult to quote with any approach to accuracy.

**Scotch Coal Trade.**—There is no slackening of the demand, which seems to be unaffected by more than one disturbing influence. The output is satisfactory, and is very large. Prices are more settled, and may be given as: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 17s. to 18s., and splint 17s. to 17s. 6d. The shipments for the week were 270,798 tons—an increase of 20,610 tons upon the preceding week, and of 85,748 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,205,531 tons—an increase of 1,344,200 tons upon the corresponding period of last year.

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## SULPHATE OF AMMONIA PLANTS.



**The Supply of Natural Gas in the Pittsburgh District.**—Mr. J. C. M'Dowell, writing in the "American Manufacturer," gives the following as the latest figures obtainable on the above subject: Combined capital of the companies, \$40,000,000; miles of pipe-line, 2500; number of wells, 1200; number of men employed, 2500; acres of land under lease, 40,000; rents and royalties paid annually, \$500,000; cubic feet of daily consumption, 110,000,000; mills and factories supplied, 500; families supplied, 40,000; number of wells drilled annually, 300.

**Tunbridge Wells Water Supply.**—Last Friday, Colonel A. J. Hepper held an inquiry at Tunbridge Wells, on behalf of the Local Government Board, concerning the application of the Town Council for sanction to borrow £1200 for laying water-mains to Speedhurst. There was no opposition, and the proceedings were purely formal; the Deputy Town Clerk explaining that the proposal was part of a scheme for the extension of the water supply to outlying districts. At the termination of the inquiry, the Inspector visited the site.

**Incandescent Gas Lighting at Dukinfield.**—The incandescent gas-lights at Dukinfield have proved a great success. They were fixed on various dates commencing twelve months ago, and up to last month had burned 23,815 hours, consuming 4.6 cubic feet of gas per hour, equal to 109,550 cubic feet, at 2s. 11d. (£15 19s. 6d.), against 95,260 cubic feet by the ordinary burners, at 4 feet per hour, which would equal, at 2s. 11d., £13 18s. 6d., or a difference of £2 1s. The cost of maintenance of the 12 incandescent lamps during this period was as follows: 15 mantles at 9d. each, 11s. 3d.; 1 chimney, 9d.; 1 rod, 1d.—total, 12s. 1d. The illuminating power of these lights is calculated to be 105 candles, or almost ten times greater than that of an ordinary gas-burner passing 4 cubic feet per hour.

**The Finances of the Heywood and Middleton Water Board.**—According to the abstract of accounts of the Middleton Corporation for 1899-1900, the accounts of the Heywood and Middleton Water Board for the past financial year disclose a loss on the year's working of £386. The Heywood Water-Works (Transfer) Act, 1898 (by which the management of the undertaking was in October of that year transferred from the Heywood Corporation to the Board), provides that any deficiency in the revenue of the undertaking after the date of the transfer shall be made up out of the district funds of the boroughs of Heywood and Middleton in the proportions of their respective rateable values according to the county rate valuation for the time being in force. The Board, therefore, during the past year issued a precept for the payment of £186 2s. 5d. by the Middleton Corporation, as their proportion of the sum of £409 14s. 9d., the deficiency in the revenue of the undertaking for the half year ended March 31, 1899. The amount of the precept has been included in the current year's estimates. The Transfer Act further provides that any surplus shall be applied in the repayment to the Heywood Corporation of the sum of £25,000 which was expended by them in making good deficiencies in the revenue of the undertaking prior to the passing of the Act; and that the Board shall not, without the consent of the Corporation, make any reduction in the price of water until that sum shall have been paid.

**Gas Lighting Restored at Alfreton.**—The streets of Alfreton, after being in darkness for several months, owing to a dispute between the Town Council and the Gas Company as to the price of gas, are again to be lighted, the Council having agreed to the Company's terms. The latter demanded an increase of 6d. per 1000 cubic feet, and the Council offered 3d. The Council are promoting a scheme for the installation of the electric light.

**Stockport Corporation Gas Supply.**—At the meeting of the Stockport Town Council last Wednesday, the Mayor (Mr. T. Webb), as Chairman of the Gas and Electricity Committee, moved the adoption of the report of Mr. S. Meunier, the Gas Engineer, for the past financial year. He stated that the profit had been £8976. As compared with the previous year, the Committee had received £3247 more for gas, £1628 more for coke, £1283 more for tar, and £977 more for ammoniacal liquor—being a total increase on these items of £7135. It had cost, however, £6029 more for wages, coal, oil, and other materials, and they had allowed £1378 more in discounts.

**Cost of the Abortive Water Scheme at Ilkeston.**—At the last meeting of the Ilkeston Town Council, the Town Clerk (Mr. Wright Lissett) presented a return of the expenditure on the boring and sinking at Little Hallam. The figures were as follows: Expended on the boring, including Engineers' fees, £1813, for which £1800 was borrowed by the consent of the Local Government Board. The expenses of the sinking operations were £6076, made up thus: Plant and machinery, £963; bricks, lime, and cement, £314; timber, £108; explosives, £34; repairs and materials, £883; team work, £16; wages, including the amount paid to the Contractors, £2941; coal, £708; Engineers' fees, £80; insurance of men, £29. The grand total was £7889.

**Prestatyn Water Supply.**—At a special meeting of the Prestatyn Urban Council on Monday evening last week—Mr. John Jones presiding—the Water Committee recommended in a report that the Council should promote a Bill for the purchase of the water undertaking. The Chairman moved the adoption of the report, and explained that he had visited London in company with the Clerk, and had been advised that the best course for the Council to pursue, in consequence of the unsatisfactory supply of water, was to acquire the works. By this means the Council would have control of the water supply, which he considered should not in any place be in private hands. Mr. J. B. Linnell, agent to Mrs. McLaren, who owns the works, said he had received a communication to the effect that an engineer was to be engaged to put matters right. Mr. J. Pritchard urged the Council not to rush on too quickly, and said he thought it better to confer with the owner. The Chairman and several councillors pointed out that for some years the water supply question had been under consideration, and Mrs. McLaren could not improve it without additional powers, as she could only take what water came through a 4-inch pipe, which was not sufficient for the town. It was considered that the works, with improvement, would yield a good profit, and that there would be sufficient revenue to pay the interest and capital charges. The Council decided to apply for parliamentary powers forthwith.

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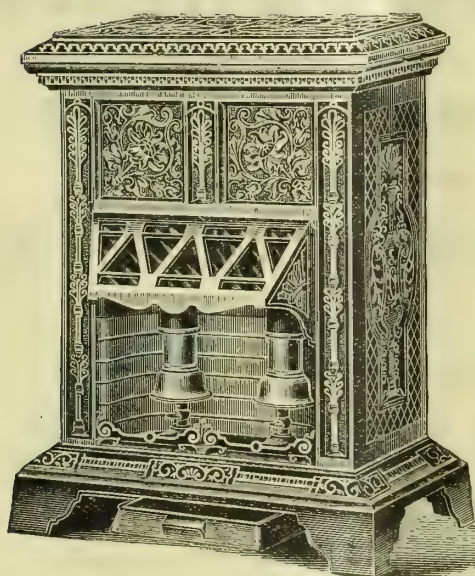
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**Atherstone and District Water Supply.**—At Atherstone on Friday, Mr. H. Percy Boulnois, M.Inst.C.E., held an inquiry into an application of the District Council for sanction to borrow £6600 for works of water supply for the townships of Atherstone, Baddesley, Baxterley, Bentley, and Merevale.

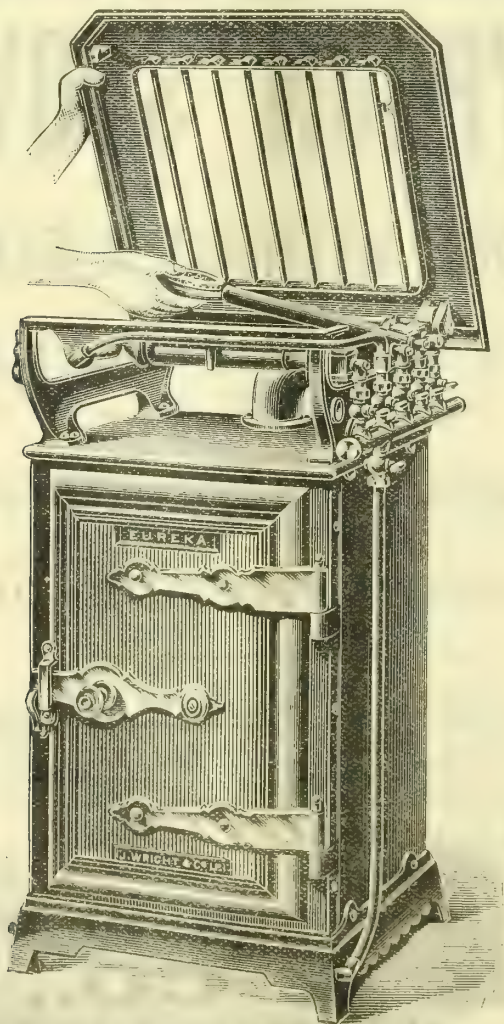
**The Local Government Board and the Erection of Carburetted Water-Gas Plant.**—At the last meeting of the Stafford Town Council, a communication was received from the Local Government Board, in reply to the application of the Corporation for sanction to borrow £10,000 for the erection of plant for the manufacture of carburetted water gas, and for further extensions of the gas-works. The Board pointed out that, as the report of the Departmental Committee appointed to consider the danger attending the manufacture and use of water gas was still under consideration, they could not at present entertain the Council's application. At the meeting of the Oldbury District Council last Friday, the Gas Committee reported that they had had under consideration for some months the question of obtaining funds to enable them to pay for the new plant in course of construction at the works. The Local Government Board had so far declined to consent to a loan specially devoted to carburetted water-gas plant, pending the settlement by the Board of Trade of regulations with regard to its limited use. Mr. J. W. Wilson, M.P. (the Chairman of the Committee) was still in communication with Mr. Ritchie; but as legislation was required, it was impossible to expect these regulations before next year. Meanwhile, as the first payment for plant had become due, the Committee recommended that it be defrayed out of revenue for the present, and had made arrangements with the bank in case their balance should prove insufficient.

**"Trade Union Tyranny."**—Under this heading, a correspondent wrote to "The Times" last Thursday as follows: "Few things amuse the average reader more than the view of English law taken by law officers, and the rendering of it to the outside public. For example. A Judge of the Queen's Bench Division last week, on a trial arising out of the Taff Vale strike, summed up as follows: 'Masters and men are at liberty to make such terms as they choose.' A very simple statement, and one perfectly lucid; but, unfortunately, though theoretically plain, practically it is ignored. Thus, a man took some work on a firm in Birmingham more than two years since, and, being aged, made such terms as would suit himself and his employers. The trade society did not admit him at his age. Subsequently, they made an arrangement to include him, and invited him to join, which he declined. They then approached the firm to complain of his non-compliance; and, on the recommendation of the manager, he agreed to join, though he would receive no benefit but strike pay. When he presented himself for admittance, he was requested to state his present wages, which he, under orders, declined to do. For this gross misdemeanour his case was referred to the Building Trades Federation, with the result that the men on the firm were determined to be called out, unless the erring party was sacrificed, which was done, and the culprit informed that if he obtained work at any Birmingham firm he would be struck against as before. A striking example of Birmingham forwardness and free trade."

**The Gas Undertaking of the Bakewell District Council.**—The Auditor of the accounts of the Bakewell Urban District Council having stated that the profit on the gas undertaking was £564, the Chairman took the opportunity, at the last meeting of the Council, to point out that they had paid £712 in loans and interest; so that the total was £1276 profit made in the one year and nine months ending in March. It would pay 5½ per cent. on the £15,000 laid out since they started; so that the working was most satisfactory. The ratepayers now had a concern worth £16,000 or £17,000, for which they had not paid a penny.

**North Middlesex Gas Company.**—The accounts of this Company for the half year ending June 30, which will be presented at the ordinary general meeting to-morrow, show that the sale of 43,125,000 cubic feet of gas for private and public lighting brought in a revenue of £8625, while the disposal of residuals yielded £1959. The total receipts were £10,934, and the expenditure was £7936. The balance carried to the profit and loss account is £2998; and the sum available for distribution is £4265. The Directors recommend dividends for the half year at the rates of 9½, £6 13s., and 5 per cent. per annum on the original, ordinary, and preference capitals respectively. The payment of these will absorb £2130, and leave a balance of £2135 to be carried forward. The Directors express their satisfaction at being able to report an increase of 23 per cent. in the sale of gas. The income from residuals has also been greater. The Directors have considered it necessary to devote a large sum to repair and renewals; and they say the expenditure has been fully justified by the results of the half-year's working.

**Suffocation by Gas.**—An escape of gas in the bedroom of the Dolphin Inn at Birmingham resulted last Tuesday in the death of the licensee, Charles Lyons, while his wife narrowly escaped with her life. They had only entered into occupation on the previous day, and had been engaged until an early hour of the morning in arranging their furniture. As they did not appear in the forenoon, apprehensions were aroused, and the bedroom door was forced open. Lyons was found at the very point of death, and his wife was almost dead. The former died directly afterwards; but the efforts made to restore Mrs. Lyons were eventually successful. It was found that the lower part of the gas chandelier hanging over the bed in the room had become displaced, the balance-weight having fallen, and so disconnected the sliding tube. As soon as practicable Mrs. Lyons was removed to the hospital, and slowly recovered consciousness. At the Coroner's inquest last Friday, the Jury returned a verdict of "Accidental death." The attention of the police having been called to the fact that Mr. and Mrs. Fletcher, who reside in Camp Street, Wednesbury, had not opened their house as usual last Friday, the front door was burst open in the afternoon. All the rooms were full of gas, and the occupants were lying upstairs unconscious. They were carried into the air, where a constable successfully resorted to artificial respiration, and then they were removed to the Infirmary. It was ascertained that Mr. and Mrs. Fletcher had been unconscious for about 16 hours; and, but for the fact that there was a broken pane of glass in the window enabling the gas to escape, they would no doubt have lost their lives. The gas had, it was assumed, entered the house from a fractured main.



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**A New Service Reservoir for Swansea.**—The Mayoress of Swansea (Miss Watkins) recently performed the ceremony of cutting the first sod of one of the two new service reservoirs which are being constructed with the object of securing for the residents in the higher parts of the town continuous supplies of water. The reservoir in question is situated on the top of the Town Hill, and will hold 3 million gallons of water. As it is considerably below the level of the main reservoir at Cray, pumping will be unnecessary. It will be 175 feet in diameter, and its greatest depth 19 feet. The cost is estimated at £9000. The work is to be completed in twelve months.

**Water-Gas Plant for Darlington.**—The General Purposes Committee of the Darlington Town Council last Wednesday decided, by a bare majority, to recommend the adoption of water-gas plant, which it was estimated would cost about £7000. This, it is calculated, will obviate the necessity of spending £30,000 in adding to the present plant. A statement was submitted from doctors in the town, who opposed the introduction of water gas on sanitary grounds. The proposal came before the Council on the following day; and, though it met with opposition from Alderman Harding, on the ground of the alleged dangerous nature of the gas, it was eventually sanctioned.

**Opening of Additional Water-Works for Leamington.**—Last Wednesday the formal opening took place of the Leamington Corporation's new well at Lillington; the ceremony being performed by Alderman Henry Bright, J.P., the Chairman of the Water Committee, who has been mainly instrumental in securing for the town the excellent water supply it now possesses. The well has been sunk in the new red sandstone, and is 170 feet deep; and the result is an additional yield of 450,000 gallons of excellent water per day—thus securing for the town an adequate supply for all time. The numerous company inspected the works, and all the pumps were set in motion. At the conclusion of the ceremony, a vote of thanks was proposed to Alderman Bright, on behalf of the town and Corporation, for his services; and it was very heartily accorded.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office not later than **TWELVE O'CLOCK NOON ON MONDAY**, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, **PERMANENT ADVERTISEMENTS** should be received not later than the **FIRST POST** on **SATURDAY**.

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[For Illustrated Advertisement, see Sept. 4, p. 608.]

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The Cheapest in the Market.

Can be Lent on Hire.

Can be Exchanged for Spent Oxide.

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The Wexford Gas Company have placed with Messrs. R. Dempster and Sons, Limited, of Elland, a repeat order for Chester's furnaces and elort-settings.

The Farnley Iron Company, Limited, of Leeds, have been awarded a gold medal for the best Yorkshire iron exhibited by them in Class 64 at the Paris Exhibition, and also one for their fire-clay goods—glazed bricks and sanitary ware—shown in Class 72.

John Spencer, Limited, of Wednesbury and London, have just issued the twentieth edition of their price list of iron and steel tubes and fittings for gas, water, steam, hydraulic, and other purposes. It contains some useful tables; and there are blank leaves at the end of the list intended for memoranda.

The Hygienic Stove Company has been registered with a capital of £20,000, in £1 shares, to acquire the business carried on at Huddersfield by the Manchester Gas Cooker, Limited, and to carry on the business of gas-cooking range, gas fire and stove, boiling-burner, and general stove manufacturers, &c.

The "Bolletino delle Finanze, Ferrovie, &c.," announces the formation of a joint-stock company at Brussels, under the title of "L'Energie par le Gaz," with a capital of 1,000,000 frs., divided into 2000 shares of 500 frs. each, for the construction and sale of gas-engines and of all machines or appliances for the production, transformation, or utilization of gas power.

In a "Note" in the "JOURNAL" for the 28th ult., on "Rendering Wood Uninflamable," it was remarked that a ready and inexpensive process which would answer the immediate purpose in a reasonable degree was wanted about the works. We have since received a pamphlet setting forth the virtues of "Xylosote," which it is claimed not only reduces to a minimum the inflammability of wood, but leaves it odourless, and makes it hard and tough without, in the least degree, impairing its elasticity and pliability.

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SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

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##### JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application.  
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NEWTON GRANGE, NEWBATTLE, DALKEITH, }

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Offices: Commercial Buildings, LEEDS.  
Correspondence invited.

#### THE Gas Company advertising recently

for additional Meter Inspectors, beg to thank the various applicants. The applicants who have not heard, or who do not hear promptly, will please conclude that the vacancies HAVE BEEN FILLED.

#### SITUATION wanted by young Man as

GAS-FITTER. Considerable experience in the Fitting up of Fires, Cookers, Meters, &c. Seven years in present situation. Change desired. Good References.  
Address No. 3557, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### SITUATION required as Fitter or

MANAGER of small Works. Well up in Iron and Compo., Fires, Cookers, Main and Service laying, Meter Fixing and Reading. Home or Foreign appointment.

Address No. 3556, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### WANTED, a Situation (permanent) as

WORKING FOREMAN, in Country Gas Company. Age 39, well up to District Inspection, in Services, Stoves, Meters, and Reading, &c. Practical, Automatic or Ordinary. Present Situation 23 years. Good References. Abstainer. Married.

Address No. 3552, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### STOKERS wanted. Used to medium-

sized Works. Constant employment to active, reliable Men. Rail fare paid by arrangement.  
Apply to MANAGER, GAS-WORKS, WALTHAM CROSS.

#### WORKING Manager required to make

Gas and look after small Gas-Works. Good Character indispensable. Cottage on Works, with Light and Firing.

Apply, stating lowest Wages, to No. 3555, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### WANTED, Two good Stokers, accus-

tomed to shovel charging. Constant employment to good men. Wages, 5s. per shift.  
Applications, with Age and References as to Character and Ability, to be made to the undersigned.

R. G. SHADBOLT,  
Manager.

Gas-Works, Grantham.



**GASMAN** wanted (non-Union; Fitter preferred) for small Private Works in Country. Wages 20s., Rent Free, and Allowances. Apply AGENT, Haverland, NORWICH.

**WANTED, at once, at a large Provincial Gas-Works, a Young Man as SUPERINTENDENT of Main and Service Laying, Public Lighting, &c. Highest references as to character and ability. Apply, stating Wages required, to No. 3550, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

**MESSRS. J. & H. ROBUS, Engineers** and Contractors, 20, Bucklersbury, London, E.C., require an ASSISTANT DRAUGHTSMAN. To one accustomed to up-to-date Carbonizing and Conveying Plant, also competent to measure up Brickwork and Excavations, a permanent position is offered. Full Particulars on or before Friday, Sept. 14.

**PORTLAND URBAN DISTRICT COUNCIL. WANTED, immediately, a practical Man as GAS MANAGER for the Portland Gas-Works.**

Present annual make about 19,000,000. Salary, £110 per annum, with House, Fuel, Light, and Water. Engagement to be terminable by One Month's notice in writing. Applications, stating Age and previous Experience, to be made, in applicant's own handwriting, accompanied by not more than three Testimonials of recent date, and addressed to me the undersigned on or before Tuesday, the 18th day of September, 1900.

J. HOWARD BOWEN,  
Clerk to the Portland Urban District Council.  
Portland, Sept. 5, 1900.

#### CITY OF BRADFORD. (GAS DEPARTMENT.)

**THE Gas Committee** invite applications for the position of ASSISTANT GAS ENGINEER, at a Salary of £300 per annum.

Candidates must have had a thoroughly practical experience in Gas Engineering and Gas-Works Management.

Applications, endorsed "Assistant Gas Engineer," and stating Age and Qualifications, with copies of not more than three recent Testimonials, to be addressed to me on or before Sept. 20.

Canvassing will be considered a disqualification.  
FREDERICK STEVENS,  
Town Clerk.

Town Hall, Bradford,  
Aug. 31, 1900.

#### SHEFFIELD UNITED GASLIGHT COMPANY.

##### SUPERINTENDENT OF MAINS.

**WANTED by the Directors of this Company,** an experienced and competent Man to superintend their Mains and Services Department. He must thoroughly understand the working of Governors, and be able to advise as to the correct sizes of Pipes required to ensure an adequate supply of Gas in all parts of the Company's district.

There are 460 miles of Mains in use at the present time.

Applications, marked "Superintendent of Mains," stating Age, Married or Single, previous Engagements, and Salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, Sept. 28, 1900.

Testimonials not to be sent till asked for.  
HANBURY THOMAS,  
General Manager and Secretary.  
Commercial Street, Sheffield,  
Sept. 4, 1900.

##### SECOND-HAND VALVES WANTED.

**TWO 8 inch or 10 inch diameter Four-Way PLUG VALVES.**  
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

##### LAMP COLUMNS.

**WANTED, at once, about Two Dozen Second-Hand LAMP COLUMNS.**  
Prices and Particulars to be sent to No. 3554, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, to Hire for a few Months, Four RAILWAY TANK WAGGONS, to carry Tar.**  
Apply, by letter, to No. 3553, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE—Two Tangye Horizontal ENGINES, 10 inch Cylinders, 20 inch Stroke, complete with Gas Exhausters, Pipes, Valves, &c. In excellent condition.**  
Address R. H. LONGBOTHAM AND CO., WAKEFIELD.

**J. FIRTH BLAKELEY & CO., Thornhill,**

Dewsbury, have FOR SALE:—  
One Set of Three 6-ft. PURIFIERS.  
One " Two 8-ft. "  
One " Four 8-ft. "  
One " Four 16-ft. by 12-ft. PURIFIERS.  
Four 5-inch ANNULAR CONDENSERS.  
Four 10-inch " "  
Six 16-inch " "  
"Cutler" ½ million WATER CONDENSER.  
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.  
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.  
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.  
"Holmes" & "Clapham" WASHER-SCRUBBERS.  
"Livesey" & "Cripps" WASHERS.  
4-in., 6-in., 8-in., and 10-in. STATION METERS.  
Splendid GASHOLDER, 50 ft. by 20 ft.  
RETORT IRONWORK, MODERN HYDRAULICS.  
Telegrams: "BLAKELEY, THORNHILL LEES."

#### GLASGOW INTERNATIONAL EXHIBITION, 1901.

##### GAS LIGHTING.

**THE Executive Council** are prepared to receive PROPOSALS for EXHIBITS of INCANDESCENT and OTHER SYSTEMS of NOVEL GAS LIGHTING for Illuminating the Grounds and Detached Buildings of the Exhibition. For such Exhibits gas will be supplied free of charge.

Application to be made to the undersigned,  
H. A. HEDLEY,  
General Manager.  
36, St. Vincent Place, Glasgow,  
Aug. 30, 1900.

**"CUTLER'S" Condenser, ½ million day,** equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.  
J. F. BLAKELEY, Thornhill, DEWSBURY.

##### HIGH PRICED COAL.

**SMALL Gas Authorities** should immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets in stock, both New and Second-hand.

Address J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

**GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.**

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

##### SECOND-HAND PHOTOMETERS.

**MESSRS. Alex. Wright & Co., Ltd.,** have several second-hand EVANS & LETHBY PHOTOMETERS, complete with Instruments in thorough working order and good condition, which they can offer at greatly reduced Prices.

Write ALEX. WRIGHT AND CO., LIMITED, Precision Works, 81, Page Street, WESTMINSTER, S.W.

**STATION Meter to pass Two Million feet per day FOR SALE.** Connections 18 inch diameter; of modern construction. Will be moved and refixed by the Makers. Suitable for either Coal or Water Gas.  
New LETHBY PHOTOMETER, "Improved Edinburgh Model," by Sugg & Co. Specially designed for use in small Office. Dimensions, 7 ft. 3 in. by 5 ft. 6 in. by 1 ft. 10 in.

For Prices apply to JAS. WRIGHT, Gas Engineer, Bridge House, Blackfriars Bridge, LONDON, E.C.

##### BOROUGH OF CHORLEY.

**THE Corporation of Chorley** are prepared to receive TENDERS for the supply of a quantity not exceeding 300 Tons of OIL suitable for the manufacture of Carburetted Water Gas.

A full description of the Oil, with a sample, must be sent with the Tender. The Oil must be delivered free in Tank Waggons at Chorley Station in such quantities and at such times as the Engineer may require.

Any further Particulars may be obtained from Mr. J. McCubbin, Gas Manager.

Tenders to be sent to me on or before Tuesday, the 18th inst.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,  
JNO. MILLS,  
Town Clerk.

Town Hall, Chorley,  
Sept. 6, 1900.

##### LONDON COUNTY ASYLUM, HANWELL, W.

**THE Sub-Committee for the Control and**

Management of the above-named Asylum are prepared to receive OFFERS for the purchase of TAR for the Nine Months ending June 30, 1901.

Terms, Cash on Removal.

Forms of Tender, containing estimated quantity for Sale, may be obtained on application to the undersigned.

Tenders, duly filled up, must be sent in sealed covers, marked "Tender for Purchase of Gas Tar," to me by or before Nine o'clock a.m., on Saturday, Sept. 15, 1900.

The Sub-Committee do not bind themselves to accept the highest or any Tender.

R. W. PARTRIDGE,  
Clerk of the Asylums Committee.  
London Asylums Committee Office,  
6, Waterloo Place, S.W., Sept. 3, 1900.

##### RADCLIFFE AND PILKINGTON GAS COMPANY.

**THE Directors of this Company** are prepared to receive TENDERS for the construction and erection of a Single-Lift GASHOLDER, 138 feet diameter and 30 feet deep, with Guide-Framing and Roof Trussing.

The Specification and Drawings may be seen at the Gas Offices, Radcliffe, and at the Offices of the Engineers, Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Three Guineas, which will be returned on receipt of a bona-fide Tender.

Sealed Tenders, endorsed "Gasholder, Contract No. 2," to be addressed so as to reach me not later than Noon on Tuesday, the 2nd day of October, 1900.

The Directors do not bind themselves to accept the lowest or any Tender.

JAMES BRADDOCK,  
Manager and Secretary.

Gas Offices, Radcliffe,  
Sept. 6, 1900.

##### CORPORATION OF BLACKPOOL.

**THE Gas Committee** are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works during the next Twelve Months from the 30th of September, 1900.

Particulars from the undersigned.  
Tenders to the Chairman by the 22nd inst.  
JOHN CHEW,  
Gas Engineer.

##### ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

##### RETORTS, &c.

**THE Directors** invite Tenders for the supply of FIRE-CLAY RETORTS, FIRE BRICKS, and CLAY.

Specification and Form of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Retorts, &c.," must be delivered on or before noon of Monday, Sept. 17, 1900.

J. M. VEEVERS,  
Engineer and General Manager.  
Gas Offices, Rochester,  
Sept. 6, 1900.

##### BOROUGH OF LEIGH. (GAS DEPARTMENT.)

**THE Gas Committee of the above Corporation** invite TENDERS for the purchase of the surplus TAR produced at their Gas-Works, for a period of Twelve Months ending Sept. 30, 1901.

Forms of Tender and any further Particulars may be obtained from the Manager, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, to be endorsed "Tar," to be delivered to me on or before Twelve o'clock noon on Saturday, the 22nd day of September, 1900.

By order,  
PEREGRINE THOMAS,  
Town Clerk.

Town Hall, Leigh, Lancs.,  
Sept. 1, 1900.

##### BOROUGH OF LEIGH. (GAS DEPARTMENT.)

**THE Gas Committee of the above Corporation** invite TENDERS for the supply of 600 6-inch CAST-IRON PIPES.

Forms of Tender and any further Particulars may be obtained from the Engineer, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, to be endorsed "Cast-Iron Pipes," to be delivered to me the undersigned on or before Twelve o'clock noon on Saturday, the 22nd day of September, 1900.

By order,  
PEREGRINE THOMAS,  
Town Clerk.

Town Hall, Leigh, Lancs.,  
Sept. 1, 1900.

##### COMMERCIAL GAS COMPANY.

**THE Directors of the Commercial Gas Company** are prepared to receive TENDERS for the surplus BREEZE produced at their several Works, for the Twelve Months ending the 30th of September, 1901.

The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:—

At the Stepney Works, on the Regent's Canal—

1000 chaldrons (of 48 bushels) of Fine Coke Breeze, and

1000 chaldrons (of 48 bushels) of Rough Pan Breeze, At the Wapping Works, on the River Thames—

2200 chaldrons (of 48 bushels) of Fine Coke Breeze, and

2200 chaldrons (of 48 bushels) of Rough Pan Breeze, At the Poplar Works, in Bow Creek (free waterway)—

5000 chaldrons (of 48 bushels) of Fine Coke Breeze, and

5000 chaldrons (of 48 bushels) of Rough Pan Breeze.

The Tenders may be for the whole or for one or more Works separately.

The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.

The Form of Agreement to be signed can be seen at the Company's Offices.

Tenders, sealed, and endorsed "Tender for Breeze," to be delivered here not later than the 13th of September prox.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works, Stepney, E.,  
Aug. 27, 1900.

##### EAST LONDON WATER-WORKS COMPANY.

**NOTICE** is Hereby Given, that the

HALF-YEARLY GENERAL ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 4th of October, 1900, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 20th of September inst. to the 10th of October inclusive, and RE-OPENED on the 11th of October, on which day the Dividends on this Stock will be payable.

Notice is also Hereby Given, that after the termination of the Ordinary General Assembly an Extraordinary General Assembly of the Proprietors of the Company will be held for the purpose of considering and determining as to the creation and issue of Debenture Stock authorized to be raised under the provisions of the Metropolitan Water Act, 1899, with the Consent of the Local Government Board, which has been duly given.

By order,  
I. A. CROOKENDEN,  
Secretary.

15a, St. Helen's Place,  
Bishopsgate, E.C., Sept. 5, 1900.



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## EDITORIAL NOTES.

## Mr. Forstall on Technological Education.

THE paper by Mr. A. E. Forstall, on the work carried on by the Trustees of the Gas Educational Fund connected with the American Gaslight Association, read before the International Gas Congress in Paris—the full text of which will be found to-day on p. 707—will recall to our readers, and amplifies, the summary of the first report of the Trustees, which was noticed in the "JOURNAL" for Nov. 21 last. The method adopted in America for the spread of technical education among the rising generation of gas workers—we use the term advisedly, as the opportunities afforded for self-improvement are by no means confined to staff officials—differs radically from that in vogue in England; and, as Mr. J. W. Helps said, in the course of the discussion on Mr. Forstall's paper, the American plan has much to commend it. The difference between the American and the English systems is, briefly, that the former provides for and supervises the education of every student, and holds no examinations, as we understand the word; while the latter is content with the holding of an annual examination, the granting of a few prizes, and the subsidizing of Polytechnics and such-like institutions, which, in all but the largest centres, means that the student receives no organized assistance or guidance in the pursuit of his studies.

We need not here explain the American system in detail. It consists, as our readers are aware, in education by correspondence; each member of the class being given twelve questions to answer every quarter, with leave to obtain the information necessary to their answering from any available source. Thus, the American student has forty-eight questions to answer in the course of the year, as against the eight which his English *confrère* has set him at the annual examination held by the City and Guilds of London; and the former must necessarily be able to give better proof of the thoroughness of his study, of his powers of forming and expressing opinions, and of his merits as a draughtsman, than can possibly be given in the scurry of answering eight fairly stiff questions in the course of a short three hours. If it be argued that the answering of questions by the aid of text-books, or after inquiry of those who know, is no test of a man's own fund of information, we would point out that the real end to be served is that of ensuring that the man eventually possesses the information; and that the seeking out of the facts, the consideration of all that is to be learnt in regard to them, their careful committal to paper, and the subsequent comments and advice of the examiner, are, in combination, even more likely to impress a knowledge and understanding of the subject firmly upon the mind of the student, than cramming for an examination may do.

It must be borne in mind that the American course of study covers three years; so that each member has to commit to writing full answers to 144 questions during his studentship. Although, as Mr. Forstall says, it is impossible to cover with that number of questions all the details of all the subjects upon which a gas engineer should be informed, the study and research necessary to the compilation of complete answers must obviously lead the student over the whole of the ground. Indeed, we should be inclined to attach considerably more value to a certificate which implied that the member to whom it was granted had been closely and successfully applying himself for three years to the work involved in answering these questions, than to one which might only mean that the examinee had done six months' cramming. Mr. Forstall speaking for the American Trustees, and Mr. Charles Hunt as a former Examiner for the City and Guilds of London, each declared that the questions set under the system he represented dealt with practice as well as theory. Indeed, Mr. Hunt went so far as to say that "the questions were 'invariably put to test their practical knowledge.'" Now, as readers of these columns will know, that is a point upon which we cannot altogether agree with Mr. Hunt; for we have previously expressed the opinion—to which we adhere—that success in the examination held by the City and Guilds of London Institute does not at all necessarily imply the possession of practical knowledge by the student. As an ounce of fact is worth a pound of opinion, we may state, in support of our view, that we know of one student at least who has been awarded a medal by the Institute for his success in the "Gas Manufacture" examination who had



never previously set foot inside a gas-works, a laboratory, or even a draughtsman's office.

We say this, not because we wish to depreciate the value of the certificates granted by the South Kensington Institute, but because we want, on the contrary, to enhance their value by inducing those responsible for the conduct of the examinations to make the papers include questions bearing upon the practical difficulties that everyone concerned in the actual management of a gas-works must at some time or another encounter; to give marks of distinction to candidates showing special practical ability; and, further, to see that sufficient time is devoted to the examinations to enable the students to answer the questions carefully and adequately. The opinion expressed by more than one speaker in the debate which followed the reading of Mr. Forstall's interesting paper—that more value would be attached to certificates granted by the Institution of Gas Engineers or the Gas Institute than to those granted by any examining body not connected with the profession—is worth the careful attention of those corporations. They might also, with advantage, consider whether it would not be possible and wise to undertake more than they at present do for the advancement of technical and scientific training among the workers in the industry, either on the lines of the American plan or on others that might be deemed more suited to the needs of English students.

#### Questions of Gas Poisoning.

LAST Thursday a fatality, ascribed in the first reports to gas poisoning, was discovered in a small house in Tottenham. According to the newspaper account, it was 3 o'clock in the afternoon before anyone opened the house door, and then the interior was pervaded by a strong smell of gas. Upstairs in the front room of the cottage the householder, an artisan, was found lying dead on the floor, and his wife unconscious in the bed. A "glimmer of gas" was burning in the room. In the back bedroom a lad of seventeen lay dead in bed. The wife and another son, not dead, but unconscious, were at once removed to the hospital. Friday's "Daily News," from which this very clear narrative is taken, concludes the report of the occurrence with the statement that "the source of the gas escape had not been discovered last night, when the premises were locked up and taken charge of by the police." We have taken measures to procure authentic information concerning this deplorable casualty. The Birmingham gas poisoning case, reported in last week's "JOURNAL," furnishes the current number of the "Lancet" with the text for a homily upon the danger of water-slide gas-pendants; and our medical contemporary, while not going so far as to say that this description of fitting should be made illegal, lays it down that no prudent householder should put one of them into his house. With this piece of good advice we unreservedly concur.

The water-slide gas-pendant, like "compo." gas tubing, is but a survival from an age of less perfect mechanical equipment than the present enjoys. Possibly few people now living have ever seen the water-joint gas-bracket, which was at one time as common as the so-called "hydraulic" pendant, and must have been as much more dangerous as the water-seal was shallower. Most people, at any rate, can easily recall the recent days when a glittering lacquered brass sliding "chandelier," with any desired number of branches, was an article of genteel furnishing that no respectable householder could dispense with. The pattern books of gas-fittings manufacturers of that period showed many such, in an embarrassing richness of apparent variety which vanished as soon as the expensive luxury was duly fixed in its place. One pendant had a way of looking very like another after a short period of service. Still, a patient, not very artistic public went on buying these costly abominations; and we are credibly informed that there is still some demand for the less pretentious patterns of the article. Happily, however, the public taste has changed in this regard. A severe simplicity, not exclusive of some daintiness, rules the present-day fashion in lamps of all kinds. No longer will the suburban resident cheerfully pay £10 for a bright brass chandelier. The regenerative gas-lamps first ousted these monstrosities of the brass-finishers' art from their pride of place over the dining-room table. The "stuffiness" of atmosphere produced by five or seven flaring flat flames, barely visible through the thickly-frosted globes, was undeniable. So in many instances at some Spring cleaning

time, when the workmen were in the house, the old chandelier went its way to the scrap-heap; and a single ventilating and perhaps regenerative gas-lamp shone steadily in its place.

The supposititious advantage of being able to vary the height of the light above the table, which was the sole excuse for the water-slide as of its humbler congener, the cork-slide pendant, has been given up in the majority of instances without causing any notable inconvenience. A more intelligent fashion of distributing lights in interiors, according to the most customary requirements of everyday-use, has done away with that senseless massing of light in the centre of every apartment of which the pendant was the symbol. There are better means, besides, of providing for a concentrated or adjustable light such as will always be required for special purposes. The man who has much close reading or hard writing to do, or the housewife who wishes to do "black work" by night, can and should be suited with special lights appropriate to the position and the purpose, and should be better advised of what is good for their eyes than remain content with a share of the general lighting which is nevertheless ample for ordinary purposes.

One is glad to notice that the "Lancet" does not commit the banality of crying out against the progressive use of carburetted water gas on those "sanitary grounds" which seem to bulk largely in the professional minds of the doctors of Darlington, as we reported last week. Rather does our medical contemporary incline to the reasonable view that the increase of the proportion of carbon monoxide in town's gas, due to the forced recourse of the manufacturers in many cases to auxiliary carburetted water-gas plant, is something to be taken note of, not in an alarmist way, but as strengthening the protest against the continued use of dangerous gas-fittings. "It must be remembered that coal gas is poisonous under any circumstances; and that 'being so, care must be enjoined in its use.'" This is the correct way to state the case. The use of town's gas is increasing so fast, and spreading so widely among the poorer and less educated grades of the community, that accidents must be expected now and again. The circumstance that the users of prepayment gas-meters have their fittings put in by the gas company is an effectual protection against any mishap attributable to flimsiness of material, unsafe design, or fraudulent workmanship on the part of some local fitter.

Curiously enough, the risk of carbonic oxide poisoning, from laundry stoves used for drying clothes, is the subject of a long report in last week's "Lancet," by Dr. C. R. Elgood, of Windsor. Two women, engaged in a work-house laundry, were overcome with carbonic oxide escaping from a mismanaged and badly-constructed coke stove; and one died. The apparatus was of an old-fashioned square cast-iron pattern in common use for this purpose, having the dangerous peculiarity that the flue-hole was nearer the bottom than the top. This left plenty of room for piling up coke above the flue, which had evidently been done in this instance, so that there was nothing for it but the escape of the fumes into the room through the feeding-hole in the top of the stove. The surviving woman confessed to having made up the fire to an unauthorized degree, for the purpose of cooking potatoes on the lid of the stove. When the fatal room was entered the same evening, blue flames were seen coming out round the feeding-door in the top of the stove. Dr. Elgood, while sensibly concluding that it is unnecessary to look farther for the cause of this death, justly makes a few observations on the circumstances. As he says, one expects to find, when in the presence of a smothered coke-fire, certain unpleasant, and even acutely irritating consequences of the fact—such as a "gassy" smell, or smell of sulphur. In the present instance, there was nothing of the kind. Both carbonic acid and carbonic oxide probably escaped freely from the stove, although the statement that carbonic oxide was seen burning round the stove lid rather militates against the conclusion that much was escaping unburnt. The condition of the blood of the dead woman was indicative of the way of her death. The most valuable of Dr. Elgood's observations on this case are those referring to the curative treatment of victims of gassing by carbon monoxide. He objects to too prolonged a use of artificial respiration as being of more harm than good. A short, brisk treatment of this kind, with oxygen inhalation, and friction and slapping over the heart, does great service. Meanwhile, the



body should be kept warm by external means, and not unduly exposed to the air.

#### Is the British Association Getting Decrepit?

THE termination of the British Association meeting at Bradford, with a record of total attendance falling short of that at the previous meeting in the same town, in 1873, inspires some journalistic critics of the Association with the suspicion that the organization is "on the wane." This is precisely the thought that might be expected of a disciple of the modern creed which sets up the "counting of noses" as the sole and sufficient measurement of the importance of a cause—except, of course, when the partisan happens to be in a minority. We have perused with some interest a lengthy newspaper article which undertakes to show that the British Association had better dispense with the support and countenance of the "nobility, gentry, and leaders of religious thought" whom Sir David Brewster thought to bring into union with men of science in 1831, when the Association was founded. It is suggested that the notable orders of the community of those days have lost their ancient importance; and therefore that "if the British Association is to continue its career as a useful and honoured institution, it must appeal to those classes who now form the backbone of our nation—namely, to the manufacturers and to the artisans of our country." Funnily enough, the same article immediately goes on to inquire how many of the Bradford manufacturers attended the Association meetings, and alleges that in all probability the artisans of the town looked at their newspapers all the week more for the football and racing news than for the doings of the Association in their midst. True enough, most likely; but one fails to see in this circumstance proof of the existence of "ample scope for effort on the part of the Association to enlist the sympathy of these classes in its work." This, surely, is preparatory work. The British Association is no elementary school, nor is it a system of evening continuation classes. If the workpeople of Bradford care more for betting, football, and "week-ending" than for the transactions of the British Association, whose fault is it? The implied sneer at the Bradford manufacturers who did not press in overwhelming numbers into the Association meetings is a miss-fire. Business is their science; as science is the business of the Association. If the prestige of the Association has suffered at all of late years—which we are not prepared to deny—it has not been by reason of too close an adherence to true science, but to too great laxity in admitting the popular, the commercial, and the self-advertising elements into its transactions. A ruthless critic "in the know" can usually mark off a large proportion of papers and appearances with the significant affix "(advt.)." The most pressing temptation of the Age for scientific men is to turn everything into shekels; and the British Association is to be revered in the measure in which its henchmen resist this pressure. The interest of the manufacturer, whether of Bradford or elsewhere, in abstract science is merely that of any other citizen of his grade—no more, no less. But as for the artisan, whose choice reading is of football and racing, why should Science bow to his tastes? Are these not already intrusive enough, in other places? Is not almost every newspaper published for him? Are not the problems of housing him, supplying him with the drink his soul loveth, providing him with the titillation of a threatened strike, ever and always with us? If the British Association could only promise tired people a glimpse of the eternal verities, regardless of all the "causes," and all the "interests" that run everything in this sublunary world, from churches to newspapers, it would earn the gratitude of a worried generation, which may no longer worship Royal Dukes, but has no inclination to bow down before a Trade Union secretary as a sort of fetish.

#### The Gas Affairs of Sheffield—Incandescent Gas Lighting in the Ascendant.

THE ordinary half-yearly meeting of the Sheffield United Gas Company was held last Tuesday, under the presidency of Sir Frederick T. Mappin, who improved the occasion, as usual, by giving the people of Sheffield a full and particular account of their gas affairs. It cannot be too widely known that Sheffield is one of the relics of the old maximum dividend settlement, and abundantly justifies this simple plan. Mr. Livesey is accustomed to say that this settlement,

which is represented by the Gas-Works Clauses Act, 1847, was all very well while there was competition in gas supply; but that with the advent of districting, it fell out of joint. In the Sheffield case, the useful office of competition is performed by several substitutes. One is the peculiar publicity of the affairs of the Company secured by the presence on the Board of Nominee Directors belonging to the Corporation. Another is the effective rivalry between Sheffield and neighbouring manufacturing towns. Sir F. Mappin is always frank and chatty to a degree; but he surpassed himself this time. He ranged over all the points of technical interest of the day, from incandescent gas lighting and the prospects of cheapened "light gas" manufacture, to the Westinghouse gas-engine. We are glad to learn that the Sheffield Company have adopted the system of installing and keeping up incandescent gas-burners. It will be valuable to hear later how this has answered. Gas managers throughout the South of England and the Midlands will smile at the announcement that Sheffield has discovered the remedy for naphthalene. An inquiry by a proprietor elicited the interesting fact of there being already 30,000 2-light meters in use in Sheffield, which render unnecessary anything like automatic prepayment supplies. These consumers, of course, escape the usual surcharge on the automatic deliveries; and the profit made by the Company out of them must be very little. These are the same class of people who go in so strongly for incandescent lighting in Germany, because they cannot afford to use flat-flame burners at German gas prices. Sheffield, in fact, beats Germany easily, since here a Welsbach burner consuming 4 cubic feet of gas per hour (which is unnecessarily large), gives ten hours of the most brilliant home light in the world for 1d. It is no wonder that the Sheffield Corporation are going to light the sewage works with their electricity. There will be small demand for it in the town.

#### Lighting Affairs at Hastings.

THE condition of the gas and electric light undertakings at Hastings is a sore point with local politicians who have burdened the ratepayers with an electricity supply business which does not pay, and are wroth at the prosperity of the Gas Company. Hastings is a typical South-Coast pleasure town, with absolutely no local industry except that of letting lodgings. It is also one of those ancient towns which still keeps up a local coal duty; and this piece of indirect taxation pleases nobody. The economy of such a place is likely to prove a curious study for anybody accustomed to live in a town of a totally different character. The first piece of information which a visitor to Hastings who might also happen to be a gas manager would esteem as reassuring, is that the gas consumption of the district has increased by about 10½ per cent. for the year. There is likewise a familiar sound about the statement that the price of gas has had to be raised. In his interesting speech at the recent half-yearly meeting of the Company, the Chairman (Dr. Gray) mentioned a circumstance in connection with the rivalry of the Corporation Electric Lighting Department with the Company which does not redound to the credit of municipal trading as practised here. It appears that public lighting is the mainstay of the electricity undertaking, and is being done at less than cost price, so as to hoodwink the ratepayers—the balance being paid out of the rates. It is the policy of the Corporation to push the public electric lighting as much as they can, and so make what can be advertised as an increasing business for the Electric Lighting Department. Accordingly, they have served notices upon the Gas Company to discontinue a number of public lamps, as they are about to be replaced by electricity, which means that the Gas Company, who are bound to provide the standards and lanterns as and when required, must return these goods into store and wipe off the original cost. As the Chairman of the Company very aptly remarked, if the Corporation were so served in their turn, there would be a great outcry; but such is municipal life. We mention this Hastings experience both for its illustrative value, and also because we recently had something to say about the unsatisfactory character of the Corporation electric light finance. The Gas Company are under the sliding-scale, so that the necessity for increasing the price of gas will affect the shareholders, who get little over 5 per cent. on the value of their investment. The apologists for the Corporation in the Press call this a "bloated dividend," whereas the Corporation need 7 per cent. to pay interest and redemption charges on their electric



light loans, to say nothing about depreciation. Yet we suppose that wherever the subject is publicly mentioned, the enterprise of the Hastings Corporation is cited as a shining example of the glories of municipal trading.

#### Waverley Association of Gas Managers.

IN matters pertaining to history, the popular mind runs upon jubilees, and even, in later years, impatient of progress, upon semi-jubilees. But there is, to thinkers of a more solid turn of mind, a deeper charm in the forty years' period of existence. Bringing the subject home to ourselves, it is forty years now since gas managers began to associate together, for purposes of mutual protection. The Waverley Association of Gas Managers held their seventy-ninth half-yearly meeting at Dalkeith on Thursday last. Assuredly, in their case, the past forty years have not been a wandering in the wilderness, but the reverse; and the same may be said of the gas industry generally. Confining our remarks to the Waverley Association, it has to be noted that the district in which its members live has undergone little material change since the Association was originated. Probably as much change is to be found within the industry itself as in any of the other common pursuits of mankind in the locality. It was a threatened industry forty years ago—threatened by the tirades of the bombastic Flintoff, and indeed the Association owes its existence to that fact. During the period which has elapsed, the spirit of combination has never flagged, but has grown both in extent and in strength of purpose. Without having accomplished great things, the industry in the Waverley district is at the present day more powerful for the fulfilment of its mission than it ever has been. If it is not free from threatening surroundings at this time, it is better able to meet them.

Undoubtedly the ground is changing for the Waverley members in more ways than one. We do not refer to the state of affairs generally, which are well known, and which are not without their effect upon the fate of Waverley gas undertakings. But hitherto the managers of these works have lived in the hub of British gas making. The canal which made Scotch gas the best product of its kind, was found in their very midst. Theirs was the citadel of gas making; but this cannot be said of it now. Other modes of enrichment have come to the front; and the Waverley members, instead of having something to teach, are passing into the position of requiring to learn. It will be a satisfaction to them to know, on the authority of Mr. J. A. Hood, the General Manager of the Lothian Coal Company, that there is no risk of their rich coal deposits giving out as yet. So that, if the members have now, more than ever, to learn things which they could heretofore ignore, they are not under any necessity to unlearn anything which they have hitherto held to be of the essentials of gas manufacture. The probability is, therefore, that for many years to come, there will be a distinctive characteristic attaching to gas management in the Borders of Scotland; and while that is so, if for no other reason, the need for the existence of the Waverley Association of Gas Managers will continue.

The meeting on Thursday last was a happy one. The absent President—Mr. W. McGiffen, of Huntly, and late of Earlston—sent an address which suggested much debatable matter, and the members gave freely their experiences, in the homely conversational style which prevails in the Association, upon subjects which are of perennial interest to gas-works managers. After this very successful meeting followed a more than usually interesting excursion, which included a descent into the bowels of the earth, to the very source of the gas supply—the coal face. It is seldom that so much useful work can be crowded into one day by any body of technical workers.

#### The Great Eastern Railway Men's Agitation.

WHEN the statesman of a past generation made the historical observation "We must educate our masters," he unfortunately forgot the preliminary necessity for educating the teachers. Many of our social troubles of to-day seem to be traceable to the same old source and origin of evil—ignorance; but this is not due to any lack of teachers, in and out of school. We are moved to offer this remark by the reports in yesterday's papers of the latest phase of the Great Eastern railway men's agitation. The Board of the Company, having gone into the men's demands for a general advance of wages and other concessions, formulated

in reply a scheme dealing with the question of wages by classes, and making definite ameliorations of the employment in certain particulars. This scheme was considered last week by a meeting of the men's delegates; and a "mass meeting" of the employees affected was held on Sunday, to say whether the men would accept it or determine to strike for more. Many speeches, more or less to the point, were made at this meeting; and the upshot of it was the carrying of a resolution in favour of handing over the dispute to the Executive of the Amalgamated Society of Railway Servants. Even the "Daily News" interprets this as agreeing to take what is offered and go on asking for more. There will be no strike. Very artlessly, the newspapers report that Mr. Richard Bell, the Secretary of the Society, happened to be present at the meeting "as a looker-on." He "jestingly remarked that he did not know "whether he should be 'chucked out' or not." Instead, he was asked to make a speech, and did so; expressing the hope that every railway man who did not belong to the Society would forthwith become a member, and obey the orders of the Executive, whatever these might be. He also indicated that he was in favour of an Act being passed in the new Parliament for compulsory arbitration in labour disputes. Most opportune was Mr. Bell's presence on this occasion; for, of course, it was no "put-up job," as he would probably call it. But the point of our initial sentence is here: This Trade Union official is in his way a product of the period which has passed since the schoolmaster was sent abroad by a supposed liberalizing Act of Parliament. So is the newspaper writer who yesterday backed him up with the statement that "compulsory arbitration has been "brilliantly successful in Australasia," and proceeded to ask why it should not be equally successful in the Old Country. More "flapdoodle!" Are parliamentary candidates at the coming General Election to be dosed with it? If so, they had better make an early note of the facts of the matter to which we briefly drew attention last week. If any of our readers should happen to be interested, as politicians, in parliamentary campaign literature, this point might be taken by them, for the facts are as we have given them. Besides, supposing compulsory arbitration to be all that the fancy of New Unionists paints it—and they would not profess such admiration for it if they thought it likely to interfere with their own interests—those who undertake to manage appeals on behalf of the men must first learn to be as businesslike as the employers usually are. There is an air of unreality, of theatrical posing, about the recent railway men's agitations that would condemn them in advance before any respectable Court of Arbitration.

#### The Transvaal War and the Gas Industry.

THE subject that has been most prominent in the minds of our readers, in common with the rest of their co-patriots, during the past twelve months has necessarily received but small notice in these columns; for—while we always endeavour to bring under consideration such events in the work-a-day life of the world as touch the interests of all concerned in the gas industry, or as afford lessons of value to those in whose hands the administration and care of its undertakings lie—the progress of the Boer War has, in the main, been a subject altogether beyond the purview of the "JOURNAL." There is, however, one respect in which the upshot of events in South Africa directly touches the acetylene gas industry. It may be remembered that twelve months ago we called attention to the gross injustice done by the Transvaal Government to the English firm of Read Holliday and Co. (the patentees and makers of acetylene gas apparatus) by conceding to another firm—in consideration of that firm undertaking to pay to the Government 10 per cent. of the profits of the concern after the third year—the sole right to make and sell calcium carbide in the Republic, in spite of the fact that Messrs. Read Holliday and Co. had previously taken out licences under the Transvaal Patent Law securing such exclusive right of manufacture and sale.

The Transvaal is now no longer a republic, but is an integral part of the British Empire. Mr. Kruger has thrown up the sponge; and, though a difficult task still remains to be performed before the complete submission of the irreconcilable rump can be secured, the new régime can be said to have begun. One of the first evidences of this fact also affords our reason for saying that the result of the war directly affects the industry the "JOURNAL" claims to represent—we refer to the notice as to concessions in the Transvaal issued by the High Commissioner for South Africa on



the 8th inst. This notice is to the effect that every concession granted by "the late Government of the South African Republic" will be considered by Her Majesty's Government on its merits, and that the Government reserves the right to modify, or to decline to recognize, any concession which may appear on examination to affect prejudicially the interests of the public, or to have been granted contrary to law. A Commission has been appointed to make the necessary investigation into the circumstances and terms of the granting of all concessions; and the Commissioners will meet for the first time on the 1st prox. The concessions into which they will, in the first instance, inquire include those conferring the sole and exclusive power of manufacturing, importing, or dealing in any commodity in the Transvaal. All persons desiring to be heard are to communicate with the Commissioners at once; and so Messrs. Read Holliday and Co. will, we trust, soon come by their own again.

The war has been not without its indirect effects upon gas undertakings. It has had some share in raising the price of coal; it has, both by the calling out of the Reserves and by the stimulus given to recruiting, caused the supply of labour to be diminished at a time when the demand has been exceptionally heavy; and it has helped to keep up the prices of iron and steel goods. It has, moreover, considerably affected the finances of the country—the lessened output of gold raising the price of money and lowering that of gas stocks; while the heavy war expenditure, with the consequent shilling income-tax, has checked to some extent the previously growing prosperity of the country generally. As Mr. L. L. Price pointed out the other day, in his paper on "Some Economic Consequences of the South African War," read to the British Association, the increased military expenditure that has been and will be necessitated may be accounted "unproductive"—in a strict interpretation of the term—while "the growing pressure of foreign competition in our own manufactures and trade, coupled with the increasing cost of obtaining the coal which is still the source of much motive power, and the large additions made to local and municipal indebtedness, may render it desirable to husband resources and avoid any augmentation of the National Debt." On every ground, individual, industrial, and national, those responsible for the management of the gas undertakings of the country may well rejoice at the approaching successful termination of the war, which has been so lamentably costly—both in blood and treasure.

## WATER AND SANITARY AFFAIRS.

It is in the highest degree gratifying to find that the prompt measures taken by the sanitary authorities of Glasgow have had the effect of checking the spread of the terrible scourge which appeared in a certain part of the city a few weeks since, as noticed in the "JOURNAL" for the 4th inst. The official bulletin issued last Thursday showed that the number of cases of plague under treatment were sixteen, though as many as seven times this number were under observation. Fortunately, the majority of the patients in the hospital were out of danger; and as the maximum period of incubation had passed on the 5th inst. without any fresh cases having arisen, it was confidently believed that the disease had spent itself. All the houses in the isolated area have been disinfected; and it is to be hoped a clean sweep will be made of them. It is a curious feature of this remarkable outbreak that, while the inhabitants have shown a disposition to co-operate with the authorities in their precautionary work, priestly influence has been brought to bear in one of the most important branches of it—viz., the cremation of the dead. Religious fanaticism showed itself in another direction—the walls in certain parts of London being scored over with expressions calculated to alarm the unthinking, though no one was mad enough to utter any denunciations from the steps of St. Paul's. Of far more importance to the Metropolis than these hysterical exclamations were the reassuring statements made by Dr. W. H. Power, one of the Medical Officers of the Local Government Board. He told a representative of the youngest of the morning papers that the Board have not the slightest fear of an epidemic of plague in London, for the reason that they have perfect confidence in the efficiency of their machinery for restricting an outbreak. He laid stress upon the foolishness, and even danger, of alarm; and added that, with our elaborate system of notification, isolation, and disinfection, "one, two, or even three cases of

"plague in London should not send the people into a panic "any more than a case or two of typhus." Each disease, as we remarked when dealing with this matter a fortnight ago, is the product of the accumulation of filth; and Mr. Baldwin Latham has pointed out in a recently issued work on "The Climatic Conditions necessary for the Propagation "and Spread of Plague," that this particular scourge is "greatly influenced by pestilential emanations from polluted and water-logged soils." Moreover, it attacks the poor and those who are living on low diet. It is an aphorism in the medical profession that if the cause is removed the effect will cease. It is therefore the business of the true sanitarian to turn his attention to any places—and there are probably not a few—where conditions such as those above indicated exist, and set about improving them with as little delay as possible. The bacillus of plague will not find a permanent home where there is plenty of pure air and water, and where personal cleanliness is attended to, as, happily, it is to a greater degree than it has ever been.

The International Health Congress, some of the proceedings at which have been noticed in previous issues, was not the only one at which sanitary matters have lately been discussed in Paris. In response to a cordial invitation from the French Society of Hygiene, the Sanitary Institute held last month a series of meetings, at which some important questions were discussed. Among them was that of river pollution and the purification of sewage, which was introduced in an address delivered by Mr. T. de Courcy Meade, City Surveyor of Manchester. He pointed out that, though the problem of preventing the pollution of streams at reasonable cost had been for some time before municipal authorities, the solution seemed to be as far off as ever. He thought, however, it had been found by the Mersey and Irwell Joint Committee, who control an area of about 483,000 acres, with a population of 2½ million inhabitants. Most of the sewage undergoes treatment before it is allowed to pass into the rivers—the solids being removed by purely mechanical filtration. Speaking upon this subject, Dr. S. Rideal said it was possible, under certain circumstances, to allow a specified amount of sewage matter to pass into streams; the problem was to ensure that the latter should remain pure. He thought future legislation should be based upon the ratio of the volume of a river to that of the sewage matter discharged into it. He supported the opinion held by previous investigators, that a great bulk of sewage might go into a large stream without detriment to towns lower down, even where the water was used for drinking purposes. Mr. Roechling was less inclined than Dr. Rideal to rely on the self-purifying power of rivers. He expressed the opinion that where streams into which sewage is discharged are used for providing supplies of drinking water, the sewage should be first purified, no matter by what system. At the same time he thought that effluents from bacterial works should be regularly and carefully watched, as it would often be found that luxuriant vegetation was produced, which was liable to cause putrefaction. It would seem, therefore, that, while the pouring of untreated sewage into a stream is unattended by serious consequences to people living a few miles below the point of discharge, the modern processes of treatment must not be too confidently relied upon to produce a perfectly harmless effluent. Dr. Rideal's suggestion as to fixing the ratio of the volume of sewage to that of the stream into which it is discharged, is a good one. But before the Legislature could be asked to do anything in the direction indicated, searching inquiry would have to be instituted; and this could best be undertaken by a public department such as the Ministry of Health which is now being called for by sanitarians.

**English Gas Engineers at the Paris Gas Congress on "Gas Manufacture" Examinations.**—In our *résumé* of the technical proceedings at the International Congress, we gave, as they merited, rather prominent notice to the remarks of Mr. J. W. Helps (the President of the Institution of Gas Engineers) and of Mr. Charles Hunt, with reference to the "Gas Manufacture" examinations of the City and Guilds of London Institute. In connection with Mr. Hunt's observations, and in extension of what we reported last week, it may be said that Mr. Helps acknowledges the difficulty that would probably be experienced if the examination papers were set by a body of examiners, and states that his idea is that the examination should be undertaken by such a body, with power to appoint and delegate to some qualified person the setting of the questions. Nominally, however, the examination would be conducted by the properly organized body of gas engineers, and would, he thinks, acquire importance from this fact.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 720.)

LAST week opened full of promise for the Stock Markets. A more cheerful feeling in regard to affairs in general prevailed, strongly aided by the sure signs of the approaching termination of the South African war; and this, coupled with easy money conditions, brought in buyers. Nor was the buying confined to the covering operations of the professional element; for it really seemed as if the public were beginning to nibble. The rise was at its height on Wednesday, when the flight of Kruger was announced. But then a reaction set in, with a strong tide that swept everything down again, with the result that all the advances were lost, and in some instances more than lost. A very disappointing sequel to a short bright interval! The Money Market was irregular too. At first, the chief characteristic was marked easiness; but later demands, coupled with the requirements of the Stock Exchange settlement, produced a degree of hardness. Business in the Gas Market was on the whole only moderate; and it was very fitful throughout. On one day there would be quite a revival of animation; and by the next it had all died away again. The tendency, however, was good, and continued a general disposition to recover from the late depression. The changes in quotation are few and moderate; but with only an unimportant exception, they are all for the better. In Gaslights, the ordinary was fairly brisk, considering the average of activity, and very steady—never ranging outside the limits of 97½ and 99. Hardly anything was done in the secured issues. South Metropolitan was moderately dealt in at about middle prices, but no better. Commercial were unnoticed. The Suburban and Provincial group displayed more activity, especially Brentford and Tottenham; and several issues showed improved values. The Continental Companies were remarkably quiet, and were quite unchanged, except for a small advance in Imperial. In the remoter world, Cape Town alone made a change. The tendency in Water continued favourable; and Kent, Lambeth, and West Middlesex had more or less of an improvement.

The daily operations were: Business in Gas was brisk on the opening day; and prices were firm, but quotations did not move. In Water, Kent rose 5, and Lambeth 1. Business in Gas died away on Tuesday; and again quotations were unmoved. In Water, West Middlesex rose 1. Wednesday was another quiet day; but prices were good. British rose 1, and Cape Town ½. Thursday was a little more brisk; and Crystal Palace and Tottenham "A" rose 2 each. Friday was more active—mostly for Gaslight issues. Imperial rose 1; but Cape Town debenture receded 1. Lambeth Water gained 1. Saturday was quiet, and without change.

### ELECTRIC LIGHTING MEMORANDA.

Refuse Destruction at Bradford—The Performance of the Plant—Combination Destructor and Electric Lighting Plants not Expedient.

AT last, after many years worse than wasted in the hopeless attempt to yoke the destruction of towns' dust to a general electricity supply station, and exhibit the combination as a working success, the whole thing has been blown upon. It happened at Bradford, the minister who operated the exposure being Mr. M'Taggart, the Cleansing Superintendent of the city. He read a paper before Section G of the British Association, which should effectively extinguish the last flickerings of an organized deception that the "JOURNAL," at least, has consistently combated from the very beginning. The ease with which one local authority after another permitted themselves to be misled in regard to the economical possibilities of this loudly-trumpeted combination, has been anything but creditable to the collective wisdom of these bodies. The people who made a living out of the business have been able to keep it up for a good spell, owing to the notorious reluctance of local authorities once deceived to confess the fact. To their credit be it said, the leading technical journals devoted to the electric lighting industry never lent any support to this delusion; and one of them came in for much obloquy for its scepticism in regard to the great Shoreditch undertaking. Their attitude in this respect has been the same as that taken by the "JOURNAL." For the process of towns' refuse destruction by fire, we have had nothing but praise. It is the only sanitary way of dealing with such absolutely waste matter, the necessary, but none the less offensive *dejecta* of a living town. To pretend that the stuff has any real value, whether for generating electricity or converting into illuminating gas, has been regarded in these columns as offending against the plainest of scientific conclusions from indisputable facts.

In respect of refuse destruction, the experience of Bradford is often referred to as conclusive. The expedient has been of necessity adopted by the Bradford Corporation in a most thorough-going fashion. Fortunately for the ratepayers, the Corporation were wise enough to see the advisability of doing one thing at a time. The duty of satisfactorily disposing of the town's refuse was imperative; and the Cleansing Committee felt that it was difficult enough to call for the most careful fulfilment, irrespective of all possible ancillary considerations. One essential to the perfect discharge of their obligations the Committee

saw to betimes—they obtained the services of a good manager for the department, and had the whole service put in scientific trim. After seventeen years' experience, they could expect to get the work done properly. There are, of course, about a destructor station many small but important details which nothing but ample experience is competent to effectively deal with. They seem to have got everything pretty nearly right at Bradford by now. Mr. M'Taggart has just published the results of a complete fortnight's working. It seems remarkable, if it is true, that the publication of results of so long a test-period is unique. One would naturally suppose that those who are interested in any way in an apparatus that is nothing if not good for continuous operation, would not be content either to buy or sell such plant on the results of a one, two, or even twelve hours' test. Yet Mr. M'Taggart more than hints that this is the usual proceeding. If so, the municipal purchasers must be worse men of business than one would believe to be possible.

Mr. M'Taggart's fortnight extended from June 24 to July 7 last. During this time, the usual summer refuse was disposed of, amounting to 1293 tons. The rate of working was 9'3 tons, or 543 cubic feet, per "Horsfall" cell per 24 hours, at a labour cost of 9d. per ton. The products comprised 365 tons of clinker, 12 tons of fine ash, 2'67 tons of flue dust—total solid residuals, 380 tons nearly. The other residual was steam, which was generated at the evaporation rate of 0'743 lb. per pound of refuse. Corrected to evaporation from and at 212° Fahr., the duty of the refuse was 0'882 lb. of steam per pound of the fuel. The total amount of power generated was 387 indicated horse power per hour, which was utilized in grinding mortar, crushing clinker, making artificial stone, and converting the fish refuse of the city into manure. Steam is also supplied to a disinfecting station; and the rest goes to make electricity for lighting the establishment. There is none over. In answer to questions on the point, Mr. M'Taggart told the Section that the possibility of generating electricity from refuse had received much consideration from the Cleansing Committee, who had not seen their way to go further into the matter than simply to light their own works and the limited area adjoining them. He was dead against the idea of a combination plant; the calorific value of the refuse to be dealt with varying so much from day to day that it would be inadvisable to bind the destructors to deliver a fixed amount of power, which they would be unable to do without using coal. "If they wished to have an electric lighting works," said the Cleansing Superintendent, in a fine burst of commonsense, "let them have one, and thoroughly up to date. If they wanted a dust destructor, let them have it as a destructor, and make that thoroughly up to date; and let them utilize every atom of power in some other useful work, such as the manufacture of bricks and tiles, and he believed it would some day prove to be as thoroughly remunerative as the generation of electricity." All this is endorsed by the "Electrical Review;" and we agree. The supply of steam for central station electricity generation is about the least suitable application of refuse-destructor heat that could well be proposed. The one is the type of intermittent, high-pressure working at daily intervals; the other is of the type of those machines which work night and day throughout the week, stop altogether on Sundays, and never know from hour to hour what the output may be. The two types will no more run together than a dust cart and a dynamo. It cannot be done. So far as the reduction of the expense of working a destructor by the suitable utilization of otherwise waste heat is in question, this is a laudable aim wherever the conditions permit. But to say that electricians are the only persons who have ever thought of doing this, is to utter that which is not true. It is true that they have made most use of the suggestion as jam for concealing the bitter taste of an expensive electric lighting installation; but the idea is scarcely one to be proud of having originated.

**Calcium Carbide Works in Great Britain.**—In the course of a recent article, entitled "The Technology of Acetylene" (*ante*, p. 464), in which we reviewed Professor Vivian B. Lewes's book on the subject, we remarked that—in a list of carbide works at present running or in course of construction, given by him—he had failed to name any works in Great Britain except those at Foyers. We added that the Foyers works belonged to the Company which had acquired Willson's English patent rights; and that, while in respect of other countries the list was a tolerably complete one, we were surprised that such works as those at Blackburn and Cradley Heath, and those at present under construction in North Wales, had been omitted from it. Such omissions, we considered, would have seemed to be intentionally misleading, if Professor Lewes's impartiality were not beyond question. We have now been asked to state that there never have been carbide works at Blackburn; that those at Cradley Heath have ceased to exist; and that at present there are no works in construction in North Wales. In so far as the Cradley Heath works are concerned, we have pleasure in accepting the correction; but our information to the effect that a Blackburn firm is making carbide, and that works capable of utilizing 4500-horse power in carbide manufacture are in progress in North Wales we cannot at present discredit. Moreover, to show that our comment on Professor Lewes's list was justified, we may add that we are informed that Messrs. Tinker and Holliday, Limited, of Huddersfield, have manufactured carbide at their works at Hazlehead, Sheffield, for nearly two years.



## METHODS OF ADVANCING THE WELFARE OF THE WORKING CLASSES.

### [FIRST ARTICLE.]

In the "JOURNAL" for the 14th ult. we noticed at some length Dr. N. P. Gilman's work on Employers' Welfare Institutions,\* but only dealt then with the author's own views on the moral duties of employers to their workpeople—which formed merely the preface to the main part of his work—and with the subject on its general and abstract side. In doing so, as we said, we were unable to touch upon what, without any disrespect whatever to the opinions which Dr. Gilman expresses, we may call the most valuable section of his book—namely, that in which he gives us an account of what some of the principal employers in different countries have done, and are doing, towards the fulfilment of their duties in regard to the social, moral, and pecuniary welfare of their servants. This record has obviously required for its compilation much time, inquiry, and industry. The labour involved has, however, produced a very full and valuable description of all the various institutions and schemes which have been founded and put in operation by one or another of the most enlightened among the employers in different countries; and Dr. Gilman doubtless feels that his time and trouble have been well spent. He has certainly laid under an obligation to him all those who believe in the need and value of some union between master and man beyond the mere "cash nexus," to use the term with which Carlyle made us so familiar. We now, in accordance with the intention expressed in our first notice of Dr. Gilman's book, propose to indicate some of the directions in which efforts have been made by employers to establish some higher relationship with their employees than that of mere buyers and sellers of labour.

Dr. Gilman first describes the welfare institutions existing in Germany, which institutions and arrangements are generically known as Wohlfahrtseinrichtungen, which may be freely rendered as "Examples of personal care for their workers by employers." The traditions, constitution, and characteristics of the population there permit of the exercise of a considerable amount of almost military discipline, and also of what in this country would, we fear, be considered "grandmotherly care" on the part of the German employers. But many of the arrangements made by them are in every way admirable and possible of adoption, where not already adopted, in this country. The majority of these arrangements for the comfort and well-being of employees will be comprised in an account of those in operation at the works of the famous Krupp firm, which Dr. Gilman very fully describes.

The gigantic concern of Fried. Krupp (employing over 40,000 hands) is, of course, of such magnitude that some of its institutions and benefit schemes would be scarcely practicable, if possible, for a smaller firm to adopt; but most are capable of being copied on a smaller scale. First, and of most certain benefit, are the arrangements made for housing the employees. Workmen desirous of purchasing their own houses can borrow the necessary amount, at 3 per cent., and repay by instalments within 25 years. But, while many avail themselves of these facilities, a far larger number live in the houses built and let out by the firm. The colony of Kronenberg (the principal of several such "colonies" laid out by the Krupps) contains 226 neat three-storey houses of stone and brick, with a church, schools, post-office, stores, library, restaurants, large hall, park, &c.; the streets are shaded with trees; and the houses have garden patches. Water and gas are supplied to each house. Altogether the firm have laid out over half-a-million of money on these colonies, making thereon an income of a little over 2 per cent. The houses are so popular that "a seniority of ten years' service is usually required of a tenant." There is also a lodging house for 1200 single men, provided with a restaurant and reading-room. "The management is of military strictness."

The Krupp firm also support and administer 51 stores for the supply of good quality food, clothing, &c., to the employees, among whom the profits are divided annually. The restaurants—of which there are seven—have gardens; while some have, in addition, bowling alleys. Baths are provided at most of the works. Sick and burial clubs are well supported; the aid given by these funds being at more generous rates than those usually in vogue. At Essen, a hospital containing 150 beds, which served originally as a barracks for the wounded in the Franco-Prussian war, is maintained for the use of the employees, their wives, and children; while in connection with their other works the firm contribute to the support of the neighbouring hospitals. Pension funds exist for both the men and the officials; and provision is made for the widows and children of any of the latter who may be accidentally killed. Life insurance is strongly encouraged; the firm contributing one-third of the premiums, and paying all the expenses of the Association through which the insurances are effected.

A special fund exists—established by Herr Krupp in memory of his father, and endowed with a million marks—for meeting special needs in individual cases, such as that of a long and severe illness in which the sick fund support proves insufficient. Out of the same fund medical attendance and medicines are

provided for the pensioners. The firm have always freely supported and encouraged the cause of education, building and endowing schools in connection with several of their works, and substantially contributing to the expenses of others. All the apprentices are required to attend secondary schools; and a special fund is applied to obtaining higher technical education for the sons of overseers and workmen who have distinguished themselves by good conduct and capacity. There is an industrial school provided for women and girls, and also one for the teaching of housekeeping. Special facilities are granted and every encouragement is given to all employees desirous of saving money; the firm themselves receiving deposits from the men at 5 per cent. interest. The mention of the provision of dining-halls for the workers, where food is to be had at cost price, and of a well-equipped club for the officials, brings us to the end of a rough outline of what the firm of Krupp have done, and are doing, for the welfare of the nearly 100,000 souls directly connected therewith. It is a record of which any employer might well be proud.

There are few (perhaps there is not one) among the multifarious plans adopted by this great—and, be it added, most flourishing—German firm that have not suggested themselves to and been put into practice some by one, some by others of the employers in this country. But the recital of them all must serve as a stimulus to the nervous and half-hearted to go further in the direction of concerning themselves with the personal welfare of their men. For the Krupps have shown plainly that the maximum amount of consideration for the employee is compatible with the prosperity of the employer. It is, perhaps, necessary to add that if benefit schemes be instituted primarily with the idea of the firm deriving profit from their existence, and not from a real sense of duty and a genuine appreciation of the great possibilities for their men's good or evil that offer themselves to all employers, those schemes are foredoomed to failure, so far, at least, as the selfish object of their institution is concerned. For motives, like truth, will out; and no one has a keener appreciation thereof than the British working man. Moreover, as a German employer has said: "What is given to the workpeople should not be given with condescension. The manner in which it is given is of consequence; human sympathy should plainly appear." It is, therefore, to the employer who would, as he knew how, do all he in reason, and with proper regard to the interests of his business, could do, that this account of what one firm have done, without prejudice to their prosperity, will be of real use.

Before passing on to note points of interest in connection with the benefit schemes adopted by other firms, we may perhaps make one or two remarks on those instituted by the house of Krupp. The policy of affording extensive facilities to the hands to acquire or to rent decent dwelling-houses, cannot but strongly recommend itself to those whose business is on any considerable scale; especially where—and in the case of gas undertakings it is a necessary sequence—that business is situated in a large town or city. The housing question is becoming more and more a pressing one; and, as is the case with many large and difficult social problems—such as that of provision for old age—very much can be, and is being, done towards its solution by private initiative, while the faddists air their fads, and legislative lethargy endures. It is, moreover, a distinct advantage to a gas company to have a fair number of their employees living within reasonable distance of the works, near together, and, consequently, easily summoned in all cases of emergency. The encouragement and facilitation (by arranging for the payment of premiums monthly instead of annually, or in various other ways) of life insurance is another very commendable method of assisting employees—possessing, too, the advantage of increasing the spirit of independence among the men. When we speak of the spirit of independence, we mean of that true independence which consists in a man doing, and wishing to do, everything he can to support himself and his family, and to provide for them should accident or worse befall him; not the spurious independence for which the agitator loudly clamours, but by which is meant only too often nothing but the negation of any sense of duty from man to master.

The provision of a fund for the alleviation of special cases of hardship is a step which, to anyone at all closely acquainted with the various circumstances that arise in the history of a large body of employees, will appear certain of most beneficial results if the fund be properly and carefully administered—a proviso which may, of course, be attached to every "welfare" scheme, but especially to the one in question. A man may have an illness of a character that demands, for its successful combating, food of a special and expensive kind, aided by a change of air; a five-pound note added to the club allowance (often scarcely adequate for the provision of the bare necessities of life) may restore to the man his health, and to the employer a valuable and grateful servant. Or protracted sickness may fall upon the wife and children of a man who may have been unable to save sufficient to meet such an emergency. In such a case, again, pecuniary assistance offered in the right spirit, at the right time, may be as seed falling upon a fruitful soil. The administration of such a fund needs personal care and thought no the part of the donors. It would, however, surely bring its own reward.

Another plan worthy of wide imitation is the provision of good meals at reasonable prices to the employees and staff. Nothing

\* "A Dividend to Labour: A Study of Employers' Welfare Institutions." By Nicholas P. Gilman (Houghton, Mifflin, and Co., Cambridge, Mass.)



is more essential to the development of a youth into a good workman or official than that, while he is growing and his earnings are small, he should have wholesome and sufficient food. The pallid boy whose mid-day meal consists of a cup of tea and a bun or roll and butter, or of a hunk of bread and cheese and beer, will do a poor day's work, and will make a man of little energy and indifferent health. It is, we believe, a sound investment for a firm to provide its youths and apprentices with a square meal in the middle of the day free of charge, or for the bare cost of the victuals. If, in addition, there be put at the disposal of the staff a reading and smoking room where they can find something better to read than the snippy papers, or the wearisome agglomerations of ill-printed photographs of uninteresting people that go by the name of magazines, which appear to form the staple "intellectual" diet of the rising generation, a further benefit will have been conferred upon the employee calculated to bear harvest for the employer. A reference technical library should be found in any such room on a gas-works.

Turning to the welfare schemes of other employers in Germany, we may note, as additional to those mentioned as in force at the works of Herr Krupp, that in several cases, as might be expected in that country, musical instruction and performances are given considerable prominence. For instance, at Herr Max Roesler's earthenware factory the musical union has a large membership, and is an excellent bond of friendly feeling between Herr Roesler and his employees. The various holidays are here musically celebrated; and the chorus combine pleasure with business by forming the fire brigade of the works. All the male hands are also required to be proficient in gymnastics. In the case of other firms, provision is made for sending children into the country during the summer; for enabling wives to buy sewing machines and men to buy bicycles on easy terms; for making small loans for special purposes to employees, at a moderate interest and repayable in weekly instalments; or for providing garden allotments.

There is little that calls for notice in respect of the "patronal institutions" in France, many of which follow on the lines of those already described. It may, however, be mentioned that pension schemes are largely in vogue there; nearly 20 per cent. of the total number of employees being insured against the time of their incapacitation from work by old age.

We will leave to another article the consideration of Dr. Gilman's account of what British employers have done for their workpeople, and the section of his book that deals with profit-sharing arrangements in England and other countries.

## THE BRITISH ASSOCIATION AND MUNICIPALISM.

### FIRST NOTICE.

THE only portion of the transactions of the Sectional Meetings of the British Association at Bradford which possesses particular interest for "JOURNAL" readers was that which occupied one sitting of the Section of Economic Science and Statistics, when a group of papers relating to various aspects of Municipal Government were read and discussed. Mr. Arthur Priestman contributed the most thorough-going plea yet put forward by a man of affairs for the almost limitless extension of municipal trading. One is well accustomed to advocacy of this kind from budding Socialists of the platform and the Press, whose zeal for every kind of shop-keeping, which they call Progress, shuts out every other ideal of municipal activity. It remained for Mr. Priestman to formulate the creed of the municipalizer in a form and place proper for either defending or attacking it. As he remarked in the beginning of his paper, the subject of municipal trading is "ripe for discussion." It is, indeed; and it is high time that public opinion took some shape in this regard. For the present, as in the past, practice in this respect has outstripped theory. Few persons of "light and leading" appear to have made up their minds as to whether the branching out of municipal institutions into commercial enterprises is or is not desirable on general principles. Meanwhile, the process has already gone to great lengths, and every such movement that does not result in patent failure is immediately utilized to support the argument in favour of still further "progress" in the same sense.

It was, therefore, quite in accordance with established rule that Mr. Priestman should base his case for more municipal trading upon the asserted success of municipalized traffic in water, electricity, and gas. Whenever during the past controversies upon the question of the expediency of transferring gas undertakings to local authorities the disadvantages of the proceeding were rehearsed—as they have often been in these columns—nobody thought of laying much stress on the "thin-end-of-the-wedge" objection. Yet this is precisely the criticism that now penetrates to the heart of the modern form of the question. Municipal gas-works, it is argued, do so well that other enterprises under the same auspices are likely to prove equally prosperous and satisfactory. It is worth remembering that it was municipal water supply which led the fashion for municipalizing gas. Now Mr. Priestman jumps at a bound from the supply of water to that of milk, and declares that "every argument used for the public ownership of the water supply applies with equal force to the milk supply." This shows the advocate's position with a clearness that leaves nothing to be desired. Once prove that a certain supply has to be forth-

coming, or service performed, and his conclusion follows that the local authority ought to do whatever is required.

This is obviously the exact opposite of the view that has hitherto prevailed in this country, dating from the far-reaching decision of Parliament, under the influence of Peel, that the balance of advantage was on the side of the private ownership of the national railway system. The value of this decision has been incalculable. There is, of course, much that is imperfect in the British railway system; but nobody who knows the truth of the matter would prefer governmental control, as it is illustrated in other countries. Now the validity of the same general principle is being undermined by insidious municipal sapping. First the water supply, next the tramways, then the gas, then the electricity—and now it is banking, insurance, and public-house management. It is difficult to draw the line. As we have always allowed in the "JOURNAL," the decision in every particular case must be taken on its merits. Mr. Priestman, and those who think with him upon the matter, are concerned to give a cumulative force to the whole body of accomplished facts. They would argue that because one hundred gas-works have been municipalized, that furnishes conclusive proof of the expediency of similarly treating the one-hundred-and-first. This we flatly deny, and say further that it will be an evil day for England when any such hypothetical pretension is allowed to overrule particular merits in any case.

There is no solid ground for the erection of any "principle" of municipalization outside the particular merits of every case. Are you still determined to treat the subject as one of principle? Then what evidence for or against the acceptability of the principle are you going to admit? To begin with, the spectral form of Municipalism paralyzes, at sight, that very power of private enterprise with which it is contrasted by Mr. Priestman and his school. We say it without the slightest fear of contradiction—that the possible prospect of a transfer is enough to damp the commercial spirit of a gas company. It is, and must be, the same with every industrial concern in similar circumstances. The management merely "marks time" while negotiations are pending. It is not worth while to do anything more than is absolutely necessary to carry on the business. Real enterprise is choked off. Not only are improvements obviously desirable postponed indefinitely, but the heart is taken out of the trade. It is unnecessary to more than allude to the blight that the tramway industry of Great Britain has suffered from the bestowal on the local authorities of a reversionary right to this class of property. The shadow of the inevitable expropriation lies across the service for years; and it is no credit to the municipal owners, when they come into possession, that they are usually able to effect notable improvements.

The whole case of municipalizers like Mr. Priestman, rests upon the premiss that defects in local services and supply undertakings are only remediable in one way, and that the way of their admiration. Whether it is the question of the better housing of the poor, or the supply of milk, these partisans shut their eyes to the possibilities of all other means of improvement besides the undertaking of the job by the parish. That is what it amounts to. A wider view of the situation, as it has existed in other circumstances, does not show much to encourage this short-sighted solution. Free capital and brains are always seeking employment; and Mr. Priestman's ideal of municipal development is that they should be warned off from all city employment. People with money should be content to let the local authority take care of and employ it for them; and persons with brains must rest satisfied with the modified prosperity to be found in municipal service. Of course, this is the rankest Collectivism; but that is the natural goal of Mr. Priestman's endeavours, and there is nothing short of it where a halt may be called.

Mr. Priestman's aspirations did not even stop at mere local or parochial Collectivism. The advanced price of gas coal has sorely vexed the Bradford Corporation Gas Committee, as it has other gas manufacturers. It is significant of the bent of mind produced by acceptance of the principle of Municipalism, that Mr. Priestman's first thought of a remedy for this dearness of gas coal is a municipal coal supply. "To resist the imposition of high charges, we shall probably find it a wise and necessary step to use the resources of the Municipality to evade the effects of a monopoly which endangers the very existence of our trade." Why did not he state in plain English what he must have meant by this guarded language, if he meant anything at all? Bradford Corporation Coal Mines, acquired or made on purchased lands; Bradford Corporation Iron-Works, Railways—what else? The private trader, when faced with an advance in the cost of raw materials, or of labour, or of any other item of expenditure, does not talk thus. If he thinks, as Mr. Priestman does, that the dearness is due to a "syndicate" of producers, he does not take this as constituting a good reason for trying to break that syndicate, with the aid of borrowed capital. He merely reduces his demands to the smallest possible figure, and awaits the inevitable collapse of the "ring." In addition, he casts about for other ways of recouping himself. This is the opportunity for the improver, or the inventor, who may have suggested vainly for years the advantages of making this or that alteration in the conduct of the concern. Accordingly, some labour-saving machine gets a trial, or a fuel-economiser long contemplated is at last actually ordered.

Not to put too fine a point upon it, many of those who dis-



believe in the "principle" of municipal trading most profoundly are guided to their opinion by regard for the fact that in its very essence it opposes an artificial rule of efficiency to the natural forces which mould free trades and industries. There is no inducement to deal with hard facts on their merits, where there is a political principle to be followed and defended. The motive to individual initiative is nipped. A municipal corporation cannot improve its plant at almost any cost, as a private manufacturer does. The satisfactory result of the extensive municipalization of gas supply in the United Kingdom is one of the stock commonplaces of the theoretical municipalizer. As already remarked in this article, it is used as a wedge, and with enormous effect, especially upon those who are not profoundly conversant with the subject. Well, there is another view of the matter, which we venture to put here for what it may be worth. It should be unnecessary to premise that we have no individual examples in mind, and admit the existence of exceptions. But stated broadly, there is, on the one hand, the fact, gratefully dwelt upon by Mr. Priestman, that the municipal ownership of gas undertakings has already been carried farther in the United Kingdom than in any other country. He notices that only 11 out of 355 scheduled gas undertakings in the United States are public property. On the other hand, there is the fact, mournfully acknowledged by experts, that the gas industry of the United Kingdom is more barren than that of foreign lands in important technical discoveries and inventions. Is there any connection between these concurrent conditions of the British gas industry? Is the dead hand of the parish beadle to be traced in this department of municipal "enterprise?"

Again, electric lighting and electricity supply is claimed as a municipal preserve in the United Kingdom. On the other hand, the superiority of the United States in regard to commercial applications of electricity is one of those contemporary truisms with which, as Mr. Priestman remarks, few newspaper readers would find cause to quarrel. It is, therefore, at least a curious circumstance that, of a total of 952 electric light plants scheduled as operating in the United States, only 320 are municipal property. Mr. Priestman does not mention street railways, one of the most characteristic of American specialties. We are always having it dinned into our ears how great are the facilities for rapid transit throughout American towns; and the municipalities have had nothing to do with it. Upon Mr. Priestman's own rule that the good of the greatest number must be the only consideration in fixing how public services should be rendered, municipal action is hopelessly behindhand in the two hemispheres.

Mr. Priestman does not shrink from the logical conclusion that there is no objection whatever to the rates being drawn upon for competition with private capital. Fortunately for the community at large, Parliament is of an altogether different opinion. How much private capital would be laid out in public service works if the local authorities were at liberty to enter the field at any moment, and compete for the business? What has recent experience to say respecting the conditions which had to be laid down before a single electric lighting company could be started in this country? Mr. Priestman passed very lightly over the difficult detail of the direct employment of labour by a municipal corporation, at "model" rates of wages and under "model" conditions as to working hours and general advantages. He thought it high time for the condition of the "masses" to be improved, through the activity of an enlightened municipal policy. This is as much as to admit that, in his scheme, the mass of the working population should be in municipal employ. He also hinted that he did not see why members of municipal corporations should not be paid for their valuable services in looking after the municipal departments. So the local authorities of the future are to live by and upon themselves. The state of that legendary community who lived by taking in one another's washing seems simple in comparison with Mr. Priestman's ideal for the Bradford of the future. Like most other prophets of his cult, moreover, Mr. Priestman tries to sit at once upon the two stools of the system—the making of a profit from, and the improvement of, the municipalized services. Whereas the bulk of his paper appears to insist on the reasonableness of corporation trading departments, such as gas-works, being carried on at a profit for the relief of the rates—even if it is necessary to start a coal mine to do it—towards the end he quotes approvingly from the Lord Provost of Glasgow, who, when asked before a Royal Commission (? Parliamentary Committee) why a company could not develop the tramway system as the Corporation had done, replied that "the Corporation and the Company had different aims in view. The Company made profit their first consideration; whereas the Corporation were principally concerned with the comfort and convenience of the citizens." Now, which is the right rule to follow? Upon which stool will Mr. Priestman elect to sit? The two positions are absolutely irreconcilable; for a municipal committee can always return just what rate of profit they choose, by a stroke of the pen. This is the way to cheap municipal glory; whereas merely carrying on an undertaking at cost price, for the comfort and convenience of the citizens, is such a thankless job that few English local authorities pretend to do it.

So much, for the present, for Mr. Priestman. His paper has the merit of candour, and distinctly tends to clear up a somewhat hazy question. We shall hope to devote a second article to the remainder of the proceedings of the Section.

#### LABOUR SAVING IN AMERICA.

THE letters of the special correspondent of "The Times," reporting the result of his investigations into the conditions under which the engineering trades work in the United States—with special regard to the bearing of these conditions upon the question of whether American machinery and goods are at all likely to enter into active competition with English in the markets now supplied with our manufactures—have recently received lengthy notice in these columns; the subject being one of much importance to the users of machinery and to the consumers of coal. Attention was especially drawn to the correspondent's report as to the differences existing between the conditions to be observed in the two countries as regards labour-saving appliances, and the attitude thereto of the working classes. The report was to the effect that employers in this country are very heavily handicapped in the race for supremacy by the obstructive policy adopted by the Trade Unions in respect to the displacement of hand by machine labour.

Confirmatory evidence as to the infinitely more sensible, satisfactory, and profitable state of affairs existing in the United States is afforded by a report recently received at the Board of Trade from the British Commercial Agent in Chicago. Our representative declares that every improvement and every invention by which labour may be saved or time economized, so that the resulting cost of manufacture may be reduced, is at once taken advantage of by the American manufacturer. In all the works he has visited, says the agent, the one great object seemed to be to save unnecessary labour, and get through the work as expeditiously as possible. It is pointed out, as "The Times" correspondent noted, that labour-saving machinery is in the States really labour saving. The ridiculous requirements of the English Trade Union—that only the skilled workmen whose place a machine is designed to take shall be employed to work the machine (be the work never so simple) and that, further, as many workmen as are displaced shall be kept on to run the machinery—are unknown across the Atlantic, or, if known, are only treated as worthy of the contempt of practical men. "Consequently, though wages are high"—mark that, Oh, short-sighted trade unionist!—"the actual cost per piece is very low, on account of one man being able, thanks to these labour-saving machines, to turn out so much work." In one works he visited, the agent was assured that ordinary labourers were being employed in place of skilled mechanics to take charge of some of the lathes and drilling-machines. This was found to answer excellently; because, owing to the perfection in the construction of the machines, the work was practically automatic. The machines were made specially strong, so that an unskilled man might work them without fear of breakages.

Again, of one of the largest establishments for the manufacture of agricultural implements and machinery, the same story is told. Labour-saving machines and appliances are to be seen everywhere. In the forge, for instance, not a hand hammer is found—nothing but tilt hammers worked from pulleys being used, and a few steam hammers for the heavier work. The iron is heated in gas and oil furnaces; electricity is used for lighting, and for actuating some of the machinery; while compressed air is also utilized for the latter purpose.

It is not surprising, we must confess, to read that machine tools of British manufacture do not seem to be in favour in the States; for the American engineer who has shown so much ingenuity and enterprise in the devising and bringing into service of so many mechanical implements, is not likely to be behindhand in the actual manufacture of them. "The designs of some of the American tools are certainly very ingenious; and the work they do is exceedingly accurate. They also appear to run at a greater speed than the English ones."

This, it may be said, is none of it new; it is a twice-told tale. That is true. But equally true is it that it is only the repeated and oft-pondered lesson that is properly and lastingly learned; and the lessons that English employers and English workmen have to learn from the example of their American brethren are of much importance to themselves and to their country. If we thought that the necessity—more urgent than formerly in these days of competition—of gas managers paying the closest attention to all possible means of substituting cheap machine for dear hand labour throughout their works, was universally grasped; that the ultimate loss to the working classes accruing from opposition to such substitution, and from a refusal to work machinery to its full value, was thoroughly realized by them; and that the public appreciated the hindrance to the national advancement that has been caused by the policy of the Trade Unions in this respect—then we should forbear from urging the subject upon the notice of our readers. Facts and not fancies, however, being what the "JOURNAL" has to consider, we once more call attention to a state of affairs by no means creditable to a people generally accounted practical.

#### CARE OF HIGH-PRESSURE INCANDESCENT GAS-LIGHTS; A NEW INSTALLATION.

TRIALS of intensified gas lighting continue to extend; and this is a happy omen. When local authorities are induced to make an experiment of a new system, it shows that they have arrived at



the point at which they see there is something in it; and having gained ground to this extent, it remains with those who are exploiting the system, aided by the gas suppliers, to see that further success follows, as it assuredly will do if only a modicum of the attention is bestowed upon the lights that electric arc lamps demand. Indeed, in the high-pressure gas systems lies our greatest strength against electric arc lamps. We mention "gas suppliers" in this connection because they are jointly interested with the owners of the patents in making the systems go. Of course, it is quite impossible for the introducers of these inventions to be here, there, and everywhere to give constant attention to isolated trial installations; and therefore it is to the advantage of the other party concerned to see that an installation within their district is kept at high-water mark.

It has not been suggested to us that we should make these observations; we do so entirely on our own initiative, and for this reason: There is an installation of high-pressure gas-lamps in a public place not one hundred miles from London of which we were pleased to write—and justly so at the time—in a most laudatory manner. Imagine, then, our disappointment, when only on the 21st ult. (the date is intentionally given) we visited the installation again, and found it in a grievously neglected condition. Wrecked mantles were plentiful; and, in some instances, out of clusters of three, one and two mantles were placed *hors de combat*. The lanterns, too, could not possibly be described as clean. Compared with an adjacent electrical installation, the brilliant gas-lamps of a few months ago, which then put their competitors in the shade, presented a woeful appearance. At whose door the fault for this should be placed, we do not know; but surely some interested person should make it his duty to occasionally inspect an installation such as this, in order that he may use his influence to have it maintained at its full light-producing capacity, and in order that the public may have before them a good illustration of what can be done in high-power gas lighting. In a case of this kind, if a gas company has the right, or can obtain permission, to keep a watchful eye on these new installations in public places, in the long run the little expenditure of trouble will be well repaid. Even the strongest children require nursing in infancy. Let it, however, be clearly understood that we do not impute neglect to either the contractors who put in the installation we have been referring to, or to the gas company in whose district it is situated—neither in this particular instance may be responsible. But we wish the remarks made here to be taken more in the light of a suggestion—that is to say, that in such cases the gas company should, if they do not already possess it (and we think the condition of the particular installation in question proves that in this instance they do not), make an effort to secure a supervisory position in regard to it.

Furthermore, what has so far been written has no connection whatever with what follows; the two subjects are merely brought under one heading for convenience. In last week's "JOURNAL," there appeared a paragraph stating that the Intensified Gas-Light Company had completed, for the Strand Board of Works, an installation of their high-pressure system of incandescent lighting in the large refuge lamp immediately opposite the Law Courts. This particular installation, although only a small one, has attracted our attention—firstly, because it is a very good example of how readily, in such situations as this, large lamp columns and lanterns can be converted so that the lighting power afforded is increased more than sixfold; and, secondly, because the lamp column itself is rather an ornamental specimen of work of its kind, and it was not until it was capped in the present brilliant style that its artistic merits were really brought prominently to notice. But at the same time, it is not out of place here to suggest to the Strand Board of Works that this column, like most others in the streets of London, would be very greatly improved by more frequent cleansing. We have recently seen street-lamp columns on the Continent that altogether put our London street-lamps out of the running in respect of cleanliness. The illustration herewith is a reproduction of a photograph of the lamp column to which the Intensified Gas-Light Company have applied their system. It will be observed that the column (which is of bronze) supports five lanterns. The four lower ones are fitted with two burners apiece, each consuming 10 cubic feet of gas per hour, and giving a light of 300-candle power per burner. The top lantern is furnished with three burners, affording together a light practically equal to 1000 candles. Therefore, this lamp now emits a light in this busy locality of approximately 3300-candle power. Formerly the lanterns were fitted with, in all, seventeen flat-flame burners, each consuming 10 cubic feet per hour; and having a total illuminating power of perhaps rather more than 500 candles. The new burners are fitted with an anti-vibrating arrangement, bye-pass, and a ring and chain device for lighting and extinguishing. As we have said, the new burners have been fixed in existing lanterns; but it may be suggested to the Strand Board of Works that, while they have secured a very fine lighting effect, the many-ribbed lanterns of the kind in use are not the best for realizing the highest results.

All that the Intensified Gas-Light Company had to do to convert the lamp to their system was to break the service in the square base of the column, tap off the gas supply, and connect up to the compressor; making the lamp service good again on to the outlet of the compressor, which is fitted in the lavatory beneath. Above the compressor are two gauges which at the



time of a visit last week showed an inlet pressure of 2 inches, and an outlet pressure of 8 inches. The compressor itself (which is about 4 feet high and only 14 inches in diameter) is never touched. When the lights are extinguished, the holder which contains the compressed gas, by means of a lever and plug cock, automatically, on attaining a predetermined height, by the aid of a quadrant cuts the water off. The compressor is capable of serving fifteen burners. But at present it has only to supply twelve—there being besides the eleven in the large lamp, one light fixed in the lavatory, which is sufficient to brilliantly illuminate the whole place. There is one other suggestion that might be made; and it is that, if the Board were to adopt (say) frosted glass panels in the upper part of the doors to the closets, they could, with this one intensified gas-light, do away with the expense of maintaining some eighteen 16-candle power incandescent electric lamps which are now necessary for the illumination of the closets. The supply of gas to the installation is registered by a meter, so that the Board can judge for themselves the actual consumption and expense. There is no doubt that this is an experiment on the part of the Board; and from such trials as this, we look for a large extension of high-power gas lighting in the Metropolis and elsewhere.

#### PERSONAL.

Mr. JAMES BAXTER, the Manager of the Armadale, Linlithgowshire, Gas-Works, has, as will be seen from our Scotch Notes, been appointed Manager of the Forfar Corporation Gas-Works, in succession to Mr. Forbes Waddell.

The Directors of the Capetown District Water-Works Company, Limited, have presented Mr. THOMAS BENNETT, their Engineer, with a life-sized portrait of himself, painted in oils, as a mark of their esteem and regard on the transfer of the works to the municipal authorities.

Mr. GEORGE KEYTE, the Superintendent of the Shields Station of the South Shields Gas Company, was on Wednesday last the recipient of a very valuable clock and pair of bronze ornaments, presented by his fellow officials and the men of the South Shields and Yarrow works, upon the occasion of his marriage.

The Directors of the Great Marlow Gas Company, Limited, have appointed as Manager of their Works Mr. GEORGE W. WOOD, son of the Manager of the Maidenhead Gas-Works, in succession to the late Manager, Mr. J. Howse, who died recently. There were some 120 applicants for the post, in response to the advertisement which appeared in the "JOURNAL" recently.



## OBITUARY.

We regret to announce the death of Mr. R. W. FORD, Clerk of the Peace of Portsmouth, which took place last Saturday week, at the ripe age of 78 years. Mr. Ford's career has been intimately associated with the progress of Portsmouth; but undoubtedly the great work of his life was his successful effort to secure for his native town the splendid supply of pure water that the inhabitants now enjoy. Had his advice been taken, the Town Council of 1854 or 1855 would have entered into the control of the water supply, which could then have been purchased for £42,000; whereas the price now would, it is calculated, be upwards of a million and a quarter sterling. The Council, however, refused to act on the suggestion; and the present Water Company was formed—Mr. Ford being the prime mover—with a capital of £80,000. He held the post of Secretary to the Company for 40 years; and on retirement was awarded his full salary (£500 per annum) by way of pension.

## COMMUNICATED ARTICLE.

## THE FUTURE OF LIGHT AND POWER DISTRIBUTION.

At the present time, when the Nineteenth Century has almost run out, and backward glances at the bye-gone eighteens are the fashion, it is interesting to each one to mark the changes that have taken place in the industries or professions with which he is either connected or interested. This searching of chronicles and records does not always prove pleasant reading; and it is not in all cases that bright prospects may be looked forward to in the future. According to whether the records of past years in a particular branch of business show a steady or a rapid improvement, a steady or a rapid decline, or a puzzling maze of alternating improvement and decline, so do the prospects of that business for the Twentieth Century appear as a bright flame, a dying glimmer, or a fitful flare. The electrical industry is one of the first class; and it probably will rank as the one which has had the most rapid growth and which has the brightest future.

The growth has not been limited to one groove, and is not of the soap-bubble type. It is universal and in practically all businesses and industries has it already been applied with some success. So general, indeed, has been its application, that it will be necessary for every man of the Twentieth Century—no matter what his trade—to know what electricity is and what it can do. It will be essential that, for any man to attain success, he must study electricity, and so learn how to make the best use of his time and his money.

To give a list of the many and varied uses to which electrical power has been put would be tedious reading, even if it were possible to obtain anything approaching a complete list. From the small fan for summer use in the drawing-room to the production of coal for winter use in the same room; for traction and other purposes above the ground, on the ground, and beneath the ground; for the production and purification of chemical materials, the breaking up, welding, and general manufacture and production of metal in all forms and shapes; in all classes of workshops, and in all pleasure resorts, theatres, and entertainments of every description—in fact, the difficulty is not to say where electrical power has been applied, but where it has not been applied.

It is of great interest to study the developments of trade by glancing over certain typical accomplishments, comparing the latest with those of previous years, and endeavouring to, as far as possible, see what is likely to be the outcome in that particular line in the future. In reviewing the greatest engineering work of power generating plants, one cannot fail to notice that, whereas the steam-engine of to-day—efficient and reliable as it is—is practically as it was ten years ago, other power producers have stepped to the front. The steam-engine used to stand out as the perfection of a power-producing machine; its long life, reliability, general adaptability, and comparative economy giving it this unique position. It has, however, remained as it was; while other rivals have come forward and now bid fair to eclipse the once so prominent steam-engine. No sooner had electricity come to be looked upon as a money-saver and form of power for every industrial purpose, and its safe and convenient transmissions over wide areas had been proved to be practical, than Nature (in the form of waterfalls) was set to provide the initial power.

This was the first trouble to the steam-engine. Many works, large and small, abandoned coal storage, boilers, and steam-engines, and substituted in their places compact electric motors, fed sometimes from works 40 miles distant. It was not only that an electric motor takes up less floor-space and requires so much less attention than steam plant, that caused it to come so readily into extensive use. The fine regulation of speed, the absence of stand-by losses on plant, the abolition of belts and counter-shafting in workshops and factories, and the cheap rates at which the electrical energy can be bought, are advantages occurring in every case. Of course, it can be well understood

that there are certain industries for which electric power is particularly suitable—in places where continuous running and cleanliness are essential, in coal mines and powder factories, among other dangerous surroundings, and so on.

The use of water-falls and electricity did not, however, make very much difference to the steam-engine. Water-falls of any size are not too plentiful; and where water-falls are not, there steam-engines have been erected to drive the electric generators. No doubt this state of affairs would have gone along quite sweetly for many years to come, to the satisfaction of both engine-builders and electrical men, and it may even yet. That which is likely to change it is as yet only just born. It is the advent of a perfectly new type of gas-engine which is destined to work these changes.

The gas-engine which, it is claimed, is to work such changes, has been on the market for about two years. The principle of its operation and the details of its construction have been dealt with in so many technical and other journals recently, that it is almost superfluous to dwell upon its technical points here, since it is in its connection with the development of power schemes in the future that this article is dealing. It is sufficient to say that it is quite different in its main principles and in its working behaviour to any other type of gas-engine which has hitherto been produced. It can be made in the largest as well as in the smallest sizes. Several of 650-horse power have been in successful operation since its introduction. With regard to even rate of rotation, to accurate governing, and ability for long-continued stretches of running, it comes up to the best steam-engine practice. The floor-space required, as well as the fuel consumption per horse-power-hour are less in the case of the Westinghouse gas-engine than in the case so far of the very best steam practice.

These facts open up great possibilities of change in the power distribution world. When coal had to be burned for steam-raising for power purposes, it was necessary until within quite recent years to carry the coal about to the various boiler-houses of the works of the country, in order to distribute its energy. This method is now dying out, and we have large works wherein huge quantities of coal are burnt for steam-raising purposes, the steam driving engines which, in their turn, operate large electrical generators, from which current is transmitted over extensive areas to the various manufactories requiring power. This system has not yet had time to settle down to a standard state—its newness has not commenced to wear off; and day by day it still appeals to people in various parts of the civilized world as a piece of wonderful news. Will it ever come to be the standard method of power distribution, as steam-locomotion on metal-rail came to be the standard means of traction? It is doubtful if it ever will.

The coal as it is taken from the mine may be put through a gas-producing plant at once, on the spot; no carriage or cartage whatever being necessary. This gas may be used by engines driving electric generators, also fixed at the pitmouth, for distribution by high-pressure electric current; or the gas itself may be transmitted, at reasonably high pressure, through pipes over large areas, and utilized in small gas-engines at each works. In all probability a combination of the two methods would be best. Current generated at the pitmouth would supply the immediate neighbourhood—say, a circle of 20 miles radius; while at various centres beyond this, sub-stations would be erected. Each sub-station would be equipped with gas-engine and electrical plant, as at the coal-pit; the gas being fed to each sub-station through a continuous length of pipe, from which the leakage would be very slight, and the risks of breakdown or interruption of supply would be practically zero.

The advantages to be gained from such a system can now be easily seen. The coal is cheaper, and yields more available energy per pound than when burnt or used in any other way for power production; the risks of interruption of supply are very slight; and the bye-products obtained from the gas-works are valuable, and still further reduce the price of a horse-power-hour.

The question so often asked in recent years, "How can gas companies meet the competition of electric companies?" may now be answered with certainty. When, taking into account the illuminating properties of gas and electricity, and the efficiency of dynamos and these gas-engines, it is found that gas companies could supply the same amount of illumination as before with about 40 per cent. of the quantity of gas originally required. To do this would only require the installation of suitable gas-driven electrical plant and electrical distribution.

The effects of such an arrangement will be manifold, apart from the cheapness of the supply, the lighting of dwellings and all buildings will be better, sanitary conditions especially will be improved by the electric light, the absence of numerous chimneys, stacks, the general cleanliness and lack of overcrowding of men and plant in workshops and factories, refuse will be burnt for gas producing, and (in short) our towns will be clean and bright as the open country.

There are many other pleasing possibilities which will suggest themselves to the imagination when looking over the work which has been accomplished during the last few years. This is one in connection with electricity and gas. There are several others to be gathered from observation of these fields of industry and in almost all branches of work, so great and rapid have been the strides of general progress in this the latter part of the Nineteenth Century.



## THE INTERNATIONAL GAS CONGRESS.

### OPENING ADDRESS OF THE PRESIDENT, M. THEODORE VAUTIER.

Gentlemen,—In the name of the Organizing Committee of the Congress, I declare the first International Congress of the gas industry to be opened. The Organizing Committee thought it would be convenient to nominate as the "Bureau du Congrès" the Committee which it had chosen to give effect to the decisions taken preparatory to the Congress, and which, owing to this, had been for a year past in direct communication with the gas societies, members and representatives of which are here assembled. It has named as Honorary Presidents those who are at present acting as Presidents of the gas societies represented at the Congress; and as Honorary Members, those who were Presidents during the year 1899 to 1900, with whom the Organizing Committee were necessarily in close touch during the preparations for the Congress. In carrying out these nominations, the Committee had in view the allotting to all technical societies which have been kind enough to lend their valuable support, representatives in the "Bureau du Congrès," which could not be better made up than by those whom the societies had placed at their head. Secretaries of different nationalities have been arranged, in accordance with the wishes of the Presidents of the various societies. The "Bureau" thus made up will exert itself to the best of its ability to manage the affairs of the Congress; and it trusts to meet with your approval.

Gentlemen, I have first of all to state that the calling together of an International Congress of the gas industry, the initiative of which has been taken by the Société Technique of France, has received a most favourable welcome; the cordial eagerness with which the Technical Societies of different countries have replied to our appeal is an obvious proof of it. We have received more than 1100 promises of support, of which about 500 came from abroad. The presence among us of Presidents, of delegates, and numerous members of these societies (among whom are well-known personalities of the gas world), gives an exceptional character to this Congress, and promises its success; the number and the importance of the papers sent ensure the interest of it. It may be permitted me, then, to give expression of our sincere thanks to all those who have in different ways been good enough to support us with their valuable co-operation. We have also to thank the Administration of the Universal Exhibition for the useful help given us, and especially Professor Gariel, the Chief Engineer of the Ponts et Chaussées, and the principal delegate of official congresses, whose experience has been so valued by us.

If the representatives of the gas industry are assembled only now for the first time in an International Congress, it is not, however, from to-day that the tendencies date which have culminated in the calling together of a gathering of this nature. This desire has been shown at different times by reciprocal visits, when some among us have sought to render an account of the state of our industry beyond the frontiers of their own country, in order to keep themselves up-to-date with improvements of a practical character. It is, in fact, a widely-spread error to imagine that gas engineers have not worked much for the bettering of their industry. This error arises, no doubt, from a very superficial examination of our works, and from the fact that the fundamental operations which free the gas, by the very reason of their primeval simplicity, have not changed in any sensible degree.

Notwithstanding, what efforts and what ingenuity have not been expended for improving apparatus for the manufacture and utilization of gas! Our technical papers, and the minutes of our societies, give proof of it to those who would take the trouble to glance through them. Further, our engineers have always sought to benefit our industry by discoveries which have been made in others connected with it. In this regard, are not the application of regenerative heating for gas-furnaces, and the recuperation of intensive burners, remarkable examples, to cite no others? And has not our industry, which some pretend to be retrograding, in its turn opened up new ways by creating gas-engines, which have already rendered great services, and for which one sees dawning to-day an immense application in metallurgy, by the direct use of the explosive force of poor blast-furnace gas?

Another prejudice, of a different character, is still spread among the public. It is that the gas business has given extraordinarily favourable financial results, owing to excessive prices, which have weighed upon consumers. It is forgotten that many of these concerns have had initial difficulties; that even now, for some of them, the shares are worth less than their nominal value; and if, for others, the value is higher, it is not difficult to find industrial businesses, without monopoly, which have stock of which the worth is five or six times the nominal value, and which, in consequence, are otherwise favoured than ours.

Since the Exhibition of 1889, many attempts have been made to better the different branches of our industry. It would be out of place here to make even an approximate list of them; but it would perhaps not be without use to see in what direction they have been made. In the manufacture of gas, one of the questions which has most occupied engineers is the development of

mechanical means of handling coal and coke. You know the principal solutions which have been devised to this end—charging and drawing machines, flap conveyors, horizontal chains, bucket elevators, waggon hoists, &c. The latest system for carrying coal is horizontal conveying by belts, combined with elevators. It includes a railway, flanked on one side by the coal-stores with inclined sides, and on the other by the retort-house. You will be able to see in the Champ-de-Mars an interesting example of arrangements of this class, due to the collaboration of MM. Rothenbach, of Berne, Weiss, of Zurich, and Giroud, of Olten. They are represented by a model of imposing proportions, exhibited by the Stettiner Chamotte Fabrik. Among other of the most recent applications which refer to these different processes, are the works of Geneva and of Zurich, designed by very competent engineers. Of the construction of these M. Weiss had charge; and concerning them he has published a very interesting pamphlet. But it is not given to many persons to have to build an altogether new works; and mechanical processes have had to be applied to the exigencies of the oldest works.

We shall see a very instructive example in coke-handling plant on the visit to the Clichy works to which the Paris Gas Company have very kindly invited the members of the Congress. The installations at Clichy form the subject of a very minute report which M. Louvel has been good enough to prepare, and which he will give us during this meeting. It would be interesting to compare the first cost of these mechanical systems with the economies arising from their use. It might thus be known what the productive power of a works should be to profit by their adoption.

In the construction of retort-arches, producers have thoroughly established their place, above all in works which have good coke sales. Their arrangement is less complicated now than it was at the beginning. It was first attempted to push to the utmost recuperation, which was impossible without some complication. Now the use of simpler and stronger systems appears to compensate for giving up some of the heat.

The inclined retort, invented by M. Coze, with the modifications which practice has suggested in its use, continues a brilliant career. It is, perhaps, of all improvements which have arisen for some time past in the manufacturing plant, that which appears to have the most definitely won its place in our industry. We number in this Congress engineers who have built important installations of inclined retorts; and we hope that they will be good enough to tell us the results they have obtained.

Before leaving the retort-house, it seems to me that we have to regret not having an instrument for measuring in a practical way, and also registering, the temperature of the retorts. The platinum pyrometer, of M. Le Châtelier, is a very interesting apparatus, which has rendered real service, but the use of which necessitates superior knowledge to that which the retort-house staff possesses. The finding of a more simple apparatus would receive attention. We shall await with interest the paper which Mr. Alten S. Miller is to give us on this question.\* Connected with this subject, is the important work which M. Eucène has prepared for the Congress, in the name of the Paris Gas Company, on the thermic reactions in the distillation of coal, and the determination of high temperatures.

I will pass over other questions connected with the manufacture, turning to mention the more complete washing of the gas, its slower speed in the purifiers, and chiefly the progress made in the way of absorbing cyanides and naphthalene, which will be treated by the author himself, Dr. Bueb, of Dessau, whose new researches have recently attracted our attention.† Dr. A. Smits, of Amsterdam, will also deal with this question.‡ Finally, I ought to remember the work of one of the Past-Presidents of the Société Technique of France, M. Mallet, who told us last year of the use of crude ammonia as manure, and as an effective agent for destroying certain insects harmful to agriculture.

It is above all in the apparatus used for lighting that the most marked progress has been made in our industry since the Universal Exhibition of 1889. At that time appeared, in all their brilliancy, intensive burners, which had already been invented some years. These burners constituted sources of light at once more powerful and more economical than former ones; for they gave intensities of 30 to 50 carcel, with gas consumptions of 40 to 30 litres per carcel-hour, while the ordinary butterfly burners required 125 litres, and those "à couronne" 90 litres. This important advancement was the result of the application (which we owe to Herr Frederick Siemens) of the principle of recuperation to gas-burners. The heating by the burnt gases of the air required for combustion, produced an increase of temperature corresponding to a considerable enhancement of luminous intensity. This, in fact, increases much quicker than the temperature, as has been shown by the experiments of Dulong and Petit, Stefan, Violle, and several other physicists. Recuperation was applied to the construction of burners of various forms, of which one of the most appreciated was that of Wenham, giving a reversed flame or luminant sheet, and other types which improved the public lighting—such as the Schulke, "Industrial" burners, &c. The use of these lamps permits of increasing five-fold (5·45 times) the amount of light thrown on to the ground by the butterfly burners (0·25 carcel per square metre), as resulted from tests made in Paris, and of

\* See ante, p. 643.

† See pp. 699, 700.

‡ See p. 701.



giving a light of the same character as that from the electric arc lamps.

These results, already sufficiently interesting, were soon, however, to be greatly surpassed. A radical change was about to take place in the way of utilizing gas combustion. Returning to an idea which was the germ of the Drummond light, and which was also seen in the burners of Frankenstein, Caron, Tessié du Motay, Clamond, and others, and abandoning illuminating flames for blue flames, Dr. Carl Auer von Welsbach adapted the combustion of gas by the bunsen burner to the increase of temperature of the mantle of which he is the famous inventor (1885). Some years later, Dr. Auer brought his mantle to a pitch of perfection which gave it a great impetus. The beautiful and brilliant light which it affords, combined with the economy of its use, ensures for it a success without precedent in our industry. The Auer burner gives to towns or to individual homes a light of varying powers according to the different desires of the consumers, from the B B burner of 1 carcel up to the No. 3 of 12 carcels, and even up to the 25 carcels of recent types.

The Denayrouze, Bandsept, and other burners, which are convenient variants of it, have not been less appreciated. Several of these systems have, besides other advantages, that of doing away with glass chimneys. However, incandescent burners only give their full effect under pressure greater than 25 mm. of water. But for some time past there have been made bunsen burners working very well with the lowest pressures that are usual in towns. M. Lecomte has devised one of the most advantageous burners from this point of view, for which a pressure of 20 mm. is enough. The Auer and the Denayrouze Companies have also made bunsen burners enjoying the same advantages.

Alongside of the comparatively high pressures which are expedient in certain cases, further progress has been made. There are burners which, with a pressure of about 100 mm. of water, give 20 to 30 carcels each. By grouping two or three together, the lighting intensity of arc lamps of 12 ampères is largely surpassed. This result may also be attained without increased pressure, by grouping five or six ordinary incandescent burners, consuming 160 litres per hour. Lastly, I leave M. Salzenberg, Engineer of the Municipal Works of Crefeld, to speak to you of the light which he obtains by using gas compressed to 1 atmosphere with a mantle of special form invented by him.

I ought also to draw your attention to the incandescent lighting as arranged by the Paris Gas Company in the walks of the Champ-de-Mars and of the Trocadéro, the total power of which is 100,000 carcels; 60,000 being given by 3300 mantles supplied with gas at ordinary pressure, while 40,000 carcels are from 1700 mantles, burning gas under a pressure of 200 mm. Those in the Champ-de-Mars are Auer mantles with Bandsept burners; \* those in the Trocadéro are Denayrouze models. M. A. Lévy has been kind enough to draw up a description of this installation for the Congress. This brilliant lighting has been a great success with the public; and I trust to be interpreting your wishes in congratulating the Paris Gas Company on having made so dazzling a demonstration of the resources of our industry.

The public may find among the varied apparatus for incandescent lighting, different types corresponding to its needs. Also, it has promptly taken note that, by adopting incandescent burners, it has much more light with much less expense than with former ones. The intensive regenerative burners give a carcel-hour for 40 to 50 litres; while incandescent burners give it for 12 to 17. Although the use of these burners is very widespread, one may predict their still more general adoption—above all in those countries where the mantle is a protected article, but which protection will soon cease. The price of Auer burners, which varies in France from 12 frs. to 14 frs. will be able to be reduced apparently to about 3 frs., according to the offers which have recently been made by different makers. The mantles, the present price of which is high, would be sold at 0.40 fr. The public may thus soon realize all the economy resulting from incandescent gas.

This lighting will be spread, moreover, among habitual users of gas. It appears, also, as likely to be adopted by a *clientèle* hitherto difficult to get at; and our industry may thus hope for some compensation for the partial loss incandescence has caused. If we are able to state the notable progress which incandescent mantles have brought to gas lighting, we do not know completely the causes to which are due the brilliant light they produce. Different explanations have been given, among which I call to mind those of Dr. Bunte, to whom we already owe so great a number of notable researches on questions which interest our industry. The author established, first of all, by a clever experimental inquiry, that it is not necessary to look for the cause of intensive lighting effect in the specially high emissive power of rare earths and their mixture. Besides, we know that mantles formed only of pure oxide of thorium or pure oxide of cerium have very feeble illuminating power, while mantles made up of a mixture of 99 per cent. of oxide of thorium and 1 per cent. of oxide of cerium give a brilliant light; and that, in fact, the proportions of this mixture cannot be varied even slightly without considerably altering the result.

\* In this connection, it is only right to point out a slight mistake in our abstract of M. Lévy's paper last week. The consumption of gas in Bandsept burners was stated as 1350 litres, giving 35 carcels. The consumption should have been 350 litres—the error occurring through the "1" placed before the 350 in the original to represent the word "litres."—ED. J.G.L.

Following our author, the oxide of thorium which, after calcination of the nitrate, presents itself in the form of swollen and porous filaments, serves as a large surface for carrying very fine particles of oxide of cerium, of very small bulk, weak in calorific capacity and conductivity, and which may thus be carried to a very high temperature. Their brilliancy, therefore, becomes very great; because the luminous intensity of the incandescent bodies increases much more rapidly than the temperature. According to MM. Le Châtelier and Boudouard, it would follow simply that, coloured bodies having a law of radiation more favourable than dark bodies at the same temperature, which is about 1650°, the emissive power would be near the unit for blue, green, and yellow radiations, and much more feeble for the red and heat radiations. Dr. Bunte shows, moreover, that oxide of cerium lowers to about 300° the temperature of the combining of oxygen and hydrogen; and he thinks that this property plays a part in the phenomenon. He sees something analogous to what is obtained with platinum, the incandescence of which can be maintained by a current of cold air—a property of which surgeons have taken such convenient advantage. Dr. Bunte will address us shortly on the photometry of incandescent bodies.\* While we are speaking of incandescence from the point of view of the laboratory, it may be permitted me to express the wish that an international understanding may be arrived at for settling the rules to be followed in determining the value of mantles. While keeping to the usual procedure adopted in each country for actual photometrical measurements, there might be arranged a certain number of precise rules which would make comparable tests on mantles. In how many vertical angles should the intensity be measured; how many photometrical tests should be made to determine the average value; how should correction be made for comparing the ascertained figures with standard gas, and of different calorific power with the corresponding value of a defined gas? These questions and many others which are connected therewith should be decided by a common agreement before anyone has formed customs which it would not perhaps be easy to alter in the future.

The great development of incandescent lighting which seems probable when the next reduction of price shall have taken place, has led some of our colleagues to ask if, in the near future, it will not be altogether substituted for illuminating flames. In this case, it would be the calorific power of the gas which would become the preponderating element in its value for all uses. This does not mean to say that ordinary gas will of necessity have to give place to different poor gases; because ordinary gas of the normal standard contains double the calories of uncarburetted water gas, the most calorific of poor gases. On this hypothesis, would there be, or not, an economy from the use of one or other of the gases, or of their mixture in certain proportions? It is, indeed, a difficult question to settle in a really precise way; for its solution rests on a great number of data, several of which might be absolutely false, owing to the state of things that would follow the exclusive use of water gas—particularly variations in the price of coke, ordinary gas coals, and bye-products.

The most recent publication that I know on this subject is that by Herr Schaefer, Engineer, of Dessau. It shows that the production of water gas is far from being as economical as is often supposed. The cost of water gas, such as is sometimes given, is that which results from the actual manufacture. It is not a net industrial price—that is to say, burdened with all the charges which it would really have to bear in normal working for a certain length of time. If these considerations are taken into account, I am convinced that the net price of water gas would not be less than that of ordinary gas, without mentioning the inconveniences it entails, from a sanitary point of view, owing to the high amount of carbonic oxide which it contains. It appears, according to some views, that the manufacture of gas from coal is only made imperative in order to satisfy the standard of illuminating power. This idea seems to me too exclusive. The illuminating hydrocarbons only form 5 or 6 per cent. of ordinary gas; and 92-100ths of the remainder are made up of hydrogen, carbonic oxide, and marsh gas. With equal volumes, hydrogen and carbonic oxide are found to have very nearly the same heating power—that of marsh gas being something like three times as much; and as this gas is itself one-third of the total volume, it is seen that the use of coal gas procures not only the standard required, but also a considerable amount of heating power. It results from this, that if the illuminating hydrocarbons are suppressed by a suitable process, the gas loses its standard, but preserves about 93 per cent. of its heating value. This it is which explains the result of certain experiments in which the intensity of the light given by an incandescent burner varies but little, whether it is supplied with ordinary or uncarburetted gas. But such a gas is not the direct product of normal distillation I do not think that there is in this result an irreducible contradiction with the interesting facts which M. Aguiton published in 1893, showing that ordinary gas has a heating power proportional to its standard in the Bengel burner. When the gas is burnt in the Auer burner, the luminous intensity decreases at the same time as the standard—a loss correlative to that of the heating power. This last result appears to me to be due, not only to the decreasing proportion of illuminating hydrocarbons—the ethylene, acetylene, and benzene, the combustion heat of

\* See *ante*, p. 642.



which is very high—but perhaps still more to the marsh gas, the proportion of which diminishes in general with that of the hydrocarbons, such as is noticed chiefly when the time of carbonization of the same coal is increased. M. St. Claire Deville has made a classification of the best coals for gas making. His analyses concern five different types. They show that the proportion of marsh gas and illuminating hydrocarbons varies at the same time, and in the same way; while that of hydrogen varies in a reverse manner. The correlation existing between the standard and the heating power of the gas is thus corroborated. With these reservations, I do not deny that some advantage may be found in the use of coals giving less lighting results than ordinary gas. A preliminary experiment should be made, so as to regulate the incandescent burners for a gas of such a character, and to find out the result. As regards carburetted water gas, used in a more or less restricted way, according to the countries and the prices of material used for carburetting, it appears of late to have had rather more attention given to it, at least in Europe, since there has been more facilities given to enriching by benzol. It seems to be able to render some service in our works, as auxiliary to the manufacture, by mixing it with ordinary gas in proportions which depend on the maximum amount of carbonic oxide allowed by the authorities. In Germany, the mixture may contain up to 30 per cent. of water gas; in England, a little more. You will have an interesting report from M. Sospicio, of Trieste, on this subject, and from Herr Dicke on the Dellwik-Fleischer process.

The carburetting of ordinary gas by benzol has given results which tend to generalize this method of enrichment. Some years ago, when carbide of calcium was prepared on a working scale by the system of M. Moissan, it was asked if the use of acetylene as a carburetter would not be advantageous. Experiments were made which proved satisfactory from a technical point of view; but they showed that acetylene was dearer than other carburetters, when the price of carbide of calcium of good quality exceeded 200 frs. per ton delivered at the works.

We should not pass by in silence the trials made about fifteen years ago for improving domestic heating by gas. Since then, a very large number of arrangements have been placed before the public. Practice has shown that there is every interest to produce the greatest possible amount of directly radiant heat by means of suitable surfaces made incandescent by the combustion of gas—such as, for example, refractory bricks covered with asbestos, arranged vertically, so that the blue flames of the stream of gas just touch it. On these lines, which our knowledge shows us to be the most rational, it may be foreseen that arrangements and materials will be found giving still better results by increasing the temperature of the incandescent surfaces. The heating of the primary air, without doubt, contributes to this to a certain degree. Also recuperation is applied to a large part of the apparatus. But there is a limit which is not to be passed, either to avoid complication in making or to leave for the chimney the required amount of heat for a proper draught. It seems to me that if it was not for the fragility of the mantles, the application of physical laws would lead us to grouping a larger or smaller number of incandescent burners without glass, to get a gas-fire of very good power. The systems using the white combustion of gas have also shown certain advantages. However that may be, it may be stated that very great progress has been made in this department, and that the public now have a very choice variety of types of burners giving good results, the advantages of which they will appreciate more and more, especially if the firms who place these stoves in the houses give as much care to this department as is taken in their manufacture.

Cooking by gas opens for our industry a market still more important than heating. The many advantages which it gives, assure its receiving increasing favour. The question of domestic heating and cooking by gas will be treated in the name of the Paris Gas Company by M. Auguste Lévy, who has been kind enough to prepare for the Congress a very detailed report, in which are given the scientific methods followed in the construction of the apparatus, in the verification of the hygienic conditions of their working, in the ensuring of complete combustion of the gas, and in the determination of the heating result. Comparing this work with the book published by M. Auguste Lévy on "The Gas Industry at the Exhibition of 1889," the ground covered since then will be seen. The progress made in this respect outside of France has not been less interesting. M. Ad. Bouvier has given a review of it as regards Germany in a report on the Industrial Gas Exhibition at Berlin in 1896, undertaken by him on the initiative of the Société Technique.

I pass on to gas-engines, concerning which M. Aimé Witz will speak to us with the authority which he has acquired by his well-known work in France and abroad. He will show us that for certain powers, the gas-engine has nothing to fear from any other competitor, even with ordinary coal gas at 20 c.; and he will describe engines of 500-horse power of the Cockerill Society which may be seen at work in the Belgian Section. Twenty years ago, the most powerful gas-engine was of 60-horse power, with two cylinders of 30-horse power each. Herr von Oechelhaeuser, whose energy is so largely spent in researches relating to our industry, will permit me to associate his name with those of other engineers who have contributed to these important results.

Among comparatively recent apparatus connected with the

consumption of gas, I may mention prepayment meters, which have rendered services more or less great according to the localities and the character of the *clientèle*, as well as automatic lighters, which are also of importance.

Among the industries which compete with our own, electricity is the one which calls for our greatest attention, and also our interest, because there are not wanting examples of gas-works and central electrical stations united under the same management. It even seems as if gas companies show a more marked tendency than formerly to combine the working of electricity with that of gas. I do not affirm that each of these associates conduces in the same degree to the prosperity of the common enterprise. It is, indeed, a question of internal policy, into which I will take care not to enter.

One of the most salient facts of recent years in electrical lighting is the practical working of incandescent lamps at 220 volts, the adoption of which offers several advantages, among which one of the most appreciable is the increase in the distributing power by the same system. The decrease in the consumption of carbon by arc lamps deserves to be noticed; but it is only obtained by arrangements which weaken the intensity of the light. The Nernst lamp, which you can see in the German Section, has not yet been endowed with an automatic lighting sufficiently sure and practical to allow it to take an important place among electrical appliances.

Of the papers read at the International Congress of Electricians, which met in Paris at the end of August, one of the most noteworthy was from Madame Herta Ayrton, on the luminous intensity of the arc on continuous current. Madame Ayrton showed that, with equal current, a space of 1 millimetre between the carbons gives the maximum intensity. An arc of 2 millimetres is much less good. The 1 millimetre arc gives, not only the most light, but also the best return. The proportion of the luminous intensity to the power developed by the generator is greater for an arc of 1 millimetre than for that of 2. The author, however, did not say in what proportion. There would be, then, every advantage by using the arc of 1 millimetre and currents of great intensity, because, with weak intensities, a too great portion of the light would remain, so to speak, shut up between the two carbons, owing to their position. The paper contains ingenious views on the causes of the weakening of the luminous intensity due to an increasing space between the carbons, principally the formation in the gaseous arc of a mist of solid particles of carbon, coming from the very rapid cooling of its vapour, at short distance from the crater. This thesis is very interesting; but it may be asked in what way will be realized a commercial apparatus allowing the maintenance with sufficient regularity of so small a space as 1 millimetre between the carbons.

In electrical distribution, the continuous current seems generally more appreciated than the alternate current of one or two phase; and the most recent tendency is to distribute at 500 volts on three wires, since there are good lamps at 220 volts. Several advantages are claimed in favour of the continuous current—chiefly the facility of starting motors, scattered through a district, the best result with arc lamps, and the least loss of energy on a system destitute of fixed transformers, which are onerous when they do not work at full charge. On the other hand, the triphase alternative system makes up for it by the carrying of energy a great distance on aerial lines at high tension. It is one more resource for using natural motive forces in cases where the establishing of these forces is not counterbalanced by the economy accruing therefrom. The continuous current at high tension has also lately been used for the distribution of energy on aerial lines traversing different localities. Each of them has a receiving machine worked to drive transformers, and all the receivers are in series on the line. It may be questioned to what extent it would be wise for the lighting of a town of any importance (so necessary for its safety) to depend on the interruption of a line traversing such distances, where proper superintendence is impossible, and which is at the mercy of a storm. The same remark applies also to the triphase current. But beyond this special case, these new systems, capable of numerous applications, may be considered as one of the most interesting triumphs of modern science, and augur well for new resources which they promise to the industry.

Acetylene does not appear to attract much attention from gas engineers, if one may judge from the publications of different technical societies. The activity of the supporters of this light is shown chiefly in the construction of a very great number of various apparatus, serving to free the acetylene from the carbide of calcium. To produce the light of a candle, there is required 0.66 litre of acetylene, or 1.5 litres of ordinary gas. The proportion of these volumes is 1:2.27; but acetylene costs from ten to about twelve times more than gas. Thus, how much inferior acetylene is to coal gas from the economical point of view may be seen. If, in addition, it is remembered that acetylene is not practically useful for heating, nor for motive power, it will be seen that a town supplied exclusively by acetylene would be deprived of a distribution of heating and motive power, at the same time adopting a light much more costly than gas. Consequently, there are only a small number of localities, and those of little importance, having a distribution of lighting from central works. The efforts first tried (without success) for supplying gas-engines with acetylene, do not seem to have been resumed. Finally, some companies manufacture oil gas for the



lighting of railway carriages or tram-cars mixed with acetylene in certain proportions.

Some new processes allow of compressing acetylene in very strong steel vessels, filled with porous bricks saturated with acetone, in which it dissolves. These vessels may be taken to the houses, and give a certain number of hours' light, after which they are returned to the works to be recharged. There is in this a future industry analogous to that of portable gas. The Society of Metallic Carbides who own the Bullier patents, have obtained judicial acknowledgment of their validity.

Besides lighting distributed from some central works, there are a certain number of recent processes which have been more or less noticed. Among these, the attempts made to produce the incandescence of mantles by means of petroleum have not given sufficiently practical results. The use of alcohol for this end does not appear reasonable, owing to its poor heating power compared with that of petroleum or illuminating gas. A litre of medicated alcohol and a cubic metre of gas give the same amount of heat. Incandescence by alcohol at 0.60 fr. will cost generally 2 to 3 frs. more than gas at 30 c. or 20 c., without mentioning the complication and high price of the apparatus. The supporters of alcohol have also tried a return to illuminating flames, using alcohol carburetted with benzene or similar hydrocarbons, into which mixture a wick plunges carried by a burner like that for ordinary petroleum lamps. Even if this system becomes practical, I do not think we shall have to regard petroleum lighting from the point of view of competition. It is rather the petroleum industry that would be attacked; because it is understood what interest the countries producing alcohol and importing petroleum would have in seeing the consumption of petroleum diminish to the advantage of a national product. I will not dwell further on these various systems, on which M. Lecomte, of Paris, will shortly speak to the Congress.

Commercial heads know how much it behoves them to have under their orders a sufficiently reliable and instructed staff. It is not enough to find technical improvements or good commercial processes. It is necessary to entrust their application to workmen and employees capable of taking their part, and of making them produce their fullest effect. The auxiliaries of this class must be more numerous in our industry. Even in the countries which have most developed professional teaching in general, they seem to have rather neglected—except in designing and in the offices—to establish suitable courses for preparing the staff for the different services of our enterprises. Yet certain industries have obtained by these means very encouraging results. Why should it not be the same for ours? As such instruction could only take place in the evening, it is quite obvious that the workmen who follow it are those who are willing to be taught, and who will have, two or three times per week, to conquer the fatigue of a day's work. And there would be more than one might believe, if I may judge from what I have seen for a long time at Lyons at the Society of Professional Instruction for the Rhone, where, with persistent success, more than 200 evening classes take place, among which are a certain number concerning manual labour. This organization is often referred to, as it has attracted the attention of both strangers and French who have studied its working. I do not mean to say that other systems would not conduce to the end of which I speak; but what I believe is desirable above all is that we should occupy ourselves more with considering it. In this connection, I draw your attention to a report which Mr. Alfred E. Forstall has sent to the Congress on the Educational Fund, founded by the American Gaslight Association, on the initiative of Mr. Clark. Mr. Clark wished to establish a system of supplementary instruction for the many young men who, without having the advantage of advanced teaching, exerted themselves, when employed in subordinate positions in our works, to become capable of occupying posts involving greater responsibility. He has organized what may be called a school by correspondence—that is, the sending of a certain number of questions to answer to all those who have joined it, and the books to consult for the solutions. The exercises are then corrected, and afterwards returned to the pupils. The results obtained are so encouraging that the American Gaslight Association have decided to give yearly a sum of 20,000 frs. to the management of this school, and to the remuneration of a person employed in the sending and correcting of the exercises for the pupils, who number about a hundred. If such an organization—which has the advantage of reaching persons scattered in different towns—has produced such satisfactory results, may not still more be hoped for by the founding of professional classes, where the scholars are more directly and more frequently under the teacher? On the same lines, we have the City and Guilds of London Institute, and the Plumbers' School, which Herr von Oechelhaeuser had the intention of establishing at Dessau, and of which we hope he will be good enough to tell us something.

In some gas-works efforts have been made to interest the stokers in the retort-house work. Therefore an inquiry into the different means employed for this end is particularly opportune, and I thank M. Hedde for having been kind enough to prepare it for the Congress. I trust that it will give rise to other information on this subject from those of our colleagues who are interested in it.

I will not attempt to speak to you of what there is to be seen in the Universal Exhibition concerning our industry. I have already told you of the lighting of the Champ-de-Mars and of

the Trocadéro, carried out by the Paris Gas Company. There is, besides, the Gas Pavilion which has been built by the aid of subscriptions made by different Companies or persons attached to our Société Technique, and by the Paris Gas Company. To show the varied and numerous ways of using gas, to bring together appliances of different types, to fit them up in places appropriate for their use, to thus take away from the public the confused impression too often caused by shows, to arrange, for example, three or four types of dining rooms, bathrooms, kitchens, &c., for flats more or less considerable, so that each can take account of the advantages of the use of gas. These have been the main ideas on which the programme was arranged by the Committee of our Société Technique. It is M. Eugène Lebon, the doyen of our Past Presidents, who has kindly taken upon himself this work.

Gentlemen, I have not the intention, in this rapid survey, of speaking of all the interesting things which have been brought out in our industry since the Universal Exhibition of 1889; nor to cite the names of all those who have taken useful initiatives therein. I have only been able to skim very imperfectly the facts which seemed to me most salient. They form, nevertheless, a brilliant and rich harvest which bears witness to the vitality of our industry and the importance of the works of its representatives in different nations. They permit of our looking at the future with the confidence belonging to men who have valiantly struggled, who have known how to defend their positions, and who march always in the front.

#### A METHOD OF PREVENTING NAPHTHALENE OBSTRUCTIONS.

By Dr. BUEB, of Dessau.

[A Paper read before the International Gas Congress at Paris.]

Naphthalene occurs among the various hydrocarbons which are formed in gas-retorts during the distillation of coal; and it is in very ill-repute among gas engineers.

Naphthalene is found in the form of a very volatile solid, which condenses, for the most part, on cooling in the condensers, together with the tar. This simultaneous separation of tar and naphthalene, however, is not a complete one; and a certain proportion of naphthalene always remains in the state of vapour in the gas from which the tar has been abstracted. This volatile condition of naphthalene is responsible for its deposition in the form of superposed scales, under the influence of a slight depression of temperature or of some small obstruction in the mains. A very small weight of this deposit is sufficient to rapidly obstruct the mains—even those of large diameter—to such an extent that a tangible loss of capacity ensues. Such are the naphthalene obstructions which are familiar to every gas engineer, and which constitute an extremely troublesome impediment to the working.

For many years, means of getting rid of this naphthalene nuisance have been studied. All attempts to prevent its formation in the retorts have completely failed. In the next place, attempts were made to discover methods having for their object the absorption of the naphthalene after it had been formed. Among ideas of this nature ought to be mentioned the method of Bunte and Eitner (see "JOURNAL," Vol. LXXIII., p. 437), which consisted in mingling vapour of xylene with the gas. The xylene vapour, when it assumed the liquid state, dissolved deposits of naphthalene which had been formed.

Researches in the direction of removing naphthalene from the gas on the works had no further practical outcome until quite recently. Attempts had been made in vain to retain it by a sudden depression of temperature brought about by the introduction of steam. Other processes, such as Erdmann's, which consisted in abstracting the naphthalene by means of picric acid, which formed an insoluble picrate with it, did not answer in practice on the works because of their complexity and the magnitude of the cost of their application.

A method which has been industrially applied at the large works of the German Continental Gas Company, at Dessau, may now be described. By its means naphthalene can be abstracted from illuminating gas on the gas-works in a simple and inexpensive manner. The principle of the process consists in bringing the gas as it leaves the Pelouze and Audouin tar extractor into intimate contact with a tar oil of very high boiling point. Anthracene oil, which boils between 480° and 750° Fahr., has afforded the best results. An oil of this description possesses the property of absorbing as much as 25 per cent. of its weight of naphthalene, according to the temperature. Nevertheless, since this oil likewise possesses the property of dissolving a small amount of illuminating hydrocarbons—such as benzene and toluene—it would, if employed in its natural condition, cause a diminution of the illuminating power of the gas. Inconvenience on this account is, however, completely overcome by adding to the anthracene oil (before use) 4 per cent. of its weight of pure benzene.

The process is applied in the following manner: Two or three compartments of a "Standard" washer are filled with the oil in question; and the gas is passed through these compartments until the oil in the first one is saturated with naphthalene. In order to ascertain the degree of saturation of the oil, a distillation test is made. The oil may be regarded as saturated when the distillate collected at 518° Fahr. sets in the receiving vessel.



The absorptive power of the oil increases as the temperature rises. At 77° Fahr., it absorbs about 19 per cent. of its weight of naphthalene. In order to indicate with how great an intensity the absorption takes place, the following results of analyses made on the three compartments in succession are given. The first compartment of the "Standard" washer had absorbed 92½ lbs. of naphthalene when 1,766,000 cubic feet of gas had passed through it; the second compartment, 37½ lbs.; and the third, only 1½ lbs.

In order to work the process, it is not absolutely essential to employ a mechanical washer. Any washer provided with a pump which will serve to maintain a continuous circulation of the oil, can be adapted to work the process; but a mechanical washer is greatly to be preferred.

The cost of applying the process is naturally dependent on the price of the oil used. But as the oil is one of the crude products of the distillation of tar, its price (inclusive of that of the 4 per cent. of benzene) cannot generally exceed three times that of the crude tar; and as the oil after saturation can be freed by distillation from the naphthalene it has absorbed, it can be thus again rendered fit for use to absorb more naphthalene. With large installations, it will generally be most advantageous to regenerate the oil on the spot; but this must depend on the contractor's terms.

The amount of naphthalene in gas is greater, the higher the temperature. For instance, in works where, summer and winter, the temperature of gas as it issues from the Pelouze tar-extractor keeps at about 77° Fahr., the proportion of naphthalene will be about 1 oz. per 1000 cubic feet. The outlet of the tar-extractor is where the absorption of the naphthalene ought to be effected. After the gas has passed through the naphthalene washer, it will be divested of naphthalene to such a degree that there need be no fear of subsequent deposition of it in the mains.

## THE PRODUCTION AND MANUFACTURE OF CYANIDES IN GAS-WORKS.

By Dr. BUEB, of Dessau.

[A Paper read before the International Gas Congress in Paris.]

It has long since been recognized that illuminating gas contains cyanogen, as well as sulphuretted hydrogen and ammonia. Even in 1850, in the specification of an old English patent, allusion is made to the fact that cyanogen is always present in gas. Nevertheless, having regard to the comparatively limited proportion of cyanogen in the gas, and to the lack of knowledge at that time of its practical utilization on a large scale, its extraction by special means was, almost without exception, not undertaken. All that was done was to extract from the gas that portion of the cyanogen which was deposited as blue in the purifying material.

Cyanogen was actually found in the gas as hydrocyanic or prussic acid (HCN) in the free state. Washing this prussic acid, by means of water, with the ammonia of the gas, does not, however, allow of its extraction in the form of readily soluble ammonium cyanide; for the carbonic acid, which is always in excess in gas, immediately decomposes the ammonium cyanide produced into ammonium carbonate and free prussic acid. This reaction accounts for the ammoniacal liquor of gas-works being free from ammonium cyanide.

On the other hand, the ammoniacal liquor always contains another compound of cyanogen—viz., ammonium sulphocyanide—which salt is formed in the washers by chemical reactions between the hydrocyanic acid, the ammonia, and the sulphuretted hydrogen present in the gas. Only a small portion, however, of the cyanogen is thus combined; the greater part does not enter into combination, and is carried forward by the gas into the purifying plant.

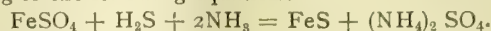
Only there does chemical combination of the cyanogen take place. In the purifiers, the cyanogen combines, on the one hand, with the oxide of iron of the purifying material and with the ammonia which is still present in small quantities in the gas, and forms therewith insoluble ferrocyanides; and, on the other hand, it combines with sulphur compounds present in the gas, with which it forms sulphocyanides, that gradually accumulate in the purifying material. The absorption of the cyanogen in the purifiers is not, however, complete. There remains a more or less considerable percentage in the purified gas; so that, in works where cyanogen is not specially extracted, an appreciable amount is actually always to be found in the gas as distributed to the consumers.

Until about the middle of the year 1880, the purifying material, after use, was only a waste product of no value to the gas-works; but at that period the employment of cyanide of potassium in gold extraction gave a new aspect to the problem. Cyanogen products thenceforth had a vast arena for employment; and all substances containing cyanogen became of great interest industrially. In this manner, the purifying material from gas-works came into demand; and now, on account of the prussian blue which it contains, it must be classed among the valuable by-products.

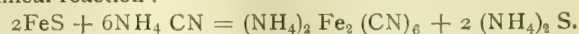
Researches were then made on gas-works with the object of recovering as much as possible of the cyanogen which is not retained by the purifying material. To do this, it was necessary

to find special methods for extracting the cyanogen elsewhere than in the purifiers. The procedure to be followed was pointed out in the old patents of Knublauch and of Rowland. These two processes aimed chiefly at the formation of a soluble ferrocyanide; and at some works in England the method was practically applied. The economical results were not, however, such as to warrant an extension.

Meantime, I was successful in devising, at the Dessau Gas-Works, belonging to the German Continental Gas Company, another method of extracting cyanogen from illuminating gas. It was a far simpler method. The principle of the process is the elimination of cyanogen by the aid of the ammonia present in the gas, by intimate contact with a concentrated solution of an iron salt, and the formation thus of an insoluble double salt. Practically the process is carried out in the following manner: The gas, immediately after it leaves the Pelouze and Audouin condenser, is passed into a special mechanical washer of the "Standard" pattern. This apparatus comprises four or five separate compartments, which are traversed by the gas in the reverse direction to that taken by the solution of the iron salt. The chemical reaction which takes place is as follows: The last compartment of the washer (*i.e.*, the compartment from which the gas leaves the apparatus) is filled with a freshly prepared concentrated solution of sulphate of iron in water. After six to ten hours, during which the gas is passing through, the sulphate of iron is completely converted according to the following equation:—



The sulphate of iron is thus converted into an equivalent quantity of sulphide of iron; and the filtrate no longer contains iron, but consists essentially of a solution of sulphate of ammonia. When this reaction is completed, the mixture in the compartment in question contains only traces of cyanogen. The contents of this compartment then pass into the next compartment, in which another change takes place. The ammonia and the cyanogen of the gas form with the sulphide of iron an insoluble double salt of ferrocyanide and ammonium, while the sulphuretted hydrogen again becomes free, and is partly carried by the gas out of the washer and partly left in the product of the reaction as sulphide of ammonia. The following formula shows the chemical reaction:—



This reaction continues in the remaining compartments up to the last one, by which the gas enters the washer, where it is complete.

The effect of the cyanogen and ammonia on the sulphide of iron, which is formed in the first instance, becomes apparent in the colour of the liquid in which the reaction occurs. In the first compartment (in which is the solution of sulphate of iron), the liquid is deep black; in the following compartments, proceeding towards the gas inlet, this hue gradually gets lighter; in the last compartment it becomes yellowish green.

The product, as it leaves the washer, is a liquid mud, which is either sold in that condition, or subjected on the works to another change. This mud or sludge, as it leaves the cyanide washer, contains cyanogen in amount equivalent to about 20 per cent. of yellow prussiate; while the ammonia present in it varies between 6 and 8 per cent. (*i.e.*, the sludge is ammoniacal liquor of from about 27 to 37 "ounces" strength). The ammonia which has not been utilized in the absorption of cyanogen passes through the cyanide washer, and should be absorbed as hitherto by the special ammonia washer. Clearly this process lightens the work of the ammonia washers.

It may be added that the absorption of cyanogen, according to the above method, need not take place at a fixed low temperature. On the contrary, the reaction occurs with even greater vigour in the warm, with gas which has not been cooled. Consequently, in planning new installations it is beneficial to put the water or tubular condensers on the outlet of the cyanogen washer, and to connect the latter to the outlet of the Pelouze tar-extractor.

Proceeding now to the working up of the sludge. It is boiled until the uncombined or free ammonia is distilled off; the distillate is condensed in a condenser to ammoniacal liquor containing 5 to 6 per cent. of ammonia (*i.e.*, of about 25 "ounces" strength), or it is mixed with the works' ammoniacal liquor. The sludge which remains in the still then consists only of a mixture of an insoluble double salt of ammonium cyanide and a solution of sulphate of ammonia. It is transferred to a filter press. The liquid expressed is merely a 10 per cent. solution of sulphate of ammonia, which is suitably evaporated to make sulphate of ammonia fit for the market. The cake which remains in the press contains about 30 per cent. of prussian blue, and 44 per cent. of yellow prussiate; and it is saleable in that condition.

Sulphate of iron is the only chemical product required for the application of this process; and, as it is readily obtainable everywhere, the process becomes peculiarly simple. For every 100 lbs. of prussian blue recovered, 200 lbs. of sulphate of iron are needed. The apparatus likewise requires only the simplest attention—say, from one to two hours' time per diem according to the gas passed through it—spent on filling, emptying, and recharging the compartments of the washer. The yield obtained by the process depends primarily on the quality of the coal employed, and secondarily on the temperature of carbonization.



Experience shows that English coals contain the most cyanogen. For instance, at one works where only English coals are carbonized, the mean quantity of cyanogen recovered by the sludge corresponds to 7.4 oz. of yellow prussiate per 1000 cubic feet of gas. Another plant, where a mixture of English and Upper Silesian coals is employed, shows a yield of 6 oz. per 1000 cubic feet. A works where only Silesian coal is carbonized obtains about 4.2 oz. Coal from the Saar basin gives a yield of from 4 to 4.5 oz. per 1000 cubic feet; while coal from the north of France gives 4 to 5 oz., and that from the east about 4 oz. In general, it may be taken that the minimum production on a gas-works will be 3.5 oz., and the maximum 8 oz. per 1000 cubic feet of gas.

The direct advantages offered by the process are the simple extraction at little cost of the whole of the cyanogen in a form which is very valuable. Apart from these, there is something to be said as to the great indirect advantages which it affords to gas-works. One of the indirect advantages of this process of extraction by means of a liquid is that it materially assists the purifiers in the removal of sulphuretted hydrogen. This is due to the fact that, previously, the iron in the purifying material (oxide) was of use quite as much for the production of blue, while now, as cyanogen is no longer present in the gas which enters the purifiers, the iron is entirely available for the retention of sulphuretted hydrogen from the gas. It has been proved at various gas-works that the purifiers have been considerably relieved after this process has been introduced on the works.

It has already been stated that cyanogen possesses the property of decomposing freshly formed sulphide of iron, and thereby liberating sulphuretted hydrogen. This chemical property of cyanogen clearly is singularly inconsistent with gas purification as hitherto conducted; as it obstructs the absorption of sulphuretted hydrogen by the purifying material. The spent oxide can be readily reduced to a solid substance containing 60 per cent. of sulphur. Though free from blue, this spent oxide is not worthless, as it can be profitably disposed of for the manufacture of sulphuric acid.

Another advantage of the process worth consideration is that the gas which passes into the distributing system will now be completely deprived of cyanogen. From the hygienic standpoint, this result must be regarded as particularly beneficial. Illuminating gas which has not been subjected to any process for the extraction of cyanogen contains as much as 1 oz. of hydrocyanic (prussic) acid per 1000 cubic feet. On the other hand, gas from which the cyanogen has been abstracted does not injure the drums of wet meters, nor the sheets of gasholders, as is frequently the case, as the blue stains which are readily found on the plates indicate. Further, water or liquor removed from gasholders loses in great measure its poisonous qualities, which are due to the cyanogen dissolved.

The working figures of the German Continental Gas Company, and of other gas-works which have already adopted the process, show that it may be truly stated that the process offers gas-works a practical means for improving the purification of gas, and for obtaining simultaneously a bye-product which is valuable and readily disposed of.

#### THE ABSORPTION OF HYDROCYANIC ACID FROM ILLUMINATING GAS.

*A Contribution on the Subject of the Progress which has been made in Gas Manufacture in respect of the Production of Yellow Prussiate (Ferrocyanide) of Potash by the Wet Process.*

By Dr. A. SMITS, of Amsterdam.

[A Paper communicated to the International Gas Congress at Paris.]

The methods which have been used, up to a quite recent date, for absorbing the hydrocyanic acid of illuminating gas by means of liquids, have generally embodied the bringing of the gas, after it has been freed from ammonia, into contact with a solution of carbonate of potash holding a salt of iron in suspension.

It is strange that the absence of ammonia has been generally considered an indispensable condition for the satisfactory absorption of the hydrocyanic acid. The following phenomenon is probably responsible for this error.

When the gas which is brought into contact with the absorbing liquid contains ammonia, analysis discloses very little yellow prussiate of potash in the clarified liquor. But if the black precipitate, which is always formed during the absorption, is also analyzed, it can readily be shown that it contains an amount of cyanogen in proportion to the amount of ammonia which the gas contained. Therefore the total amount of hydrocyanic acid absorbed in this case is actually very large. In this manner a quantity of hydrocyanic acid is secured which would be lost during the absorption of ammonia in the ordinary scrubbing plant.

How can the fact that the presence of ammonia facilitates the absorption of hydrocyanic acid be explained? Modern physical chemistry teaches us that reversible chemical changes pure and simple, whenever they appear, can never be made use of to give a quantitative absorption. When gas which, in addition to hydrocyanic acid, contains two other acids—carbonic acid and sulphuretted hydrogen—is passed through the above mentioned

absorbing liquid, various reversible reactions take place; so that no quantitative combination is possible unless the quantity of absorbing liquid is infinite. If, however, ammonia is present in quantity sufficient to neutralize the three acids, reversible reactions no longer occur. The reactions then take place quantitatively.

It should be added that the presence of ammonia favours the formation of an insoluble cyanide; because, as has been already stated, less yellow prussiate of potash is found in the liquid when ammonia is present. Such are the reasons which induced the author to think that the place for the absorption of the hydrocyanic acid had been wrongly selected. It seemed to him reasonable to attempt to absorb the hydrocyanic acid while the gas still contained an abundance of ammonia.

Under such conditions it is unnecessary to add a potash salt; as, in the presence of sufficient ammonia, all the hydrocyanic acid is retained in an insoluble compound of cyanogen. In place of carbonate of iron, a solution of ferrous sulphate may be used, with the advantage that it absorbs chemically a considerable portion of the ammonia.

Experience has proved that a concentrated solution of ferrous sulphate completely absorbs hydrocyanic acid, when the gas which passes through it contains plenty of ammonia. For instance, the gas as it leaves the Pelouze tar-extractor is well adapted for the purpose. The author had scarcely arrived at this conclusion, when he read in the "Journal für Gasbeleuchtung" that Dr. Bueb, of Dessau, had attained the same result from practical considerations, and that the new process had already been successfully applied at the Dessau Gas-Works. The results obtained at the Amsterdam Gas-Works confirm the facts assumed above. It has been there demonstrated that all the hydrocyanic acid can be absorbed in this fashion.

Notwithstanding its success, the method does not, however, completely satisfy the author. On the one hand, it is an advantage to fix the ammonia in the apparatus in which the cyanides are being recovered; but, on the other hand, this method has disadvantages with respect to the ultimate treatment of the absorbing liquid—at least if the gas-works is one where it is the custom to manufacture on the spot yellow prussiate of potash and sulphate of ammonia. In such a case, the author has found it preferable to substitute carbonate or hydroxide of iron for the ferrous sulphate; and experience on a large scale has completely confirmed his view. In order, however, to assist the ultimate treatment, not only is it desirable to use an insoluble compound of iron, but carbonate of potash should also be added. This is, however, a point of minor importance. The main question is that an absorbing liquid, made of water or a solution of carbonate of potash, to which has been added carbonate or hydroxide of iron, is preferable to a solution of ferrous sulphate if the yellow prussiate of potash is actually made on the gas-works.

The advances which have taken place in this branch of gas manufacture are therefore as follows: In the dry way, not more than 50 per cent. of the hydrocyanic acid could be absorbed; but in the wet way, as much as 80 per cent. Now, however, we are able easily and well to absorb the whole.

#### CARBURETTED WATER GAS AND ITS USE IN COAL-GAS WORKS.

By HENRI SOSPICIO, of Trieste.

[A Paper read before the International Gas Congress at Paris.]

In a paper read by Dr. William Siemens before the Glasgow Science Lecture Association, in 1881, on "Gas and Electricity as Heating Agents," the immediate widespread use of gaseous combustibles was predicted. According to Dr. Siemens, towns would be supplied with two distinct gas services—one for lighting, the other for heating. The first would be produced in the earlier period of the distillation of coal, and the second in the later. If we may now regard this prediction as fulfilled in the case of illuminating gas, the practical methods by which it has been done are not those anticipated. The distinction between heating gas and lighting gas has broken down to a great extent; and the present tide of favour sets in the direction of the production of one gas, possessing a certain calorific power, which can be carburetted direct or can be used without carburetting during a part of the day.

Under present-day conditions—increased production and the higher prices of raw material—economy in manufacture is of the greatest importance to the gas maker, who must devote all his efforts to obtaining the greatest yield from every kilo. of coal. A conversion of 16 per cent. of the carbon in coal is not enough; nor is the transfer of 20 per cent. of the calorific power of the coal to the gas, when a yield of 60 per cent. of carbon and 85 per cent. of calorific power are possible by the use of water gas in conjunction with coal gas.

Water gas was invented in Italy, about the same time as coal gas. Its inventor was Félix Fontana, a celebrated physician, who was born in the Roveredo district on April 15, 1730, and died at Florence, Jan. 11, 1805. In the course of an experiment, Fontana observed that, when passing a jet of steam over a column of coke heated to incandescence, the latter gave off an







According to Strache, the coke required in his apparatus per cubic metre of water gas is given in the following table, which applies to the use of superheated steam :—

Temperature of Air in Degrees Centigrade.	Temperature of Steam in Degrees Centigrade.										
	0	100	200	300	400	500	600	800	1000	1200	1500
1	2.06	2.03	1.99	1.94	1.89	1.84	1.78	1.66	1.49	1.32	1.01
100	1.76	1.73	1.69	1.66	1.62	1.58	1.53	1.42	1.29	1.14	.89
200	1.53	1.51	1.48	1.45	1.41	1.39	1.33	1.25	1.14	1.01	.80
300	1.37	1.36	1.33	1.31	1.27	1.24	1.20	1.13	1.03	.92	.73
400	1.25	1.23	1.21	1.19	1.16	1.13	1.10	1.03	.94	.85	.68
500	1.15	1.13	1.11	1.09	1.07	1.04	1.01	.96	.88	.79	.64
600	1.07	1.05	1.04	1.02	.99	.97	.95	.89	.82	.74	.61
1,000	.86	.85	.84	.82	.80	.79	.77	.73	.68	.62	.53

In small plants, the consumption of gas coke per cubic metre of gas produced is from 0.8 to 1 kilo.; while with large apparatus Strache hopes to reduce the amount to 0.5 kilo. per metre.

The average composition of Strache gas is as follows :—

	Per Cent.
Hydrogen	50
Carbon monoxide	40
Carbon dioxide	4
Nitrogen	5
Hydrogen sulphide	0.40

Oxygen, marsh gas, and iron carbonyl are present as traces.

Hydrogen sulphide is removed from the gas by the usual method of purification with iron oxides, while the iron carbonyl (which would be fatal to Welsbach mantles if left in the gas) is removed by sulphuric acid or by passing the gas through rough iron tubes.

Strache is a strong supporter of the sole use of uncarburetted water gas for lighting either with Welsbach mantles or with Fahnehjelm combs. Welsbach mantles have been used with it for the lighting of the principal hospital in Vienna.

In case of escape, water gas in the pure state is a serious danger—containing, as it does, 40 per cent. of carbonic oxide. It is, therefore, recommended that the gas be given a penetrating odour by the separate introduction of some substance such as mercaptan, or more economically, according to Strache, with the carbilamine of Dr. Jahoda.

The cost of water gas by Strache's process varies with the circumstances of individual cases. Some may have use for the producer gas formed at the same time; others, not. Strache, in his "Das Wassergas," gives data on the cost of installations and working, which have not up to now, however, obtained much currency as standard facts, but which may nevertheless be consulted by those studying the question.

In the Dellwik-Fleischer apparatus water gas is made, but no producer gas. Dellwik, from a consideration of the heat freed by the combustion of a gramme-molecule of carbon to carbonic acid (28,800 calories) and that of a gramme-molecule of carbon into carbon dioxide (viz., 96,000) has endeavoured to avoid the production of carbon monoxide by reducing the depth of the producer, and by regulating the air pressure so as to obtain as complete a transformation as possible of the carbon into carbon dioxide. He thus retains in the producer a much larger proportion of the heat available for the oxidation of the carbon, and so is able to employ the steam-blast for a longer time with consequent increased production of water gas per kilo. of coke

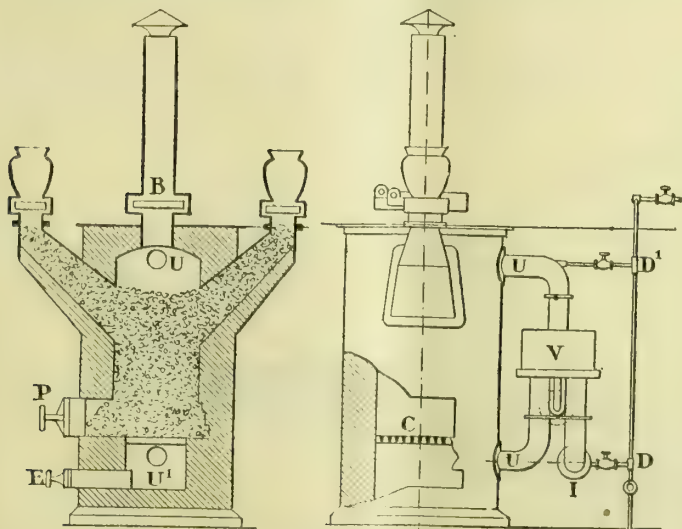


FIG. 2.

The Dellwik-Fleischer producer (fig. 2) consists of an iron generator lined inside with refractory material, and provided with two hoppers for charging, so that the apparatus can be fed alternately from either side. The height of the fuel in the generator is thus kept constant. This is in order to avoid any alteration in the speed of the current of gas. The generator is fitted with a valve B, connecting with the flue for the waste gases; with a furnace C; with two doors P and E, for the removal of clinker and ashes; with two outlets O O, and the

valve V for the escape of the water gas; with two steam pipes D D; and with a pipe (provided with a valve) for the necessary air supply.

The action of the apparatus is as follows: The charge of fuel having been brought to incandescence in the usual way, the injector is turned on at D, and the water gas produced is led off at O. As the temperature is slightly lower in the bottom part of the producer, the injection of the steam is changed by allowing it to enter by the tube D; the gas passing to O. It afterwards finds its way to the purifiers by the pipe J.

These two periods having been concluded, steam is shut off, and the valve V is closed. The valve B is then opened, and the air admitted to the generator. The time during which the air-valve is open is from 1 to 1½ minutes; that of gas-making, 8 to 10 minutes.

The average composition of the gas produced is as follows :—

		Per Cent.
Carbon dioxide	CO <sub>2</sub>	4.65
Heavy hydrocarbons	C <sub>2</sub> H <sub>2</sub> n	0.05
Oxygen	O	0.20
Carbon monoxide	CO	39.65
Marsh gas	CH <sub>4</sub>	0.82
Hydrogen	H	50.80
Nitrogen	N	3.83

With the Dellwik-Fleischer apparatus each kilo. of coke will give 2.48 cubic metres of gas, as is done at Königsberg. The gas produced can be carburetted after purification, either with benzol or naphtha.

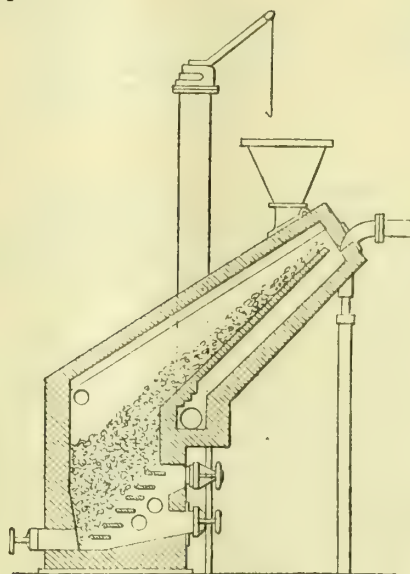


FIG. 3.

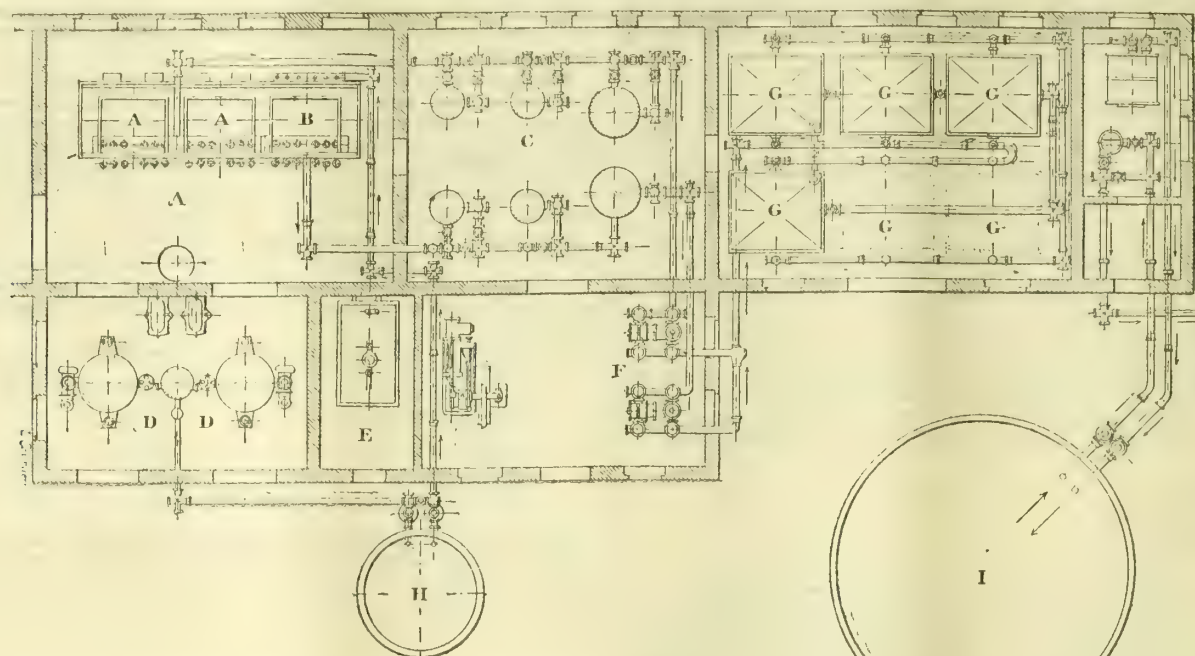
Dellwik has also studied a producer for making water gas, in which fuels containing volatile matters can be used, such as gas coal or lignite. The apparatus is shown in fig. 3. From this it will be seen that the gas produced is forced to pass under the "hearth" on which the coal is spread for distillation—an arrangement devised to prevent caking fuels attaching themselves to the sides of the producer. But having been once converted into coke, the fuel slides gradually down to the bottom of the generator, and is converted into water gas as already described. Very little, however, can be said at present as to the practical working or efficiency of these producers.

The special features of the Dellwik system have led to its extensive use during the past year or two—especially in Germany—in many ways. It is used particularly for producing water gas carburetted with benzol for the enrichment of coal gas.

The water gas produced in the Strache and Dellwik generators, although possessing a high calorific power, has no luminosity, in consequence of the absence of hydrocarbons. This fact makes it necessary to carburet the gas. Two methods of doing this are in vogue: (1) with benzol, (2) with petroleum or naphtha oils. Carburetting with benzol is a simple operation. The benzol is allowed to drop slowly through an apparatus on the Rau system. In the case of naphtha, on the other hand, it is necessary to first mix the water gas with oil gas of sufficiently high illuminating power, and to make a permanent mixture of the two. In order to obtain good results, it must be borne in mind that the carburetting plant ought to pass, in a given time, equal volumes of gas to be carburetted and of the carburetter, and that the temperature of the carburetting plant ought to be as nearly constant as possible.

The apparatus used by Dellwik for carburetting water gas with oil is on the Meyer system, and consists of a setting of four cast-iron retorts arranged in two tiers, one above the other. Those in the lower row are connected with the upper retorts by a chamber at the back of the furnace. The water gas enters the lower part of the retort, through a special valve; and on the same side the oil to be volatilized is injected. At the temperature of about 700° C. (which the retort should have), the oil is volatilized, and mixes with the water gas. The mixture passes through the upper retort, in which the high temperature permanently unites the two gases, giving a product which does not





A. Ordinary Retorts. B. Carburetting Retorts. C. Condensers and Scrubbers. D. Water-Gas Generators. E. Condensers. F. Exhausters. G. Purifiers. H. Compensating Gasholder. I. Storage Holder.

FIG. 4.

deposit oil at ordinary temperature and pressure. On leaving the retort, the gas goes to condensers; then to scrubbers and purifiers; and finally to the gasholder for distribution.

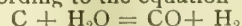
Fig. 4 shows the arrangement which may be added to an ordinary coal-gas plant in order to permit of the manufacture of Dellwik-Fleischer gas.

The quantity of naphtha oil which Dellwik states is required to carburetted his water gas up to a lighting power of 16 candles is 0.268 kilo. per cubic metre. The fuel required in the furnace for the carburetting and the subsequent "fixation" of the mixture, is placed at 0.17 kilo. of coke per cubic metre of gas. The labour necessary for this operation is stated to be about 0.6 fr. per 100 cubic metres of gas; and the product contains 75 per cent. of gas and 25 per cent. of oil. According to Dellwik, 22 grammes of benzol are required per cubic metre to produce a 16-candle gas by carburetting water gas with benzol—using a mixture of 80 per cent. of coal gas and 20 per cent. of water gas. The cost of labour in this case is negligible.

Apparatus making carburetted water gas direct, without separately forming producer gas, is the kind which has hitherto been most used in England. The type of plant is that of Lowe, which has been variously modified in the Humphreys-Glasgow, Merrifield-Westcott, and Cutler installations. As shown in fig. 5, the Humphreys-Glasgow plant consists of three parts—

the generator, the carburettor, and the superheater; the two latter filled with chequer brickwork. The coke in the generator being raised to incandescence, the making of producer gas commences. The producer gas passes to the carburettor, where it meets a current of air at a pressure of about 500 millimetres of water, by which the combustion of part of the producer gas is effected (a valve regulating how far this shall proceed). The products of combustion raise the carburetting apparatus to a high temperature; and along with the unburnt producer gas they pass to the superheater, at the entrance to which they meet with a further quantity of air, so that the complete combustion of the producer gas is thus brought about. They then escape by the flue.

The carburettor and superheater, having thus reached about 950° C., the second stage in the process commences. A jet of steam is turned on at the base of the generator; and this produces water gas according to the equation—



The water gas thus produced passes into the carburettor, so as to mix with a jet of oil (heated by the combustion of the gases in the previous stage). The oil is injected in the form of fine spray on an iron grating at the top of the carburettor. It volatilizes, and is thoroughly dispersed in the stream of gas by the chequer brickwork. The carburetted gas then passes to the

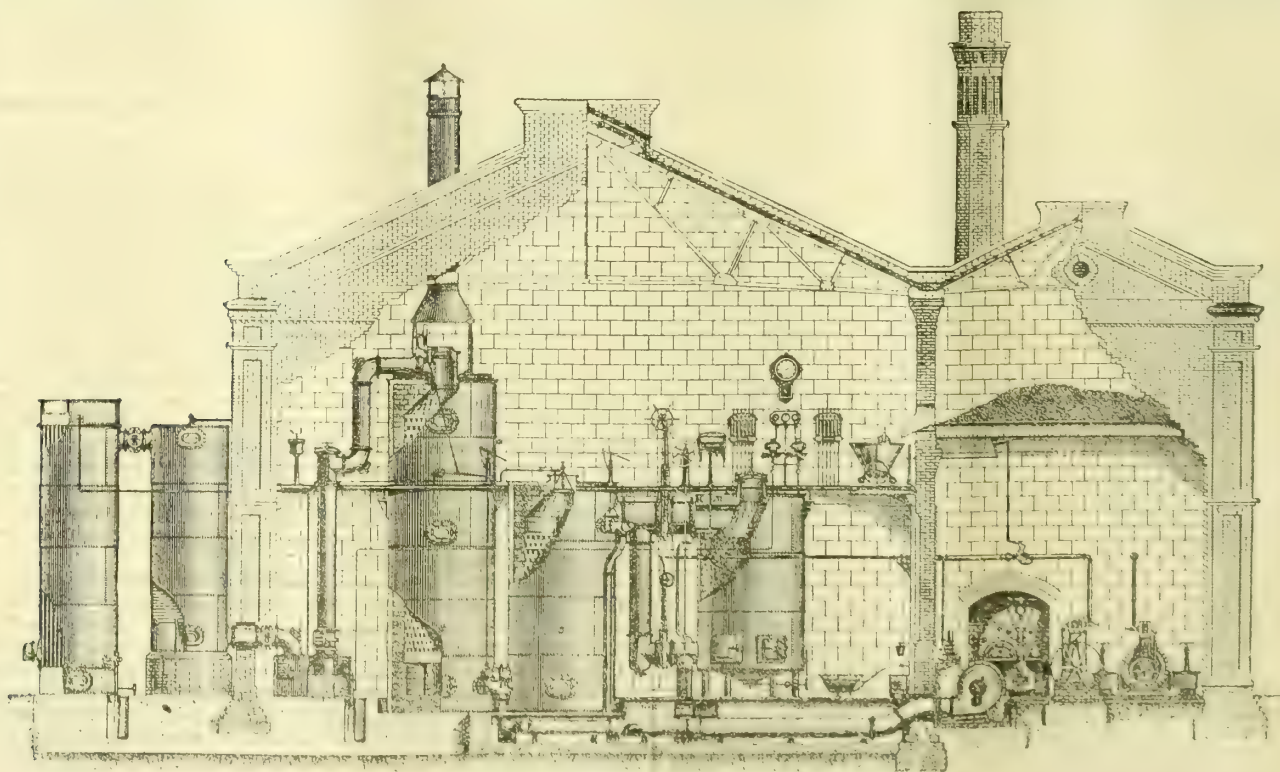


FIG. 5.



superheater, where the hydrocarbon vapours are permanently gasified. On emerging from the superheater, the gas goes through a hydraulic main (to prevent a return of gas from the gasholder) to a washer-scrubber, to a condenser, and lastly to a small gasholder, to which an exhaustor is attached, whereby the gas is pumped to the purifiers or the works meter. As soon as the generator falls in temperature, air injection is recommenced. The first stage lasts from 3 to 4 minutes; the second, from 7 to 8 minutes.

It is easy to see that, by modifying the quantity of oil injected, the illuminating power of the gas can be altered in a few minutes—e.g., from 0 to 30 candles—at will.

The Merrifield-Westcott-Pearson plant is on the same principle as that of Humphreys-Glasgow; it differs only in details of construction.

The mean composition of carburetted water gas, using solar distillate oil (a residue from petroleum distillation) of '850 to '950 specific gravity, is the following:—

Hydrogen. . . . .	H	..	40'22
Marsh gas . . . . .	CH <sub>4</sub>	..	16'80
Heavy hydrocarbons . . . . .	C <sub>n</sub> H <sub>2n</sub>	..	8'72
Carbon monoxide . . . . .	CO	..	28'74
Carbon dioxide . . . . .	CO <sub>2</sub>	..	'00
Oxygen . . . . .	O	..	'14
Nitrogen. . . . .	N	..	5'38
100'00			

For the production of (say) 1000 cubic metres of water gas (16 candles) about 400 kilos. of oil are required; and, in order to further increase the lighting power by one candle, 40 kilos. of oil are required per 1000 cubic metres within the limits of 16 to 19 candles. The coke required per 1000 cubic metres is: For heating the boilers, 300 kilos.; for the generators, 700 kilos.

It should be noted, however, that the boilers can be fed with the tar from the water gas and with the residue from the generators—thus reducing the coke required. A cubic metre of gas can, therefore, be made with a little more than 750 grammes of coke.

Purification is a small matter. From 2'5 to 3 kilos. of oxide may be reckoned for purifying 1000 cubic metres of gas. Labour for a water-gas plant capable of making 35,000 cubic metres every 24 hours (exclusive of purifying) is from six to seven men per shift—including the engine and boiler men.

The space occupied by a works for this make—including purifiers but not gasholder—is about 500 square metres.

A few figures will show the superiority of water gas over that produced by the distillation of coal. Take, for example, a gas coal, such as—

Carbon . . . . .	80'0 per cent.
Hydrogen . . . . .	5'0 "
Oxygen . . . . .	5'0 "
Nitrogen . . . . .	1'5 "
Sulphur . . . . .	1'5 "
Ash . . . . .	3'0 "

Its calorific power will be found to work out to about 8000 calories. Distilled in the ordinary way, about 34 per cent. of volatile matter is obtained, which, after purification and condensation, gives 12 per cent. (by weight) of gas, 68 to 70 per cent. of coke, 5 per cent. of tar, and the rest ammoniacal liquor. The gas will have a heating value of about 12,500 calories per kilo.; and hence there will be scarcely 0'12 × 12,500 = 1500 calories in the gas from 1 kilo. of coal, instead of the 8000 calories in the coal. About 5000 calories remain in the coke, and about 540 calories in the tar. But to obtain these 1500 calories in the gas, there must be used (in the best furnaces) 12 per cent. of the weight of the coal for fuel—i.e., at least 840 calories. So that in the actual process there is obtained—

$$\frac{1500}{(8000 + 840) - (5000 + 540)} = 0'45$$

i.e., a thermal yield of 45 per cent.

This loss is easily explained by the loss of heat through the thick non-conducting walls of the retorts, a fact which according to Lencauchez may give a thermal yield so low as 7 to 8 per cent. in badly constructed furnaces.

In water gas, there is no serious loss by radiation—no non-conducting walls. In the case of a Dellwik-Fleischer producer with 1 kilo. of coke of about 7000 calories, 2'48 cubic metres of water gas (yielding 2500 calories per cubic metre) are obtained. In this case the thermal yield is

$$\frac{2'48 \times 2500}{7000} = 0'88$$

i.e., 88 per cent.

The existence of so high a figure shows that water-gas generators are scarcely susceptible of further improvement in efficiency, and that the only direction for progress is in construction. No other machine gives so high a return of heat. Water-gas manufacture has, in fact, almost reached perfection.

The advantages of a water-gas plant in a coal-gas works are of two kinds—technical and moral. Rapidity of production, such that immense quantities of gas can be turned out in one-third or one-fourth of the time required by other systems, is one. To this, must be added the lower cost (less than half) of producing a given illuminating power by water gas compared with coal gas, and the small space required. Thus the plant can be expanded indefinitely. Then, too, water gas permits those

who cannot sell their coke, or can command but a poor price, to cut down the production of coke to the point at which only enough is made to supply the water-gas plant. The huge mountains of coke too often seen, would thus disappear, and the gas maker would obtain interest on the value of the coke. The use, too, which can be made of water gas as an enricher of poor coal gas, enables cannel or boghead coal to be dispensed with; and the difficulties connected with the high price and poor coke resulting from these coals are thus removed. But perhaps the greatest advantage is in the economy of labour. In order to produce 35,000 cubic metres of gas per 24 hours, six to seven workmen per shift must be employed; while for the mere attention to the furnaces, the coke, and the coal, the same quantity of coal gas, even with inclined retorts or mechanical stokers, will require at least fifteen workmen per shift, and older systems will require considerably more.

The moral advantages are connected with the last-mentioned fact. The labour being small and simple, no skilled workmen are required; so that in case of labour trouble, any men of average intelligence could be at once employed on the work.

There is, of course, the poisonous action of the gas, which is much more powerful in this respect than coal gas. But this is a point that need not be exaggerated. Modern authorities on toxicology agree that there is no danger in its use under certain conditions. Professor Vivian B. Lewes, who was consulted by the Birkenhead Corporation on the disadvantages of water gas, was asked whether it was possible to sanction the distribution of mixed coal and water gases. He made many analyses of ordinary gas, of carburetted water gas, and of mixtures of the two, the results of which are subjoined:—

	Ordinary Gas.	Carburetted Water Gas.	Mixture.
Hydrogen . . . . .	H 47'69	39'44	44'29
Marsh gas . . . . .	CH <sub>4</sub> 35'75	16'99	28'95
Hydrocarbons . . . . .	C <sub>n</sub> H <sub>2n</sub> 4'88	8'23	6'74
Carbon monoxide . . . . .	CO 5'99	29'03	14'49
Carbon dioxide . . . . .	CO <sub>2</sub> —	—	—
Nitrogen . . . . .	N 4'76	6'20	4'46
Oxygen . . . . .	O '95	'21	1'06
Lighting power in candles . . . . .	22'3	22'7	21'3
Density (air = 1000) . . . . .	549	647	—

From these results Professor Lewes concludes as follows:

(1) There is no danger in supplying a town with a mixture of coal gas and carburetted water gas, so long as the percentage of carbon monoxide does not rise above 17. This figure means that (in the case of the gases examined) the proportions of water gas must not exceed 50 per cent. of the mixture. (2) Mixtures containing 50 per cent. or less of carburetted water gas are, under all ordinary conditions, similar in behaviour to coal and cannel gas; for lighting by incandescence and for heating they are much superior.

To this conclusion may be added that of M. Adolphe Wurtz, a Member of the Institut de France, who on June 12, 1878, wrote to Mr. C. G. Franklyn, the President of the Mutual Gas Company of New York: "There is no doubt that the danger of poisoning exists in the case of every gas containing carbon monoxide. Coal gas is not free from this defect; for it sometimes contains as much as 12 per cent. of carbonic oxide. But I believe that the danger, which may be serious in exceptional cases, is in general exaggerated, and need not be taken into account. You have made important progress in the ready production of the gas, and you have produced it with sufficient odour to make its presence known. Any attempt, therefore, to belittle the importance of your discovery seems to me to be reprehensible."

Many other favourable opinions might be cited; but it need only be mentioned that, even in England—where hygienic regulations are of the strictest—the opinion of a Commission of chemists and hygienic experts was taken, and they did not hesitate to allow a proportion of 20 per cent. of carbonic oxide in the gas. This means a larger proportion of water gas than 50 per cent.—a mixture which is not easily produced or exceeded in ordinary practice.

Import duties on carburetted materials have so far retarded the general use of carburetted water gas; but Governments will do well to consider this question. Much of the money passing to mining countries would be spent in districts poorer in fuel.

The general verdict will be that the use of water gas is likely to prove invaluable. Difficulties which now exist will be removed by future research. Thus the exhaustor separator (of Mazza) of mixed gases, based on the separation of gases of different densities by centrifugal force, will be found to have an important application in water-gas technics, as it will enable the excess of carbonic oxide to be removed and used for heating retorts. It is possible, too, that chemical progress will enable the manufacturer to produce with his water gas the hydrocarbons necessary to render it luminous. Then the system will have reached a degree of perfection such as few industrial processes can show.

In summarizing the report of the discussion on the papers by MM. Sospicio and Dicke in last week's issue, it would (as we then stated) have been useless, in the absence of the text of the



first author's communication, to have given even an indication of the criticism passed upon it by Mr. A. G. Glasgow; and we therefore publish a report of his remarks this week. He said he had listened with so much pleasure to the descriptive portions of M. Sospicio's paper, that he sincerely regretted his inability to accept some of the most important figures presented by him. Were the discrepancies of ordinary character, the fine style and thought reflected in the paper would altogether restrain adverse comment on his part. The author entered into what was practically a comparison between two classes of gas-making apparatus—the one, producing blue water gas only; the other, producing carburetted water gas in the one operation. Two sources of error, to which all comparisons were subject, were observable in the present case: First, the conditions were not exactly similar; secondly, the figures themselves were erroneous. He would give the key to his argument by omitting all intermediate steps, and turn at once to the following equation in the paper—

$$\frac{2.48 \times 2.500}{7000} = 0.88.$$

The Dellwik-Fleischer pamphlets claimed to have produced at Königsberg 2.48 cubic metres of gas per kilo. of carbon—not per kilo. of coke. Hence, in accordance with this claim, the efficiency of the generator would be about—

$$\frac{2.48 \times 2500}{8100} = 76 \text{ per cent.,}$$

instead of 88 per cent., as stated in the paper. This, be it noted, was for a simple producer making blue water gas only, which was but one step in the process of carburetted water-gas manufacture. In October, 1890, he (Mr. Glasgow) presented to the American Gaslight Association a completely detailed determination of the efficiency of a carburetted water-gas installation constructed in 1888—more than twelve years ago. This efficiency proved to be 81 per cent. in commercial operation. Each kilo. of carbon produced 2.65 cubic metres of carburetted water gas, or 1.75 cubic metres of blue water gas, *plus* the energy consumed in manufacturing 0.90 cubic metre of permanent oil gas. He might here point out that, when the candle power of the carburetted gas was reduced, thereby decreasing the energy required for the gasification of the oil, the yield of the blue gas should be correspondingly increased; and the art of manufacturing carburetted water gas lay in maintaining the efficiency, whatever were the relative proportions of the blue and oil gases. As the results he had indicated were not in accordance with those given in the present paper, it would be instructive to see where the principal discrepancies came in. The author stated that 400 kilos. of solar distillate oil were required for 1000 cubic metres of carburetted water gas of 16-candle power, and that a further 40 kilos. were required for each additional candle up to 19 candle power—making 520 kilos. of solar oil per 1000 cubic metres of 19-candle gas. This was equivalent to 5.16 candles per English gallon per 1000 cubic feet; and it was to be noted that the analyses showed the gas free from carbonic acid. Now it happened that the plants at both Rotterdam and Utrecht were tested by the respective Municipalities when making gas of about this candle power. The average of their official tests, upon which the acceptance of the plants depended, was above 8 candles per English gallon per 1000 cubic feet—a result 55 per cent. higher than the figures in the paper. He had with him the working oil results of 22 representative installations; and the minimum was 40 per cent. better than the figure quoted by the author, and the average 47 per cent. Furthermore, the paper made no distinction between English and German standard candles; and all carburetted water-gas results hitherto published were expressed in English candles, having a value 20 per cent. greater than the German Hefner candle. With reference to fuel consumption, the paper gave 1000 kilos. of coke as necessary for the production of 1000 cubic metres of gas. This was equivalent to 62.3 lbs. per 1000 cubic feet. He had before him the returns from half-a-dozen installations where the gross coke for both generators and boilers averaged 37.8 lbs. per 1000 cubic feet; and, when a portion of the oil tar produced was burned under the boilers, this figure was reduced to 33.4 lbs. per 1000 cubic feet. The total figure given in the paper was therefore 65 per cent. greater than that frequently obtained in careful practice. Eliminating the boilers, he found that the figure quoted by the author for generator consumption alone was 54 per cent. greater than the average consumption at the twelve towns on the list he possessed. The remarks he had submitted regarding the paper by M. Sospicio seemed to be equally applicable to the *mémoire* of Herr Dicke. But he might add that a very complete discussion as to the relative merits of these processes had already taken place between Herr Dicke and Herr Gerdes, the Chief Engineer of the firm of Julius Pintsch, of Berlin.

Mr. J. MONKHOUSE has been appointed to act for the Corporation of Ossett in the arbitration in connection with the transfer of the undertaking of the Ossett Gas Company.

A rat-hole in the East Park reservoir at Philadelphia has been causing much trouble during the past few months. It was discovered by the appearance of a spring a little distance outside the embankment, which was traced to a burrow into which water passed through the brick and cement lining of the basin.

THE DELLWIK-FLEISCHER WATER-GAS SYSTEM.

By H. DICKE, of Frankfort-on-Main.

[A Paper read before the International Gas Congress at Paris.]

There is no need to inquire here into the history of water gas. The aim of the present communication is to describe the new Dellwik-Fleischer water-gas process, and to allude to the very considerable development which has taken place in this industry since its inception three years ago. The originator of the system is M. Carl Dellwik, an Engineer, of Stockholm; but it has been brought to its present stage of perfection largely through the scientific work of Dr. Fleischer.

The gas produced by this method is practically identical in its composition with that obtained by similar processes. The temperature resulting from its combustion is also the same; and, therefore, the efficiency of the gas for incandescent lighting is also the same, since the luminosity of the incandescent burner is solely dependent on the temperature of the flame.

The following analyses of gas from Dellwik-Fleischer generators are by Professor Vivian B. Lewes:—

Composition of Gas from Dellwik-Fleischer Plant.

	(1)	(2)	(3)
H. . . . .	52.43	50.09	52.76
CO . . . . .	38.30	39.95	37.50
CO <sub>2</sub> . . . . .	4.73	5.38	4.08
O . . . . .	0.74	1.22	0.46
N. . . . .	3.80	3.36	5.20

As these analyses show, the gas is not greatly different from that produced by other systems. The difference in the Dellwik-Fleischer plant lies in the efficiency of the apparatus.

The gas which issues from an ordinary gas-producer is, of course, carbon monoxide, which is burnt to carbon dioxide by a second supply of air. It is the heat produced by this reaction—carbon into carbon monoxide—which is applied to ordinary furnaces; and the combustion of one kilogramme of carbon produces a heat of 2473 calories. In the Dellwik-Fleischer plant, however, the gases emitted from the apparatus, in the first stage of the process, are carbonic acid and nitrogen—*i.e.*, each kilogramme of carbon produces 8080 calories. Therefore, the total heat thus available for the production of water gas is three times greater than in other processes, and hence a yield of 2 cubic metres of gas per kilo. of carbon is obtained—a figure which no other apparatus can equal.

According to the old theory of the combustion of carbon in a producer, carbonic acid gas was first formed, and was reduced to carbonic oxide by the incandescent carbon. But, as has been shown by scientific experimenters, what actually takes place is the formation first of carbonic oxide. It is known, moreover, that when there is no excess of air, only carbonic oxide is produced, as in ordinary water-gas plants worked with a deep charge of coke.

In the Dellwik process, the carbonic oxide first formed is converted into carbonic acid by an excess of oxygen; whence, as stated above, the total heat produced is three times that of any other method. This difference will be seen on comparing the figures of the two processes.

In the producer system:—

	Calories.
One molecule of water = 18 kilos. of steam to be decomposed = 2 × 28,780 . . . . .	57,560
One molecule of carbon = 12 kilos. converted into carbonic oxide . . . . .	28,800
Difference . . . . .	28,760

Thus for the decomposition of 18 kilos. of water 28,760 calories must be supplied.

Let us now assume that, in the first case, the carbon produces carbonic oxide, and in the second carbonic acid; the theoretical quantity of air being used in each case.

	Calories.
A.—Old process—carbon into carbonic oxide: 12 × 2400 . . . . .	28,800
This includes the 16 parts of oxygen, which escape as carbonic oxide at about 700° C.; and hence remove (the specific heat of carbonic oxide being 0.248) 28 × 700 × 0.248 . . . . .	4,860
We must also add 16 × 3.31 (= 52.9 kilos.) of nitrogen, which escapes at 700° C.; 52.9 × 700 × 0.244 (the specific heat of nitrogen being 0.244) =	9,035
Residual heat . . . . .	14,905
B.—Dellwik process—carbon into carbonic acid: 12 × 8080 . . . . .	96,960
44 parts of carbonic acid remove at 1000° C., 44 × 1000 × 0.217 (the specific heat of carbonic acid being 0.217) . . . . .	9,548
52.9 × 2 = 105.8 parts of nitrogen remove 105.8 × 1000 × 0.244 . . . . .	25,814
Residual heat . . . . .	61,598

Thus, for the same consumption of carbon, the Dellwik process yields far more heat.



The high efficiency of the producers has been confirmed by such authorities as Professor Bunte, of Carlsruhe, Professor Vivian B. Lewes, of London, Dr. Lunge, of Zurich, Dr. Hempel, of Dresden, by managers of gas-works, such as Herr Schiming, of Charlottenburg, and others.

After the appearance of the process, competitors declared that they could guarantee a yield of 3 cubic metres of water gas per kilo. of carbon, whatever the fuel employed. But this is impossible, as the following figures prove: Water gas has a calorific power of 2600 calories; and hence the maximum yield possible from the combustion of a fuel of about 6800 to 7000 calories is

$$\frac{6900}{2600} = 2.65 \text{ cubic metres of gas per kilo. of fuel.}$$

Dellwik gas carburetted has already received several applications in gas-works. It has been mixed with oil gas in such proportion as to yield a product of about the same illuminating power and density as ordinary coal gas. With supplementary water-gas plants it is easy to add carburetted water gas to coal gas up to 25 per cent., or more by arrangement with local authorities. The ideal conditions are to have as many retorts distilling coal as will yield enough coke for the production of the water gas.

The immediate result of working in this way would be a reduction in the coal distilled, and a consequent appreciable economy—an important consideration in view of the high and rising price of coal. In addition to this, it would become more possible to be independent of foreign coals and to use a less costly raw material.

On the Continent the system of Humphreys and Glasgow, as well as the Dellwik-Fleischer, occupies a prominent place. The former, which uses oil, cannot be economically worked in France or Germany, in consequence of the heavy duties on petroleum. The cost of 100 kilos. of Russian petroleum is 15.60 marks in Germany; and, in order to make 1 cubic metre of carburetted water gas of 16-candle power, 275 grammes of petroleum are required—i.e., the cost of carburetting is 4.29 pf.

In the Dellwik system, 80 to 90 grammes of benzol are added per cubic metre of water gas. The price of benzol is only 18 to 20 marks; but, taking 25 marks as the outside price, the carburetting works out to 2.12 pf. per cubic metre—i.e., 2.17 pf. cheaper. In France benzol may be taken at 24 marks (30 fr.), and petroleum at 32 marks (40 fr.); and on this basis the carburetting would cost:—

Humphreys and Glasgow . . . . .	8.80 pf.
Dellwik-Fleischer . . . . .	2.04
Difference . . . . .	6.76 pf.

The following are methods of using the Dellwik gas for the enrichment of ordinary coal gas: (1) Separate storage of the water gas in a gasholder, and mixing this pure gas with coal gas before the whole goes to a large holder. The mixture to be carburetted with benzol at the entry to, or exit from, one of these large holders. (2) Separate storage of the purified water gas (carburetted with benzol) in a holder, and mixture of this gas with the coal gas before the whole passes to the principal holder. (3) The water gas may be stored in a holder, and led into the coal gas between the hydraulic main and the condensing plant.

The last method is particularly good in practice, for it is economical of benzol; the water gas taking a portion of the benzol from the tar during its passage through the condensers. The mixture of coal gas and water gas passes through the whole works' plant, and is brought up to the necessary lighting power by benzol before entering, or after leaving, the gasholders.

Königsberg was the first town in Germany to use Dellwik gas, which is carburetted with benzol. The gas-works of this town were in the position of having a gasholder capacity equal to only 30 per cent. of the daily make. This was in 1898; and the new works under consideration would not be finished before 1902. The Manager (Dr. Kinger) on the advice of Professor Blochmann, of the Königsberg University, put up a Dellwik-Fleischer plant, the success of which has exceeded the anticipations of those concerned; and the plant, which was erected for temporary use, is now a permanent part of the works. It has been noticed that, since the installation of water gas, naphthalene deposits have been much less frequent at Königsberg. The gas is carburetted by the second of the methods mentioned above. The mixture contains 20 to 25 per cent. of water gas; and the lighting power of the mixed gas in an argand burner of 32 holes is 18 Hefner standard units at 20 millimetres pressure. The calorific power of the mixture is about 5000 calories. No precipitate of iron oxide has appeared on incandescent mantles; while the results with gas-motors have been very favourable.

Many other German towns have installed similar plant; and the gas has found application, too, in the production of high temperatures—such as in steel-making in the Martin furnace, in the soldering of sheet iron, in making steel tubes, &c. An example of the industrial use of the gas is shown in Paris, in the Palace des Machines, among the exhibits of the Société Anonyme Fitzner et Gamper. Other firms are using the gas for glass smelting, for chemical operations, for driving motors, &c.

It will thus be seen that the Dellwik-Fleischer water-gas plant has rapidly found many industrial uses during its few years of existence.

## THE HISTORY, CHARACTER, AND RESULTS OF THE EDUCATIONAL WORK CARRIED ON BY THE TRUSTEES OF THE GAS EDUCATIONAL FUND.

By ALFRED E. FORSTALL, of New York.

[A Paper read before the International Gas Congress in Paris.]

The idea which finally resulted in the formation of the "Gas Educational Fund" originated in the mind of Mr. Walton Clark, and was brought to the attention of the American Gaslight Association in the presidential address delivered by him at the meeting of the Association held in 1895. In this address, Mr. Clark stated that the chief function of the Association was educational, and was carried out principally through the medium of the formal papers and discussions forming the greater part of the programme of the annual meetings. But, in addition to this education of the members themselves, there was a need of "giving systematic aid to the many boys and men who, without the advantage of advanced education, are struggling to fit themselves for positions of responsibility, while filling subordinate positions in our gas-works;" and in this direction the Association was doing nothing. He continued:

I respectfully submit that the Association is failing of its duty in this matter. There are no gas text-books. As far as I am aware, the only authority attempting the work of setting problems to tax the ingenuity of the gas student is the City and Guilds of London Institute. Its work, while admirable, is insufficient to meet the occasion. The field is broad; the work worthy the best effort of the Association. Its cost in money would be small. Its value to the industry, and to the youth engaged in it, may best be estimated by those of us who have worked our way up from the ditch or the bench without the advantage of a previously obtained education. I recommend to you a Standing Committee on Education.

This recommendation was adopted. A Committee was appointed; and the work was taken up by it under the active direction of Mr. Clark, who was made Chairman. The following extract from a circular issued in February, 1896, gives the outline of the method by which it proposed to accomplish the work committed to it:—

It is proposed to form a class of men and youths occupying subordinate positions in gas-works, or employed as superintendents of small gas-works, to whom shall be mailed, at intervals to be determined later, problems in gas manufacturing and distribution, and questions upon the sciences concerned with the manufacture and distribution of gas, together with suggestions as to the sources of information to be examined in studying the questions involved.

It is proposed to begin the work with but one grade of students—submitting problems and questions of the simplest character, and looking for the success attained to determine the future development of the plan.

The Committee hope that there will be enough of interest manifested to justify an extension of its work to the formation of classes of two grades, and the awarding of certificates of excellency at the termination of a two-years course in either grade.

It is not desired to include in the class now to be formed, students who have had the advantage of advanced or technical education, or of considerable experience in the gas business. The work is intended to "give systematic aid to the men and boys, who without the advantage of an advanced education are struggling to fit themselves for positions of responsibility while filling subordinate positions in gas-works." To stimulate their interest in the work, certain appropriate and valuable prizes will be awarded for the first, second, and third best answers to the examination questions, submitted at a time to be determined by the Committee. The prizes will consist of books, drawing implements, or chemical apparatus.

A class was started along these lines in March, 1896, with a membership of 76, which had been reduced to 44 by October through the failure on the part of the other 32 to answer the questions sent out. The experience gained by the Committee in the actual working of their plan led it to report to the Association, at its meeting in October, as follows:—

The work up to this point has been experimental and preparatory. From the 1st of December next the regular work of the class begins. It is proposed to send out four lists of questions a year, and to have these questions cover the entire range of the duties of the gas superintendent. The Committee believe that the good that can be obtained by a member of the class from work in the class is in but small part the privilege of receiving the answers to the questions. The greater good must come from the familiarity with the books, and from the mental training that he will get from working up his answers. With many of the class, the greatest good of all will probably be the clearing up of ideas that comes from their exact expression in writing.

The Committee referred in one of their circulars to the matter of prizes. After serious consideration, they have come to the conclusion that it will be better to expend whatever money may be at their command in such work as will benefit all of the class, rather than for the purchase of prizes which can benefit but few, and very possibly those who (all things considered) are less needful of assistance. Therefore, with your approval, the Committee will abandon the idea of giving prizes, and will expend such funds as may come into their possession for the purpose in circulating among the members such literature as they may be able to command and think will be of value to the class.

Between December, 1896, and January, 1898, the work of the Committee was carried on with regularity; the number of members of the class varying between 50 and 60. During this time, five sets of questions were sent out. Practically all the work of preparing the questions and the correct answers to them, receiving, examining, and commenting upon the answers of the students, and sending out the questions, answers, and comments



was done by Mr. Clark, who, though he was already a very busy man, was willing to give to the work the time and attention it required of him personally, even with the aid he received from his office force. But even he, though still intensely interested in advancing the welfare of the students and the Association, found himself unable to continue the work after January, 1898; and it was suspended pending the result of an effort to organize it upon another footing that was being made by a Committee of the Council of the Association.

The task set for itself by this Committee was to secure from gas companies, individual members of the Association, and other persons interested in, or connected with, the gas industry, subscriptions extending over a period of five years, and amounting to a sum sufficiently large to enable the payment of a salary that would compensate some competent person for devoting a large portion of his time to the work. The fund so raised was to be administered by a Board of Trustees, appointed in the first instance by the American Gaslight Association, but which after its appointment was to have the power of filling any vacancies that might occur in its membership. The President and the Junior Past-President of the Association were, however, to be *ex-officio* members of the Board. These Trustees were to have full power as to the selection of the person who should have charge of the work, and the handling of the money subscribed to the fund.

The labour of the Committee was successful. It was able to report to the Council, at its meeting in October, 1898, that it had secured subscriptions pledging the payment for five years of a sum amounting to \$3193 per annum (this has since been increased to \$4170 per annum), and that this showing warranted it in recommending the immediate appointment of a Board of Trustees of five members, three of whom were to be permanent and two *ex-officio* members, as specified above. The Council endorsed the recommendations of the Committee, and so reported to the Association, which thereupon gave the final confirmation to the suggestions by appointing the Trustees and committing the work to their hands. It also voted a sum of \$250 per annum to be paid for five years from the general fund as its subscription to the Educational Fund.

The Trustees so appointed effected an organization in January, 1899, under the name "Trustees Gas Educational Fund;" and the educational work was resumed in February of the same year. This work is carried on by means of a correspondence class, membership in which is limited to those employees of gas companies who can secure the endorsement of their applications for admission by a member of the American Gaslight Association, or a subscriber to the fund. No tuition or any other fees are charged. The course of instruction has been made three years in length; the questions and problems set becoming more and more difficult from the beginning to the end of the course. A new section of the class is formed each year; each section being given practically the same course. The method of instruction is as follows.

On the 1st day of January, for instance, a set of twelve questions is sent out to all the members of a section; each section receiving a different set of questions. Answers to these questions, in the preparation of which the student is at liberty to use any and all means of securing information of which he can avail himself (and is encouraged to consult the Secretary upon any points which he does not understand or about which he can find no information), must be sent to the Secretary of the Trustees on or before March 1. The Secretary, who is in charge of the work, examines each set of answers carefully, and makes the necessary criticisms upon them in a personal letter to the student, which is mailed on April 1 together with what are considered by the Trustees to be the correct answers to the questions, and the next set of questions. Any general criticisms applying to the work of the section as a whole are embodied in circular letters. In this way four sets of questions are received and answered by the student each year; all the answers being commented upon by the Secretary.

All the students being, as stated, employees of gas companies, the work done in connection with the class must of necessity be done outside of working hours; and it is, therefore, impossible for them to answer a set of questions in a shorter time than two months. Owing to the number in the class, it is also impossible for the Secretary to give the proper attention to the answers in less than a month's time, which limits the number of sets to one each three months.

The questions deal with practical subjects and with those theoretical points a knowledge of which is necessary in order that the practical problems continually arising in gas-works may be fully understood and correctly solved. It is, of course, impossible to cover with 144 questions all the subjects upon which a gas engineer should be informed; but it is hoped that the effect of the three years' work will be to form in the case of each student a habit of study which, with the knowledge of where and how to find information already obtained, will lead, and at the same time enable him to continue by himself the work begun in the class. Special attention being paid to the exact expression by the student of the idea sought to be conveyed, the training in this direction must also be of great value. In fact, as is stated in the portion of the first report of the Committee on Education previously quoted, the mental training acquired will undoubtedly be of much greater value than the actual knowledge obtained from the answers to the questions, though

it is hoped that these will form, in time, a valuable catechism for use by the student in gas engineering.

There being no inducement for membership in the shape of prizes, or the element of competition, and as membership cannot be maintained unless the student is willing to devote no small amount of his leisure time to the work, it is safe to assume that the great majority, if not all, of the members of the class possess an earnest desire to increase their knowledge of the business in which they are engaged. The fact that since its inception the number in the class has never fallen below 40, and that since the organization of the Trustees it has averaged 100, shows that this desire for increased knowledge is wide-spread among the employees of gas companies. The extent of this eagerness to learn, and the value placed by the students upon the means afforded to gratify it, as shown by the painstaking labour devoted to the work, has surprised even those with whom the idea at first originated. Instruction given by correspondence is necessarily more difficult to impart, and at best less complete, than instruction given by an instructor in personal contact with his pupils; but it is the only possible method of supplying the demand, when, as in this case, the hundred members of the class are scattered over an area of some 2,000,000 square miles.

It would also be better if the money at the disposal of the Trustees would permit the employment of more than one instructor, since more time could then be devoted to a study of the needs of each student, and the efficiency of the work be correspondingly increased. But even as it is, the work of the Trustees has proved of great value, as is shown by the record of the section of the class which completed its course on Jan. 1 last; and as this value is recognized, the size of the Educational Fund will increase, and still better results will be obtained.

I have so far dealt only with the advantages conferred by the class upon the students, and it may be thought by some that the gas companies which subscribe to the Educational Fund are philanthropically spending money for which no return is to be received. It is, however, hardly necessary at this day to enter into any elaborate argument to prove that anything that increases the efficiency of the workers in any industry must, of necessity, prove of immediate and great value to the industry itself; and that, therefore, anything that helps to increase the amount of knowledge of the art of gas making possessed by the foremen and superintendents of gas-works, and by the subordinates from whose ranks future foremen and superintendents must be drawn, cannot fail to return to gas companies increased profits many times greater than the small amounts required from each company to afford sufficient revenue to carry on the educational work in the most efficient manner. The more extended recognition of this truth will doubtless lead to a continual increase in the interest taken by the companies in the work of the Trustees, and to a corresponding increase in the amount of money at their disposal.

Although his knowledge of what is being done in other countries is necessarily incomplete, the writer is under the impression that the class carried on as described in this paper affords the only instance of an organized effort to help and direct students of gas manufacture in their endeavours to acquire the increased knowledge necessary for their advancement in their chosen profession without compelling them to leave their work and gather at some one place to receive the desired instruction. Such a course as that given at Karlsruhe or by the German Continental Gas Company at Dessau does not provide for the great majority of the employees of gas companies, who, though anxious to learn, must acquire their education as best they can in the leisure time at their disposal outside of working hours. It is the need of these men that the Trustees of the Gas Educational Fund are endeavouring to supply by the practical class, with a success that is already encouraging, but the true extent of which time alone can reveal. Is not the example worthy the study of all Associations of gas men with a view to its possible improvement and adoption?

## TECHNICAL RECORD.

### WAYERLEY ASSOCIATION OF GAS MANAGERS.

#### Half-Yearly Meeting at Dalkeith.

The Seventy-Ninth Half-Yearly Meeting of the Waverley Association of Gas Managers was held in the Cross Keys Hotel, Dalkeith, on Thursday last, and was well attended.

The HON. SECRETARY (Mr. A. C. Young, of Kelso) said that, as they were all aware, their President (Mr. W. M'Giffen, late of Earlstoun) had gone to Huntly. He would be unable to be present; but he had sent his address, which would be read. Their first business was to appoint a Chairman for the meeting; and he moved that Mr. A. Bell, sen., of Dalkeith, be asked to take the chair.

Mr. BELL took the chair and returned thanks for the honour.

#### NEXT YEAR'S MEETINGS.

On the motion of Mr. H. RUTHERFORD (Aberlady), seconded by Mr. J. M'LAREN (Duns), it was agreed that the meeting of the Association in April next should be held in Innerleithen, and the meeting in September in Musselburgh.



## ADDRESS BY THE PRESIDENT.

The CHAIRMAN said that, in a way, it was unfortunate that their President was not with them; but, of course, they were all pleased that he had gone to occupy a better position. His address would be read by one of the Past Presidents.

The address, read by Mr. M'LAREN, was as follows:—

Owing to my removal to Huntly, I am sorry not to be able to personally perform the duties of President at the seventy-ninth half-yearly meeting of the Association. Though absent, I thank you sincerely for the honour you have conferred upon me by electing me President.

The subject of my address I will confine to the practical working of the retort-house, which I consider the most important factor in gas making. A good deal of worry and anxiety have been taken off the shoulders of the gas manager during these last few years by the introduction of regenerative settings. But there is still another important part to be considered, and that is the building-in of retorts—more so in small works, where practical retort-setters are not or cannot be employed, being more expensive than the local tradesmen. On this department depends a good deal of the profit-making; for one defective part will ruin the whole year's working. It is very annoying when one comes to light up a setting to find that the heats are not up to expectation; for if anything annoys a gas manager, it is dull heats and leaky retorts. Perhaps your retorts are a little twisted; the bed for same is made level, and as soon as the oven is lighted, the retort collapses, and then and not till then do we see the evil of our neglect. Of course, in works where experienced retort-setters are employed, that alters the case.

Another point I wish to state is the advantage of keeping the retorts clean—in other words, to allow as small a quantity of carbon to form on the retort as possible. Of course, this is rather a difficult matter. But it can be done to a great extent by keeping the mouthpiece clean, and allowing the retort to be well filled every charge, so that the rake or "hurl" may be caused to rub on the roof of the retort, which always tends to keep down any deposit that may arise. Another plan I have found to be very beneficial in profit-making is to slacken the lid of the retort about an inch or so after the charge is worked off, and allow it to remain so for fifteen or twenty minutes (as time will permit) before refilling. This allows a uniform heat to be raised all over the retort; and when refilled the charge is burned off much more quickly, which always helps the make of gas per ton of coal carbonized.

As regards the life of a retort, it is rather a difficult matter to explain, for some of them will last much longer than others. Of course, a good deal depends on the usage they get, and on the amount of heat they are required to stand. In my experience, I have used both English and Scottish retorts; and I have not found much difference in regard to quality. I think, therefore, it is best for every gas manager to test for himself, as some may prefer one, and some another.

In conclusion, there is one thing that must be borne in mind, and that is that cleanliness and tidiness ought to be maintained in the retort-house.

*Discussion.*

The CHAIRMAN said the President's paper was a short but a very practical one. Two or three points were raised in the paper, which were worthy of discussion. Retort-house work, for instance, and the keeping of the retorts clean, were matters which were within the knowledge of them all; and if they would all give their opinion with regard to them, it would be helpful. There was a feeling he had heard of that there was no need for the Waverley Association. He thought there was. Managers of small works had diffidence in expressing themselves in the presence of greater men. They were there a company of managers of small works; and that was, therefore, their opportunity for speaking their mind.

Mr. J. BLACK (North Berwick) said the President had taken a practical view of the matters he had dealt with. He believed that all managers of small gas-works had difficulties to contend with in the building of retorts. In country places these arose greatly from the want of practical skill on the part of those who set the retorts; and he thought it was the right thing that managers of small works should be able to guide a retort-setter, whether experienced or not.

Mr. W. B. M'LUSKY (Perth) thought the matters the President had brought forward were ones upon which he was thoroughly qualified to speak, because Mr. M'Giffen, in his work at Earlston, he believed, held the record in the district for economical retort-house work. He raised the make of gas to an abnormal extent, and reduced the price about 1s. 8d. per 1000 cubic feet—entirely due to economy in the retort-house. He himself had had experience of retorts built by handy men, by local masons, and by experienced retort-setters; and there was no question that the work of the skilled setter was the cheapest in the end. There was no doubt whatever as to the higher duty obtained from settings which were built by a man who knew his work; but there was no doubt, also, as Mr. Black had said, that the manager should be able to guide the retort-setter, so that the best results should be obtained. The regenerative setting was the best and cheapest, even for the smallest works. The initial cost would very soon be recouped. He was bound to speak in the highest praise of the results Mr. Young, who succeeded him at Kelso, had obtained in the retort-house. The results were certainly

better than his were. He had never had any difficulty in keeping carbon off the retorts, even with the very highest heats; and he believed he had had the biggest make per ton possible. His difficulty was in controlling the illuminating power of the gas at the high temperatures. From 10,700 to 11,000 cubic feet per ton was a very ordinary yield from the kind of cannel that was used in the Border district; and managers there should never be content with a make of 9000 cubic feet. In the west country, where common coal or shale was used, 9000 cubic feet was perhaps a very satisfactory make; but that should be no standard for a Border manager, because he handled the best coal—whether he had a small works or a large, and whether he had an exhaustor or not. In Selkirk, he had a rake made to do the work that Mr. M'Giffen spoke of; and the result was that very little carbon gathered in the retorts. What carbon there was could be removed in about ten minutes by using a gardener's squirt. In fact, with it no pinch was required. The leaving of the retort open for about fifteen minutes after the charge was drawn, he did not approve of; and he thought it was a method Mr. M'Giffen would not continue after he had tried another plan.

The HON. SECRETARY said he had to thank Mr. M'Lusky for his remarks with regard to his work in Kelso. In anything he had done there, he had simply been carrying on what Mr. M'Lusky began. The President spoke of cleanliness as being a great matter in the retort-house. Cleanliness meant that some system was carried on. Without system, it was impossible to keep a gas-works clean. They had chemistry in connection with gas manufacture; but they, as practical men, knew that it was in the working of the retort-house that the money was made. And systematic working went very far towards a successful financial record for the year. His experience had been in works where rich cannel coals were used. With high heats, there were large deposits of carbon, which were very difficult to remove unless the retorts had been, from the time they were lit up, thoroughly scraped daily. If the carbon were allowed to eat into the pores of the fire-clay, it was almost impossible to get it to disengage itself; but if the retort were thoroughly scraped, the carbon came away from it in scales. Those who had used a deep furnace with regenerative flues never thought of going back to anything else, and wondered why they had not adopted the system before. Anyone could have such an oven built; and he thought the results he himself had had with it were very much like those of Mr. Ewing, at Hamilton, as related by him in a paper read before the North British Association.\* Mr. Ewing showed them that the existing arches were made to contain the retorts and the regenerative flues, and that he was able to get a yield of over 10,000 cubic feet of gas from ordinary Lanarkshire cannels. His own results were very much like that. He did not think it was necessary, in a small gas-works, to put in an expensive furnace. His furnace was all above ground. He had as much gas from it as he could consume with the air at his disposal. The regenerative flues were 6 in. by 9 in.

Mr. J. TULLOCH (Loanhead) said he had found it always best never to leave retort setting even to a practical man, but to look after him. Often a retort appeared from the outside to be well put in, but it might not be lying right, and so would soon give trouble. He considered it was the gas manager's fault if this happened, and not the mason's. The President spoke about filling the retorts and using a rake which would go back on the upper surface of the retort, and in this way clean the retort while they were drawing it. He did not see how this could be advantageous to the extraction of gas from the coal, because if a retort were filled to its utmost capacity, the make of gas would be deteriorated. As to the opening of the retort-lids and allowing the retort to heat up by the admission of air, certainly a little of that was very good; but if twenty minutes were allowed, he had always found that the little which was gained was lost by the cracks opening again.

The HON. SECRETARY said he remembered that in Perth, some fifteen years ago, with retorts charged with 1½ cwt. of coal, the doors were struck, and the waste gases were allowed to blow off for twenty minutes every day. They had settings of threes; and under every three there were two furnaces. Even with two furnaces they never had heat enough; and the main reason for leaving the doors open was to raise the heat to incandescence for the new charge. If this were attempted now, with regenerative furnaces, they would simply melt the retorts, or bring them to such a state of heat as would vitiate the gas.

Mr. H. RUTHERFORD (Aberlady) very much doubted whether, let the retort be as full as they liked, the rake would clear the carbon from the top. He thought the opening of the doors of the retorts was a mistake, because he believed they would lose far more than they would gain by the opening up of cracks in the retorts, which would have to be filled up again before they could get the quantity of gas they wished. High heats were spoken of; but in regard to trouble with carbon, he thought there was a good deal in the dip of the pipe in the hydraulic main. Too deep a dip he had no doubt caused a great deal of the deposit of carbon in the retorts. He had tried everything—including scraping—but unfortunately he could not get quit of carbon. He had shortened his dips in the hydraulic main, and carbon still gathered. Mr. M'Lusky spoke of spraying with water. This was the first time he had heard of such a thing.

Mr. M'LUSKY said that he would like to emphasize the point.

\* See "JOURNAL," Vol. LXXII., p. 306.



He hoped it would not be understood that he deluged the retorts with water. On the contrary, he had a nozzle on the squirt barely  $\frac{1}{16}$  inch in diameter; and the water was put in with such velocity that it was really a very fine rain shower impinging on the carbon at the point where the tool was working. The stoker knocked off the carbon with a bar. It had always been his practice to give retorts every year three coats of enamel with a fire cement. The first coat was a priming, the second was a little thicker, and the final one was of the consistency of pretty thick paint. The result was that the interior of the retorts was really enamelled. He understood that the son of their Chairman had been getting glazed retorts at Innerleithen, and with very beneficial results. There was no doubt that this operated in somewhat the same way. Doubtless, if every retort were enamelled as he had spoken of, the carbon would come off with the water spray. He believed, with regard to firing, that where many went wrong was in the producer. Most of the furnaces had too big a furnace-bar area. The addition of too much air reduced the heat. He had always had the best results with deep fires, with the producer no hotter than the inside of the retort. This might be taken to be a very dull heat; but, in the chamber above, the temperature was kept at a sparkling heat. He was heating five retorts with one furnace; and he had lately reduced the furnace area to 150 square inches. Many, he presumed, had more than that for three retorts. He had gradually been coming down from an area of 250 inches, with great benefit and saving.

Mr. J. GEMMELL (Melrose) said he found, in starting a new retort, that it was good to have it thoroughly well scraped, to keep down the deposit of carbon; and also that the putting of a little common salt into the coal enamelled the surface of the retort and prevented carbon adhering to it.

Mr. P. BLAIR (Haddington) believed that where there was no exhauster the slackening of the lids of the retorts once a week or so, for half-an-hour, would keep down the carbon. It must not be allowed, however, to go so far as to burn out the cracks. Where there was an exhauster, they might go longer without scraping.

Mr. F. W. CARLOW (Lasswade) said he had tried scraping and the opening of the retorts, to get rid of carbon; but he found that it gathered in spite of all. He now let it grow a certain distance, and then inserted a pipe through the mouthpiece, and opened the ascension-pipe lid on the top. This took off the carbon; and, burning it in that way, he had run retorts for three years. By this method they did not open up the cracks; and no pinching was required. The pipe he used was a 2-inch boiler-tube; and he had never melted it. A strange thing happened to him last winter. He found his hydraulic main pitched pretty thickly. He continued to work it; and recently, when he dipped it, he found the pitch all removed, and a light tarry substance in its place. Of course, in the summer time the heats were reduced. As regarded retort-setting, he believed he employed one of the most experienced setters. He had three retorts in an oven. Let him do what he would, he found that the top retort cracked—a circular crack. It was the top retort which usually gave way first. Yet he watched the building in of them, and had the work done according to the best plan.

The CHAIRMAN explained that his retorts were built in about 12-inch sections; and the section built they were obliged to let dry to such a consistency as would carry the next section. He had had retorts which broke at each section of 12 inches. They could not blame the setter for that.

The HON. SECRETARY said that the burning off of the carbon by means of a pipe was a very common experience in the West of Scotland, where they got tile pipes for about 6d. each. Of course, the pipes were useless when once employed.

Mr. M'LUSKY said that, with regard to using a pipe in this way, the time-limit had always been a consideration with him.

Mr. J. M'LAREN (Duns) remarked that when in Ireland, nine years ago, he was terribly troubled with carbon. On one occasion it was 2½ inches thick. He sprayed with water, and a man poked it. It very soon came away. When he went to Duns, there was very heavy carbon in the retorts. They were then working with 11 inches of back-pressure. This had been reduced to 4 inches; and now, except at the very mouth of the retort, he never had more than 1 inch of carbon.

The CHAIRMAN thought it was wrong in principle to fill the retorts as spoken of. They would all have read Mr. Young's paper, which was printed for the last meeting of the North British Association,\* and also Professor Lewes's really able lecture before the last meeting of the Institution of Gas Engineers.† These were diametrically opposed to the proposal here, because, in order to get the largest volume of gas of high quality, they must have a free space, to allow the radiant heat to act. If a retort were full up to the top, the gas which was made at the back or middle of it had to wind its way through the interstices of the coal. It was in continuous contact with the hot coal. This was not radiant heat, but contact heat; and the gas got broken up, and became crude hydrocarbons. He thought the idea suggested was exploded long ago. With regard to deposits of carbon, Mr. M'Lusky said that with an exhauster there should be almost none. He thought this was a mistake, because the more rapidly the gas came out of the retort, the less time it was exposed to the action, not only

of the coal, but of the surface of the retort. If carbon did grow, his experience was that the better way was not to open the door to begin with. The moment they opened the door, the first particles of carbon—the heat being about 1200°—became carbonic acid. The iron mouthpiece expanded and broke the joint; and this was the way they had leaky mouthpieces. It was a bad practice to open the doors. The burning off of the carbon by means of a pipe was simply taking the oxygen of the atmosphere to the very back of the retort. The moment they did this, the carbon heated up very rapidly. Give it oxygen, and it became carbonic acid and burned away freely. Instead of filling up the retort, would it not be better to charge it in a normal way, and get a rake made with which to scrape the retort every charge. This would save a quarter of an hour's time, and there would be no risk. Instead, they would smooth the surface of the retort. Clay retorts were porous; and they knew that the more porous a retort was, the stronger it was, and there was also more carbon. With the slightest back-pressure, the gases began to find their way through a porous retort; and they burned on the outer surface. Therefore, a retort which was absolutely tight was very much more difficult to heat. He had used glazed retorts for two years. He believed it was his son who first of all asked why it was necessary that gas managers should require to glaze the inside of their retorts, and why the manufacturers did not glaze them while they were burning them. There was now no carbon to sell at the Dalkeith works. Formerly he had 4½ tons of carbon to sell in a year. Last year, with glazed retorts, he had not 2 cwt. If any carbon formed on a retort, all that was required was to touch it, and it fell off and left the surface clean. He recommended glazed retorts to everybody. There was a retort on the market which gathered no carbon; but it was of so fine grain that it would not last a second season. It stood the heat once; but if let down and heated up again, it fell to pieces. As to the depth of dip in the hydraulic main, he thought it was the opinion of everybody that the least possible seal they had the better. With regard to Mr. Carlow's strange experience, it was simply the hydrocarbons taking up the pitch when the heats were reduced. If they wanted to make a good varnish, they had only to mix pitch with naphtha or other light oil. They could reduce pitch by this means; but, in doing it, they would lower their illuminating power.

Mr. H. O'CONNOR (Edinburgh) said his remarks would be somewhat opposed to those of the Chairman. In London, their idea had always been to put as high a charge as possible into a retort, in order to leave the smallest space between the top of the coal and the top of the retort, which was a very hot place, so that the gas as it was made was forced forward, and got away from the heat as quickly as it could. The quickest method to get it away was to leave a small space, so that it had to travel faster, and had not time to play against the heated surface of the retort, and so get burnt up what should be passed on with the gas. This, he believed, was the custom, down to the present time, in most of the works in the South. He had used a tube in retorts—a 1-inch wrought-iron tube 9 feet long—and he never had any trouble. He kept the tube in from 24 to 36 hours; and he got all the carbon removed. Possibly he employed it oftener than in other works, and did not require to use it so long. The question of the durability of the pipe, he thought, depended upon the height of the rising-pipe, according to whether they got a good or a bad draught. If they had a short ascension-pipe, they would not have the same amount of draught, and the quantity of air passing in would not be sufficient to keep the pipe cool. There was an arrangement for putting air into boiler-furnaces which acted in a somewhat similar manner. As regarded Mr. M'Lusky's remarks about the area between the furnace-bars, a method he adopted a good many years ago, with a simple regenerative setting he put up, was—it was an old-fashioned furnace door—to fit a bent iron plate so as to cover over the space where the ash-pan came, in front of the setting, with a bolt at each side of the furnace-frame; and when a stoker, after he had cleaned his ash up, pushed the plate back into its place, the bolts prevented it getting close up to the setting, and they could set it so as to get air sufficient to form carbon monoxide in the setting itself, and to form carbon dioxide where they got the secondary air in. In this way, he managed to overcome the difficulty about the space between the bars. He had seen a great many regenerative settings in small works; and he had come to the conclusion that many of them were really too elaborate—there was too much attention given to the provision of secondary air. He thought much smaller channels would be sufficient to get all the heat that was necessary. Before he left the Beckton works, he used nothing except bricks and tiles to make the regenerative portion of the setting; and they answered most admirably. In one case he had, in a furnace, three retorts 20 feet long; and one furnace did for them all. Of course, the furnaces were very deep; and it was one of the most important points to make the furnace sufficiently deep to have the secondary air, as it entered, formed into carbon monoxide, and, in passing up, formed into carbon dioxide. The only way to get this was by having a considerable depth of fuel in the furnace. This, of course, might be difficult in small works. If anyone was building new furnaces, he should make the arches sufficiently high to enable him to deal with the secondary air in this way. As far as the primary air was concerned, it did not require much heat; but it was well, if they could, to give one layer of the chamber

\* See ante, p. 282.

† See "JOURNAL," Vol. LXXV., p. 1194.



to heat it up. As regarded mason work in the furnace, it was important that the joints should be made very small. A great many masons were not accustomed to fire-brick work and were not careful to keep their joints small enough. Then, a broken edge of a brick should never be laid where the fire had to play upon it. Wherever there was a broken edge of a brick, it at once started burning away. It began to alter its condition and to run much sooner than the surface of a brick which was whole. He thought this had a good deal to do with the breaking down of settings which looked to be thoroughly well laid.

#### VOTES OF THANKS.

The CHAIRMAN proposed, and the meeting agreed, to record their thanks to the President for his address.

Mr. M'LUSKY proposed a vote of thanks to the Chairman for presiding, which Mr. BELL acknowledged.

This concluded the meeting.

#### FESTIVITIES.

The members and friends dined together in the Cross Keys Hotel. Afterwards, through the kindness of the Lothian Coal Company, Limited, they enjoyed a drive through Eskbank, Bonnyrigg, and the policies of Dalhousie Castle, to the Company's "Lady Victoria" pit at Newcastle. They were there met by the General Manager of the Company (Mr. J. A. Hood), the Secretary (Mr. J. Callendar), and a number of officials, who extended a cordial welcome to the visitors, and proceeded to show them over the pit workings, which are the largest and most modern in Scotland. The pit is only a few years old. Its depth is 1656 feet. The winding engine is of 2400-horse power; and there are besides large pumping and ventilation engines. The shaft is employed to draw coal from the new and old workings over a wide area. The output at present is about 1000 tons per day; but it may be increased to 2000 tons. The far-famed Newbattle Cannel is worked from this pit. Mr. Hood explained that the journey to the cannel workings would be so long that it would take an hour-and-a-half to get there and back. It was therefore agreed to be content with viewing the getting of the ordinary splint coal. The visitors were shown the engines, the screening and the washing machinery at work; and those who wished to go down the pit were allowed to do so. Nearly everyone went. The cages, it may be mentioned, are capable of carrying 48 men at one journey. Refreshments were afterwards served in one of a new range of workshops.

The CHAIRMAN proposed a vote of thanks to the Lothian Coal Company for allowing the visit to be made to their works, and for the entertainment they had provided.

Mr. Hood expressed the pleasure they had in making the personal acquaintance of so many of their customers. They were, he said, upon historic ground; for coal mining was begun there seven hundred years before, by the monks of Newbattle, and it had gone on ever since. He was very glad to find that cannel coal was not yet a thing of the past. He believed that, notwithstanding all that had been said about oil gas and the like, cannel would hold its own.

#### PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(Concluded from p. 646.)

Mr. O. M. Gregory, of San José (Cal.), the Editor of the "Experiences" Department, read his report. It commenced by detailing some practical working in connection with the use of a steam-jet exhauster for revivifying oxide *in situ*; and preference was expressed for revivifying at regular and short intervals, rather than letting the material run till a foul test was shown at the outlet of the purifier. A writer described a device for use when it was necessary to work in a poisonous atmosphere, which consisted simply of a 50-feet length of 1-inch hose and a speaking-tube mouthpiece. With the aid of this simple arrangement, he had remained in a pit in which a large quantity of gas was escaping from a broken main for 15 minutes, and could have stayed there for hours. One end of the pipe was left open to the air, the other, to which the mouthpiece was attached, was held over the mouth by one hand. He inhaled through the tube and exhaled from the nostrils.

The contents of the "Question-box" were next examined; and the first item related to the use of gaseous fuel for hot-water radiators. Mr. Britton said he had tried it for this purpose, but found it too expensive. He was, however, supplying gas to a firm for the purpose of generating steam under an ordinary upright tubular boiler; and the installation had proved an entire success. At the outlet from the boiler-flue, he had fixed a super-heater constructed out of about 100 feet run of ordinary 3/4-inch pipe; and in passing through this, the water was raised to 185° Fahr. by the waste gases before entering the boiler proper. Mr. Grimwood said that he had been afforded an opportunity of inspecting the arrangement just described, which consisted of an upright boiler about 6 feet high by 2 1/2 feet diameter. The consumer was perfectly satisfied as regarded his gas bill; and the whole affair was a success. Another question led to a discussion on the respective merits of Welsh, Pennsylvania, Colorado, and New Mexico anthracite. The latter was considered very satisfactory, but there was a difficulty in getting regular supplies.

The Welsh anthracite was said to leave a lot of waste from screenings; and the Colorado coal contained a great deal of sulphur and ash.

The meeting closed with the usual votes of thanks.

#### THE HEATING AND LIGHTING POWER OF COAL GAS.

By T. FAIRLEY, F.R.S.E., F.I.C., of Leeds.

[A Paper Read before the British Association at Bradford, Sept. 11, 1900.]

The consumption of coal gas for heating and gas-engine purposes is constantly increasing, and in populous districts varies from 20 to 50 per cent. of the amount manufactured. Legislation provides a candle unit for measuring the lighting power of gas; but no notice has been taken of variations in heating power. As to the relations of heating and lighting power, opinions differ. On one side, it is said that a high lighting power gas is no better than a lower gas for heating and engine purposes ("Encyclopædia Britannica," Vol. X., p. 102); on the other, a definite relation has been traced between the two (Aguillon in "Compt. Rend.," Vol. CVII., p. 56-58; "Journal of the Society of Chemical Industry," 1894, p. 26).

To obtain the best lighting or heating effects, the apparatus must be adapted to the gas. By ignoring this, either as regards lighting or heating burners or gas-engines, misleading results may be obtained. From an economic point of view, each candle-unit costs so much; and it is a question of price whether the extra candle of 16 over 15 candle gas, or of 17 over 16, &c., is worth the additional cost of production. If the heating power marches with the lighting power, the same consideration applies to the heating value. From a health point of view, the less gas that can be made to supply the light required the better. The introduction of the incandescent and other improved burners shows how much we have still to learn in obtaining light by the combustion of coal gas. The luminosity of incandescent burners is largely an effect of high temperature, rather than of quantity of heat; and I shall not refer to it further in this paper.

Coal gas is a complex mixture, varying in composition with the coal distilled and the conditions of manufacture. Speaking broadly, it is a mixture of hydrogen and marsh gas, with smaller quantities of heavy hydrocarbons, oxides of carbon, aqueous vapour, nitrogen, &c. In ordinary burners, the lighting power depends chiefly on the heavy hydrocarbons. The heating value is also affected by these, but depends mainly on the marsh gas and hydrogen, which form 70 to 80 per cent. of the gas.

In gas made from common coal, with a lighting value of 12 to 17 candles, the heating and lighting values march well together. If any material proportion of air is drawn into the gas before it is consumed, or if the gas first given off from the coal is collected separately from that given off last, the relations of heating and lighting powers are materially affected. Air or nitrogen in gas lowers the lighting power more than the heating power; whereas heavy hydrocarbons have an opposite effect. This latter consideration applies to gas enriched with light petroleum ("carburene") or with benzol, and explains why carburetted water gas has a much lower heating value in proportion than coal gas. In my own and other experiments, its value is lower, by at least 10 per cent., than that of coal gas of the same lighting power. In gas made from the same kind of coal, the heating and lighting powers march together; and a calorimeter kept constantly working may be used to watch the gas, in place of a jet photometer. With mixed gases, it would not be applicable; in that case only a full photometric test would give the true lighting power.

Since gas has been so much used for heating, the measurement of its heating or calorimetric value assumes additional importance. Various calorimeters have been devised by Berthelot in France, Junkers in Germany, and Dowson in this country. The two latter are adapted for continuous working, and are very similar in principle and construction. In both, the products of combustion are made to pass through metallic syphons, so as to give up all their heat to a circulating current of water. Knowing the quantity of water heated during an experiment by so many degrees, the heat units are obtained; and reading the volume of gas consumed during the experiment, the heat units per cubic foot of gas are calculated. In these instruments, the steam produced by the combustion of the hydrogen in the gas is condensed into water. If it is desired to deduct the heat due to this condensation, the water is collected and measured. With such a large surface wet with the condensed water, this correction can only be an approximate one. The amount of water obtained from gas of from 15 to 18 candles averages about 25 c.c. per cubic foot of gas, corresponding to 15 calories, or about 60 British thermal units. The following average results have been obtained with coal gas:—

Lighting Power, English Standard Candles.	Heating Power, British Thermal Units, (Pounds of Water Heated 1° Fahr.)
11 . . . . .	533
12 . . . . .	555
13 . . . . .	578
14 . . . . .	601
15 . . . . .	624
16 . . . . .	648
17 . . . . .	670
18 . . . . .	704

\* Not corrected for steam condensed.



These numbers are comparable with those obtained by Aguitton, but are lower.

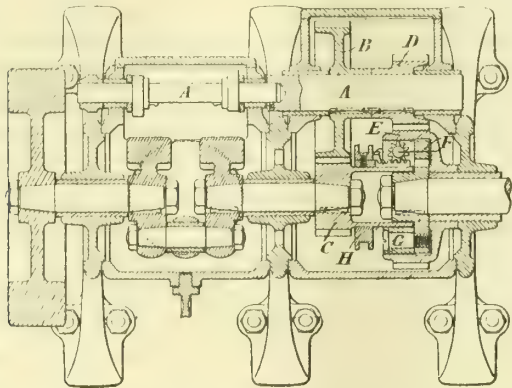
To obtain trustworthy results, the following precautions are useful: The calorimeter should be carefully shielded from all draughts. The gas should pass through an efficient governor; and the water supply should be as constant in pressure as possible, and should leave the calorimeter at a constant level—that of the top of the instrument. It is well to place a mirror under the burner, so that the flame may be seen at any moment. The flame should be clear and steady; and no result should be accepted with a flickering or unsteady flame. In starting the instrument, it is often some time before a steady flame can be obtained; and for this reason the instructions sent out with the calorimeter (to turn off the gas at the meter at the close of an experiment) would be much improved by directing the gas to be turned into a bye-pass past the meter, so that the working of the calorimeter for the next experiment should not be interfered with.

## REGISTER OF PATENTS.

**Variable-Speed Gearing for Gas-Engines.**—Simpson, W. E., of Victoria Street, S.W. No. 12,136; June 10, 1899.

This invention relates to the arrangement of speed gearing shown for use in conjunction with motors working on the "Otto" or four-stroke cycle. It is self-contained with the motor, so as not to require separate foundations or framing.

The usual half-speed cam-shaft A, and a pair of gear-wheels B C, are made of such strength as to be capable of transmitting the whole power of the motor; and on the cam-shaft is mounted a third pinion or wheel D, gearing with a fourth pinion or wheel E co-axial with the motor-shaft. In line with the motor-shaft is a second shaft, upon which is a clutch adapted to engage either with the motor-shaft itself or with the fourth



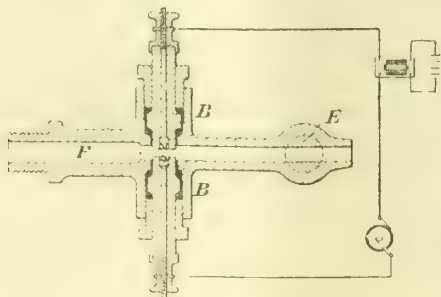
pinion or wheel E, in such manner that the second shaft may be driven at the same speed as the motor-shaft, or at such other speed as is determined by the ratio of the third and fourth wheels D E respectively. The ratio of the first and second gears must be two to one (or a multiple thereof)—as four to one, in which case the cams would be double, so as to give two four-stroke cycles per revolution of the cam-shaft.

The clutch preferably consists of a disc F keyed on the second shaft, a ring on the disc driven or carried by pins G (and split in one or more places), and a grooved collar H adapted to be moved laterally by a lever or other means upon a rim extension of the pinion C, and having racks secured to the collar so as to gear respectively with pinions in the adjoining ends of the segments of the split ring. Thus, when the grooved collar H is moved in one direction, the ring is expanded and forced against the annular extension of the fourth wheel E; while when it is moved in the other direction, the ring is contracted upon the rim extension A of the pinion C.

**Igniters for Gas-Engines.**—Simpson, W. E., of Victoria Street, S.W. No. 12,138; June 10, 1899.

This invention has for its object to render the sparking-points of gas-engine igniters capable of being readily inspected and cleaned.

According to one arrangement, an electrical igniter is formed (as shown) of a barrel or pipe in communication with the cylinder, and having two insulating plugs B (each carrying a sparking-point), preferably arranged diametrically opposite to each other, so that the sparks pass from one to the other across the barrel. The outer end of the barrel is closed by a



plug E (similar to a cock-plug), moveable so as to allow of access to the sparking-points from the outside. An ordinary ignition-tube may also be fitted to the barrel, so that either tube or electric ignition may be used; and the tube may be shut off from the cylinder, when required, by another plug or cock, or by the one E first described. This latter may

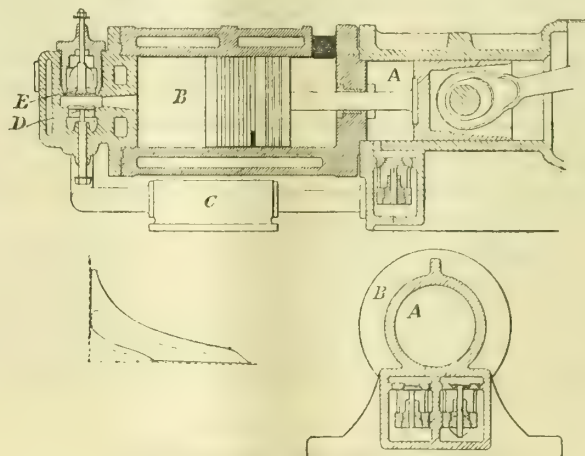
also be used for allowing compressed air or vapour to escape from the cylinder, so as to reduce the compression at starting, and also to remove deposits of carbon from the sparking-points, while the motor is running. For this latter purpose, the passage F is preferably restricted near the sparking-points, in order to obtain greater velocity of the gases in their passage between them.

**Working and Regulating Gas-Motors.**—Abel, C. D.; a communication from H. Eckhardt, of Berlin. No. 16,509; Aug. 14, 1899.

In gas-motor engines of known construction (the patentee remarks), the combustible charge drawn into the cylinder remains in contact with the hot walls during the suction and compression strokes, whereby it is subject to a considerable increase in temperature, which "unfavorably reduces the weight of the charge for each cycle of strokes, and renders it necessary to limit the degree of compression to considerably below the most advantageous end-pressure in order to prevent premature ignition." The present invention relates to a method of operating and an arrangement of parts whereby this disadvantage (which is more particularly felt in large motor engines) is said to be obviated.

For limiting as much as possible the interval of time during which the gas and air mixture is exposed to the action of the hot walls of the engine cylinder, the combustible charge is drawn into a special mixture-pump, and is subjected to a preliminary compression to as high a degree as is possible in an intermediate chamber. By cooling this mixture-pump, or the intermediate chamber, a greater or less isothermal condensation can be obtained. The mixture, thus initially compressed, is led into the engine cylinder from the intermediate chamber, towards the end of the return stroke of the piston, without appreciable reduction of pressure; and it is there subject to the required degree of end-compression by the remaining part of the piston stroke. The ignition of the charge and its expansion then takes place in the usual manner. By thus introducing the combustible mixture into the engine cylinder at a comparatively high initial pressure, the instroke of the working piston which follows the working outstroke can be almost entirely utilized for expelling the combustion gases, whereby the engine can, without difficulty, be arranged to work as a two-stroke-cycle engine.

The cylindrical-guide A is utilized as the charging-pump of the engine cylinder B, in the manner described in patent No. 11,263 of 1899. This pump draws in the combustible mixture, and forces it into the chamber C, which is made of such a size that the pressure of the charge therein is



about equal to one-half the end-compression pressure produced in the engine cylinder. In the latter, the expelling period commences at about nine-tenths of the outstroke of the piston, at which moment the discharge-valve E is opened. The closing of this valve is only effected at about 70 to 80 per cent. of the instroke of the piston; and, in consequence, the engine piston is enabled to expel the combustion gases of the previous working charge from the cylinder B during nearly the entire instroke.

Immediately after the closing of the discharge-valve E, the inlet-valve D for the combustible mixture (which is worked with a positive motion) is opened; and the initially compressed charge now flows from the intermediate chamber C into the engine cylinder B. As soon as an equilibrium of pressure is established in these two spaces, the inlet-valve is closed; and the engine piston during the remaining portion of its stroke brings the charge up to the required degree of end-compression.

At the dead-centre, ignition is effected in any suitable manner; whereupon the combustion and expansion period continues during about nine-tenths of the out-stroke of the piston.

The sooner the gas-mixture admission-valve D is opened, the greater will be the quantity of mixture passing into the engine cylinder, and the higher will be the compression and combustion-end pressure therein. On the other hand, by retarding the opening of the valve, the weight of the charge admitted to the cylinder will be correspondingly reduced. By this means, a convenient method of regulating the power of the engine, by varying the time of opening the inlet-valve, is provided.

With gas-motor engines that require to be worked with comparatively large charges (such as engines operated by generator or blast-furnace gas), the effectual expulsion of the combustion residues from the engine cylinder may be assisted by introducing into it, at the commencement of the expelling stroke, a strong jet of clearing air, and allowing this to act until the discharge-valve is closed, and the introduction of the initially compressed new charge begins.

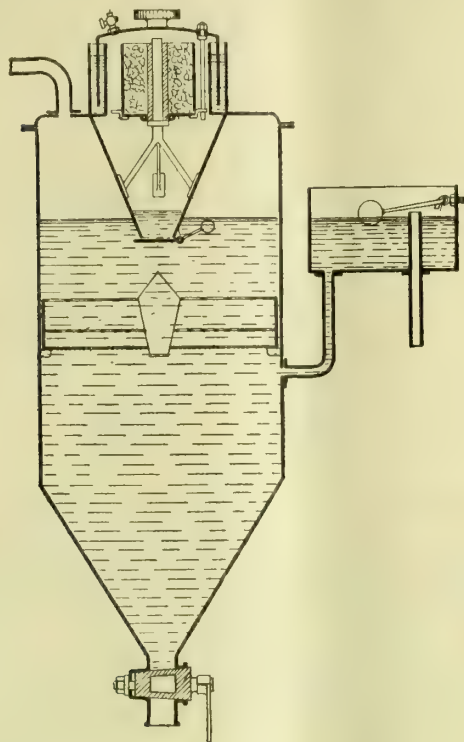
**Generating Acetylene.**—British Pure Acetylene Gas Syndicate, Limited, and Talbot, C. E., of Liverpool. No. 18,556; Sept. 14, 1899.

This invention relates to the class of acetylene generator in which the calcic carbide is allowed to fall into an excess of water—such, for example, as the generator described in patent No. 18,207 of 1896 (granted to Raoul Pierre Pictet); and the object aimed at is "to improve this class of generator, by preventing the escape of the gas generated as the carbide passes through the water in the shoot leading to the generating chamber,



by preventing the loss of gas due to solution in the main body of water, and by certain modifications in the structure of the generator."

As shown, the acetylene generators are constructed as follows: The main body of the generator consists of a cylindrical tank with a conical bottom, the apex of which is closed by a sludge-cock. The tank is partially filled with water, the level of which is maintained constant by a cistern and ball-tap, or other convenient means. The charging chamber is carried from the top or cover of the tank; the portion above the cover having a double wall which forms a deep annulus. The lower portion



of the charging chamber (which passes gas-tight through the cover of the tank) is of conical configuration, and extends so that its apex is just below the water level in the tank; and the opening at the apex is closed by a hinged and counterweighted flap, which normally closes the opening. The charging chamber is closed at the top by a bell-shaped cover, whose deep rim enters the annulus, which is filled with water, and so forms a water seal.

A central fixed spindle is carried by arms from the conical part of the charging chamber; and on the spindle is supported a cylindrical carbide container, divided into four or more separate compartments by radial walls—suitable means being provided to prevent the rotation of the container. The container has an open top, but the bottom of each compartment is provided with a separate hinged door. Each door is normally held closed by a catch; and the catches are adapted to be released in succession, as the bell-shaped cover is rotated. In the tank, and at a level slightly below the counterbalanced flap, a series of transverse grids are supported. The uppermost grid has a coarse mesh; the next grid a somewhat finer mesh; and so on to the lowermost grid, which has the finest mesh. At the centre of the grids is a conical spreader, which serves, as the carbide falls through the flap, to spread it out circumferentially on to the upper grid.

The action of the generator is as follows: When charged, the carbide container is placed in position on the central spindle, and the bell-shaped cover is inserted in place—the vent-cock being opened to allow the air to escape. On giving the cover (say) a quarter turn, the catch of one of the hinged doors is released by a projecting arm on the bell-shaped cover, which allows the carbide in one of the compartments to drop on to the hinged flap. It is thus opened, and so allows the carbide to fall on to the uppermost grid, on which it is spread out. The hinged flap is then closed by its counterweight, which prevents the escape of gas. The larger pieces of carbide are supported by the upper grid; the other portions passing through on to the second grid (of these, the larger pieces are intercepted by the second grid), and so on.

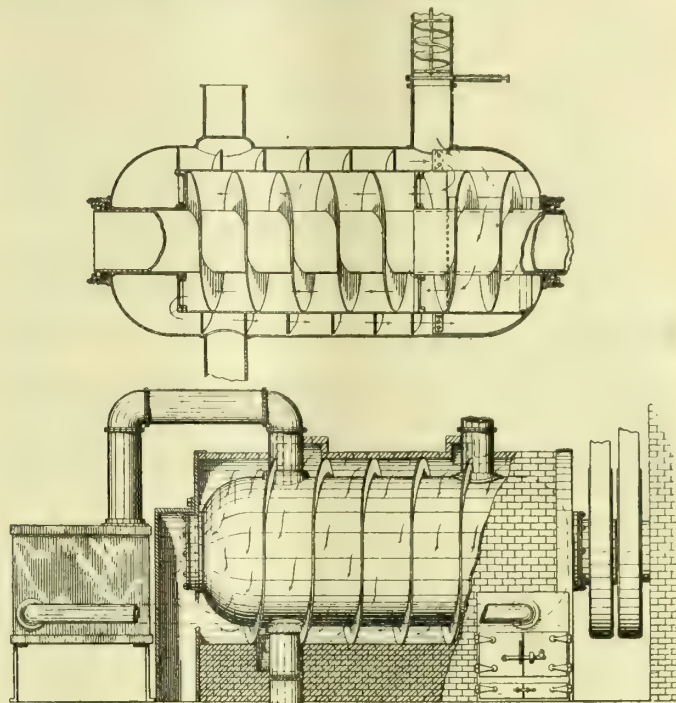
The acetylene liberated from the carbide on the lower grids prevents any caking of lime on the larger pieces on the upper grids, and causes the lime to rapidly fall through into the large volume of water below; and as the water is at rest, the lime rapidly settles to the bottom of the cone, and can be drawn off by the sludge-cock. As soon as the carbide in the first compartment is exhausted, the cover is rotated another quarter turn, the next compartment is emptied, and so on.

**Revolving Retorts.**—Johnson, G. W.; a communication from H. Spurrier, of St. Henri, Quebec. No. 18,825; Sept. 18, 1899.

This invention relates particularly to retorts for use in the destructive distillation of sawdust, although they can be employed in the manufacture of coal gas, and for other purposes. The patentee states that his object is to provide means whereby the substance to be distilled, during the process of distillation will be kept in a constant state of agitation, and each particle be brought at intervals into the area of the greatest heat, "at the same time providing for the most effective collection of the by-products, and the uniform feeding to the retort of the sawdust." The best results are said to be obtained by dividing the chamber or main compartment into a number of sub-chambers or smaller compartments, and causing the substance being treated to circulate from one to the other and alternately through each of the compartments. Better results are claimed to be obtainable from retorts on this principle, "for the reason that the material being treated is always divided (each portion being com-

pletely separated from the other); thus enabling one portion to be agitated to a greater degree than the other portions of the material, and be continually, during treatment, subjected to different temperatures."

The retort (as shown) is completely enclosed in a furnace, the side walls and top of which are built of brick, the ends of cast iron, and formed with bearings—one provided with an opening or flue. A cast-iron box is bolted to this end, and encloses the flue to a point above the bearing. A brick-work bed supports the retort, through the medium of a spirally-arranged vane, which is of sufficient width to extend completely across the space between the retort and the interior of the furnace-casing. This vane provides a spiral flue extending from the fire-chamber at one end of the casing to the box at the opposite end; while access to the fire-place is obtained through the fire and ash-pit doors respectively, carried by a cast-iron frame, which also has an opening to receive the end of a pipe through which the gases are fed to the fire-place.



A condenser is situated near the end of the furnace, communicating through a pipe with the adjacent end of the retort. The opposite end of the condenser communicates with the fire-place by means of the first-mentioned pipe; while a third pipe leads from the bottom of the end next the retort, through the bed, to a water-tank.

The stationary outer cylinder of the retort consists preferably of a tubular section having hemispherical ends bolted to it. These ends are formed with bearings, in which rest the tubular trunnions (in the form of a sleeve) of the open ended inner rotary cylinder, and one end of a hollow shaft, or tube, which extends from the cast-iron box through the hollow trunnion into the chimney. A pulley is attached to the tubular trunnions, and a helix is secured on the exterior of the inner cylinder; the vanes being of sufficient width to allow of their radially outer edges rotating in close proximity to the inner surface of the outer cylinder. The hollow shaft, or tube, has a pulley fastened to it.

An open-topped horizontally-arranged cylindrical section of corresponding diameter to the inner cylinder is rigidly secured to the interior of one end of the outer cylinder by an angular strip riveted at its side edges respectively to the interior of the end of the outer cylinder and to the adjacent end of the cylindrical section. The trunnion is of sufficient length to extend a short distance within the inner cylinder, to which it is rigidly connected by a spider at the inner end, while a second spider maintains the other end of the cylinder (to which it is firmly connected) in its proper position relatively to the hollow shaft. A left-hand helix is secured on this trunnion; its convolutions extending from end to end of the portion within the cylinders, while the inner end is connected to one edge of one of the spider arms, which are set in a plane corresponding to the plane of the helix. A third helix is carried rigidly by the hollow shaft, and extends from end to end of the cylinder, the interior of which it closely fits.

Two vanes are secured by angle-braces upon the exterior of the inner cylinder, diametrically opposite to one another, and at the end adjacent to the open-topped cylinder, along the full length of which they extend.

The surface of the outer cylinder is formed near one end with a dome-like extension, to the upper end of which a pipe is connected to conduct the gases to the condenser; this pipe having a perforated diaphragm secured transversely through it.

A supply-pipe, having a helix mounted therein, and driven from any suitable source, is connected adjacent to the other end of the outer cylinder. It preferably communicates at its upper end with a hopper to carry the supply of sawdust or other material to be distilled; while the discharge-pipe before mentioned enables the residue, after the distillation has been effected, to be discharged.

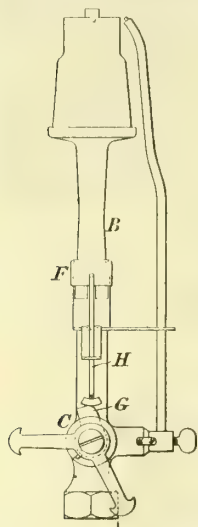
**Gas and Other Fluid Cocks.**—Dickinson, G. W., and Garlick, R. H., of Manchester. No. 24,261; Dec. 6, 1899.

This valve or cock is provided with a taper plug having a hole through the centre lengthwise; also a hole across the diameter and in connection with the first-mentioned hole. One end of the plug is formed so as to be able to be connected by a screw thread to ordinary gas or other piping. The other end of the plug is connected to a tap for regulating the quantity of gas passing through in a given time—a barrel being made to fit the plug so as to form a swivel, and the barrel having connections for taps to regulate the quantity of gas supplied.



**Incandescent Gas-Burner.**—MacKean, W., of York Street, Westminster. No. 20,641; Oct. 14, 1899.

In order to prevent damage to mantles by the shock of the momentary explosion which takes place when the flame is lighted or extinguished, the patentee proposes to so arrange the burner and its stopcock that, in the act of turning on the gas and lighting the flame, the supply of air is cut off, or so far reduced that the gaseous mixture is not of an explosive character, but only becomes so after ignition is effected and the gas is fully turned on. Again, in the act of extinguishing the flame, the mixture is first rendered inexplosive, and then the gas is turned off.

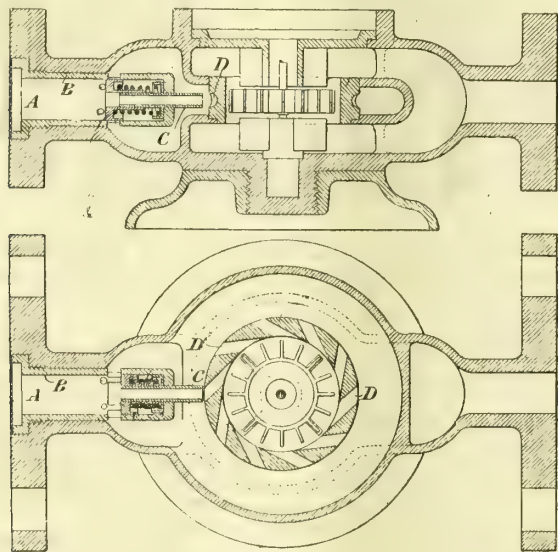


This is effected by using a burner of the form shown. On the burner-tube B is fitted a sleeve F, which can slide over and cover the lateral air-inlets; and on the plug of the gas-cock C is a cam projection G to operate on the end of a rod H, which is attached to the sleeve. When the cock is closed, the air-inlets are covered by the sleeve; and it is not until it is fully opened, and the flame lighted, that the inlets are fully open. In like manner, in turning back the plug of the cock for the purpose of extinguishing the flame, the air inlets are closed by the descent of the sleeve before the gas is fully cut off.

The sleeve, instead of having only its own weight to cause its descent as the plug of the cock is turned, might be urged down by a spring.

**Water-Meters.**—Gernutz, W., and Beschornor, A. M., of Vienna. No. 9285; May 19, 1900.

This invention relates to inferential water-meters, of the kind wherein the quantity of water passing is deduced from the velocity of a turbine actuated by the flow. It has for its object to render such meters "more sensible than heretofore, so that they also measure flows which are smaller than would correspond to the cross-section of the water-way within the instrument."



This purpose is attained by interposing (as shown) in the admission neck of the meter a casing, which forms a diaphragm or cross partition, and from which a narrow pipe extends to the outer end of one of the inclined passages formed in the turbine casing. The diaphragm casing has its sides provided with openings, the total area of which is equal to the cross-section of the water-way, and which are kept closed by a slide-valve or by a clack-valve. Where a slide-valve is used, it is loaded by a spring and connected with a piston, one face of which is exposed to the pressure of the water. If clack-valves replace the slide-valve, they are conveniently loaded.

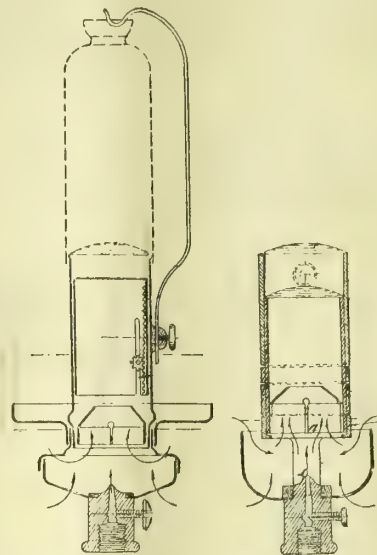
In the case of small flows, there is always a jet of water issuing from the narrow pipe; and as the jet immediately passes into one of the inclined passages of the turbine casing, it is capable of turning the wheel. When there is a strong flow, the slide-valve is displaced by the pressure of the water on the piston, or the clack-valve is opened in the same way, so that the water is allowed to pass through the openings in the sides of the cap-shaped diaphragm.

The cylindrical cap B is so screwed into the admission neck A of the meter that it forms, within the neck, a cross partition or diaphragm. From the bottom of the cap, a narrow pipe C extends into the immediate vicinity of one of the inclined passages D, formed in the casing of the turbine. The sides of the cap are provided with perforations or ports controlled by an annular slide-valve made integral with a piston adapted to work within the cylindrical cap B, and to slide along the extension pipe C inside the cap. A coiled spring tends to keep the piston and valve in their rearmost position, in which the valve closes the ports. When more water flows in than can pass through the pipe C, the pressure of the water pushes the piston forward, whereby the ports are opened, so as to allow the water to pass through them.

**Burners for Incandescent Gas Lighting.**—Delin, G., of Brussels. No. 11,369; June 22, 1900.

This incandescent gas lighting burner is provided with a mixing-chamber, divided by a wire-gauze partition and a coned nozzle or efflux-tube; the chamber being thus divided into three compartments, the heights of which are adjustable to suit the richness and pressure of the gas by shifting the upper and intermediate wire-gauze partitions so as to

quicken or retard the passage of the gaseous mixture. The burner is also provided with a closing-in device surrounding the gas-supply jet, by which the gas-flame is prevented from flickering, "due to the fluctuations of the surrounding air," and which at the same time allows the admission of air for combustion.



The mixing-chamber of the burner (as shown) is provided at its upper end with a wire-gauze partition, at the place where the combustion of the gas takes place. This chamber is divided into three compartments by a lower wire-gauze partition, and a hollow-coned nozzle or efflux-tube. These latter are intended for intimately mixing the gas and air for combustion; but, in order that the mixing may be perfect, it is necessary that the capacities of the three compartments of the mixing-chamber can be regulated. To this end, the cylindrical-shaped portion of the nozzle is split or slit, so that the sections thus formed on the cylinder may act as springs, and press slightly against the inner wall of the tube. By this means, the tube may be fixed in place at any convenient height, and its position can be varied as desired. The conical-shaped portion of the nozzle is intended for retarding the flow of air and gas, the direction of which is indicated by the arrows, so as to obtain an intimate mixing.

The left-hand form of burner has a regulating device for adjusting the intermediate wire gauze or perforated metallic sheet relatively to the upper wire gauze or diaphragm, which is stationary. The tube of the diaphragm contains a rack, which engages with a small pinion, the spindle of which extends through a slot in the tube, and is turned by the milled head. In the other form of burner, the lower gauze diaphragm is stationary while the upper one, and consequently the space between them, are regulated by means of rings of convenient breadth, arranged as a support for the tube of the lower wire gauze. These interposed rings afford the advantage that, regulation once made for any place to be lighted is made permanent, so that adjustment will not be required again.

#### APPLICATIONS FOR LETTERS PATENT.

- 15,204.—TOLSON, J. E., and HAIGH, D., "Gas-generators." Aug. 27.
- 15,229.—DODILET, R., and BERGMANN, E., "Turbines for steam, water, or gas power." Aug. 27.
- 15,242.—POTTER, W. G., "Incandescent gas and vapour lamps." Aug. 27.
- 15,292.—TITUS, E. S., "Production of acetylene gas." Aug. 28.
- 15,315.—SUGG, W. T., "Compressing gases." Aug. 28.
- 15,341.—WERNERT, C. F. J., "Registers for gas-meters." Aug. 28.
- 15,393.—BRADLEY, W. H., "Gas-producers." Aug. 29.
- 15,408.—MARGRETH, J., "Acetylene gas generators." Aug. 29.
- 15,452.—SPOONER, A. F., "Carburettors." A communication from A. Orlandi and J. B. Penne. Aug. 30.
- 15,455.—KERSHAW, H. B., "Heating, cooling, or condensing liquids or gases." Aug. 30.
- 15,462.—TURNER, B. M., and SMITH, R. T., "Mixing air and oil gas, or other combustible fluid, for use in oil gas and like motors." Aug. 30.
- 15,501.—FLETCHER, T., NEIL, A., and FLETCHER, RUSSELL, AND CO., LTD., "Burners for gas." Aug. 31.
- 15,526.—POTTER, W. G., "Compressing gas for incandescent street and other lighting." Aug. 31.
- 15,536.—EVANS, E., "Generating acetylene gas." Aug. 31.
- 15,545.—BOHR, J., "Regulators for gas-burners." Aug. 31.
- 15,550.—MARTINI, A., "Gas-igniting devices." Aug. 31.
- 15,645.—KURZ, F. K., "Carbureting a gas by the vapour of a liquid." Sept. 3.
- 15,654.—MURRAY, E. F., "Acetylene-engine." Sept. 3.
- 15,658.—POWEL, H. C., "Gas and petroleum engines." Sept. 4.
- 15,682.—BROOKS, F. M., "Bunsen burners." Sept. 4.
- 15,712.—JENNINGS, W. E. A., "Governor and enricher of gas." Sept. 4.
- 15,731.—KOMMANDITBOLAGET SVENSSON & CIS. ACETYLENAPPAR, "Generator for acetylene gas." Sept. 4.
- 15,797.—ABEL, C. D., "Two-stroke internal combustion engines." A communication from the Gasmotoren Fabrik Deutz. Sept. 5.
- 15,801.—HASTINGS, G., "Acetylene gas generator." Sept. 5.
- 15,813.—LAZAREFF, P., "Manufacture of combustible gases from hydro-carbon liquids." Sept. 5.
- 15,869.—REA, S. W., "Explosive engines." Sept. 6.
- 15,886.—CARTER, W. T., "Internal combustion motors." Sept. 6.
- 15,892.—FROST, H. H., "Fluid meters." Sept. 7.
- 15,966.—KOWALSKY, P., "Testing gas-pipes and the like." Sept. 7.
- 15,974.—MILNE, J., and O'CONNOR, H., "Coin-freed gas-meters." Sept. 8.
- 16,012.—GASTER, L., "Treatment of tar pitch residues for extracting carbon suitable for electrical purposes." Sept. 8.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Allowance to be Made for Fast and Slow Meters.

SIR,—Your correspondent, "Gas-Meter," is evidently misinformed. A tester passes his 100 cubic feet (or maybe 5 feet) through the meter in dispute, and makes his reading on the test-meter. This, of course, makes your correspondent's letter unnecessary. It is hardly likely that a tester would try to make his reading on an ordinary meter or that the company would make an error in all cases against them.

B. P. P.

SIR,—I have to thank "Gas-Meter" for bringing forward a matter in which I have taken more than ordinary interest, and respecting which I was rather puzzled a few years ago.

"Gas-Meter" points out that the meter in his example is "12 per cent. fast according to custom." But that is not so; and I do not think it would be according to custom to so state the error of the meter.

In passing 100, the meter tested registered 112—making a plus error of 12. It is, therefore, 10.71 per cent. fast. On the other hand, in passing 100, the meter tested registered 88; and is therefore 13.63 per cent. slow. Taking 112 as an exemplary consumption, the adjustment works out thus—

Fast: 10.71 per cent. of 112 = 12. Then  $112 - 12 = 100 =$  the correct measurement and quantity to be charged.

Slow: 13.63 per cent. of 88 = 12. Then  $88 + 12 = 100 =$  the correct measurement and quantity to be charged.

I always test my meters thus, and with the following results: Test-meter, 11.2. Meter tested, 10 = 12 per cent. slow. Then, taking 10 as the exemplary consumption, we have  $10 + 12$  per cent. = 11.2 = correct measurement and quantity to be charged. This example does not agree with some tables I have seen, but which I cannot trace.

W. H. A.

Sept. 14, 1900.

SIR,—In regard to the above question, I beg to say your correspondent has been misinformed. He says he understands it is the custom to pass 100 cubic feet of gas through the test-meter, and if the meter registers 112 feet it would be called 12 per cent. fast. Now if meters were tested on this system, the figures which follow would be correct; but as they are not tested in this manner, the statement is misleading.

It is usual to have a correct instrument to test gas-meters with, generally a small holder; and it is by this that the amount of error is decided. The method is this: The meter is set to a definite point on the test finger of the index. The holder is then set to zero; and when the finger of the meter being tested has made a complete revolution—say 5 or 10 feet as the case may be, according to the size of the meter being tested—a reading is taken on the test-holder. This gives the amount of error; and in making allowances for error, it follows that the quantity fast or slow must be taken or given on the exact amount registered by the meter.

J. TEMPLETON.

Leeds, Sept. 14, 1900.

### Testing the Soundness of Gas-Mains.

SIR,—I have recently laid about 700 yards of 24-inch gas-main; and after connecting it with the governor-house mains by a temporary 10-inch connection, and before blowing out the air prior to connecting the end distant from the works with the live mains, I determined to make a careful test of the soundness of the joints, and the main generally.

A recording pressure-gauge was connected to it by means of a  $\frac{3}{4}$ -inch wrought-iron pipe at about 5.30 p.m. some few weeks ago. The diagram the following morning showed that the pressure had been perfectly regular at zero; but on again examining the gauge at 5.30 p.m. the same evening, I found that the pressure had gradually risen from 11 a.m. to about 20-10ths. This I attributed to the very hot sun during midday. I then decided to leave the gauge another day; and, much to my surprise, the next morning I found that the pressure had risen to 45-10ths, which afterwards I found to have been caused by the blacksmith fitting a key to the valve on the temporary 10-inch connection at the time when the pressure began to rise. I immediately had the valve closed, and about 10 feet of the 10-inch main adjoining the valve flooded with water, so as to render any further trouble from this source impossible. The gauge was still kept in the same position; and gradually the pressure dropped until, two days after the main was flooded, the gauge again stood at zero. But on the third day there was a vacuum of 4-10ths in the main; on the seventh day a vacuum of 20-10ths; and on the fourteenth day a vacuum of 52-10ths. This vacuum has continued now for four weeks at about 4 to 6 inches.

The only explanation I can offer is that, owing to the diffusion of the gas in the main at a greater rate than air can take its place, a vacuum has been set up. I invariably test all new mains immediately after they are laid; but I must confess that this is a new experience to me, and I should be glad of the opinions of some of your readers on this matter.

"PERPLEXED."

Sept. 15, 1900.

**Halifax Corporation Gas and Water Supply.**—The accounts of the Halifax Corporation for the year ended March 31 have just been issued by the Borough Accountant (Mr. James Nicholl). The income from the gas-works amounted to £110,681, and the expenditure to £92,489—a difference of £18,192, as compared with £16,340 in the previous year. The expenditure on the water-works was £47,706; and the income, £51,180—leaving a balance of £3474. From 1856 to 1888, a sum of £86,635 was transferred from the borough fund to make up deficiencies in the water-works revenue. From 1886 to this year, £76,027 has been transferred from the water-works revenue in aid of the borough fund. The net loss to the ratepayers so far, therefore, is £10,608. Formerly interest was added at the rate the Corporation were paying, but since 1896 this has been discontinued. Had interest been still reckoned, the adverse balance would be some £80,000 more. The assets of the Corporation amount to a total of nearly £3,000,000, and include £764,508 for water-works and baths, and £554,348 for gas-works.

## MISCELLANEOUS NEWS.

### SHEFFIELD UNITED GASLIGHT COMPANY.

The Ninety-first Half-Yearly Meeting of this Company was held last Tuesday—Sir FREDERICK T. MAPPIN, Bart., M.P., in the chair.

The GENERAL MANAGER AND SECRETARY (Mr. Hanbury Thomas) having read the notice convening the meeting, the report of the Directors—which was summarized in the "JOURNAL" for the 21st ult., p. 478—was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the net profit for the half year had been £50,001; and after the payment of dividend and interest on debenture stock, it left a balance of £6905 to carry to the balance in hand, the total of which now stood at £28,851, a position which made it, in the present state of the market for coal and other material, a very satisfactory asset. He was afraid, however, that it would not be of the same amount at the end of the present half year. The reserve fund (amounting to £86,848) was at its maximum; and the result of the working had been as follows: The receipts for gas had been £4693 more than they were in the corresponding half year of 1899; for coke, more by £10,709; for tar, £3544; and for fittings, £541; while the expenditure had been less for the repair of works by £1604; and for the repairs of mains and services less by £2615. The Company had been able to curtail their expenditure in these two items very much, because they had expended their money very freely upon them in years past, when materials were lower. On the other hand, their expenditure for coal had been £13,154 more than in the corresponding half of 1899; so that they had already felt very materially the increased price they had to pay for coal. Purifying materials and wages had been more by £653. They had also had some misfortunes, or, at all events, they had felt the result of misfortune which had previously occurred. Their receipts for sulphate of ammonia, although the price had been high, had been less by £2125. He must explain how this occurred. The shareholders were aware that in December, 1899, they had a serious fire at the sulphate works; and although they were fully insured for the damage that was done, they could not make a claim for the loss which was incurred afterwards, and they had had to buy acid instead of making it. This had entailed an extra cost of £1457. Again, they had had also a serious expenditure with leakage in their liquor tank at Grimesthorpe. This tank, 150 feet long by 50 feet wide by 20 feet deep, was unfortunately not made sufficiently strong in construction to resist the pressure upon it; and the loss of liquor suffered thereby had been of the value of £491, while he was afraid that the repairing of the tank would cost four or five times that amount. Then they were unfortunate in having broken pipes on two different occasions at Neepsend, entailing a loss of liquor to the extent of £596; so that their receipts from sulphate of ammonia had been materially affected. Though they had suffered this loss, yet the financial position of the undertaking was, he thought, in no way prejudiced. Their consumption of coal during the past six months had been large, amounting to 130,446 tons. The Directors had felt that, in the face of the large advance in the price of coal they had had to provide for during the coming year, they were compelled to increase the price of gas; and they had done so by putting on 4d. per 1000 cubic feet. This increase would not by any means meet the entire extra expenditure upon coals; yet the Directors hoped it would go a long way towards it. The leakage had been 50,648,000 cubic feet, equal to 3.76 per cent., against 4.34 per cent. in the corresponding half year of 1899. The increase in the consumption of gas was still going forward; and up to the present time this half year, they had sent out 27,347,000 cubic feet, equal to 8.6 per cent., more than during the same period in the corresponding six months. He wished to refer to the incandescent gas-light, and the mode of dealing with it; for in his opinion it was the most economical of all artificial lights in the world. The Welsbach Company had made sweeping reductions in the prices of burners and mantles; and he thought this would ensure the incandescent light being used in greater quantities than it had been before. Everyone who understood that these Welsbach burners only consumed from 2½ to 4 cubic feet of gas per hour, and gave a light equal to from 40 to 80 candles, would, he thought, see the desirability of applying them wherever possible. If they did not, they would not be doing good business and using the best article in the best way. Even at the present increased price of gas in Sheffield, a Welsbach burner consuming 4 cubic feet per hour, cost only 1d. for ten hours. Incandescent gas-light was about as perfect as working hands could make it. The future was, in his opinion, very satisfactory for all gas undertakings. The British Westinghouse Electric and Manufacturing Company were about to establish works in Manchester, to make gas-engines. Mr. George Westinghouse believed that gas-engines would be the most generally used prime movers of the future; and he was a man whose opinion all would recognize as the best and most reliable. The Westinghouse people evidently believed that within a short time gas would be produced in England and Wales at a price far below that which now prevailed in any part of the world. He quite endorsed this opinion; and he would give his reasons for it. Mr. Webber lectured at the Royal United Service Institution in June last, to the Incorporated Gas Institute, on what he called "The New Gas;" and in the course of his lecture, he said: "Come to Germany, where I will show you things that shall be here in due course. It so happens that Germany did not give the Welsbach or the Auer system any patent monopoly whatsoever (as England did). The result has been that the system has for years been worked there, on all hands, strictly on a commercial basis. The manufacture of mantles, burners, and all the accessories, had progressed enormously; and the whole trade was far more advanced and important than it was in any country where a patent monopoly had kept it in one proprietorship. . . . There are half-a-dozen well-reputed makers of incandescent mantles for the German markets. The gas companies get them at from 1d. to 2d. apiece; and the burners cost 9d. A good incandescent lighting fitting, complete with mantle, burner, reflector, shade and Jena chimney can be fixed for 2s. 3d. by the gas companies; consequently German towns are brilliant with the brightest and cheapest light known." He might say something further on this subject. Dr. Auer's invention of the Welsbach burner had done this for Germany; and he



hoped it would do more for this country. In many parts of Germany they were using gas at the present time of from 7 to 9 candle power, which almost compelled the consumers to use incandescent burners. With these burners and mantles, they obtained as good a light as we did in England with our 16, 17, and 18 candle-power gas. Using 3·67 feet per hour with these burners in Germany, the consumer obtained a light equal to 73·66 candles. Parliament would, in his opinion, in the near future pass a Bill that would enable gas companies in this country to have more liberty, more freedom, and which would no longer require them to use the expensive coal and other enriching materials they employed at the present time to keep up their standard of gas to what they had been accustomed to supply. Consumers had the matter in their own hands, if they used the best burners for producing a good light; but if they persisted, as they had done hitherto, in using burners for years, without being at the trouble to exchange them, they must suffer. If, however, an alteration was made in the quality of the gas, then, in his opinion, they would be compelled to use incandescent burners. In Munich, they had replaced the electric arc lamps in their streets by 7000 Welsbach gas-lights. In Berlin, they had replaced arc lights with 35,000 incandescent Welsbach burners, and the principal streets of Paris were lighted in the same way. Liverpool, also, had found electricity too expensive for street lighting; and although the city owned the electric light works, the Council had arranged with the Gas Company to supply the streets with incandescent gas. He was sorry to see the other day that the Sheffield Highway and Sewerage Committee considered it advisable to have the electric light at the sewage works, and that they had instructed the City Surveyor to report as to cost, and to obtain tenders from the Electric Lighting Department. Surely the Sheffield Council were not going to spend the ratepayers' money in such an extravagant way. The experience throughout the kingdom was that arc lights were being given up. He maintained that for the Sheffield sewage works gas-light, at a quarter the price, should be good enough for an undertaking of that kind. The first step in the direction of legislation to permit the reduction of the quality of the gas was the passing of a Bill of the South Metropolitan Gas Company this year, which enabled the Company in the future to supply gas of 14-candle power, instead of 16 as heretofore. The passing of this Bill would be the nativity of a cheap gas supply; and it was the result of Mr. George Livesey's enterprise, and of his common sense. The Sheffield Gas Company were now supplying Welsbach burners, with chimney and mantle complete, for 3s. 6d.; and the mantles were only 7½d. each. They also employed men to pay fortnightly visits to any consumer who had these lights, and who would pay 4d. per light per month for the attention given, which included new mantles when required. He was sorry to say that the Company's troubles with naphthalene had been very great again this year—not so great as in 1899, but certainly a source of much anxiety and worry. Their efforts had not been relaxed in endeavouring to cope with the difficulty. Only in the last three weeks, however, had they had much confidence in their hopes being realized, that they would find out the cause of the trouble. He believed they had now discovered it. They had found that the foul mains at each of the works, which were used for cooling the gas before it was sent to the purifiers, had all been placed inside the retort-houses; and during the hot weather they had not had the effect they should have had—in fact, they had cooled the gas very little. It was now believed that the naphthalene trouble had arisen from this. They had inquired what other companies were doing; and they had found that companies who were not troubled with naphthalene had most of their foul mains placed outside the retort houses. Now that this had been discovered, he had confidence that in the near future they would master the naphthalene difficulty, and thus reduce trouble and anxiety that not the Company only, but also consumers in many parts of the city had experienced.

Mr. EBENEZER HALL seconded the resolution.

Mr. JOHN WILSON asked whether the Directors had had before them the question of adopting penny-in-the-slot meters, of which he understood that over 100,000 were in use successfully in the South of London, to the great advantage of working-class consumers.

The CHAIRMAN replied that he did not think there was any other city in England that had as many 2-light meters for gas consumers as Sheffield. There were more than 30,000 such meters, which were practically the same as penny-in-the-slot meters. The price of Sheffield gas was so low that there had been no application for the penny-in-the-slot system; and he did not think there was any call for it at present.

Mr. HANBURY THOMAS mentioned that the companies who sold gas through slot meters added about 9d. per 1000 cubic feet to their ordinary price for gas delivered in this way.

The report was then approved, and the dividends recommended were sanctioned.

On the motion of the CHAIRMAN, seconded by Mr. H. K. STEPHENSON, it was decided to convert the 25,357 Class "F" £3 fully-paid shares, into £76,071 Class "C" stock.

The retiring Directors (Mr. W. G. Blake, Mr. R. A. Hadfield, and Mr. H. K. Stephenson) were re-elected; and the meeting ended with a vote of thanks to the Chairman for presiding.

#### HASTINGS AND ST. LEONARDS GAS COMPANY.

The report and accounts of the Hastings and St. Leonards Gas Company (which were noticed on the 4th inst.) were submitted at the recent meeting of the shareholders by Dr. Gray. In the course of his address, he said the last half year had been an exceptional one, especially for gas companies, owing mainly to the war and its direct and indirect effect upon business. Coal had gone up to such an extent as certainly never had been the case during his connection with the Company; and he believed that not since the Crimean War, when the Company obtained their first Act of Parliament, had it been so high, while, according to some authorities, it never had been at its present price before. This was due, as he said, largely to the amount of coal which had been used by the War Office for transports, to the scarcity of labour at the pit's mouth, consequent upon the calling out of the Reserve men, and to the large demand of industries owing to the impetus given them by the war. At the last meeting he told the shareholders that their contracts for coal,

and for freightage, were, unfortunately, running out in June; and unless the price of coal fell, or unless there was a speedy termination of the war, they would have to renew contracts at a considerably increased rate, which would materially affect both the price of gas and the dividend. The result of renewing the contracts under the advance had been that they had to pay 80 per cent. increase on coal, which was equal to 9d. per 1000 cubic feet of gas. They also had to pay an increase of 6d. a ton on freightage, and the many commodities a Gas Company has to deal with. To meet the increased price of material, the Company had raised the price of gas, as from July 1, by 4d. per 1000 cubic feet. Dealing with items in the accounts, Dr. Gray pointed out that, under the heading of public lighting, there had been an increase of £65. They could not expect to have much in the future, because the Corporation had given notice to discontinue a considerable number of the lamps, which were going to be superseded by electricity. This meant to them no small loss in the supply of gas, as unfortunately they had to supply the lamps for the benefit of the town; and when they were discontinued, they were of no use. It would represent a loss of £800 to £1000 on what they had expended. If the Corporation had been called upon under similar circumstances to make a loss, there would have been a great outcry, especially as there was no need for the great outlay. It would be quite easy for the Company to supply an incandescent gas-burner giving a better and more diffused light, and at less cost than the Corporation would have to pay for electricity. Instead of this, they were doing away with gas, and superseding it with electricity, even at greater expense; and in order to get it done, they had to underestimate the cost of the work, and say it would be £13 or £14, when, as a matter of fact, they were charging £50 for existing lamps. Thus the Corporation were placed on the horns of a dilemma. They got out of the difficulty by saying that they had a white elephant, and must use it whether or not it cost more. The experience of large towns would some day be the experience of this; and the ratepayers would refuse to pay more than they could get as good an article for at another place. The report was adopted; and, among other business, the salary of the Secretary was increased £50 per annum.

#### AUSTRALIAN GASLIGHT COMPANY.

The Annual Meeting of this Company was held on July 30—Mr. GEORGE J. COHEN in the chair.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the Directors' report was presented. It stated that the profits for the six months to June 30, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, amounted (with the balance brought forward) to £54,677; and the Directors recommended the payment of a dividend of 9s. per share, which would absorb £51,135, and leave a balance to be carried forward of £3542. The Company commenced supplying gas to the new district on the Milson's Point Line on May 24; but the unfavourable state of the weather of late had somewhat militated against the extension being availed of by intending consumers. To meet the great demand for "penny-in-the-slot" gas-meters, arrangements had been made for fitting up one hundred houses per week. As a result of the introduction of the meters, 5300 new consumers had already been added to the Company's books. The greater part of the carburetted water-gas plants for Sydney and Mortlake was to hand; and the remainder of the machinery was expected shortly. It was in view of these and other contemplated extensions that additional land was recently purchased at the Company's head station, from which half of the gas made is being supplied. The Engineer (Mr. T. J. Bush) reported that the Company's plant has been maintained in good condition.

The CHAIRMAN, in moving the adoption of the report, said that the past year had been a very satisfactory one, with the exception that the Early Closing Act had somewhat curtailed the consumption of gas—more particularly among small shopkeepers, many of whom had had to give up their establishments in consequence. With regard to the North Shore extension, he said the work was going on fast; and he hoped to be in a position at the next half-yearly meeting to say that the return on the outlay there was even greater than was anticipated. The penny-in-the-slot meters were in such demand that the Company intend to double their output during the next half year. The consumption of gas for the past half year had considerably increased; and these meters were accountable for the increase to a very large extent. The Chairman then went on to say the Company had no intention of transferring the machinery at the head station to Mortlake; on the contrary, new and extensive machinery for carburetted water gas manufacture was now in course of erection. The number of public street lamps was 10,131, showing an increase of 159 lamps for the half year. There were over 10,000 gas-cookers in use; and the number of consumers was stated at 43,216. The increase in the mileage of mains and service-pipes for the year was 96 miles; the total amounting to 1381 miles. In conclusion, the Chairman feelingly referred to the death of their late colleague (Mr. John Rae), who held a seat at the Board for twelve years, and was seldom absent from their meetings. Possessing a genial nature, his presence would be greatly missed by the Board.

The motion was seconded by the DEPUTY CHAIRMAN (Mr. S. Dickinson), and carried unanimously.

The eleven retiring Directors were re-elected, and Mr. A. A. R. Maxwell was elected in the place of Mr. Rae. The retiring Auditors were also re-elected.

A vote of thanks was carried by acclamation to the Directors and Officers of the Company for their efficient services during the past year.

**The Gas Storage Question at Middlesbrough.**—The question of gas storage at Middlesbrough (to which reference has been recently made in these columns) occupied the attention of the members of the Town Council in Committee for two hours last Wednesday. The points under discussion were whether a new holder should be provided, or No. 5 holder be repaired, and so avoid the expense of the former. Finally, it was resolved to instruct the Manager to continue taking the levels of No. 5 holder, and report to the Committee until further notice.



### THE GAS SUPPLY OF TOKIO, JAPAN.

The Engineer of the Tokio Gas-Works, Mr. S. Hiramatsu, who is at present in England, where he intends residing for a few months, supplies an interesting statement as to the position and prospects of the Company.

He says: The Tokio Gas Company are, and will remain, the only establishment for gas supply in Tokio, the capital of the Japanese Empire, for the reason that circumstances do not admit the appearance of a rival. The city has more than 1,500,000 of population, and this is increasing year by year. The Company was established 25 years ago. At first its productive capacity was only 60,000 cubic feet per diem; it is now capable of producing 1,570,000 cubic feet—an increase of about 26 times. This increase has been accomplished by expansions effected on several different occasions. The last such extension work was begun in June, 1897, and completed in December last. It was the most marked; for by it alone the daily productive capacity was increased to the extent of 1,150,000 cubic feet. The demand for gas, however, is increasing by about 50 per cent. every year—chiefly caused by the increasing use of gas for cooking, heating, and in motors; so that the Company is compelled to make another large extension.

At present, the Company have three works, whose capacities are as follows: The first works is capable of producing 1,030,000 cubic feet of coal gas per diem. There are four benches of horizontal single retorts, each bench consisting of four arches of seven retorts; and a bench of inclined retorts, consisting of eight arches of seven retorts each. The holder capacity is 860,000 cubic feet. The second works has a daily productive capacity of 324,000 cubic feet. There is a bench on the old system, consisting of five arches of seven retorts, and a bench of inclined retorts of three arches of six retorts each. The holder capacity is 130,000 cubic feet. The third works is the most newly erected. It has a daily productive capacity of 225,000 cubic feet. There is a bench of inclined retorts here consisting of three arches of six retorts each. The holder capacity is 125,000 cubic feet.

These productive and holder capacities are altogether capable of meeting the demand till next winter, according to the past experience as to the rate of increase of consumption. In order to make the supply sufficient for the subsequent increase of consumption (which, as above mentioned, is striking), the Company have decided to undertake the following work in the course of the next five years: At the first works they will replace the four benches of single retorts with a carburetted water-gas plant of the capacity of 1 million cubic feet per diem. This plant has already been ordered of the Economical Gas Apparatus Construction Company. At the second works a bench of single retorts will be erected, consisting of six arches of seven retorts each. All the machines and apparatus required are to be utilized from those taken down at the first works. They will also add a retort to every arch of the inclined retorts, and replace the 20,000 cubic feet holder with one of 120,000 cubic feet. It is also intended at the third works to add a retort to every arch of the inclined retorts; to erect a bye-products plant to deal with the ammoniacal liquor and tar; to erect a coal-gas plant of the capacity of 700,000 cubic feet per diem; and to erect a holder of the capacity of 1 million cubic feet.

The situation of the works being remote from the "up town" section of the city, a gasholder of the capacity of 500,000 cubic feet is to be erected at a suitable point, in order to supply gas to the district; and pipe connections are to be made to each of the works, so that the gas from any of them may be stored and supplied there.

The cost of the extensions (including mains, services, meters, &c.) is estimated at yen 3,150,000,\* and this sum is to be met with yen 2,100,000 accruing from a call on the shareholders and yen 1,050,000 of loan.

The Company is of opinion that another larger work of extension may yet become inevitable soon after the completion of the present undertaking, which it is estimated will not be for about five years.

Some figures from the accounts for the half year ended June 30 will be interesting: The coal carbonized amounted to 14,467 tons; and the gas made, to 145,088,100 cubic feet, or 10,029 cubic feet per ton. The quantity of gas supplied to private consumers was 99,027,126 cubic feet, for gas-motors 15,892,780 feet, and for street lighting 7,087,613 feet—making a total sale of 122,007,519 cubic feet. The amount of gas used on the works and unaccounted for was 22,481,581 cubic feet. Of coke there was 9609 tons produced, and of tar 135,044 gallons. There are 177 miles of mains, which supply 10,533 consumers, 242 gas-engines (1234 brake horse power), and 1130 street-lamps. The authorized capital of the undertaking is yen 2,100,000; and of this amount yen 1,890,000 has been paid up by the 454 shareholders among whom the 42,000 shares are divided. The capital value of the works and plant is yen 1,065,339; and the reserve funds amount to yen 200,000. The gross profit realized in the period referred to was yen 188,793.

### DISTRESSING CASE OF GAS POISONING AT TOTTENHAM.

A case of gas poisoning involving a whole family, and resulting in the death of father and son, occurred at Tottenham during the past week. The deceased are Mr. John Sanders, a house decorator, of 34, Markfield Road, Tottenham, and his youngest son Arthur. The full circumstances surrounding the lamentable occurrence were no doubt revealed at the inquest last evening; but in the meantime inquiries have disclosed the following particulars: Mr. Sanders, his wife, and two sons, had lived in the house for upwards of four years, and were supplied with gas, through a shilling-in-the-slot meter, by the Tottenham and Edmonton Gas Company. Last Tuesday the old meter was removed on account, it is stated, of faulty registration, and a new one was fixed. A shilling's worth of gas represents 270 cubic feet, which would be exhausted by the constant use of one burner in about 54 hours. In the house, however, were four burners and a gas-ring, though to what extent these were in regular use, the survivors—Mrs. Sanders and her elder son—had not, at the time of writing, sufficiently recovered from their more or less dazed condition to be able to state with anything like reliability. Nothing amiss appears to have been noticed until Thursday, when a Mr. Clarke called several times during the day; and being

unable to make anyone hear by ordinary means, he finally knocked very loudly, with the result, as he says, that the elder son (John) came and opened the door in a dazed condition, and asked for a doctor to be called. Dr. Edward Hutton was immediately fetched; and John was then found unconscious at the foot of the stairs, while a strong smell of gas was permeating the house. Further investigation discovered the father lying in his bedroom on the floor dead, Mrs. Sanders in bed in the same room unconscious, and, in another room, the younger son dead in bed. It is said that a glimmer of gas was burning in the front room where Mr. and Mrs. Sanders were, and that the means of ventilation had been very considerably lessened by the blocking up of the chimney in one room with a bag of shavings, and the register in the other was let down. Our last information stated that the mother and son were making good progress towards recovery.

### THE LEAMINGTON GAS-WORKS PURCHASE QUESTION.

#### The Position of the Corporation Defined.

The difficulty over the gas-works transfer question at Leamington, raised by the Corporation desiring to withdraw their notice to purchase, is not yet, judging from published information, any nearer settlement; but the Corporation have had their position clearly defined, and that is a step in the right direction. In a letter dated July 25 last, the Solicitor to the Gas Company (Mr. J. W. Hassall) writes to the Town Clerk in these terms: "The proposal made by you, for the Company to release the Corporation from the notice to purchase the gas-works, came before the Directors at their meeting yesterday; and it was fully discussed. It is, however, too clear for argument that the sale and purchase is a statutory obligation, which nothing but another Act of Parliament could release the parties from, and to this the Directors feel they cannot assent. They do not, however, wish to hurry the Corporation in the matter, and have postponed the appointment of an Arbitrator until their next meeting, which will be held the last week in August." Writing from the office of the Association of Municipal Corporations, Messrs. Sharpe, Parker, and Co. thus advise the Town Clerk: "Your Council cannot withdraw their notice to treat without the concurrence of the Company. They need not, however, proceed under their notice, unless they are compelled to do so by the Company obtaining a *mandamus* against them." These communications were included in the report which the General Purposes Committee submitted at the meeting of the Leamington Town Council yesterday week; but Alderman Wackrill mentioned that they would be unable to take any action on that occasion. A special meeting was called for yesterday to further consider the letters, and it was expected a report would then be made upon them.

### THE COST OF REMOVING GAS-LAMP COLUMNS FROM STREETS LIGHTED BY ELECTRICITY.

An interesting controversy is proceeding at Windsor regarding the question whether the Town Council can compel the Gas Company to remove the gas-lamp standards from streets which are now being lighted by electricity. The cost of doing this, which is the main factor in the dispute, is variously estimated at from £250 to £300. A Committee of the Council have met a Committee of the Company's Directors, and talked over the matter; and, in practically identical terms, cases have been laid before Mr. Macmorran, Q.C., on behalf of the Council, and before Mr. Shiress Will, Q.C., and Mr. Danckwerts, Q.C., for the Company. Mr. Macmorran is of opinion that the Council can compel the Company to remove the columns; while Mr. Shiress Will and Mr. Danckwerts are equally confident that they cannot. Under the circumstances, the Council are in a quandary; and the best course to take is not altogether clear to them. Various suggestions have been made to get the issue definitely determined. One is that the matter should be jointly submitted to another Counsel, whose opinion should be final and binding. A second proposition is that a special case should be stated for the decision of the Queen's Bench Division of the High Court of Justice. Neither proposal has yet been adopted. During the discussion of the matter, it has transpired that lamp standards in Eton have been removed at the request of the District Council, and that the Council have paid the Company for the cost of removal £1 in the case of standards and 10s. in the case of brackets. Upon these terms, the Company are willing to remove all or any of the lamp-standards in Windsor; the Council to bear the expense of reinstating, if required. The Council, however, will not agree. The end of a discussion on the matter at their last meeting was that the question was referred to a Special Committee, consisting of members not interested in either Company.

### CARLISLE CORPORATION GAS AND WATER UNDERTAKINGS.

#### Gas-Works Extensions and the Annual Report.

The minutes presented by the Gas and Water Committee at last Tuesday's meeting of the Carlisle City Council contained the information that Mr. Corbet Woodall had met the Committee and discussed with them the question of the extension of the gas-works so as to meet the increasing demands of the city either by (1) the development of the existing works; (2) extension at Boustead's Grassing; or (3) the erection of a carburetted water-gas plant. He had promised to submit his report upon the existing works, and the best means to be adopted for increasing the quantity of gas made, as early as possible. The annual report and accounts, from which we gave particulars last week, were also submitted.

Mr. CORBETT, in moving the adoption of the report, said that the gross gas profits showed a falling off to the extent of £2600 as compared with last year, although the consumption of gas had increased about 2 per cent. The gross gas profits came to £7090, as against £8760 last year. This was almost entirely due to the increase in the cost of coal. The net profit, after paying interest and meeting the redemption of loans, was £4513, as against £6713 last year; being £2200 less. The residuals were much better than they were last year. The number of consumers had increased by 574; and there were now about 6474 ordinary meters,

\* The Japanese yen is about equivalent to the U.S.A. dollar—say yen 5 = £1.



and 3250 slot meters. The abolition of meter-rents had reduced the revenue from this source to £450 this year; and next year there would be no revenue from meter-rents at all. With regard to the net profits of £4513, the Committee felt, and he hoped they would approve of the course, that the sum should be left in their hands, in order to meet the heavy strain which would be brought upon the finances in the current year owing to the great increase in the cost of coal—about 50 per cent. If the sum were not left in the hands of the Committee, there would be a great deficit at the end of the year; and this deficit would have to be made good by the Council, or the price of gas would have to be raised. On the other hand, if the Council left it at the disposal of the Committee, the income and expenditure next year would probably about balance each other; at least, he hoped any deficiency there might be would not be much. The water accounts showed a gross profit of £5783; and after paying interest and redemption of loans, a net profit of £4461 was available for the district fund—about £300 less than last year, owing mainly to the increased cost of fuel and extra repairs, and also the cost of a new pump which had been put in.

Mr. COULTHARD, in seconding the motion, said the accounts were not quite so satisfactory as they had been in some past years; but still, when they took everything into consideration, the gas and water works had proved a great boon to the city. In looking over the figures, it would be seen that the net profit from the gas-works the past five years had been £27,851, and from the water-works during the same time £19,284—making a total of £47,035, or an average of nearly £9500 a year, which at the present rateable value represented about 1s. 1d. in the pound. He hoped by the end of next year coal would be reduced in price, and they would again return to prosperity.

The motion was agreed to.

Mr. CORBETT, replying to a question later in the proceedings, stated that the amount expended in investigating the River Gelt and other probable sources of water supply from the year 1895 until parliamentary proceedings had been about £600. This amount had been expended with the sanction of the Water Committee, who had directed the investigation to be made, and had been charged to the revenue account of the department in the years in which it was expended.

### NOTTINGHAM CORPORATION GAS SUPPLY.

#### The Results of the Year's Trading.

In presenting their report to the Nottingham City Council for the twelve months ended March 31, the Gas Committee point out that, though the weather during that time was not at all severe, the consumption of gas increased enormously; the excess of output over the previous year being no less than 125 million cubic feet. This is the highest increase which has ever taken place in any year during the existence of the undertaking. The total quantity of gas sold was 1,742,154,300 cubic feet, as compared with 1,617,055,700 cubic feet the previous year. The Committee had to pay £17,256 more for coal than in the previous year; but fortunately this was more than recouped by the higher prices received for residuals. The coal contracts have since been let at varying increases up to 5s. per ton advance on last year's prices; and as the top of the market had already been reached in residuals, the Committee have been reluctantly compelled to raise the price of gas by 4d. per 1000 cubic feet, to cover the increased cost of coal. The amount realized from the sale of gas last year was £209,317, compared with £194,489 received, being an increase of £14,828. The sum of £2260, withdrawn from the Giltbrook depreciation fund in 1898-99, for the purpose of renewals, has now been refunded; and £1000 has been written off capital for depreciation of stoves, as compared with £500 the previous year. The net profit for the twelve months was £26,038. Of this sum £24,000 will be paid to the Finance Committee (by order of the Council) in aid of the expenditure of the municipal year; and the balance will be carried to the annuity redemption fund.

Appended to the Committee's report was one by Mr. W. R. Chester, M.Inst.C.E., the Engineer and General Manager, on the works and manufacturing operations during the year to March. It states that the plant, machinery, and buildings at the various works have been kept in good repair throughout the year.

The work in connection with the conversion of retorts in No. 2 retort-house at Eastercroft (commenced last year) has now been completed, and the apparatus put into successful operation. The installation includes the conversion of sixteen beds of horizontal retorts, which were formerly worked by hand, into a like number of beds of inclined retorts wholly worked by mechanical power. This is the most complete installation in existence, and the first in which the whole process of carbonizing is done by mechanical means from the point where the coal enters the works in trucks until the coke is loaded into trucks ready to leave again, sorted, sized, and in good marketable condition. The retort-settings, which were formerly heated by two furnaces to each, will now be heated by one only; and it is expected this will result in a considerable saving in fuel.

At Basford works the output of gas has already overtaken the capacity of the existing plant and machinery, most of which has been taxed to the utmost limit during the past winter. Before any increased output of gas can take place, it will be necessary to make some rather extensive additions to, and enlargements of, apparatus at these works. The foundations for a third section of retorts in the new retort-house are already being put down; and contracts have been let for two additional steam-boilers. These must be followed by an enlargement of purifiers, exhausters, condensers, and station-meters, and, finally, by additions to the gas-holder storage capacity.

At the Radford works gas making has been discontinued during the summer months on account of the high cost of production at these works compared with Eastercroft and Basford, where the apparatus is so much more modern and efficient. The works will be put into operation again in the early winter.

The renewals and enlargements of the acid and ammonia plant at the Giltbrook chemical works, which were commenced last summer, have all been completed; and with one or two exceptions these works are in a high state of efficiency. Additional boiler-power is needed, and also a duplicate saturator for the ammonia plant.

The alteration to the tramway lines has necessitated some extensive

alterations to the gas-mains along the respective routes; and these are now being carried out.

The average illuminating power of the gas for the past year has been 1872 candles; and the sulphur compounds have been kept down to 27.49 grains of sulphur per 100 cubic feet of gas.

The total mileage of mains is 306.83; there having been 5.32 miles added to the canalization during the year. The number fixed to March 31 (including 364 lamp-meters), was 46,551; being an increase of 1887 meters on the previous year. Of these, 43,895 belong to the gas department, and 2656 to the consumers. The demand continues for prepayment or "penny-in-the-slot" meters. At the end of the financial year 8034 of these meters were in operation, an increase of 1487 on the previous year. The application of gas for trade and domestic purposes, other than lighting, continues to increase. There are at present in use about 6935 gas cooking stoves, 7011 gas-fires, and 452 gas-engines, besides a large number of other appliances of almost every description, which have not been numbered. Of the 6935 cookers in use, 5654 are rented from the department, and 935 supplied with automatic meters rent free.

*Analysis of the Accounts for the Years ending March 31, 1899, and 1900.*

		1899.	1900.
Coals carbonized	tons	167,011	184,487
Gas made	cubic feet	1,715,760,000	1,853,377,000
" sold	"	1,617,055,700	1,742,154,300
" unaccounted for	"	98,704,300	111,222,700
" "	per cent.	5.75	6.00

	Amount.	Per Ton of Coals.	Amount.	Per Ton of Coals.
EXPENDITURE.	£	s. d.	£	s. d.
<b>Manufacture—</b>				
Coals . . . . .	78,329	9 4.56	95,585	10 4.35
Purification . . . . .	5,346	0 7.68	6,630	0 8.63
Salaries . . . . .	1,916	0 2.76	1,946	0 2.53
Wages for carbonizing . . . . .	22,190	2 7.89	24,855	2 8.33
Repairs and maintenance . . . . .	27,822	3 3.98	37,632	4 0.96
<b>Distribution—</b>				
Salaries and wages . . . . .	6,228	0 8.93	6,280	0 8.17
Repairs, &c., mains and services . . . . .	9,266	1 1.32	10,178	1 1.24
Repairs, &c., meters . . . . .	5,637	0 8.10	5,219	0 6.79
Repairs, &c., stoves . . . . .	3,732	0 5.36	4,843	0 6.30
<b>Lamp Fittings—</b>	23	0 0.03	233	0 0.30
<b>Rents, Rates, and Taxes—</b>				
Rents and acknowledgments . . . . .	526	0 0.76	521	0 0.68
Rates and taxes . . . . .	10,475	1 3.05	10,657	1 1.86
<b>Management—</b>				
Salaries . . . . .	3,168	0 4.55	3,236	0 4.21
Collectors . . . . .	2,252	0 3.24	2,337	0 3.04
Stationery, printing, &c., . . . . .	795	0 1.14	830	0 1.08
General establishment charges . . . . .	483	0 0.69	521	0 0.68
Auditors . . . . .	110	0 0.16	110	0 0.14
<b>Law Charges—</b>	21	0 0.03	48	0 0.06
<b>Bad Debts—</b>	401	0 0.58	354	0 0.46
<b>Total expenditure . . . . .</b>	<b>178,720</b>	<b>21 4.83</b>	<b>212,015</b>	<b>22 11.81</b>

	Amount.	Per Ton of Coals.	Amount.	Per Ton of Coals.
RECEIPTS.	£	s. d.	£	s. d.
<b>Sale of Gas—</b>				
Private consumption . . . . .	184,776	22 1.53	199,174	21 7.11
Public lights . . . . .	9,713	1 1.96	10,143	1 1.19
Rental of meters . . . . .	6,313	0 9.07	6,405	0 8.33
" stoves . . . . .	2,137	0 3.07	2,383	0 3.10
<b>Residual Products—</b>				
Coke and breeze . . . . .	24,109	2 10.64	32,133	3 5.80
Tar and its products . . . . .	12,807	1 6.40	17,946	1 11.35
Sulphate of ammonia . . . . .	7,192	0 10.34	15,182	1 7.75
Refuse lime, &c. . . . .	917	0 1.32	1,051	0 1.37
<b>Distribution materials (meters and services) . . . . .</b>	<b>2,672</b>	<b>0 3.84</b>	<b>3,059</b>	<b>0 3.98</b>
Stoves, gas-fires, &c. . . . .	960	0 1.38	1,258	0 1.64
Rents . . . . .	461	0 0.66	508	0 0.66
Sundries . . . . .	34	0 0.05	89	0 0.11
Annuities . . . . .	31	0 0.05	31	0 0.04
<b>Total receipts . . . . .</b>	<b>252,122</b>	<b>30 2.31</b>	<b>289,362</b>	<b>31 4.43</b>

At the Monthly Meeting of the Nottingham City Council yesterday week, Alderman Barber moved the adoption of the Gas Committee's report—a motion that was seconded by Alderman Truman, and carried without discussion.

### DANGEROUS GAS PENDANTS.

[From the "Lancet."]

If we do not go so far as to say that the "gas chandelier," or water-slide pendant as it is called, should be made illegal, we certainly think no prudent householder should put one of them into his house. It is never at any time, by any twist of the imagination, ornamental; it frequently occasions alarm; and in not a few instances it has been the cause of death. As everyone knows, the principle of this "chandelier" is that of a water-seal, which, of course, fails when there is no water in it. Few people remember to replace the water, which easily evaporates in a warm atmosphere. Even supposing, however, that there is water in the sliding-tube, the chains supporting the weights which keep the pendant in position may easily get defective; and thus the bracket may drop below the water-seal, and the gas be allowed to escape. This is probably what happened in the melancholy occurrence reported from Birmingham last week [see *ante*, p. 660]. It was shown that a water-slide pendant had become defective owing, not to want of water in the tube, but to the flimsy chain fittings. These defects accounted for the



death of a man, and very nearly that of his wife. Both had retired to bed in good health; but before the morning they were poisoned with the escaping coal gas, which doubtless they had inhaled during most of the night. We have before recorded cases of this sort; and surely it is time that this clumsy contrivance known as the "chandelier" should be banished. It is a most dangerous fitting, and quite unnecessary in view of the improved modern appliances which are now made for conveying gas from the supply-pipes to the burner. A good deal has been said of late against the increasing practice of carburetting gas—a method which raises the proportion of carbon monoxide very considerably in illuminating gas. It is said that gas of satisfactory illuminating value could not be supplied without recourse to this plan; for not only are all kinds of coal more expensive than formerly, but the supply of the more bituminous varieties is distinctly running short. It must be remembered that coal gas is poisonous under any circumstances; and, that being so, care must be enjoined in its use. But the fact that our present supply of coal gas does contain much more carbon monoxide than was hitherto the case, warrants more forcibly our argument in favour of the abandonment of the "chandelier."

### GAS EXHIBITION AT MANCHESTER.

An interesting Gas, Industrial, and General Illuminating Exhibition was opened on Monday last week at St. James's Hall, Manchester. The General Manager of the undertaking is Mr. Thomas G. S. Hersey, who was the organizer of a similar exhibition held at the Royal Aquarium, Westminster, last winter; and most of the firms who exhibited on that occasion are again represented by specimens of their productions. The inaugural proceedings, a full account of which appears below, presented a somewhat novel feature in the fact that, while the Chairman of the Manchester Corporation Gas Committee (Alderman Gibson) performed the opening ceremony, the head of the Electricity Committee (Alderman Higginbottom) occupied the chair; and further proof of the active interest taken by the Manchester Corporation in the enterprise is furnished, at one of the stands, in a special exhibit which has been prepared by Mr. J. G. Newbigging, the Engineer to the Gas Department, to illustrate the methods whereby gas can be tested and analyzed. The exhibits are divided into a number of classes, including gas cooking and heating apparatus, gas lighting, gas plant, gas plant photos and models, acetylene gas apparatus, samples of bye-products, gas coal and cannel coal, and the testing and analytical appliances already mentioned. In addition to the exhibits at the various stands, the Manager has arranged for a series of cookery lectures to be delivered by Miss Sylvester, the Principal of the Leamington School of Cookery; and the Band of H.M.'s Royal Horse Guards (Blues), under the conductorship of Lieutenant Charles Godfrey, is engaged, by permission of Colonel Lord Binney, to give musical selections daily. The exhibition will close in Manchester on Sept. 29, and will be continued in Bristol in November next.

In the gas cooking and heating section, one of the most prominent displays is that of Messrs. Fletcher, Russell, and Co., who show a large selection of their new and standard designs in heating and cooking appliances, comprising combined gas and coal kitchen ranges, close-fire ranges, coke grills, mantelpieces, overmantels, copper and brass interiors, with tiled panels, gas-fires in Victoria bronze, nickel, and gold finishes, gas cooking-ranges, carving tables with overhead dish-covers, gas-governors, gas soup-boilers, gas greenhouse boilers, gas stockpot stands, and gas water-heaters. Messrs. S. Clark and Co. have a good display of their patent "Syphon" stoves, which dispense with the necessity for a flue, and, it is claimed, produce the heat of a coal-fire at the cost of 1d. for three hours' burning. At the stand occupied by Messrs. Richmond and Co. is to be seen a varied group of this well-known firm's specialties in gas heating and cooking apparatus, including both designs which are already secure in popular favour and new ones for the coming season. It may be mentioned that the firm are just now introducing, in connection with their slot cookers, a new detachable gas-bar, which enables the taps to be readily taken out for cleaning or other purposes; and a further novelty is an improved attachment to prevent lighting-back where water gas is used in connection with gas-fires. The firm have also opened a special department at Warrington, for large cookers, for hotels and institutions, adapted for either steam or gas. The Davis Gas-Stove Company draw attention to their Manchester Metropolitan "L.B." cookers; and the Manchester Gas-Cooker, Limited, show the patent "Hygienic" gas cooking-range. The Cannon Hollow-Ware Company's exhibit includes all their latest improvements and designs in gas-cookers, grillers, &c.; and in connection with the "Chef" and "Hercules" cookers, special stress is laid on the fact that they are fitted with the "Porceliron" oven linings and crown plates, which, it is claimed, are practically indestructible. Messrs. Wilsons and Mathiesons have a grill, in which the radiating plate is constructed with two separate supplies of gas, one to each side of the burner, so that either half can be used independently.

At the stand of the Matchless Gas Lighting Syndicate are shown the latest improvements in their self-lighting apparatus. The ignition agent in this self-lighter has recently been greatly improved; and it is stated that it will now remain active for two to three years without attention, instead of about twelve months as previously. The mechanism has also been greatly simplified by the adoption of a specially constructed two-way tap. When this is turned full on, the gas is switched to the ignition-jet. The tap is then turned half-way back, which switches out the ignition-jet, and lights the burner. In addition to ordinary and incandescent indoor lights, the Company show a street lantern worked on the same principle. In this arrangement, the lamp-lighter has simply to push up a lever as far as it will go, and wait for the ignition-jet to light by the action of the igniting agent. This jet is placed close to the mantle; but the lever which actuates it is underneath, and outside the lantern. The advantage secured is that all the mechanism is outside, and there is no necessity to put any torch or lighting arrangement into the lantern itself. In conjunction with Messrs. Richmond, the Company are showing their self-lighter as applied to gas-fires, in which a small tap is used for lighting the ignition-jet, and a larger one for turning on the main supply to the stove. The Company are also introducing an adjustable nozzle for Welsbach "C" burners, whereby the pressure of gas can be regulated so as to secure the greatest possible effective lighting power in the mantle. An interesting

novelty among the exhibits of the London and Manchester Sanitary Patents Company is a new patent connection for gas and other pipes, by which washers and soldering are dispensed with. In this arrangement, the pipe goes inside the ferrule or tail-piece, instead of outside, and is turned over on the flange of the ferrule, making its own joint, after which the ordinary nut is placed over it. The pipe can be bent close to the connection, without fear of its breaking the joint, and can be disconnected and re-connected as frequently as desired without using a washer. The Incandescent Novelties Company are giving daily exhibitions of the process of mantle-making.

Perhaps the most interesting portion of the exhibition from a scientific point of view is the stand occupied by Messrs. Alexander Wright and Co., who show a large selection of their well-known photometrical, testing, and laboratory appliances. Their exhibits include several varieties of standard photometers; a speciality being one with incorrodible porcelain meter, King's gauge, and governor. A rapid-reading photometer for use with water gas, which has previously been described in the "JOURNAL," is also shown; while a Harcourt's table photometer, as specified for use in London, is another feature. There are exhibited several standards of light, including the Methven screen, Simmance's pentane standard, &c., with methods of instantly connecting these to the photometer. Among other apparatus on view are chemical benches specially designed for use in gas-works, chemical balances, sulphur and ammonia testing apparatus, experimental minute clocks, chemical apparatus and solutions, and pressure gauges and registers. Simmance and Abady's calorimeter is exhibited, showing the special arrangement for fitting to existing photometers, so as to avoid expense in connection with auxiliary apparatus, such as experimental meters, &c. Street-lamp governors for ordinary and incandescent burners are also on view. A special feature of the exhibit is a dark room in which is working a Harcourt photometer, arranged for testing gas from 14 to 24 candle power, as used by the Manchester Corporation, and which has attracted a good deal of attention. This portion of the stand has been arranged by Mr. J. G. Newbigging, Gas Engineer to the Corporation, who has also prepared an interesting exhibit of other apparatus used by the Corporation, most of which is of Messrs. Wright's manufacture, including porcelain jet photometers, sulphur-testing appliances, &c. In addition to these, Mr. Newbigging has arranged an excellent display of purifying materials, bye-products of oxide and of tar, &c. Public interest was specially attracted by an exhibit showing Simmance and Abady's patent momentary pilot system, which was described in the "JOURNAL" for Oct. 10 and May 1 last.

The Acetylene Illuminating Company show a number of photos of works engaged in the production of carbide. Messrs. S. Cutler and Sons have sent a number of interesting photos of work which they have carried out in connection with gasholders in various parts of the kingdom. The official illuminators, stand fitters, sign-writers, and decorators to the exhibition are the firm of Defries and Son, who make a good display of their cut crystal illuminations, and also exhibit the Defries and Feeny patent differential gas-regulator, which has previously been referred to in these columns.

At the opening proceedings, Alderman Higginbottom (Chairman of the Manchester Corporation Electricity Committee) occupied the chair; and he was supported by Alderman Gibson (Chairman of the Gas Committee), Alderman Rudman (Mayor of Salford), Sir W. H. Bailey, Mr. C. Nickson (Superintendent of the Manchester Corporation Gas Department), Mr. Price (Assistant-Superintendent), Mr. J. G. Newbigging (Gas Engineer to the Corporation), Councillors Phythian, Fildes, Marsden, Harrop, and Hassall, and Mr. Hersey (the Manager of the Exhibition).

The CHAIRMAN observed that his duty on this occasion was a very simple one. The whole of the work devolved on the gentleman who had to declare the exhibition open. He himself, however, was particularly pleased to be there, because he held the position of Chairman of the Electricity Committee, who were supposed to be rivals of the gas undertaking, and running it very hard indeed. He wanted to disabuse the minds of people who held the view that the Electricity Committee were inimical to the gas undertaking. When first electricity was taken up in Manchester, there was a feeling among many people that the Gas Committee and undertaking would in a few years be defunct. He himself had not held this opinion, nor had the Chairman of the Gas Committee. The actual result was—not only in Manchester, but in every other leading city in the United Kingdom—that wherever electricity had flourished and made rapid strides, the gas undertaking had made quite as great, if not greater, progress. To-day they saw the beginning of what was to be a good exhibition; and he hoped the public would take advantage of it. They would have an opportunity of getting a good deal of information respecting everything which tended and appertained to the working of the gas industry, and the relation of the gas industry to themselves. They would be able to learn, if they liked to take the trouble, how they could have gas tested, in order to see that they got what they paid for. The promoters had taken a great deal of pains to prepare a good exhibition; and he trusted the public would give it their support.

Alderman Gibson said he thought Mr. Hersey was to be congratulated in securing the presence of the Lord Mayor Elect, who was Chairman of the Electricity Committee. It certainly seemed somewhat unique to find the Chairman of the Electricity Committee and the Chairman of the Gas Committee of the same town, standing on the same platform, one taking the chair and the other opening an exhibition connected purely with the gas industry. He hoped that both Alderman Higginbottom and himself would in the future, as they had done in the past, do the best they could to develop the particular undertakings with which they were connected. The exhibition was not yet in a complete state; but from what he had already seen, he ventured to say that in another three or four days it would be a very excellent show. In looking at the various exhibits, he could not help wondering what would have been said by Murdoch, the discoverer and original introducer of gas as a source of lighting, if he had been living and present on this occasion. Perhaps they would be interested to learn that Manchester was the first town that ever secured an Act of Parliament enabling them to supply gas to private houses for illuminating purposes. The first public lamp that was ever seen was in Manchester. It was fixed over the door of the old Police Station, in Police Street, and was a source of great amazement to many people, who



Sir W. H. BAILEY, in moving a vote of thanks to Alderman Gibson for the able manner in which he had opened the exhibition, said they all admired that gentleman, and knew that his Committee was a triumph of municipal government. It seemed very proper that the exhibition should be held in the Metropolis of Gas Engineering. Manchester and Salford were the first two towns in which the ratepayers owned the gas-works. The Commissioners did establish a gas-works in 1817, under the auspices of Murdoch; but before that, by two or three years, the first cotton-mill in Lancashire was established in Salford—Phillips and Lees, in Chapel Street—and gas was used there. He had seen tubes from this mill; and it was interesting to note that neither lead nor iron was used. The tubes were formed of brown paper glued together. Manchester was now making great progress in its gas undertaking; and whatever might be the opinion of those who used electricity or gas as to their relative efficiencies, they knew very well that the introduction of electricity

Alderman HIGGINBOTTOM having briefly responded to the vote, the inaugural proceedings were brought to a close.

The Hastings and St. Leonards Gas Company have received a word of praise from the "Hastings Observer" for the tasteful manner in which they carried out part of the illuminations at a recent Rifle Band Fête in the Alexandra Park. The gateways and the bandstand, it is stated, were brilliantly adorned with gas-lights, and here and there within the Park were beautiful incandescent gas-lamps.

Referred to on p. 690.

Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apr. 11	10 $\frac{1}{2}$	Alliance & Dublin 10 p. c.	18 $\frac{1}{2}$ —19 $\frac{1}{2}$	..	5 7 8	60,000	5	Feb. 23	7	Ottoman, Ltd.	5—5 $\frac{1}{2}$	..	6 7 3
100,000	10	"	7 $\frac{1}{2}$	Do. 7 p. c.	18 $\frac{1}{2}$ —14 $\frac{1}{2}$	..	5 3 5					People's Gas & 2nd Mtg. of Chicago Bonds.	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb.	101—103	..	4 17 1	500,000	100	June 1	6	River Plate Ord.	10 $\frac{1}{2}$ —11	..	6 7 2
200,000	5	May 16	8	Bombay, Ltd.	6—6 $\frac{1}{2}$	..	4 12 4	851,070	10	Apr. 27	7	Do. 4 p. c. Deb.	99—101	..	3 19 8
40,000	5	"	12	Do. New, 4 $\frac{1}{2}$ paid.	4—4 $\frac{1}{2}$	..	5 6 8	250,000	Stk.	June 28	4	San Paulo, Ltd.	11 $\frac{1}{2}$ —12 $\frac{1}{2}$	..	6 8 0
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245—255	..	4 14 1	250,000	10	Apr. 11	8	Sheffield A.	—	..	—
270,000	"	"	5	Do. New	177—182	..	4 18 11	135,000	Stk.	"	10	Do. B.	—	..	—
50,000	"	"	2	Do. 5 p. c. Pref.	140—145	..	3 9 0	209,700	"	"	10	Do. C.	—	..	—
159,375	"	June 14	4	Do. 4 p. c. Deb.	116—120	..	3 6 8	447,427	"	"	10	Do. C.	—	..	—
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220—230*	..	4 6 11	5,641,885	Stk.	Aug. 15	5 $\frac{1}{2}$	South Metropolitan, 4 p. c. Ord.	127—129	..	4 2 7
1,009,500	Stk.	"	7	Do. A. Ord. Stk.	150—160	-1 $\frac{1}{2}$	4 7 6	1,520,000	"	July 12	3	Do. 3 p. c. Deb.	94—97	..	3 1 10
420,000	20	Mar. 29	5	Bristol, 6 p. c. max.	117—118	..	4 4 9	380,940	Stk.	May 16	5	Southampton Ord.	115—120	..	4 3 4
50,000	10	Aug. 15	12	British	40—42	+1	4 15 3	70,825	"	July 12	4	Do. 4 p. c. Deb.	117—122	..	3 5 7
79,000	10	"	9	Bromley, Ord. 10 p. c.	24—26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham } A. 5 p. c.	112—117	+2	5 2 7
500,000	10	May 16	6	Do. 7 p. c.	19—21	..	4 5 8	250,520	"	"	4 $\frac{1}{2}$	and } B. 3 $\frac{1}{2}$ p. c.	80—85	..	5 5 11
220,000	Stk.	June 14	4	Buenos Ayres (New) Ltd.	83—94	..	6 9 9	61,560	"	June 14	4	Edmonton 4 p. c. Deb.	111—115	..	3 9 7
150,000	20	July 12	8 $\frac{1}{2}$	Do. 4 p. c. Deb.	98—100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
100,000	10	June 14	8	Cagliari, Ltd.	28—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
50,000	50	May 2	6	Cape Town & Dis., Ltd.	13 $\frac{1}{2}$ —14 $\frac{1}{2}$	+ $\frac{1}{2}$	5 10 4								
550,000	Stk.	Apr. 11	13 $\frac{1}{2}$	Do. 6 p. c. 1st Mort.	54—56	-1	5 7 2								
286,425	"	"	10 $\frac{1}{2}$	Commercial Old Stock.	270—280	..	4 16 5								
288,237	"	June 14	4 $\frac{1}{2}$	Do. New do.	205—215	..	4 17 8								
800,000	Stk.	May 31	9	Do. 4 $\frac{1}{2}$ p. c. Deb.	133—138	..	3 5 3								
200,000	"	"	7	Continental Union, Ltd.	160—165	..	5 9 1								
61,600	Stk.	"	14	Do. 7 p. c. Pref.	170—175	..	4 0 0	780,404	Stk.	June 28	11	Water Companies.			
178,400	"	"	11	Croydon A 10 p. c.	—	..	—	150,000	"	"	4 $\frac{1}{2}$	Chelsea, Ord.	298—303	..	3 12 7
555,000	Stk.	Aug. 15	5 $\frac{1}{2}$	Do. B 7 p. c.	—	..	—	160,000	"	"	4 $\frac{1}{2}$	Do. 5 p. c. Pref.	155—160	..	3 2 6
60,000	"	"	5	Crystal Palace Ord. 5 p. c.	112—117	+2	4 9 9	160,000	"	"	4 $\frac{1}{2}$	Do. 4 $\frac{1}{2}$ p. c. Pref. 75	143—148	..	3 0 10
486,090	10	July 27	11	Do. 5 p. c. Pref.	130—135	..	3 14 1	170,785	Stk.	Mar. 29	4 $\frac{1}{2}$	Do. 4 $\frac{1}{2}$ p. c. Deb.	145—150	..	3 0 0
14,993,075	Stk.	Aug. 15	4 $\frac{1}{2}$	European, Ltd.	19—20	..	5 10 0	654,740	"	June 14	4 $\frac{1}{2}$	East London, Ord.	145—150	..	3 0 0
2,600,000	"	"	3 $\frac{1}{2}$	Do. 47 10s. paid.	14—15	..	5 10 0	890,000	"	"	3	Do. 4 $\frac{1}{2}$ p. c. Deb.	192—197	..	3 11 8
8,799,735	"	"	4	Gas 4 p. c. Ord.	97—99	..	4 8 10	700,000	50	June 14	7 $\frac{1}{2}$	Do. 4 $\frac{1}{2}$ p. c. Deb.	147—152	..	2 19 8
8,993,975	"	June 14	8	light 3 $\frac{1}{2}$ p. c. max.	92—94	..	3 14 6	810,000	Stk.	Mar. 29	4	Do. 8 p. c. Deb.	96—98	..	3 1 3
70,000	10	May 31	8	and 4 p. c. Con. Pref.	114—117	..	8 8 5	708,000	Stk.	Aug. 30	14	Grand } 10 p. c. max.	107—110	..	3 8 2
3,800,000	Stk.	Aug. 16	10	Coke 3 p. c. Con. Deb.	98—95	..	3 8 2	160,000	"	"	7	Junction 4 p. c. Deb.	130—135	..	2 19 8
478,600	Stk.	May 15	8 $\frac{1}{2}$	Hongkong & China, Ltd.	134—144	..	5 10 4	1,043,800	100	June 28	10 $\frac{1}{2}$	Kent	295—305	+5	4 11 10
75,000	5	June 14	6	Imperial Continental	203—208	+1	4 16 2	406,200	100	"	8	Do. New, 7 p. c. max.	200—210	..	8 6 8
560,000	100	Apr. 2	5	Do. 3 $\frac{1}{2}$ p. c. Deb. Red.	99—101	..	3 9 4	850,000	Stk.	Mar. 29	4	Lambeth, 10 p. c. max.	284—289	+2	3 12 8
250,000	100	"	4 $\frac{1}{2}$	Malta & Medn., Ltd.	44—5	..	6 0 0	500,000	100	Aug. 15	14	Do. 7 $\frac{1}{2}$ p. c. max.	205—210	..	3 16 2
541,920	20	May 31	8 $\frac{1}{2}$	Met. of 5 p. c. Deb.	107—110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb.	128—132	..	3 0 7
667,946	Stk.	Aug. 30	9 $\frac{1}{2}$	Melbourne 4 $\frac{1}{2}$ p. c. Deb.	106—108	..	4 3 4	902,300	Stk.	June 14	7 $\frac{1}{2}$	New River, New Shares	410—415	..	8 7 6
299,855	Stk.	June 28	8 $\frac{1}{2}$	Monte Video, Ltd.	104—114	..	6 1 8	126,500	100	"	7 $\frac{1}{2}$	Do. 4 p. c. Deb.	128—133	..	3 0 2
150,000	5	May 16	8	Newcastle & Gateshead Con.	210—215	..	4 6 1	489,200	Stk.	"	5	South- } Ord.	193—198	..	8 15 9
135,000	5	"	8	Do. 8 $\frac{1}{2}$ p. c. Deb.	104—107	..	3 5 5	1,019,585	"	Apr. 11	4	wark } 7 $\frac{1}{2}$ p. c. max.	182—187	..	4 0 3
15,000	5	"	8	Oriental, Ltd.	72—72	..	5 3 8	1,155,066	Stk.	June 14	10	and 5 p. c. Pref.	155—160	..	8 2 6
				Do. New, 4 $\frac{1}{2}$ 10s. pd.	6—6 $\frac{1}{2}$	..	5 10 10	200,000	"	"	4 $\frac{1}{2}$	Vauxhall 4 p. c. Deb.	129—134	..	2 19 9
				Do. do. 1879, 4 $\frac{1}{2}$ pd.	12—12	..	4 11 5	300,000	"	Sept. 14	8	West Middlesex	273—278	+1	8 11 11
												Do. 4 $\frac{1}{2}$ p. c. Deb.	140—145	..	3 2 1
												Do. 8 p. c. Deb.	97—99*	..	3 0 7



**ELECTRIC LIGHTING NOTES.**

The Cleethorpes District Council have resolved to take the necessary steps to purchase and extend the electric lighting plant to be erected by the Tramways Company ; it being the purpose of the Council to light the town with electricity.

The report on the Hampstead Vestry's electrical undertaking just issued, states that the capital outlay since the commencement of the undertaking five years ago has been £162,212. The total receipts for the past twelve months amounted to £30,661—an increase of £6283 on the previous year. The "gross profit" amounted to £16,325, of which the repayment of principals of loans and interest absorbed £6619. The total "net profit" since the commencement of the undertaking is said to have been £20,586.

The scheme for electrically lighting the Victoria Embankment will probably be commenced, it is reported, about the beginning of November. Tenders have already been accepted for laying the mains ; and the whole of the lamp standards have been purchased. The scheme is expected to be completed by the early summer of next year. A London news agency reporter has learnt that the total number of the lamps will be 144 ; and that they will be divided into nine electrical circuits. The lamp standards will be 24 feet in height ; and the lamps will be suspended over the roadway from an extending arm.

The Dudley Gas Company have a very bitter enemy in Alderman Bagott. For many years past he has never seemed to lose an opportunity of directing attention to what he is pleased to consider their shortcomings, and has consistently tried to influence his fellow-members of the Corporation to attempt a purchase of the gas undertaking. Now he is embracing the chance he has of "advertising" the rival illuminant. At last Tuesday's meeting of the Town Council, alluding to the increase in the price of gas which would be charged for public lighting after the 29th inst., he remarked that for years the Corporation had been trying to purchase the gas-works ; but on every occasion they had endeavoured to do so they had failed, owing to the price asked being so large. Before the conclusion of the present year, however, the inhabitants of the town would be able to choose between gas and electric light ; and he "hoped that the burgesses would rally round the Council by taking the electric light and making the scheme a gigantic success."

The Corporation of Longton having made application to the Local Government Board for sanction to borrow £28,500 for purposes of electric lighting, and for approval of the use of certain lands situate at the Corporation gas-works as a site for a generating station, &c., Mr. H. P. Boulnois sat at the Town Hall last Wednesday to inquire into the application. It was explained by the Town Clerk that the amount named was required to provide the necessary generating station, mains, feeders, &c., for the supply of electrical energy throughout the borough. The Order authorizing the supply was obtained in 1899. Before then the Corporation had retained Mr. Robert Hammond ; and it was upon his report and recommendations that they were now proceeding. The staple trade in the town was the manufacture of china and earthenware ; and apart altogether from the question of lighting business premises and residences,

there was another important question. Recently there had been considerable agitation with reference to lead-poisoning and poisoning in other forms by the dust emanating from various processes ; and a great amount of motive power was required for driving fans and other mechanical appliances. The Corporation anticipated that the supply of electrical energy would be a very great factor with reference to this particular matter, and that manufacturers' requirements would call for a large supply. It was proposed to put in the low-pressure continuous system ; and the formal approval of the Board of Trade had been received. There was no opposition to the application.

**THE TEES VALLEY WATER BOARD.****Some Striking Figures.**

Two large sheets of figures have been presented to the Tees Valley Water Board, showing the amounts the Corporations have paid in the maintenance of the water-works during the past twenty-two years. From these it would appear that the three Corporations have paid £1,196,866 in that period, of which £127,498 represents redemption of capital. After deducting the revenues of the Water Board divided between the three Corporations each year, it is to be seen that between them they have had to pay out of the rates £214,494, which, after deducting the above-mentioned £127,498, representing their share of capital invested, leaves £86,966 as the total loss on the working during the twenty-two years. To meet this excess of charge over revenue, and the redemption of the £127,498 capital, the Corporation have had to levy rates varying from 2s. in the pound in 1895, to 1-96d. in the pound last year, or an average levy in 22 years of 5-92d. in the pound per year. Middlesbrough's average contribution from the rates is 5-28d. in the pound per year over the same period ; Thornaby's is 9-93d. in the pound per year during the last sixteen years. These figures will, if divided by 2½, give an idea of what the Corporation have actually lost so far. The assumption is that the revenue may soon exceed the annual charges, and thus repay the Corporation in time for what they have lost, and leave them in possession of the water-works, with a slowly decreasing capital debt. Stockton last year had to levy only a rate of 1-96d. in the pound ; Middlesbrough 1-18d. in the pound ; and Thornaby 5-13d. in the pound.

The returns serve (says the "Northern Echo") to remind ratepayers of the three boroughs what a huge business the undertaking is. It cost £846,000 to begin with, but above £1,000,000 has been spent since then in additional works, and over a million pounds have been paid in interest on the capital borrowed on the security of the revenue and the borough funds and rates. Only £127,498 of the nearly two million pounds sterling has been redeemed ; so that the capital representing the water-works is still a stupendous amount. More capital outlay is to be undertaken in providing the Grassholme reservoir ; and the £68,570 paid last year in interest alone will, in the course of another ten years, be appreciably increased. These figures give a very inadequate idea of what is at stake, and dependent upon not merely the continued but the increasing

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prosperity of the three Teesside towns. About three-fourths of the water supplied, it has to be remembered, is consumed by the "large consumers"—the iron manufacturers. Thus the water undertaking is very closely concerned with the growth of industrial activity on Teesside.

Mr. D. D. Wilson, the General Manager of the Board, has reported, in accordance with instructions, on certain resolutions passed at a town's meeting in Middlesbrough on July 27. These resolutions protested against the decision to let a contract of £385,000 for the Grassholme reservoir without obtaining tenders by open competition, especially after going to the expense of preparing bills of quantities. It was further considered that the advance of 10 per cent. on the present schedule of prices was excessive, as the value of labour and material would fluctuate during the ten years over which the contract would extend. Mr. Wilson replied that as only eight out of forty councillors signed the requisition, and 200 ratepayers out of 19,000 had attended the meeting, it was evident that only a small minority protested. The statement as to bills of quantities was not in accordance with facts. The Board had incurred no expense whatever in preparing them—they were prepared entirely at the expense of the Engineer, and before the Board had decided to either invite tenders or ask Mr. Scott to tender. The small increase of 10 per cent. upon the prices of eleven years ago was very much more favourable than might have been expected, judging from the experiences of other public bodies. Three tenders, Mr. Wilson added, were received in response to the advertisements, and Mr. Scott's—the one in question—was the lowest.

### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I was present this week at the meeting of the Waverley Association of Gas Managers, a report of which appears on another page. It was held under somewhat peculiar circumstances, for the President (Mr. W. M'Giffen), who, when he was elected at the meeting in Selkirk last April, was Manager at Earliston, in the valley of the Tweed, has since been translated to Huntly (in Aberdeenshire), to succeed the late Mr. Bowman; and his new location being a distant one, Mr. M'Giffen was unable to be present. The meeting having been called to order by the Hon. Secretary, the Past-President (Mr. W. B. M'Lusky), who has, since the April meeting, been transferred from Selkirk to Perth, not being in the room, the choice fell unanimously upon Mr. A. Bell, sen., the venerated Manager of the Dalkeith Gas Company. Mr. Bell is not only himself a host in all matters pertaining to gas making, but he has two sons gas managers, both already distinguished for intelligent enterprise—the one at Peebles, and the other at Innerleithen. No meeting held under Mr. Bell's chairmanship will ever flag; for his experience in gas matters has been so long, and in other respects so varied, that were no one else to speak, he could himself conduct the business profitably for an indefinite period. He is at home in chemistry and in geology, of which latter fact the members had ample evidence before the day was over, in his lucid

descriptions, on the ground, of the Lothian coal-field and its workings. Dalkeith is a centre of the Waverley district which is easily reached; and the attendance was therefore excellent. Great pleasure was felt when, shortly after the proceedings were opened, Mr. M'Lusky arrived from Perth, thus showing his interest in his old Association. The members were also pleased to have among them Mr. Henry O'Connor, of Edinburgh, who, however, taking a back seat, missed the observation of the Chairman, and thereby led to a most powerful contribution to the day's discussion being almost lost. Though the President was absent in person, his mind was present in the most effective form in which intellect can be felt and handled—viz., in his thoughts delineated upon paper by means of the printing press. This Presidential Address was read. It was just what an address to the Waverley Association should always be—short, practical, and free from generalities. According to Mr. M'Lusky, the department in which Mr. M'Giffen is conspicuously successful is the retort-house; and it was therefore wisdom on his part to confine his remarks to difficulties which are encountered in retort-house working. Avoiding giving any expression of opinion upon plans or systems of constructing retort-benches, Mr. M'Giffen applied his mind to difficulties which are common to all methods—defects in setting, and the removal of the carbon which gathers in the retorts. These were both common ground to all gas managers, and were most eminently fitted for tapping the reservoirs of discussion—which they most effectively did. Everyone had some experience of his own upon one or other of the subjects; and the narration of these experiences was the most due fulfilment of the primary object of the Association, which is to give mutual help in matters of working. Thus a most profitable hour was spent; and Mr. M'Giffen ought to feel highly gratified at the success which attended the first of the two meetings of the Association under his presidency.

The meeting was a success; the excursion was even more so. I surmise that it is owing to the personal respect in which Mr. Bell is held in the Dalkeith district that the Association were invited to visit the latest constructed pit in the Newbattle collieries. The great shaft was sunk by the owners—the Lothian Coal Company—about five years ago, for the concentration of their workings in several collieries which they own in the immediate neighbourhood. The workings extend for miles on either side. As the company approached the colliery, they passed, about a mile off, the stately castle of Dalhousie, upon the towers of which the sun shone with splendour; and before descending the shaft they were informed that their underground walk would carry them to the region below the castle grounds. At the bottom of the shaft, in another direction, down a steep incline, with insufficient headroom to enable a person to walk upright, involving a two-mile walk, it was explained, lay the workings of the famed Newbattle canal. On account of the difficulty of reaching the place, and the time which would be occupied in traversing the narrow mine, the visit to the canal workings was reluctantly given up. Everyone was, however, supplied with a piece of canal, as a souvenir of the occasion. The visit of inspection over, the visitors were hospitably entertained by the Coal Company; and the usual courtesies followed. The Association are undoubtedly indebted to Mr. J. A. Hood, the General Manager of the Company, and Mr. John Callendar, the



Secretary, for the welcome they extended to the Association and the attention they showed them. Such fraternity between the producers of coal and so large consumers of it as are gas undertakings, is worthy of recognition and commendation. It ought not to be omitted to add here that all the arrangements for the meeting were most carefully made, and their progress superintended by the Hon. Secretary of the Association, Mr. A. C. Young, of Kelso.

Not since the time when the Edinburgh and Leith Gas Commissioners were appointing a Chief Engineer has there been so much excitement over a vacancy in Scotland as there is at present over the selection of a Manager of the Greenock Gas-Works. There is a very large list of applicants; the place being, I think, the fourth largest in Scotland. The competition is very keen. The Corporation have a list of excellent men before them; and it will be their own fault if they do not choose a man who will be all that Mr. Stewart has been to them—one of the best men of his time.

Out of this appointment at Greenock, there has arisen one of the most pleasant incidents which I have yet recorded in these pages. Mr. A. Yuill, of Alloa, was one of the applicants for the post. On Monday of this week, at a meeting of the Gas Commissioners of the burgh, Bailie Arrol, the Convener of the Works Committee, said that he had contemplated in the near future moving that Mr. Yuill receive an increase in salary. The most opportune time, he thought, to make such a proposal, would have been when the present improvements at the gas-works had been completed. However, circumstances had arisen which had prompted him to bring the matter before the Commissioners that evening. At present the Gas Commissioners of Greenock were on the look out for a Manager; and Mr. Yuill had been asked to put in an application for the position. The salary offered was £400 per annum to start with. They all knew how faithfully Mr. Yuill had served the Commissioners and the ratepayers since he had taken over the management of the works. Besides being able to supply the community with gas at a price which could only be beaten by one other town in Scotland—viz., Hamilton—Mr. Yuill had in many ways saved the pockets of the ratepayers. In connection with the alterations which from time to time had taken place at the works, the Commissioners had been saved the payment of architects' fees; Mr. Yuill having drawn the plans and specifications. The many improvements had turned out successful; and in the results attained the figures estimated by Mr. Yuill had in almost every instance been fully realized. It would be a misfortune to the burgh if they were to lose Mr. Yuill's valuable services. As he had already indicated, they were in the fortunate position of keeping the gas at 2s. 6d. per 1000 cubic feet; while Glasgow, Edinburgh, Dunfermline, and other places, had to raise the price of their lighting commodity. The only place which was lower than Alloa was Hamilton; and the Gas Commissioners of that town were in the unique position of being able to cart the coal right from the pit-head to the gas-works at very small cost. They had also under their charter no need to make any provision for a sinking fund, and had altogether a freer hand in financing their undertaking than the Alloa Commissioners had. Taking everything into account, he thought the Commissioners should recognize Mr. Yuill's services by offering him some substantial

increase on his present salary, £275; and in order to put the matter in proper form, he moved that Mr. Yuill's salary be increased to £350, the advance to take effect from the first of next month. The proposal was agreed to unanimously; and next day Mr. Yuill withdrew his application. The action of both parties is commendable. Mr. Yuill has been about fifteen years in Alloa. During this time he has so managed the undertaking that, while the output of gas has risen from 30 to 60 million cubic feet, the price has been reduced from 3s. 9d. to 2s. 6d. per 1000 cubic feet; and not only so, but he has been extending and improving the works, upon a plan foreseen from the beginning, at a cost, taken from revenue, of over £20,000. He is, it may be said, just getting into a position where he might expect to rest upon his oars—reaping, without effort, the fruit of his labours. It will, therefore, be more pleasant for him to remain in Alloa than to go elsewhere and enter upon new and arduous tasks. It has been a feature of Mr. Yuill's management all along that he has always been willing to adapt new methods of working, wherever he could; and it is, according to my observation, the manager who fearlessly shapes his course out of the beaten track, who succeeds in life. There are working processes which are languishing in the market because no one has the spirit to take them up, and which would have made the name of any gas manager. Men go to meetings and hear papers and discussions; but they do nothing with the knowledge they acquire. Such was not the way with Mr. Yuill.

Dealing still with appointments, I come to that at Forfar, which was made last night, and resulted in the election of Mr. James Baxter, at present Manager at Armadale. There were 37 applicants for the post; and on Monday the Gas Corporation met and selected the following short list of six: Francis Chalmers, Gas Manager, Spittal, Berwick-on-Tweed; James Baxter, Gas Manager, Armadale; J. B. Terrace, Gas Manager, Brechin; William Whyte, Gas Manager, Renton; Charles M'Pherson, Assistant, Aberdeen; and Mr. F. W. Carlow, Gas Manager, Lasswade. At the meeting last night, Mr. Christie moved that the election be by ballot, because, he said, he had received letters from five different business acquaintances and friends, pressing him to vote for a certain candidate. It was not every man who could afford to give offence to influential business acquaintances, as it meant the destroying of his bread and butter. The motion was ruled incompetent; and the vote was taken openly. Bailie Hanick, the Convener of the Gas Committee, moved the appointment of Mr. Baxter. The others who were moved were Mr. Terrace and Mr. Whyte. The vote resulted: Baxter, 9; Whyte, 4; and Terrace, 2. Mr. Baxter, having a majority over the other two, was declared to be elected. He is about 36 years of age. He was a plumber to begin with, and has been Gas Manager at Innellan, Renton, Berwick, and Armadale.

The "North British Daily Mail" of to-day publishes the following paragraph relating to the state of affairs in connection with the Greenock Corporation gas undertaking: "From the report of the Sub-Committee appointed to investigate the affairs of the Gas Trust, it appears that there has been a loss of £700 to the Trust on account of contractors failing to implement their contracts. Yielding to pressure, some of the coalowners are said to be fulfilling their contracts; and the loss has in consequence

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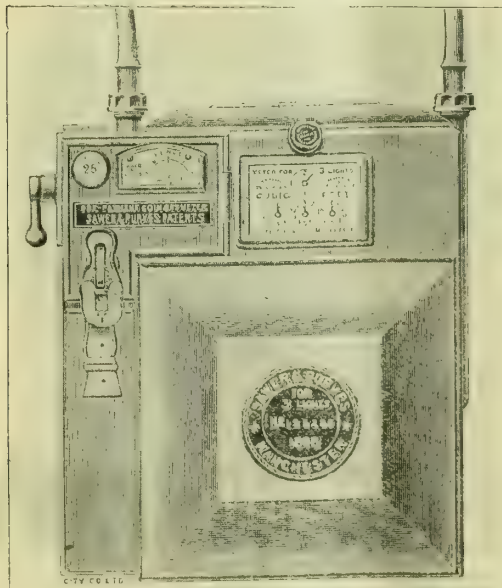
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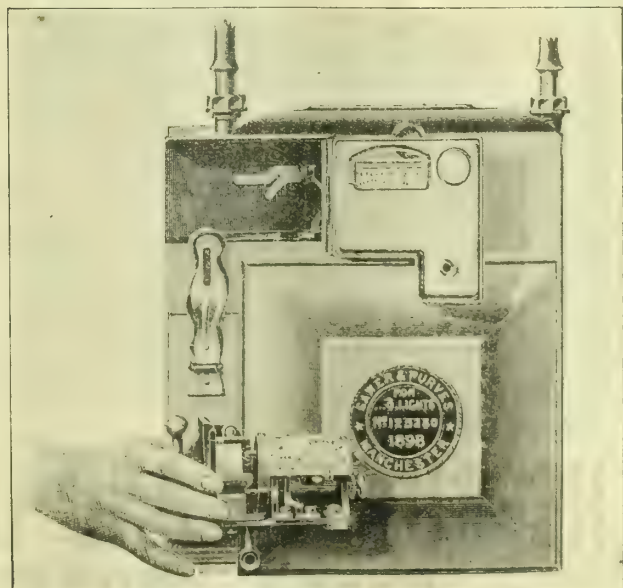
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been reduced by about £180. The Gas Committee before whom the Sub-Committee's report was laid, regretted that they had not been informed of the failure of the contractors to implement their contracts, and that the coal had been purchased without the Committee having been previously consulted. The Committee also regretted that the cash in the hands of the collector had not been disclosed in the public accounts." This report was before the Police Board on Thursday; but the matter does not seem to have been made clearer than this leaves it. Possibly, in view of a new appointment, it may be better to drop the subject, as the defects cannot now be made good.

The Finance and Law Committee of the Edinburgh and Leith Gas Corporation on Monday considered a report by their Treasurer (Mr. John S. Gibb) to the following effect: "As the price of gas for the coming year has to be considered and settled at the meeting of the Commissioners on the 24th inst., and judging that you might wish to make a recommendation on the subject to that meeting, I beg, at the request of the Convener, to enclose copy of my estimate of revenue and expenditure for the present year, based on the actual figures for the year last closed. In determining this estimate, I have had the benefit of the aid and experience of the Chief Engineer, who has carefully examined and approved the items belonging specially to his own department—viz., the expenditure for manufacture and distribution, and income from sale of gas and residual products. Supposing the output and price of gas to continue the same as last year, the estimate shows a probable deficit of £52,100. A penny per 1000 cubic feet represents £7185; the estimated deficit is, therefore, as near as may be, equal to 7½d. per 1000 cubic feet. My calculation takes for granted the renewed suspension of the sinking fund for repayment of money borrowed for new works at Granton; and the minimum statutory allowances for the other sinking funds. Interest on money borrowed has been considerably increased, but not more than almost certainly will be required. The deficit is caused almost entirely by the abnormal increase in the price of both coals and oil. This is responsible for £51,979, or within £121 of the total deficit. Two courses are open to the Commissioners for meeting the emergency—either (1) to raise the price of gas the full sum needed to make the income and expenditure of the year balance one another; or (2) to raise the price so as partially to meet the deficiency, and, for the remainder, draw on the working balance of £28,349 brought forward from last year. Supposing the latter method were adopted, and the price raised, say, 4d. per 1000 cubic feet, £23,353 would be required from the working balance to make expenditure and income square, leaving only £4996 unappropriated. Should the cost of coal and oil continue unchanged, a further rise in the price of gas would be required next year." After discussion, the Committee agreed to recommend that the price of gas be raised by 4d. per 1000 cubic feet, making it 3s. 4d.

Following upon the announcement which I made in the "JOURNAL" of Aug. 21, of the collapse of a gasholder at Milngavie, there comes the report that this week a deputation from the Gas Company waited upon the Burgh Commissioners, and said that this was a most opportune time to offer the gas-works to the Commissioners. On account of the mishap, the Company were negotiating for more space for the erection of a new

gasholder, and even for the changing of the site of the gas-works, to suit the growth of the burgh. A special meeting of the Commissioners is to be held to consider the matter.

At a meeting of the Committee of the Arbroath Gas Corporation on Tuesday, the Manager (Mr. R. S. Carlow) stated that they had been very fortunate this year so far as the coal contracts were concerned. Last year the average price of their coals was 19s. 4d. per ton; while this year it was 22s. 6d.—the increase being small, considering the heavy rise in the price of coal in the country. The Finance Committee met last night, and agreed to recommend that the price of gas be increased by 2½d. per 1000 cubic feet, making it 4s. 4½d.

The Directors of the Annan Gas Company, finding that it would be necessary, in the ordinary course, to raise the price of gas by 6d. per 1000 cubic feet, have resolved to divide with the consumers the loss which will be sustained in working, and to raise the price by only 3d.

The Falkirk Gas Commissioners are in the fortunate position of not requiring to raise the price of gas. At their meeting on Wednesday, they resolved to retain it at 3s. 9d. per 1000 cubic feet. The estimates for the current year showed a probable revenue of £22,742, of which £18,842 is expected from gas, £2044 from coke, and £1748 from tar and ammoniacal liquor; and a probable expenditure of £18,340, of which coal is estimated to cost £10,682, or about £3000 more than last year. The gross surplus is estimated at £4402, to which falls to be added the balance brought forward of £1429, making £5831. The capital charges amount to £4962; and there is thus an apparent surplus of £869. It will be seen that the situation is saved by the balance brought forward, as without it there would be a loss on the year's working of £560. But, of course, the financing is perfectly sound. In speaking to the estimates, Provost Weir very properly gave due credit to the good management of Mr. Kincaid, as having enabled them to go on without raising the price of gas. With such a high capital as there is in Falkirk, and the prospect of its rising still higher, it undoubtedly is evidence of good management, and of confidence in the Manager, when the Commissioners arrange for the eating up of an accumulated balance.

Proceeding upon a report by Mr. G. Malam, of Dumfries, the Kirkcudbright Gas Commissioners have resolved to reconstruct the retort-house in their works, and to make other improvements, at an estimated cost of £450. Mr. Malam suggested the erection of a new gasholder of 18,000 cubic feet capacity, at a cost of £1100; but this portion of his report has been delayed till it be seen whether it may not be possible to continue without a new holder.

The annual meeting of the St. Andrews Gas Company was held on the 7th inst. It was stated by the Chairman (Mr. J. R. Welch) that the output of gas during the year was 1,923,000 cubic feet more than in the preceding twelve months, and that the quantity of coal carbonized was between 4000 and 5000 tons. The Managers and Directors had had an anxious time during the year, in consequence of the continued increase in the price of coal, which had cost them about £1200 more than they previously paid. The present price of gas is 3s. 9d. per 1000 cubic feet without meter-rent. The number of consumers had increased by 57. There are now 124 consumers with prepayment meters. The Chairman

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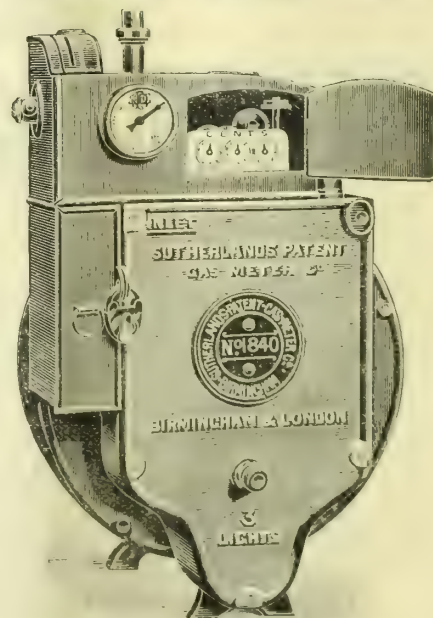
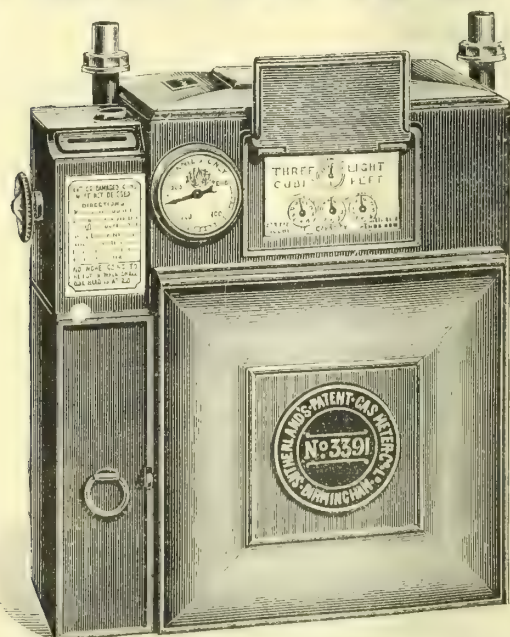
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acknowledged that the satisfactory position of the Company's affairs was largely due to the excellent way in which the Managers (Mr. Jesse Hall and his son, Mr. R. Hall) had conducted the business; and he moved that the thanks of the shareholders to them be engrossed in the minutes. The Directors proposed to convey their coal by sea, instead of by rail, on account of the congested state of the mineral traffic at St. Andrews. The cost of the carriage of the coal to St. Andrews by rail was about £700 a year. There had been some friction between them and the Railway Company, as to demurrage; but this would not occur again. A shareholder congratulated the Company upon the low price of their gas, which, he said, was 5d. per 1000 cubic feet less than in a town he had recently visited, which was much nearer to the coalfields than they were. The report was adopted.

The Directors of the Cowdenbeath Gas Company, whose retort-house was destroyed by fire a fortnight ago, have resolved to rebuild the house with coal-gas plant in it, if they get sufficient support. It has always been a puzzle to most people to understand why a gas company in the heart of the Fife coalfield should ever have given up the manufacture of coal gas. There should, it may be premised, be no difficulty in the matter of support for a coal-gas supply, if the proposals of the Company are reasonable.

### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 15.

**Sulphate of Ammonia.**—The tendency of the market is still in favour of buyers; the closing quotations being £10 12s. 6d. to £10 15s. per ton, delivered f.o.b. at the ports. Scotland has been the weakest point, as low as £10 11s. 3d. per ton having been accepted f.o.b. Leith. Elsewhere supplies have been rather plentiful; the dropping of the forward price in London having discouraged makers who were disposed to resist the downward movement, and encouraged buyers to hold aloof. In the forward position, London, Beckton terms, is quoted £10 12s. 6d. per ton, delivery up to March; while speculators have "gone one better," and sold abroad at below the equivalent.

**Nitrate of Soda** remains quiet at 8s. 1½d. to 8s. 4½d. per cwt., according to quality, on spot. Forward is also quiet; but prices are unchanged—producers being very firm, and tonnage difficult to find.

LONDON, Sept. 15.

**Tar Products.**—Trade continues very unsatisfactory; and many distillers are losing heavily on contracts entered into at high prices some time ago. The extraordinary drop in the value of creosote, and the neglected condition of some of the other products like anthracene and naphthas, have seriously affected the initial value of tar. There is no change in the price of benzol and its congeners. Solvent naphtha is a little firmer; and carbolic acid is steady. But taking the market all round, there is a feeling of depression and anxiety.

The average values of the week are: Tar, 15s. to 23s. Pitch, east coast, 37s.; west coast, 32s. 6d. Benzol, 90's, 10d.; special qualities for

gas, 10½d.; 50's, 11d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d.; crude naphtha, 3½d.; heavy naphtha, 1s. Creosote, 1½d. to 2d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 10½d. Naphthalene, 70s.; salts, 45s. Anthracene, nominal, "A," 3½d. to 4d.; "B," 2½d.

**Sulphate of Ammonia.**—A fair amount of business has been done. In every case buyers have had the advantage. It is curious, seeing that there is very little sulphate being made, and not much offering, that buyers should be so indifferent. The value at all ports may be taken at an average of £10 12s. 6d., less 3½ per cent.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The only special feature to notice in connection with the coal trade here is that, while round coals fully maintain their strong position, there is undoubtedly a weakening as regards engine classes of fuel. This is particularly noticeable in the shipping trade, where colliery proprietors are getting quite 2s. per ton above what they are quoting on inland sales for round coals; while, on the other hand, engine fuel is being sent away for shipment at about 1s. below the basis of pit prices for inland business. Delivered at the Mersey ports, good qualities of screened coal are fetching from 17s. to 18s. per ton, with slack obtainable at about 11s. to 11s. 6d. This state of affairs is easily explained. In round coals, the inland demand is sufficient to take away the whole of the output; and shipping orders are only being entertained where some substantial advance can be secured. With regard to engine fuel, however, the demand for mill purposes has been restricted, owing to the holidays during the past month and the unfavourable outlook in the cotton industry; and the activity in the round coal trade has necessarily involved a large production of slack. Supplies have consequently exceeded requirements; and to maintain inland prices, collieries have either had to put into stock or send away surplus lots for shipment at lower figures. As to the inland trade, house coals are in brisk request, with prices firm; and some further upward move with the close of the month is regarded as not improbable. Steam and forge qualities meet with a good demand, and list rates are fully maintained; but any further advance in them is not considered likely. For engine fuel, the inquiry is fairly active, but not so heavy as it has been; and though Lancashire collieries still quote about late rates for good sorts, inferior descriptions are obtainable at much lower figures, and from other districts cheap parcels continue to be offered. At the pit, best Wigan Arley may be quoted about 16s. 6d. to 17s. per ton, Pemberton four-feet and seconds Arley 15s. to 15s. 6d., common house coal 14s. to 14s. 6d., steam and forge coal 12s. 6d. to 13s., and good qualities of rough Lancashire slack about 10s. 6d.

**Northern Coal Trade.**—There is still great activity; and the quantities sent from some of the shipping docks this month are higher than in any similar period. Steam coals are, however, a trifle easier, as the end of the Baltic season is approaching. Best Northumbrian steam coals

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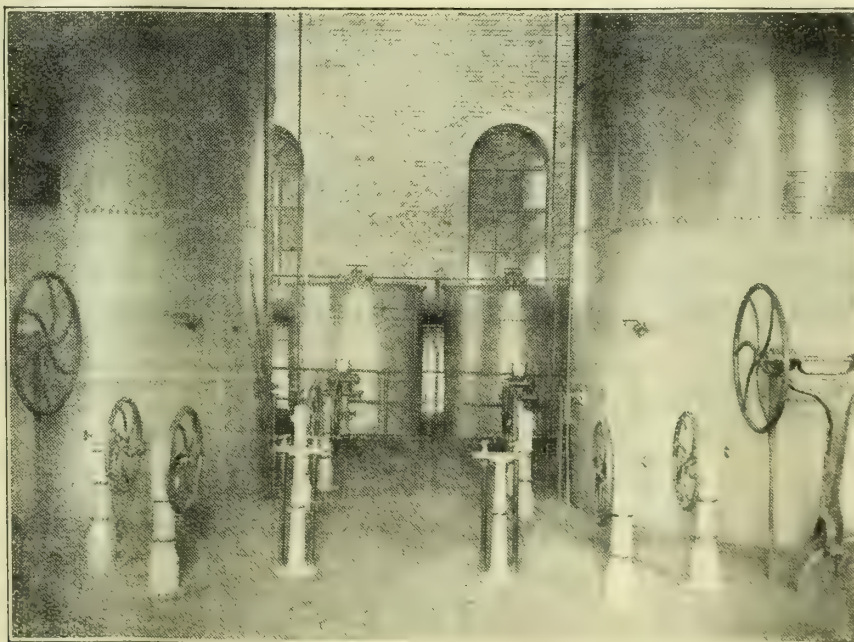
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are quoted from 19s. to 20s. per ton f.o.b., with a good demand for prompt delivery, though with some falling off for forward delivery. Steam smalls are from 11s. 6d. to 12s. In gas coals, there is a full output; but it is well taken up, and the demand for the large contracts is now increasing so satisfactorily that there is less coal for casual sale. For such sales 18s. per ton f.o.b. is asked; while for contracts over the whole of next year, the general quotation is still 16s. In the coke market, the demand is rather reduced; the shipments to the Baltic now falling off, as is usual at this time of the year. For best Durham coke 31s. to 33s. per ton f.o.b. is the quoted price; and for blast furnace coke 28s. at the furnaces. Gas coke is now in rather fuller supply; but both for factories and for export very high prices are asked—as much as 24s. per ton f.o.b. having been quoted for gas coke for shipment. There are, of course, deliveries on contract at lower prices.

**Scotch Coal Trade.**—There is demand for more than the output. The latter could be increased if the miners would work more steadily. But this would lead to a reduction in prices, followed by lower wages; and neither masters nor men are enamoured of the approach of the period of smaller returns. Another class of people who are beginning to quake at the prospect of a fall in prices are the middlemen who have sold forward, but have not been able to buy forward to cover all their sales. The policy of these folk is that of "hedging;" and it is being largely adopted. The forces which control the market are thus all combined against the consumer. Prices scarcely vary, and may be given as: Main 15s. 3d. to 15s. 6d. per ton f.o.b. Glasgow, ell 16s. 6d. to 17s. 6d., and splint 17s. to 17s. 6d. The shipments for the week amounted to 261,502 tons—a decrease of 9296 tons upon the previous week, but an increase of 48,842 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,397,033 tons—an increase of 1,323,043 tons upon the corresponding period of last year.

**The Wages of Stockton Gas Workers.**—A deputation of labourers employed at the Stockton Corporation Gas-Works, accompanied by Mr. Lynas, of the Gas Workers' Union, waited upon the Chairman of the Gas Committee and the Manager (Mr. William Ford) yesterday week, with reference to their claim for 2s. a week advance in wages. The result of the interview is that the Committee are to be recommended to increase the wages of the labourers, which vary between 23s. and 24s., to 25s. a week all round.

**Proposed Extension of the St. Mary Church Gas-Works.**—It was decided by the St. Mary Church District Council on Thursday to apply for a Provisional Order to raise £10,000 for gas-works purposes. Mr. Grant explained that the Council originally had power to borrow £15,000, nearly all of which had been spent. They were constantly extending the works; and it was necessary now to make further enlargements and provide better apparatus to cope with the increased demand for gas. The scheme for the amalgamation of the district with Torquay had delayed the work; but he thought the Manager (Mr. T. Evans) would be able to get through the winter satisfactorily.

**The Healthfulness of Gas-Works Employment.**—A Bethesda gas-works man is said to have unsuccessfully asked the District Council for more salary because, since he had been at the gas-works, his appetite had greatly increased, and he had to take an extra meal daily.

**The Price of Gas at Totnes.**—The suggestion of the Directors of the Totnes Gas Company (see *ante*, p. 601), to meet the trouble threatening in the town in consequence of the recent advance in price, has been accepted; and all the consumers have now paid their gas accounts in full without further demur.

**Bedford Gas Company.**—The half-yearly report of this Company showed receipts amounting to £14,734, an increase of £1200, and that 80,408,000 cubic feet of gas had been sold, an advance of nearly 4½ millions. The Directors stated that the Company held a larger stock of coal than ever before; 6000 tons having been secured before the recent rise. The Company's Bill had been passed in Parliament; and the best possible understanding existed with them and the Corporation.

**The Purchase of the Skipton Gas-Works by the District Council.**—With reference to the report of the proceedings at the winding-up meeting of the Skipton Gas Company which appeared in the "JOURNAL" for the 4th inst., it should be mentioned that in addition to the £66,500 awarded to the Company, the Urban District Council agreed to take over a mortgage of £4750; bringing up the purchase price virtually to £71,250, the amount previously stated in our columns. The shareholders have received £300 for each £100 of 9 per cent. stock, and £250 for each similar amount of 7½ per cent. stock.

**Matlock Bath Gas Affairs.**—The minutes presented by the Gas Committee at the meeting of the Matlock Bath District Council last Tuesday stated that the Auditor had certified the accounts for the year ended March last; and the profit on the gas undertaking amounted for the year to £938, to which should be added another £40, which had been charged to revenue, but belonged to capital account. A letter was read from the Auditor which recommended a question regarding the position of the Council in relation to the Matlock Bath Gas Act being referred to the Local Government Board. There had been £10,000 allowed by the Act for extension and removal of works; and the Auditor questioned whether the money could be used for any other purpose.

**The Gas-Works Purchase Scheme not to be Proceeded with at Rushden.**—At Wednesday's meeting of the Rushden Urban District Council, the Committee appointed to further consider the matter of the purchase of the gas-works, reported that, after careful investigation, they were satisfied the undertaking could not be acquired on more favourable terms than those set out in the report of the Special Joint Committee of the Councils of Rushden and Higham Ferrers made in February of last year, and then submitted to a town's meeting. The Committee also gathered from reports of recent arbitrations that the amounts awarded on compulsory purchases generally exceeded the figures named in the report of the Joint Committee. Under these circumstances, and having in mind the manner in which the proposed purchase was received by the town on previous occasions, the Committee did not recommend the Council to take further steps in the matter. The report was adopted.

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**Incandescent Lighting in the City of London.**—This form of light for the side-streets of the City is being gradually extended. About 100 lamps have already been put up in some of the more important of these minor thoroughfares—viz., Fetter Lane, London Wall, Paternoster Row, &c. The burners consume 4.25 cubic feet of gas per hour, and one-third of a foot per hour during daylight on the pilot light—giving a duty of about 80 candles.

**St. Albans Gas Company.**—At the recent half-yearly meeting of this Company, the Chairman (Mr. Kent) stated that their continually increasing business had overtaken the extensions made to the works five years ago, and they were obliged to erect another retort-house and larger station-meter. Before another winter, a new gasholder and larger purifiers would be required. Towards meeting this outlay, £5000 of stock was recently sold. For the current year's coal contract, they had to pay an advance of 5s. 6d. per ton; and the price of gas had in consequence been raised 4d. per 1000 cubic feet.

**The Wentwood Water-Works of the Newport Corporation.**—Under this title a paragraph appeared in our news columns on Aug. 28 reporting a statement made by Colonel Lyne, the Chairman of the Newport Corporation Water Committee, on the occasion of a visit of the members to their new water-works at Wentwood. In the course of this paragraph, it was incidentally remarked that the estimate for the Birmingham Corporation Welsh water supply scheme was being exceeded by 200 per cent. Mr. James Mansergh, M.Inst.C.E., the Engineer to the scheme (whom we regret should have been troubled in this matter), asks us to state that the figures "quoted from Colonel Lyne's speech are grossly inaccurate in every particular." It now appears that the statement by Alderman Lyne to which Mr. Mansergh naturally objects was made on what the speaker regarded as a private occasion. This is evident from a brief conversation which took place at last Tuesday's meeting of the Newport Town Council, and was reported as follows in the "South Wales Daily News": Alderman Lyne, Chairman of the Water Committee, drew what he called serious attention to the necessity for care in the use of water, as there was only 44 days' supply in hand. Mr. R. Wilkinson found another serious matter which he said the Chairman had not alluded to—namely, that the borrowing powers of £256,000 for the Wentwood scheme were nearly exhausted—and asked the Chairman to tell him what the probable total cost would be. Alderman Lyne replied that he could not answer an impossible question, but declared that when the scheme was completed it would be a great success. "Would the worthy Alderman give me his opinion," insinuated Mr. Wilkinson. "I have not the slightest idea," retorted the Alderman; whereupon Mr. Wilkinson turned to a report of the Alderman's speech at a recent lunch, where he said the cost would be about £200,000. Alderman Lyne said he declined to reply to questions on private speeches at a lunch. He was sorry that what he said had been reported. He said at the time, "I am happy to see there are no reporters present, and so I can open my mouth freely." Mr. Wilkinson: Would you say whether it is a correct report of your speech? Alderman Lyne: It was partially correct, and partially incorrect.

**A Large Coal Conveying Belt at Sheffield.**—The Rosendale Belting Company have recently supplied the Sheffield United Gaslight Company with one of their patent waterproofed belts for conveying coal and cannel. It is 750 feet long, 2½ feet wide, and eight-ply thick, and weighs nearly 2½ tons. The belt will convey 65 tons of coal per hour, when running at the rate of 200 feet per minute. It is driven by a pulley 3 feet in diameter, and is supported on concave rollers 7 feet apart, and passes through a movable carriage which throws the coal off at any point in the length of the coal stores.

**Hoyle and West Kirby Gas and Water Company.**—The Secretary of this Company (Mr. A. G. Readdy, F.I.S.) forwards a neatly got-up "Souvenir" of the undertaking—a little book containing a brief review of the career of the Company from its formation to date. The majority of the details furnished were given in the Chairman's speech upon the occasion of starting the new Simpson pumping-engine at the West Kirby Water-Works, on Dec. 2 last; but, with the aid of photographs of some of the plant, and a map showing the authorized area of supply, Mr. Readdy has made the production interesting to all residents in the locality and others not so intimately concerned with the rapid growth of the place.

**The Lighting of Holsworthy.**—A difference of opinion between the Holsworthy Gas Company and the District Council, as to the charge for public lighting, led to the streets being without light from the early part of the present month until Thursday evening last. The Council refused to accept the Company's tender; and, as an alternative, they offered to pay either 28s. per lamp or 6s. per 1000 cubic feet of gas consumed, with 5s. for waste, or to settle the account by arbitration. The Company declined all these proposals at first, but ultimately decided to accept the offer of arbitration, and the lamps were lit on Thursday evening. A meeting of the ratepayers is to be held to consider whether the gas-works should not be purchased by the Council.

**Street Lighting in York.**—Last Friday's "Yorkshire Chronicle" mentions editorially the recent starting of the electric lighting of some of the city streets. It is said: "At last we have seen some of the street electric lights; and, curiosity being satisfied, it is 'the thing' to compare notes and impressions. So far there seems to be little to be enamoured about. What looked all right in the daytime, hardly bears examination at night; and the effect is by no means so luminous as was expected generally. The lamps seem to be badly placed in relation to each other, and are not sufficiently numerous. In some streets, at any rate, unless we are to be satisfied with worse lit streets, some if not most of the existing gas-lamps will have to be retained. Under the circumstances, it is not to be wondered at that the Gas Company's Secretary, Directors, and shareholders were able to look happy at their general meeting. A few years ago the contrast in the street-lighting would have been very marked on the installation of the electric supply; but really the advances in gas-lighting, especially since the advent of the incandescent mantle, have been so real and great that the competition between the two is fought out on a much nearer level. And apparently gas is not going to be dethroned yet, at any rate in York."

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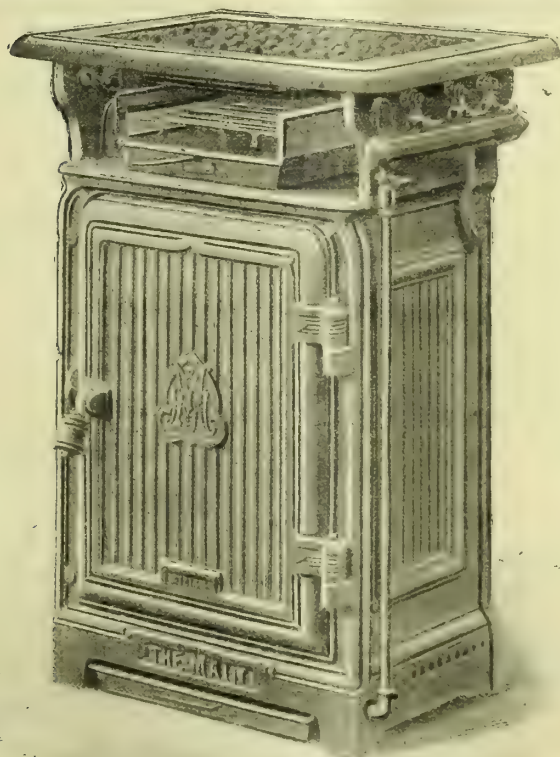
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**The Nuneaton Gas Company Require Additional Capital Powers.**—The Nuneaton Gas Company have given notice of their intention to apply to the Board of Trade for a Provisional Order, authorizing them to raise additional capital to the amount of £50,000.

**Proposed Water Board for Southport.**—Last Wednesday, a meeting of representatives of the Southport Corporation, the Birkdale District Council, and the West Lancashire District Council met, under the chairmanship of the Mayor (Alderman Griffiths), to formulate a scheme for acquiring the water-works. Information as to the population, rateable value, &c., of the districts covered was laid before the meeting; and it was decided to obtain information with regard to Water Boards in other places before proceeding further.

**Levelling the Wages of Bradford Gas Workers with Those at Leeds.**—Last Friday a deputation from the Gas Workers' Union waited upon the Gas Committee of the Bradford Corporation with reference to the wages paid to the purifying men and yardmen employed in the department. The Committee recently increased the wages of the purifying men from 6d. to 6½d. per hour; and those of the yardmen from 5½d. to 5¾d. per hour. The deputation asked that a further increase of a farthing per hour should be conceded in each case, in order to bring the rates up to those in force at Leeds. The Committee granted the application.

**Ottoman Gas Company, Limited.**—The Directors of this Company in their report for the half year ended June 30 state that the gas-rental amounted to £10,009, as against £8869 in the corresponding period last year; and the net profit is £2654. The amount standing at the credit of profit and loss account is £3366, from which the Directors recommend a dividend at the rate of 7 per cent. per annum on both classes of shares. This will absorb £2625, and leave £741 to be carried forward. The Directors report, with pleasure, that since the last meeting they have renewed the public lighting contract with the Municipality of Smyrna. They also mention that Mr. Strachan C. Clarke has joined the Board.

**East Dereham Gas Supply.**—At the last monthly meeting of the East Dereham District Council, the Chairman of the Gas Committee (Mr. T. Cranmer) reported on the working of the gas undertaking in the year ending the 31st of March last. He said the accounts showed a net profit for the year of £716. Out of this, £296 had been paid for interest; and the balance, £420, had been added to the amount brought forward, increasing it from £2389 to £2809, which represented the total profit made since the works were purchased, beyond the amount paid for interest. In the past year, the gas sold realized £1896, against £1657 for 1898-9; being an increase of £239. The make of gas was also higher for the past year by 652,600 cubic feet. The receipts for residuals in 1898-9 were £220; being the lowest of any year since the gas-works had been in the possession of the Council. The receipts for the year 1899-1900 were £476, or more than double. The gas made per ton of coal carbonized in 1898-9 was 9480 cubic feet, and last year 10,280 cubic feet; being 800 feet more per ton. This year's working showed a decrease of 3·84 per cent. in the quantity of coal used, and an increase of 4 per cent. in gas made. The gas unaccounted for last year was 847,500 cubic feet, against 1,118,370 cubic feet in 1898-9. The cost of coal per ton in 1898-9 was 17s., and last year 18s. For the ensuing year the contract figure was 23s. 4d.; and in consequence of the present price of coal, there could be no reduction in the charge for gas for the current year. The list of repairs passed by the Council, with one or two exceptions, had been satisfactorily completed by the Manager (Mr. H. Kitson) and his staff of workmen at over 50 per cent. less than the estimated cost.

**A Loan for Gas Cookers and Meters for Malvern.**—Mr. W. A. Ducat conducted a Local Government inquiry at Malvern last Friday respecting an application by the District Council for sanction to borrow certain sums of money. One of them was £3000, which is required for the purchase of gas cookers and meters.

**Luton Water Company.**—At the 65th half-yearly meeting of this Company, the report stated that the two new water-towers to supply the highest parts of the town were nearly completed. The balance of the net revenue account was £3265; and this sufficed to pay the maximum dividend and carry forward £854 to the renewal and contingency fund, which now stands at £6441. The Chairman pointed out that £15,000 had been spent during the past twelve months on buildings, mains, and extensions.

**Opening of New Water-Works at Newton-le-Willows.**—The official opening of the new water-works for Earlestown and Newton-le-Willows (Lancs.) took place last Thursday. The whole scheme drawn up by the Urban District Council is estimated to cost £23,000; and this is divided into three sections. The first section was that which was opened last week, whereby over 3300 consumers will receive for a considerable period water which has been pronounced as excellent. This first section of the scheme has cost nearly £7000 to institute. Duplication of the plant forms the second section; and this will be started almost immediately. The saving to the ratepayers is considerable; and the institution of the Council's own water-works has been a matter of congratulation on all sides.

**The Dorking District Council to Purchase the Water-Works.**—At Thursday's meeting of the Dorking Urban District Council, the Chairman (Mr. W. J. Palmer) moved—"That, in the opinion of this Council, it is desirable to apply for power to take over the Dorking Water Company's undertaking at the earliest possible moment; and that the Clerk be and is hereby instructed to take such steps as may be necessary for promoting a Bill in the next session of Parliament, either in conjunction with the Dorking Rural District Council, or, in case that Council be not willing to co-operate, then on behalf of this Council alone, for the purpose of taking over the undertaking, pursuant to powers conferred jointly and severally upon this Council and the Dorking Rural District Council by section 26 of the Dorking Water Company's Act, 1900." Mr. Palmer said the principle had been already adopted; and he thought the only question which the Council really had to consider was, as to whether this was the proper time to apply for power to take over the Company's undertaking, or whether the matter should be allowed to stand over until the succeeding session of Parliament. His own opinion, as they knew, was strongly in favour of taking action at once; and he would be glad to see this course adopted. He would also be glad to have the unanimous vote of the Council on the subject. They had had no official intimation of the action which was to be taken by the Rural District Council; but they would probably hear from that authority in due course. The motion was seconded by Mr. Clift and carried.

The Morecambe Gas Company have placed the order with Messrs. R. Dempster and Sons, Limited, of Elland, for an elevator, &c., for lifting coke from the yard and depositing it in railway waggons.

The Enfield District Council have resolved to apply to the Local Government Board for permission to borrow £41,000 to increase the water supply of the parish—an amendment, that the New River Company should be asked to state the terms on which they would supply the parish, being defeated.

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# EDITORIAL NOTES.

## The Dissolution.

THE dissolution of Parliament has come, as most people expected, with the conclusion of the war in South Africa and the consequent necessity for making it clear to the world what the English nation wishes the Government to do next. That is the short point, as the lawyers would say, of the pending appeal to the British electorate. We can say nothing here, of course, on the main question actually before the country; but it is worthy of remark how completely all sectional issues and small side causes are "out of it" this time. The fiery cauter of War has burnt out most of those "cankers of a calm world and a long peace," which spot the body politic at other times. There is less chance than ever of mere faddists getting into Parliament by election eddies in out-of-the-way constituencies. If only the constituencies will return honest gentlemen to represent them, and will send about their business the bores and faction-mongers, the country will do well. After all their bluster and pretence of representing "the workers" of the nation, the combined strength of the political Trades Unionists, the Social Democratic Federation, and the Independent Labour Party appears to be scarcely equal to the task of putting three serious candidates in the field. The election addresses of the members of the present Government naturally do not contain any programme of domestic legislation for the new Parliament; and those of the Opposition leaders are almost as reticent. Vague references are made, in some of these declarations, to the need for further industrial legislation and other every-day matters; but nobody pretends that these are of any real political importance at this juncture. With that remarkable knack for getting themselves disliked by their fellow-citizens which distinguishes our Socialists and Independent Labour people, the election managers of these eccentrics have insisted on identifying them with the anti-war fanatics—as if there were not sufficient obstacles already to their getting into Parliament! The British Workman is not very likely to vote for those who forget or belittle his share in doing his country's work in South Africa. The old Parliament was a very good one, on the whole. It had its irrepressibles, of course—men who were for ever speaking and wasting public time; but it also contained a very large proportion of the best blood and intellect of the nation. We cannot send to Westminster better men than the country breeds; but so long as Englishmen of the right sort continue to offer themselves for election to Parliament, and constituencies return them, this realm will take no hurt from foes or factions.

## The Meeting of Eastern Counties Gas Managers—Coal Prices, Workmen's Compensation, and other Topics.

THE quaint old Lincolnshire town of Spalding—the home of the President, Mr. J. G. Hawkins—was visited by the Eastern Counties Gas Managers' Association last Wednesday; and a very profitable day was spent. Although a man of few words at public meetings, Mr. Hawkins has a record which marks him as a thorough gas practitioner. His works, wherever he has been in charge, have spoken for him. The visit to the Spalding ones on Wednesday was an object-lesson for many of the managers who were fortunate enough to be able to attend. There they saw proof that even works on a moderate scale are not debarred from participation in the benefits of advanced engineering. The works have been practically reconstructed during the management of Mr. Hawkins; but nowhere can one trace that a penny of capital has been misspent. Everything has been done to produce gas on the most economical and modern lines; and in fact the works might, with advantage, be taken as an exemplar by many more extensive establishments. Mr. Hawkins's ingenuity has been brought to bear upon the retort-house work; and for a modest outlay he has produced at home appliances of unpretentious appearance which appear as successful in alleviating the toil of the stokers and expediting the performance of their duties as perhaps more expensive apparatus would be in a house of such limited dimensions. We expect to hear of other managers taking a leaf out of Mr. Hawkins's book; and they will not regret it.

No complaint can be made of the quality of the matter provided for the meeting. While it does not give much scope for comment, it was of a useful character. Never given to verbosity, the President restricted his address



to quite an unobtrusive length. Yet, its brevity notwithstanding, he stated his views, with refreshing directness, on quite a multitude of current subjects. The address, of course, contained (and it would not have been complete without) a reference to the topic of the day—the price of coal. With some of the luminaries in the gas profession who have made pronouncements on the question, Mr. Hawkins thinks that the existing high price cannot last much longer; and he founds his belief on the fact that “stocks are increasing everywhere, and buyers are being flooded out with coal.” So far we go with the President; but we cannot follow his reasoning when he proceeds to say: “Had all of us held off a short time ago from making contracts, and bought lightly as required, prices to-day would very likely have been lower than they are.” To our mind, the probabilities are that they would not have been. Looking critically all round the question, we cannot see how the direct opposite of what the President first of all advanced would have had a similar and perhaps quicker effect. This does not appear to us to be a case in which a temporary excess of supply over demand would have had such a beneficial result. The coalowners, if unwise, are not dolts, and they are as capable of judging within a little what the requirements of gas undertakings will be as are those who have the direction of such concerns. Therefore, is it not likely that, when they found gas companies were only buying from hand to mouth—knowing that they could not carry on their business without coal, and that, consequently, the demand would be from sheer necessity a continuous one—they would simply have smilingly sat still, and booked the orders as they flowed in at the still high prices? The greatest sufferers would eventually have been the gas companies themselves, who, when their needs were greatest in the winter, would have found themselves barren of stocks, deliveries erratic, the gas supply in jeopardy, and the coalowners coolly and suavely demanding their own prices. The condition of the gas manufacturer would, without doubt, have been immeasurably worse this winter than last. What has happened, and what is happening, are, so far as can be judged, the best remedies for restoring the coal market to, at any rate, something approaching a healthy state. At the same time we grant that those who have not been compelled to contract yet may have “the best of the deal.” One other point in the President’s address is particularly noteworthy. The commotion caused by the Workmen’s Compensation Act has long since died away; and it has not proved the haunting phantom that it was expected it would be. The Act, Mr. Hawkins tells us, has proved a friend in disguise at Spalding; for the amount paid to the insurance company is less than was formerly required to meet cases of injury to workmen.

Inclined retorts have not so far obtained a strong footing in the Eastern Counties—in fact, we believe Cambridge is the only town represented in the Association which has an installation. It was therefore not surprising that the paper read by the member for Cambridge—Mr. R. Brown—did not draw a very brilliant discussion. The only real critic was Mr. R. G. Shadbolt; and the other speakers merely joined in for the purpose of eliciting information. The paper itself, taken in conjunction with Mr. Brown’s reply, will command attention for the exact figures furnished as to the working of the installation. In Mr. Brown’s experience, the great secret of success in working inclines is to have a properly constructed furnace. Further, using screened nuts, he is not worried by the “creeping” of the charges; and the production of gas, compared with ordinary coal, is not affected. The question of the creeping of coal is an anxious point with our Copenhagen friend, Mr. F. D. Marshall; and doubtless he will be glad to hear of Mr. Brown’s experience. Among other matters which occupied attention at the meeting, Mr. C. W. Phillips gave some fresh information regarding the Scott-Snell-Phillips self-intensifying lamp; two new members were elected; and Norwich was selected for the Spring meeting.

#### The Gas Affairs of New York.

IN January last we gave an account in these columns of the latest “Gas-Rate War” of New York. The particulars will be found in the “JOURNAL” for Jan. 2. It was a case of fighting to a finish for the gas business of the city, between the men in possession (the Consolidated Gas Company) and outside capitalists. The conflict dragged on for some months; but quite lately it has ended in the complete triumph of the

Consolidated Company. The others were beaten to the ground; and the Consolidated bought them up at a discount. Now there is again only one Gas Company in New York, although the once-competing undertakings still retain their own names and affect an independence which is not theirs in reality. So far as the public is concerned, the immediate consequence of the termination of the war of prices is the return of all the Companies to the uniform statutory rate of \$1.05 per 1000 cubic feet, and a uniform charge of \$3 a year for a gas-kitchen. Advertisements to this effect in the New York papers were the only public notification that the gas magnates had ceased to dispute with one another for the bodies of the Metropolitan consumers. But this is not all. It begins to look as though the gas administration had definitely turned over a fresh leaf. Not only are the pseudo-Companies actively advertising and pushing gas-stoves, they are putting their affairs in better trim than has ever been possible under the old circumstances. The badly-situated in-town stations are to be done away with and cleared off; splendid new works being planned in a better situation. It is stated that there will be no more competition; the Consolidated interests being now supreme, not only over the gas supply, but also over the electric lighting. This security from future piracy is stated to ensue from an Act of the State Legislature which forbids the granting by the local authority of any new “franchise” for the opening of streets without the consent of a majority of the frontagers. This will be practically impossible to obtain; public opinion being strongly averse to further aldermanic trafficking in franchises, which has long been so fertile a source of municipal corruption.

It is also believed that American business men begin to realize that competition among identical public services is an economic fallacy. The substitute they seem to favour for the time being is a legislative assize of prices. Thus the price of gas in New York is for the current year \$1.05; next year it will be the even dollar per 1000 cubic feet, which satisfies public opinion. The State Legislature, in fixing these prices, does not act blindly. All treasurers of joint-stock undertakings in the State of New York are bound by law to make a sworn disclosure yearly of the state of a company’s affairs, as fully and correctly as they know them. These particulars are not published to the world; but those who have a right to know the truth can always get at it. The limitation of the dividends paid by trading companies, including gas companies, is not an article of American commercial faith; and Americans do not believe that it does any real good in England. It is not a high rate of dividend, but over-capitalization, which is the curse of joint-stock enterprise in all countries. The American gas companies have doubtless been extravagantly capitalized in the past; but this is to a certain extent a national fault. Financial America claims to be settling down to serious business, after sowing its wild oats; and the Consolidated Gas Company of New York are going to be one of the strictest of plaindealers henceforward.

#### The Coal Market.

As we noted a week or two since, the coalowners of the country are beginning to realize, somewhat too late in the day, the fact that their action in taking full advantage of the temporary failure of the supply of coal to equal the demand, and running the price up to the extreme height possible, is having and will have a disastrous effect upon the trade of the country. They had this consideration brought to their notice last week by the Lord Mayor of Bristol, Sir Herbert Ashman, who officially welcomed to the city the members of the Institution of Mining Engineers, assembled there to hold their annual general meeting. Sir Herbert said that he did not know whether, as Lord Mayor, he might presume to caution those whom he welcomed; but sometimes one had to accept responsibilities, and he could not help saying that there was at the moment a danger of coal becoming too dear. There was a risk of proprietors grasping at the immediate advantage, and, as it were, “killing the goose which laid the golden eggs,” by forcing prices to a point at which manufacturing energy might be paralyzed. “The result of such a course must, of course, be ultimate disaster.” Sir Christopher Furness, speaking about the same time at the first annual meeting of the Weardale Coal, Coke, and Steel Company, expressed himself to a similar effect. He said that personally he was a little alarmed at the high price of coal in this country. It suited them as colliery proprietors to receive good prices



and pay high dividends; but he looked at the matter from a larger point of view—as one of a nation which only existed by the increase and development of manufacturing industries, and he would not be sorry to see a reduction in price take place very soon. We do not wish to be ungracious, but that remark savours rather strongly of making a virtue of necessity. The price of coal will, there is some reason to hope, go down soon, whether the colliery proprietors be glad or sorry; so apparently both parties will be thereby satisfied.

It is, indeed, amusing to note that the President of the Institution of Mining Engineers, Mr. H. C. Peake, when acknowledging the remarks of the Lord Mayor to which we have referred, was good enough to say that, “as regarded the price of coal, he agreed with his Lordship that this should not be allowed to go much higher.” It is always wise to affect, like the fox in the fable, not to desire that which is beyond one's reach, and Mr. Peake is most considerate of the consumer—now. But if, by the occurrence of some unforeseen event—say, the advent of severe winter in mid-October—the demand for coal were suddenly increased, we wonder if Mr. Peake or the coalowners would be found saying that the price of coal “should not be allowed to go much higher?” To Mr. Peake's further remarks, giving his explanation of the present situation, there is no exception to be taken. He pointed out that during the lean years, when coal mining could only barely pay its way, without the owners dealing very satisfactorily with the demands of the “depreciation” account, there was no inducement to colliery proprietors or to the public to invest more capital in sinking new shafts, and thereby increasing an output already adequate or more than adequate to meeting the demand. The result was that when the sudden increase in trade activity came about, the consequent heavier demand for coal could not be immediately met. Moreover, cheap coal means wasted coal and unnecessarily heavy purchases. *Hinc illæ lachrymæ.*

This being undoubtedly the case, it is satisfactory to note that in every direction steps are being taken to increase the output, by the sinking of new shafts and the re-working of disused mines; while purchasers are doing everything possible to reduce the demand. Indeed, were it not for the continued heavy shipping orders received from the Continent—both in France and Germany coal appears to be scarcer than ever—we should say the prospects for the near future were brighter at present than they have been for some time past. Unfortunately, the trouble with the miners in America (about one-fourth of all the coal miners employed in the States are said to be on strike, and prices are bounding up), will for the time being tend to delay the progress of the delivery of American coal in Europe. It is worth noting that our own Admiralty have recently bought coal from “the other side;” that during the first seven months of this year about 77,400 tons of coal have been imported into France from the United States; and that a Swiss-Italian Company has been formed at Genoa, with a capital of some £800,000, for the purpose of buying and distributing American coal. We have, therefore, a direct interest in the state of the American coal market.

We deal elsewhere with the outlook in the iron and steel trades, which, so far as it is possible to judge, is decidedly favourable to the expectation of cheaper coal in the near future. Indeed, information that has come to hand since that article was in type only goes to confirm its conclusions. The past week is, in fact, reported to have been, in spite of lower prices and a decided break in the Glasgow pig-iron market, one of the quietest of the whole year in regard to the new orders received. The journal of the allied industries—the “Iron and Coal Trades Review”—states that the feeling is that there will shortly be a considerable reduction, not only in the price of coal, but in iron, ore, and other raw material. The stoppage of work in the Lancashire mills, and the continuation of fine, open weather, both make for an easing of the market.

#### The Report of the Joint Committee on Municipal Trading.

THE careful attention of members of local authorities, gas companies, and indeed of everybody interested in the practical politics of local self-government in the United Kingdom, may well be directed to the contents of the report of the Joint Committee of Parliament on Municipal Trading, just issued as a Blue-Book. The report of the Committee is purely formal; merely stating that it was not possible to bring the inquiry to a satisfactory conclusion

during the session, and recommending its continuance. They have therefore published the minutes of evidence as taken, with an appendix; and this collection of statements, emanating mostly from persons of unquestioned competence, is now available for the instruction of the public in the matters germane to the general question. The result is a text-book which cannot be safely ignored by those who profess views for or against the principle of municipal trading. We do not propose to examine in detail the substance of this Blue-Book. To do so at adequate length would be an undertaking far beyond the compass of our columns. We must therefore rest content with commending the record itself to the earnest study of interested persons; with the observation that it contains matter that tends to support the judgment of those who have been inclined to think that, while the idea of municipalization is encouraged by a superficial survey of the question, a deeper inquiry points to a different conclusion. The present is notoriously an age of hasty generalizations from “tit-bits” of undigested information. The noisiest and most cock-sure of political and social reformers, on the Platform and in the Press, get hold of a few small facts and work them to death. These laborious inquiries supply the best antidote to this hand-to-mouth idea of the way to deal with political problems; and those who will take the trouble to follow them, will never lose their pains.

#### A Deceiving Meter.

AMID the dying echoes of war and the growing mutterings of a General Election, the London newspapers last week found a pleasant interlude in the communications that have passed between the South Metropolitan Gas Company and the Rotherhithe Vestry respecting certain arrears of the gas charges for the local Baths and Washhouses. It appears that for the past eighteen years the gas-meter of this establishment has been misread, with the result that the Vestry have been charged only one-tenth of the correct amount. This extraordinary blunder arose, it is stated, from the circumstance that the meter, which belongs to the Vestry, is peculiar in having the “thousands” dial where the “hundreds” dial is situated in ordinary meters. The meter inspectors took the registration as they were in the habit of doing, never suspecting, it appears, that they were entering thousands as hundreds of cubic feet, and so on. This is the remarkable part of the story. It seems odd the smallness of the gas consumption recorded for such an establishment was not discovered at once. The story goes that when the apparent fact was noticed, the meter was tested and found to register correctly. Yet, though the first dial on the face of the meter is plainly lettered “thousands,” underneath it, the inspectors evidently never dreamed of regarding the legend as giving the key to the mystery. It is very easy to blame them for this blindness; but how should they ever expect one meter in the whole district to have dials set differently from all the rest? At last, a London County Council meter inspector was called in to test the meter; and he reported that the index showed a total consumption of 26,000,000 cubic feet since the meter had been working—it was new with the Baths—whereas the Company's books only showed a registration of 2,600,000 feet. Investigations followed; and as a result the Company have sent in a little supplementary account for close on £3000. When this bill and the explanation came before the Vestry, there was, naturally, an explosion. Some of the members were heard by the vigilant reporters to mutter “Don't they wish they may get it,” or words to that effect. The incident is certainly curious, and we imagine unprecedented. There is no denying the fact of the Vestry having had the gas; and common honesty prescribes that it should be paid for. At the same time, some consideration is due to the present-day victims of the Company's long-continued mistake. The incident shows the possibilities that lie unsuspected in the term “unaccounted-for gas.” We imagine that the law of the matter, as well as the justice of it, are on the side of the Company's claim. Meanwhile, the story has had quite a vogue in the newspapers.

#### Private Enterprise at Bristol.

IN occasional discussions of the problem of improving the dwellings of the industrial population of towns, we have consistently taken the view that the migration of industries to the outlying regions might prove a satisfactory partial solution of the difficulty, where rapid transit is available. It is gratifying, therefore, to learn, on the authority of the



last annual report of the Chief Inspector of Factories, that something like this adjustment is actually in progress in and near Bristol—the instigating influence being the electric tramway. It is stated that, in consequence of the boldness of the Tramway Company in running their fast and frequent services into suburban districts previously sparsely populated, several firms of manufacturers have already built fine and commodious modern factories in these regions, to replace their old pent-in establishments within the walls, and are further providing neat and good housing accommodation for their hands. This revolution in the industrial life of Bristol has been rendered possible solely by the circumstance that a neighbourhood penetrated by an electric tramway is never “out of the way.” People can live, and carry on industries in such localities, while still having the conveniences of the city close at hand, so to speak. As our contemporary the “Hospital,” in commenting on this intelligence, very wisely observes, it is nonsense to maintain that only the country can be healthy. Towns would be healthy enough if they were only opened out. The choice between the factory in the centre of the town, and that planted a few miles out, yet fully within call through the agency of swift transport facilities, is determined in favour of the latter by numerous considerations. To the proprietor, it is a matter of rent, rates and taxes, and room. To the workpeople, it is a question of light and air, of a regular home life, and relief from the worry of catching trains. If the workman must reside near his town employment, it means either living in a slum, or shut up in a gloomy block of buildings in a dark street. If this is not necessary, the alternative is workmen’s trains. Far better move both factory and workpeople out in the open, where the men can get home to their dinners. Not the least satisfactory feature of this Bristol news is the spontaneity of the movement. Mr. Priestman, of Bradford, has just told the British Association meeting in that enterprising town that municipalization is the only remedy for all shortcomings of town equipment. This is a hard saying, and one that common experience does not bear out. It may be impossible in Bradford to get a pennyworth of good milk unless one goes to the Town Hall for it; but in Bristol, at any rate, private enterprise still seems to be good for even bigger things.

#### A Question of Style.

It has happened more than once for the “JOURNAL” to pose as a stickler for the use of plain, good English in technical writings. Whatever scheme of technical education may be devised for the behoof of the young engineer of the future, and whatever examinations he may be required to pass, it is to be hoped that any sign of slipshod tendency in his use of English will be visited with the sharpest condemnation. Technicians who enjoy the privilege of having English to speak and write in, must be made aware that they are individually responsible for maintaining the purity of the language. Technicalities, slang expressions even, do not degrade a language, as does the slovenly use of words and the foggy construction of sentences. It is, of course, possible to use slang quite accurately; whereas ordinary words employed in a wrong sense constitute really bad language. Take, for example, the following passage, drawn almost at random from a technical paper. The writer is discussing the quality of the oil used for lubricating air-compressing cylinders; and he remarks: “It cannot be too volatile, or its flash-point and burning-point will be dangerously low; and it cannot be too heavy, or it may with the dust form a gummy mixture,” and so on. Now the context shows plainly enough that the wretched man meant “must not” when he wrote “cannot.” When one says in English that an oil “cannot be too light,” the meaning sought to be conveyed is that it should be as light as it can possibly be obtained. Yet here the exact opposite was intended. The example is a very glaring one; but it serves to point the moral. Such a misapplication of words in a patent specification would imperil the validity of the patent.

**Corrosion of Cast-Iron Mains.**—The corrosion of a water-main at St. John’s (New Brunswick), under unusual circumstances, is reported by Mr. W. Murdoch, Engineer of the water and sewerage works. It is a 24-inch cast-iron pipe; and the manner in which it has been injured is described by Mr. Murdoch as follows: “Some portions are quite soft, partaking more of the nature of graphite than iron; the metal being disintegrated by salts contained in the soil, which was flowed by the tide about a hundred years ago.” Similar instances of corrosion have been reported from Boston and other places.

## WATER AND SANITARY AFFAIRS.

THE progress of the epidemic of bubonic plague with which Glasgow was visited about a month ago continues to be the most important topic in connection with sanitation. Unfortunately, two additional deaths occurred in the hospital last week, making six in all; but, on the other hand, a number of cases under observation have been dismissed from the reception-house—the period of incubation having been safely passed. The death-roll is not officially regarded as remarkable, considering that the disease had a long start in one of the poorest districts of the city. It is noteworthy that two fresh cases which occurred last Thursday were those of a woman and her daughter living at Tradeston—something like a mile distant from the locality where the outbreak originated. The inference must not be drawn, however, that the sanitary conditions of this particular district are such as to favour the propagation of plague, as there was direct evidence that the parties attacked had been in contact with previous cases. Had this not taken place, the chances are that they would have escaped. This points to the necessity for the prompt isolation of all suspected cases during the period of incubation. Unfortunately, the poorer classes, with whom isolation is out of the question, not unfrequently object to the removal of members of their families who may be suffering from infectious diseases; and it is only when medical men are armed with authority to insist upon this being done, that the patient is prevented from becoming a source of danger to others. As our readers are aware, ample arrangements have been made by the authorities in Glasgow for the reception of suspects; and although, as mentioned last week, the medical staff at Whitehall have not the slightest fear of an epidemic of plague in London, it has been deemed advisable to issue an order to Medical Officers of Health in England and Wales, and others specially concerned, to immediately notify to the sanitary authorities and to themselves all cases of plague, in the same manner as ordinary infectious diseases. It is to be hoped that none may arise; but while there is the possibility—we do not for a moment say probability—of their occurrence, the Local Government Board have taken the very proper step of ordering their notification.

In dealing with this matter in the “JOURNAL” for the 4th inst., and again last week, we emphasized the importance of sanitation in staving off attacks of the disease which is now causing trouble in Glasgow, and suggested that attention should be turned to those places where conditions exist which might, under certain circumstances, favour an outbreak. Of these, notwithstanding the existence of the Parish and District Councils created by the Act of 1894, there are, as we remarked, probably not a few; and, curiously enough, the existence of one in Surrey, not many miles from Whitehall, was evidenced by a letter which appeared in “The Times” on Thursday last. Our contemporary had recently been commenting—and not very favourably either—on the work of the above-named bodies. It was pointed out that the farmers, who are generally in a majority on these Councils, have no very keen sympathy with schemes of sanitary improvement, which necessarily cost money, and involve an addition to the rates, which it is their main thought to keep as low as possible. Consequently, the promoters of a much-needed drainage or water supply scheme will possibly have to contend with “the opposition of their own representatives, and certainly with reluctance and dilatoriness on the part of the whole Board.” Even supposing this dilatoriness is eventually overcome, the scheme has to receive the sanction of the Local Government Board, which is not obtained for some few weeks—it may be months—and, as “The Times” put it, “the long-suffering parish may be thankful if it does not have to wait till some serious epidemic comes to wake up the slumbering powers that be.” This, according to the writer of the letter, was an exact description of the condition of things obtaining in his particular parish. For many years, only half the parish has had a proper water supply, furnished by one of the London Companies; the other half being served from surface wells, which run dry for nearly all the summer months, when a disused brick-pit has to be drawn upon by the kind permission of the owner. It appears that for some years the inhabitants of this part of the parish have been struggling to get a better supply of water, the present having been condemned by the



Medical Officer of Health as "quite unfit for domestic use, "showing a large excess of organic compounds owing to "the contiguity of the cesspools to the wells." We are assured that this is the position of affairs, notwithstanding that the Local Government Board have been appealed to, and the assistance of the local District Council solicited "times out of number;" further, that many of the poorer classes are so terrorized by the threats of the landlords to raise their rents if any water-rate has to be paid, that they speak "with bated breath" of their desire for good water. As extensive building operations are going on in the vicinity, there has necessarily been an influx of labour into the village, and all the available habitations have been filled up to the point of overcrowding; for, by what appears to an outsider as singular inconsistency, while the authorities have for some years persistently rejected the applications made to them for a better service of water, they prohibit the occupation of any new buildings which are not provided with a pure and abundant supply. The result is that the erection of suitable modern houses has been stopped, and the accommodation afforded by the cottages, which are said to be in some cases in a questionable state of repair, is overtaxed. "Here," says the writer of the letter, "is a plague-spot which may at any time burst out "into a hot-bed of disease." It will be well for the District Council to look to the condition of the village, in view of the possibility of its being brought under the notice of the Local Government Board in connection with the order referred to in the preceding paragraph.

The much-discussed question of the control of water supplies was the subject of an interesting address by Professor Glaister, of the Glasgow University, at the Annual Congress of the Sanitary Association of Scotland, recently held in Stirling under the presidency of Dr. A. Campbell Munro, of Glasgow. Starting with the proposition that all water supplies are liable to accidental contamination, he said the natural corollary was that they should be under rigid and continuous supervisory control. This being so, the points to be considered were the nature and extent of the control. He thought it should embrace knowledge of the natural history of the supply, inspection of sources, and chemical and bacteriological examination of the water at regular short intervals. Historical knowledge of a water would allow of a right estimate being formed of its fitness for a town's supply; while inspection, if entrusted to an intelligent person, cognizant of the usual modes of pollution, would facilitate the detection of causes of impurity. In regard to chemical and bacteriological examination, he expressed the opinion that the time had arrived for analytical results to be reckoned at their true value, as hitherto it had been pitched too high. Chemical methods had their limitations; while the present systems of bacterioscopic investigation, although accurate and reliable, as far as they went, were far from perfect. He urged that bacteriologists should formulate some definite line of examination of water, as chemists had done in regard to analyses. He strongly advised the purchase or lease of protecting areas.

Coming to the question of the powers of supervision and control over water companies which should be granted to local authorities, Professor Glaister very properly pointed out, as had already been done by others, that these companies are simply performing duties which the authorities ought themselves to have discharged, but have failed to do so, and that therefore care should be exercised that they should not be unnecessarily harassed by unreasonable proposals. At the same time he thought some alteration in the law was needed in this regard, in view of the fact that water is a necessary of life, and that a company possesses the monopoly of its supply in a given district. He expressed the belief that the clauses which have been drafted by the Local Government Board for embodiment in a General Act applicable to the whole country would meet the case; and he confessed to having no sympathy with the proposal to centralize the control of water supplies in a new Board, nor did he approve of the suggestion to establish a State Department of Public Health. He thought local authorities have already sufficient power in their hands to protect their water supplies. This same question of the control of water supplies, which has had to remain in abeyance in consequence of the more important matters occupying the attention of the Government, will very possibly be revived, with some other neglected home affairs, when the new Parliament meets "for the despatch "of business" early next year.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 791.)

THE condition of affairs on the Stock Exchange last week went from bad to worse. When we wrote last, they were suffering from depression, having had a severe disappointment; but worse was to come. The dissolution of Parliament has practically killed business; and it does not take much to kill it. All hope of any revival until after the elections are over is quite abandoned; and people are settling down in a resigned way, accepting the inevitable. Prices, of course, are all down. There was a bit of a fillip after the receipt of Lord Roberts's wire on Thursday; and things were fairly firm at the close, but they could not recover their lost ground. In the Money Market, short loans were met on easy terms; but rates for discount were harder. In the Gas Market, there was just as much restriction upon business as in any other department; transactions being on a very limited scale. But it had the advantage of immunity from the depression which characterized the markets in general. Where so little was done, changes in quotation are naturally few in number. But some of them were fairly large; and they all indicate a continuation of the tendency to recover from the low figures to which quotations were reduced when the great rise in the price of coal first took hold. At the same time, it ought to be borne in mind that it is in the current half year that the effect of the rise will press most heavily. In Gaslight issues, there was moderate business in the ordinary at good firm figures that seemed to justify a higher quotation; and the secured issues were fairly active too. South Metropolitan was rather quiet, and devoid of feature. A few transactions in Commercial were at good middle figures. Dealings in the Suburban and Provincial group were very limited, but at good prices. Crystal Palace further advanced. Southampton was set back; but that might have been done earlier. The Continental Companies, though quiet, showed out well; both Union and Imperial improving on their figures. There was nothing to notice among the remoter undertakings. The Water Companies were quiet and firm; and several issues made a further slight advance.

The daily operations were: Business in Gas on the opening day was very moderate; but the tone was good. Continental Union rose 2. On Tuesday and Wednesday, business fell away to very small proportions; and quotations did not vary. Thursday was no better in point of activity; but Imperial rose 1. Southampton was put back 5. Friday was a shade more brisk, and quite as firm. Union had a further rise of 3. In Water, Chelsea and Southwark rose 2 each; and East London, Lambeth, and West Middlesex gained 1 each. Saturday was fairly active, and very firm. Crystal Palace improved 3.

### ELECTRIC LIGHTING MEMORANDA.

The Combination of Cable Makers—Suggestions for Standardization—A Paper on Electrolysis—The Woes of Manchester.

IT is an old complaint of the electric engineering profession that while the engineers and electricians do all the work of developing the industry, the cable makers take the lion's share of the profit on every job. Consequently the cable maker has been injuriously likened to Brer Rabbit, who commonly found his advantage in "lying low and saying nuffin';" to the proverbial still swine who eats up most of the draff; and so forth. The design and construction of dynamos, questions of "phase," of lamps, of meters, and all the numerous technical problems which exercise the electrician and fill the professional journals, are naught to the cable maker, who simply takes orders and pockets his profits. His is the only branch of electrical trade which has kept above water throughout the stormy periods that have supervened since cables began to be required for other than telegraphic purposes. Naturally, the others are sore about it; but they cannot help themselves. The manufacture of insulated cables is not everybody's business. It is in few hands; and those in the trade have been able to make their own terms. This circumstance has not prevented the purchasers of cables for different purposes from following their own fancies in regard to the design of these conductors; and some of them have been fearfully and wonderfully made. A volume might be filled with descriptions of the various patterns of electrical conductors actually made to order during the past twenty years, ranging from Dr. Kennedy's plain, bare copper bars to the newest rubber-substitute insulated wire.

Now, after all this experience of the fancies of consulting electricians, the cable makers have formed themselves into a league, and put forward a suggestion for the standardization of cable specifications of which the outside profession hardly knows what to think. In so far as the action of the cable makers favours legitimate standardization of means and requirements, there is obviously no objection to it. Besides, they were the only people who could do it. Clients and contractors alike have suffered in the past from the vanity and the ignorance of self-styled electrical engineers, who were more successful in touting for business than in carrying it through. Judged from the commonsense, commercial standpoint, it might be difficult



to say which is the greater nuisance—the pedantic electrician who works out the dimensions of his conductors to four places of decimals, and scorns to recognize any stock dimensions and patterns, or the ignorant pretender who does not care what he promises so long as he gets a job into his hands. It is equally difficult for the cable maker to work satisfactorily with either. The step taken by the associated cable makers should be a salutary check upon both these troubles of the trade. It will place the makers in a position to decline orders that do not come within the very wide scope of what their experience teaches to be legitimate. Naturally enough, the suggestions of the makers go a little beyond what might be esteemed on all hands the strict necessities of the trade. Thus, they desire to free themselves from the common contractors' obligation to submit to the engineer's decision as final, and propose an arbitration clause in specifications. This is a general question of engineering contracts which cannot be summarily disposed of with special reference to one class of business. We have had previous occasion to discuss the point on its general merits, and therefore need not go into them here. Suffice it to remark that a consulting engineer who knows his position, and is determined to do his duty, will never consent to be bound to order payment for what his judgment tells him his client does not want. If a contractor has reason to distrust an engineer, he can decline to tender to his specifications.

The current number of the "Electrician" contains the text, with illustrations, of a valuable paper by Mr. Dabney H. Maury, of Peoria, on the electrolysis of underground metal structures, due to the operation of electrical street railways. Mr. Maury has been, since March, 1893, Engineer and Superintendent of the Water-Works of Peoria, Ill., and has therefore lived right through the period of electrolytic disturbance. The trouble first showed itself by the remarkable frequency of service-pipe bursts, although the lead piping was of extra strength. Then the cast-iron mains became affected. Interest soon concentrated on the joints of tar-coated mains; and Mr. Maury instituted a series of experiments, the results of which he gives, to determine the nature and extent of electrolytic currents on spigot-and-socket joints. Broadly speaking, the teaching of experience in this regard is that cast-iron mains cannot convey electric currents without injury. It is wholly a question of degree. The owners of such pipes can do nothing to protect themselves. Those owning the electric tramways must bear the entire responsibility. It has been proposed by some electricians to take the bull by the horns, and make electrical connection between the return wires and the pipes, thus converting the latter into part of the electrical system. Mr. Maury objects that, although this expedient would certainly lessen the amount of mischief done in what are recognized as dangerous areas, it would eventually lead to the breakdown of the entire pipe system, beginning, perhaps, at points remote from the original cause. He also denies the utility of any such device as an "insulating joint," or "insulating section" of pipe. In order to be effective, he says, the whole system would have to be made of some non-conducting substance, as stoneware; because a really dangerous current can get round a length or two of pipe just as easily as it passes by the smaller obstacle of a yarn joint. The real difficulty arises from the fact that not even a continuous rail can be relied upon to carry the return current without leakage. "The rails are not insulated from the ground; and the pipes would still carry, and be affected by, a large portion of the current, as is clearly shown by numerous electrical surveys and reports of serious damage in cities where the best tracks known to modern science are in use." In conclusion, the author recommends the double-trolley or conduit system as offering the only perfect means of keeping current out of the ground and preventing electrolysis.

Manchester has lately had its fill of electrical troubles. Following hard upon the accidental destruction by fire of the central telegraph station, came a mysterious collapse of the municipal electric lighting, which completely broke down at about 8 o'clock on the night of the 19th inst. No particulars of the mishap have yet been published; nor do we know how soon the service was restored.

## METHODS OF ADVANCING THE WELFARE OF THE WORKING CLASSES.

### [SECOND ARTICLE.]

In the opening article we summarized and commented on the account given by Dr. Gilman (in his book "A Dividend to Labour") of some among the most noteworthy of the efforts made by employers in Germany to advance the welfare of their workpeople, and to create that bond of friendly feeling between man and master which is worth a king's ransom to a business. We have now to notice Dr. Gilman's record of schemes instituted by employers in this country in the hope of achieving the same results. Many of the schemes are on the same lines as those adopted in Germany; and we need not go again over the ground already covered. But, generally speaking, it may be said that the employer in this country does less for his men in the way of organizing their home life, their pleasures, and their methods of thrift and providence, than does the Continental, especially the German, employer. The explanation of this state

of affairs is not far to seek. It lies in the fact that in England the working-classes, having greater freedom, and being better educated and more intelligent, have done much for themselves by organization—through the agency of trade unions, co-operative stores, and friendly societies—that the Continental employee needs to have done for him, or it would never be done at all. Moreover, the English workman, by very reason of his superior intelligence and greater political liberty, is far too independent in spirit to care to have too close heed paid to the conduct of his private life and affairs by his employer or any other outside person. He is strongly imbued with that spirit which well-meaning, but officious, persons often encounter in their kindly efforts to teach all mankind (or womankind) its business—namely, the spirit of preferring to manage one's own business indifferently, rather than allow other people to manage it for one, be it never so well that they could do it.

Nevertheless, there are many directions in which the employer in this country can be of assistance to his workmen without in any way running counter to that spirit of independence, and in no way more than by giving to them, in the management of the various provident or other clubs to which they subscribe, the benefit of business and financial experience, which he and his principal officials naturally possess in a more marked degree than any workman can—though, even here, care must be taken not to give the impression of desiring to dictate. Men are very apt to imagine—and the Friendly Societies and Trade Unions do nothing to lessen this aptitude—that clubs connected with their firm, and on the management of which the firm is represented, are run really in the interests of their employers rather than in their own. Where such a belief exists, no good, and sometimes harm, will accrue. Whether it exist or not depends very largely upon the amount of tact displayed in offering and giving the assistance; and it is, of course, as impossible to teach tact as to impart taste to those who possess it not. We merely wish to throw out the hint that, in such matters especially, how a thing is done is often of more importance than how much is done.

Dr. Gilman instances the efforts of numerous firms as proving that English employers have shown interest in their employees in "an admirable and comprehensive fashion." First among these is the firm of Lever Brothers, whose village of Port Sunlight, built for the accommodation of their workpeople, is well known to many by repute, if not by actual acquaintance. A number of the houses in the village were practically given to the men as a form of profit-sharing; the rent being gradually reduced to the nominal figure of 10 per cent. of that originally charged, and the firm, moreover, undertaking the maintenance and repairs. This system is not now continued; it being considered "that living almost rent free would impair the workman's feeling of self-respect and independence"—an argument which hardly appears conclusive, as the man would, it seems to us, feel he had earned the right to so live. We may take it, however, that Messrs. Lever found from experience that their original plan was not best calculated to ensure the successful working of profit sharing; and one of the most valuable features of Dr. Gilman's book is that it is a record of experiments actually made by practical men, and tells therefore of failure to avoid as well as success to emulate.

The cottages at Port Sunlight are lighted by gas, and have each at least three bedrooms, as well as a bathroom—a great and much-needed improvement on the ordinary workman's house—and a garden. A tract of land is let out in allotments for kitchen garden purposes, at very moderate rental. The houses, be it said, are not simply the brick boxes made by the score, and all of a hideous sameness, which constitute the ordinary working-class quarter, but red brick and half-timbered structures of varied architecture. The proverb that "God made the country, man made the town, and the devil made the big town," always recurs to one when passing through the miles of squalid dreariness that are to be encountered (say) in some of the outskirts of London. The depression that pervades the atmosphere of such mean streets is enough to drive men to drink and crime; and no employer can do a truer service to his men than to give them the chance to rent houses which it is not a mockery to call homes. There are, in the village of Port Sunlight, various clubs and institutions—bowling alleys and billiard, smoking and concert rooms—which were originally founded by the firm, but are now self-supporting and are managed by their own committees. "There is no public-house in the place." The hours are 44 and 48 per week for women and men respectively; a system of premiums on wages is in vogue; and "in all the departments wages are higher than elsewhere in the district."

The most noteworthy feature of the various schemes in force for the benefit of the employees of the well-known printing firm of Hazell, Watson, and Viney—who have tried, but abandoned, a system of profit-sharing—is the plan for facilitating the acquirement by the workmen of shares in the concern. Arrangements are made by which the men can purchase shares by means of weekly instalments of one shilling, receiving dividends thereon from the date of their first payment. The share, therefore, eventually becomes the man's property for payments (less dividends) equal to only three-quarters of its market value; while it is provided that if a man dies "at any time after paying the first instalment, his family own the share without further payment." When all the instalments are paid on the shares now in process of being acquired, the value of the capital held



by the men will be close upon £30,000—"no small part of the capital required to work the concern."

Messrs. Hazell, Watson, and Viney have, as we have said, instituted many plans for furthering the welfare of their men. Most of them are similar in character to those we have described as in operation in other employments. We will only now mention the fact that the Directors subscribe for a number of letters for convalescent homes, hospitals, and medical aid societies. This is a course adopted by the directors of numerous large concerns—certainly by many, and we hope by most, of the principal gas companies in this country, and is in every way commendable. The provision for sending deserving cases to homes by the sea or in the country, in order to render recovery from debilitating sickness more complete than it can possibly be made in town dwellings (often none of the most healthy), is, as has previously been urged in the "JOURNAL," one of the most truly profitable forms of expenditure. The difference between the quantity and quality of the work done by the man who crawls back to duty so soon as he can get out of doors, and of that turned out by the man who is not allowed to come back until fresh air has put fresh life into him, will soon repay tenfold the cost of sending the second man away for a fortnight or three weeks. We may also note that "the Company encourages its apprentices to acquire a good technical knowledge of their business, by allowing them to attend, in business hours, classes conducted by certain technical institutions in London, they being paid as if still at work."

No list of employers who have sought to improve the condition of their workpeople would be complete that did not include the name of Cadbury Brothers, the senior partner in which—Mr. Richard Cadbury—died last year. To his private generosity alone Birmingham owes about £70,000 worth of buildings, in the shape of "a great educational institution for the working classes, a convalescent home for children, and various provisions for the aged." The works of the firm at Bournville are, as all will bear testimony who have had the pleasure of visiting them, a perfect model of comfort and health for the employees; while the houses built for their accommodation are most attractive, yet are made to pay interest on their cost out of a five to six shilling rent. The gardens attached average about one-sixth of an acre—which makes the Londoner sigh with envy.

The firm of Sir W. G. Armstrong, Whitworth, and Co., of Elswick, combines the encouragement of thrift with a kind of profit-sharing, by receiving deposits from the employees or the officials in sums of not less than one shilling nor more than one pound (in the case of officials two pounds) per week, and adding thereto not only 4 per cent. interest, but also "a bonus equal to half the difference between the fixed rate of 4 per cent. and the dividend payable on the shares of the Company." The firm also take much interest in the education of their employees. There are connected with the works "a mechanics' institute, a day school with a science class, and a night school mainly for apprentices, with classes in mathematics and natural science. These have enjoyed the patronage of the heads of the concern, and have had very excellent results."

Dr. Gilman's account of English employers' efforts for the welfare of their men comes to an end with a description of the provident funds connected with the great railway companies, which are run upon familiar lines. We have left ourselves no space to touch upon Part III. of his book, dealing with profit-sharing, which we must consider in a further article. We have, let us hope, quoted sufficient from Dr. Gilman's account of concrete efforts that have been made to attain the abstract ideal which he set forth as realizable by the employer, to give our readers an adequate conception of what can be, and is being, done both in this country and abroad to raise the level of the relationship between employer and employed. In Dr. Gilman's words:—

The employer who would proceed with animation, but with moderation, on the line of a practicable advance, has now before him the record of the experience of many such men as himself who have . . . made a high-way in the social wilderness for him. Realizing, from the purely financial standpoint, that the human equipment of a factory is at least as important as the mechanical equipment, these sagacious men have provided for its maintenance at the highest point of efficiency. The employer is "made of social earth," as well as his operatives; and welfare-institutions for their benefit, undertaken merely from long-sighted prudence, can hardly fail to bring him nearer, as time goes by, to a living sympathy with these men and women of like passions with himself. An employer who concerns himself to house his helps well, and gives them the benefit of his capital, used in buying land on a large scale, laying it out with a view to health and beauty, and purchasing building material for them at wholesale rates, may be very unconscious that he is a social reformer. None the less, though quite independent of legislators, and even distrustful of "theorists," he is doing more to establish democracy on its necessary moral basis, and to bring in the Kingdom of God, than the social enthusiast whose large projects meet a fatal enemy in human nature.

We can only hope that Dr. Gilman's book will have the wide circulation among employers that it deserves.

**The Temperature of Acetylene Flames.**—The maximum temperature of an acetylene flame has been given by M. Le Chatelier as from 2100° to 2420°; by Professor V. B. Lewes as 1517°; while Professor Smithells's figure is somewhere between the above. Mr. E. L. Nichols, in a paper read before the American Physical Society, gives the temperature in the middle of the flame as 1900°, and at a distance of 1 mm. from the middle 1920°. The highest temperature obtained from a luminous coal-gas flame with the same apparatus was 1780°, and from a candle flame 1670°.

## THE BRITISH ASSOCIATION AND MUNICIPALISM.

[SECOND NOTICE.]

LAST week we explained, with a running commentary, the nature of the case for unlimited municipalism which Mr. Arthur Priestman laid before the British Association meeting at Bradford. We showed how his ruling idea was that private enterprise should be wholly excluded from every kind of employment embraced in organized town services and supplies, and how he ignored every objection to a rule of Municipal Collectivism. Mr. Priestman was immediately followed by the Hon. Auberon Herbert's paper on "Municipal Building for the Overcrowded," which set out the opposite view, that unnecessary municipalization (which is another name for compulsion), is to be avoided. Mr. Priestman, although a man of much experience in municipal business, was the theorist, the dreamer. Mr. Herbert, the detached and somewhat eccentric philanthropist, was concerned with the practical effect of government on the parliamentary model, by the conflict of majorities with minorities. The difference of the two voices expresses the irreconcilable divergency of the two ruling political parties which divide all civilized commonwealths. The one party sets much store by names, principles, and professions. Its followers easily persuade themselves as to the sovereign efficacy of certain forms of government and systems of administration. So long as a "programme" can be classified as democratic, or parliamentary, or progressive, they accept it blindly for themselves, and make believe that it must be good for everybody at all times and in all circumstances. The other habit of thought is less gracious to the outward view. It is largely influenced by ever-present remembrance of human frailty, and is consequently forever inquiring how things work, regardless of what they are called.

Mr. Herbert, whatever his political profession, is one of those who submit even the parliamentary idea of government to the test of experience. He perceives that the rule of majorities is hard on minorities, and is apt to degenerate into administration by machine. The theory of democracies is that the people rule themselves by their chosen representatives; the practice is that the minds, the bodies, and the property of all are at the disposal of the victorious section. Happily, the innate honesty of the English character, its impatience of logical formularies, and the sportsmanlike appreciation of fair play which appears to be an English peculiarity, help to keep English national and municipal institutions healthy. Hence, as Mr. Herbert says, we must look abroad for the worst examples of the failure of what is facetiously termed "popular" government. "What a chronicle of extravagance and corruption has met our eyes in many cities of other countries! What violent partisanship in the Paris and Vienna of the present hour! What organized illegality in New York! What desperate remedies in the suspensions of the right to govern themselves in the cities of America!" Mr. Herbert's suggestive preventive against the infection of British municipalities with this kind of poison, is to preserve and develop the voluntary side of municipal service. "We cannot go on for ever slipping and sliding against our will into Socialism; we must learn to meet great wants in better fashion—the fashion of men who are not compelled. . . . So long as we satisfy every new want by the easy and idle methods of compulsion, we learn nothing; for compulsion leaves all faculties undeveloped, and only deepens the courses of strife."

The note of common sense and practicality was struck, between these discordant voices, by Mr. E. Bond, whose name has been mentioned in the "JOURNAL" as that of an authority on the housing of the poor. He is Chairman of a joint-stock Company who actually make a living profit out of the rents of the humblest class of good industrial dwellings, which is more than most municipal corporations can do. Mr. Bond laid down the rules, hitherto esteemed good and valid, by which the question of the expediency of municipal action in any particular may be determined. "They were all agreed that a municipality should look after the health of its population, should see that the streets were properly paved and lighted, and should exercise a large number of multifarious functions depending to some extent on local circumstances; but not in any case for the sole purpose of making a profit." The supply of water is typical of the kind of enterprise, exceeding the primary and imperative functions of local government which a municipality might reasonably undertake. Among the reasons cited by Mr. Bond as justifying this addition to the responsibilities of a local authority—as the necessity of water, the absence of risk in the management and financing of a town's supply—he omitted the most potent of all. This is the consideration that the due apportionment of the water resources of the country, which cannot be increased, but can certainly be husbanded, is become a matter that transcends the range of private interest.

As regards other subjects which are being too lightly regarded as suitable for municipal appropriation—such as gas and electricity supply—Mr. Bond has reasonable doubts. He pointed out that if municipal gas or electricity, were to turn out a failure for any reason, the municipality would be in a difficult predicament. Even in the modified way in which the Bradford Corporation gas business has failed this year—failed to return the "usual profit" for relieving the rates—the circumstance has induced Mr. Priestman to contemplate a step which would be jumping out of the frying-pan into the fire. A municipal coal



mine is wanted to ensure the relief of the rates out of gas profits. This reads like an absurdity; but it is a statement of fact. Mr. Bond justly declared that the whole idea of municipal trading was that of making a profit. At the bottom of it lies the presumption that "persons who had no special knowledge of the kind of business entered upon were perfectly capable of undertaking the control of any business simply because they were called a municipal corporation." The truth is otherwise. Mr. Bond can speak for the London County Council, of which he is a member; and he avows that the mass of work thrown upon this body is already so great that only a very small part of it can be properly understood by any one member. The result is that reliance has to be placed more and more upon the paid staff, the individuals forming which may not always be competent and honest. Therefore is Mr. Bond desperately against any considerable enlargement of the scope of municipal trading. "So far from sharing Mr. Priestman's view that the health, wealth, and well-being of the community would be advanced by the extension of municipal enterprise, he was of a directly opposite opinion. He believed that municipalities would find themselves in a financial muddle if they went much further on these trading lines. There was no reason to believe that articles of general consumption could be supplied cheaper, better, or more suitable by the municipalities than they could be supplied by private enterprise," while, of course, no choice is open to the customer of a municipality. The municipal corporation who go into trade abdicate their right of supervision of the trade in the public interest. The mediæval ale-taster was not a beer-seller.

Professor Silvanus Thompson intervened in the discussion with a mild reminder to Mr. Priestman that electricity supply is not the parochial affair that Bradford and other towns have hitherto made of it. He jibed the Corporation for their mismanagement of the local tramways—in keeping to the old local narrow-gauge lines because there were a few antiquated cars to be worn out. This reproach, if just, bears out what has been often remarked in the "JOURNAL" concerning the reluctance of local authorities to "scrap" obsolete plant. A speaker who challenged a hearing by the sheer weight of his matter was a Mr. J. H. Levy, who carried the campaign into the enemy's country by declaring, against the presumption of the paper, that monopolies hardly ever pay, in the best commercial meaning of the term. Of course, in the case of a municipality holding a monopoly, it could be made to pay by the exclusion of all competition, and charging a higher price for the services rendered than would be charged by private enterprise. This is a view of municipalism not likely to please the ardent municipalizer; but Professor Gonner lost no time in pressing its consideration. He would have nothing to say in favour of municipalizing the supply of necessities of town life, or any other false generalization respecting the kind of services that may be monopolized. A monopoly is an economic expedient for getting certain services performed which cannot be so satisfactorily done under other auspices. It is not a question of whether the services are necessary to life, or whether they are large or profitable. It is a question of the sinking of capital, and of establishment expenses. Two national postal services are unthinkable; and so are two distinct tramways in one street. This is the aspect in which to place the question of monopoly or competition. Professor Gonner confessed that he did not like to see municipalities taking up with trading merely for the sake of the profit of it. This should not be the inducement at all. Mr. H. Wilson followed on the same side. He also pointed out that municipal trading in England is an affair of very recent growth; and its character for success has therefore depended altogether on the ability and integrity of those individuals who had inaugurated the various schemes, and had seen to their execution. There remains the danger that the management of these enterprises may fall into improper hands, with the same result as that rendered familiar by American experience.

Dr. Hime also came down very heavily on Mr. Priestman for his Socialism—declaring that the presumption of the success of municipal trading had no justification in the history of the world. Individual rivalry and trade competition is a fruitful source of individual misery; but there is no adequate proof that the human race would have risen to its present degree of civilization and development without anxieties, wants, trials, dangers, and sufferings. The municipalization of everything meant, to Dr. Hime, the control of everybody by the Corporation Inspectors, who are a class of men often unfit for their duties. This prospect did not please him. These high theories so commonly pass out of sight behind the commonplace agent through whom they operate in the last resort!

On the whole, therefore, it cannot be truthfully said that the cause of municipal progress in the direction of trading received much encouragement at the Bradford meeting of the British Association. Doubtless, if some of the smart young journalists who do the newspaper puffing of the Progressive Party in London and other large centres had been at Bradford, they would have been as facetious at the expense of the cautious old individuals who were generally averse to turning the Town Hall into a general dealer's shop, as they usually are in the acknowledged "organs" of the Party. They were absent, however; and Mr. Priestman stood alone for his cause. It would be flattery to say that he advanced it materially.

Meanwhile, before concluding this notice of the subject, it is

very much to the point to mention that the Blue-Book containing the "Interim Report" of the Joint Committee of Parliament on Municipal Trading, with the minutes of evidence, has been issued. It is a mine of interesting information, naturally more distinctly focussed in support of various opinions than evidence of facts. The volume is worth getting, if only for the evidence of Sir Benjamin C. Browne, Mr. Livesey, and other men of affairs who freely gave the Committee their views of the guiding rules, not merely of municipal trading, but also of the main principles discerned by them in the development of the national industries. It has been the cue of a certain brand of politicians to sneer at the Joint Committee on Municipal Trading; but although the title of the Blue-Book which records the fruit of the labours of the Committee up to the present time is not a taking one, it is better worth studying than most text-books by anyone who is curious in respect of the multifarious subjects spoken of by the numerous witnesses called. It is one of the most valuable aids to the effective criticism of the matters to which it relates that has ever been put into the hands of the public. The appendices are alone worth the price of the book.

#### THE POSITION OF THE IRON AND STEEL TRADES.

AN incident significant of the present very peculiar condition of the iron trade has just occurred in Glasgow, when the Secretary of the pig-iron ring was presented by the members with a pair of white gloves to commemorate an event which had not previously happened for many years—namely, that not a single transaction took place that day at the meeting of the Glasgow iron market. The outlook in the iron and steel trade grows, in fact, more gloomy, and the future more difficult to accurately forecast, with the passing days. The ironmasters have to face, on the one side, the facts that orders on hand are being executed at a greater rate than new orders are being received, and that foreign competition is becoming daily more assertive; and, on the other, a greatly increased cost of production, both on account of the really tremendous price of coal and of the present high rates of wages.

That orders of sufficient magnitude to replace those in process of execution are failing to come in, cannot be doubted, and is, of course, only what was to be expected, as consumers naturally are restricting their requirements to the lowest possible figure, rather than buy at present prices—especially those whom we may describe as "ultimate" consumers, by which we mean buyers whose purchases would be in the nature of capital expenditure. For such, buying at present prices means laying on their undertakings a permanent handicap. Prominent in this class stand the shipowners; and, though the activity of trade has had the effect of sending up freights, there are two considerations that give pause to those who contemplate giving out orders for new ships just now. The first is that bunker coal is so dear as to largely discount the higher freightage receipts; the second, that the activity of trade is obviously diminishing rather than increasing.

Not only, however, are the shipbuilders of Scotland and Ireland obtaining a less volume of orders, but no small quantity of the material wherewith to execute those they do receive they are buying, not in the home, but in the American market; and a considerable increase in the imports of ship-plates and other structural materials from the States will certainly be shortly witnessed. Reports are, indeed, in circulation as to the purchase of from 50,000 to 100,000 tons of steel from American houses; but we shall require the evidence of the Board of Trade statistics before placing absolute reliance on figures which may be invented for market purposes. There can nevertheless be no doubt that with the prices of iron in the States much below those in this country, and showing signs of falling lower still, American material will be increasingly used for structural purposes here, unless a marked change comes rapidly over the coal market.

For it is, we need hardly say, the price of coal that is the main, if not the sole, cause of the growing depression in trade generally, and in the iron trades in particular—not only in this country, but in others. Germany especially finds herself in much the same boat as ourselves. The irony of the situation is that it was the activity of trade everywhere that produced the "boom" in coal; and now, boomerang fashion, it is the price of coal that is checking the activity of trade. And, of course, the check to trade will in its turn bring down the price of coal. So we go round like a dog after its tail. What most people want to know is, What gave the originating impulse to trade? It is always dangerous to dogmatize on points so obscure as this; but we have before now expressed our belief that it is to the general expansion of the world's navies that we may look for the *causa causans* of the industrial activity of the past few years. And a trade revival based upon the non-productive expenditure of taxes is necessarily so artificial as to be of but short duration. The enormous growth of trade in America cannot, however, be put down to naval construction; for that is, comparatively speaking, but in its infancy in the States. There the general increase of business has resulted from the rapid but natural development of the nation—the higher standard of living, and the exploitation of the resources of the country.

From whatever cause the recent trade revival sprung, the gas



industry has suffered heavily from its effects, and cannot view the prospect of a return to less exciting and more humdrum times in the industrial world with anything but relief. If, however, the present time of adversity should result in the introduction or stricter observance of economy, and the cultivation of a greater spirit of enterprise, in the conduct of the affairs of gas-works undertakings, good will have, as it is always said to, come out of evil.

### AN ENGINEERING RECORD OF THE PARIS EXHIBITION.

LAST month's number of the "Engineering Times" was specially and entirely devoted to the engineering exhibits in this year's Paris Exhibition. It forms a handsome book of nearly 300 pages, and is profusely and admirably illustrated. It will prove of considerable interest to the many gas engineers who have visited the Exhibition—serving to remind them of much they may have seen; while for those who have been unable to go to the greatest Industrial Exhibition the world has yet seen, it will suffice to bring before them its chief technical novelties and attractions.

The interesting editorial introduction opens with a brief historical review of Exhibitions, dating, in modern times, from the year 1797, when the Marquis d'Avèze organized a display of the three principal French government manufactories—the porcelain of Sèvres, the tapestry of the Gobelins, and the carpets of the Savonnerie. The seventh National Exposition, held in the Louvre in 1827, was the first in which the steam-engine played an important part; while that of the year 1844 was remarkable for the heavy moving machinery exhibited. The present Exhibition marks the tremendous strides that have been made within the past hundred years, and forms the starting-point for the further advances of the Twentieth Century.

The great enterprise and keen competition of Germany is one of the most striking facts that is brought home to us from a visit to the 1900 Exhibition. Not that the comparison between the German and British exhibits justly represents the proper position of each in the industrial world; but this is the conclusion—erroneous though it may be—that many foreign visitors will come to. How can it be otherwise when Germany voted a grant of £250,000 to represent her at the Exhibition, and Great Britain only £75,000? Even more convincing than this is a glance at the number of exhibits for which each country is responsible. France naturally leads the way with 30,000, followed by the United States with 6564, Belgium with 2500, and Germany with 2000—the same number being also attributed to Italy. Great Britain (bracketed, if you please, with British Columbia) figures with 600! being beaten also by Russia, Scandinavia, and Austria. It cannot be doubted but that such poverty of representation on the part of Great Britain will exercise a depreciating influence, and have a baneful effect, on its future commerce. Strong animadversion is passed on our Royal Commission for the "half-hearted, spiritless manner" in which it has performed its duties.

There are many interesting pages, with beautiful photographs, dealing with subjects that do not fall within the immediate province of the "JOURNAL," such as railway locomotives, steam-engines, and machinery of various kinds and for various purposes. Modern electrical plants are also dealt with, and would repay examination. Let us, however, notice those branches and those exhibits in which our readers are more particularly interested. There are two chapters on "Oil and Gas Engines." Of the former, the largest one shown is of 40-horse power, known as the "Hornsby-Akroyd." There are others, of which details are given—such as the Cundall, Dudbridge, Campbell, Priestman, and Ruston engines. The oil-engine of Messrs. Blackstone and Co. is easily converted into one for the use of gas. Its oil reservoir is in the foundation casting of the engine; and it is stated that the cost of working a 14 brake horse power engine, with oil at 6½d. per gallon, is 0.588d. per brake horse power per hour. A portable engine of the same make is also illustrated. With regard to the show of Messrs. Crossley Bros.' gas-engines, it is complained that it cannot be regarded as really representative; for, owing to lack of space, only their smaller-sized engines are exhibited. Special "Campbell" gas-engines for electric lighting are described; and the consumption of Halifax gas in one of 34 brake horse power proved to be 15.4 cubic feet per brake horse power per hour. Of course, mention is made of the 650 brake horse power Westinghouse gas-engines in use; and a view is given of a three-cylinder engine connected directly on to a dynamo. Illustrated details of its working parts are also shown, and its action explained. The "hit-and-miss" principle of gas-engine governing has been done away with; the number of explosions always being the maximum, whatever may be the engine load. With a reference to the carburetted air, gas, and oil engines of Messrs. Dougill, this portion of the Exhibition is concluded. Analogous to it, however, is the consideration of "Blast-Furnace Power Machinery." An admirable full-page illustration of a 600-horse power blast-furnace gas-engine, made by the John Cockerill Company, of Seraing, Belgium, is given; and this exhibit is one of the most important novelties of the Exposition. The engine has only one cylinder, 51.18 inches in diameter, with a length of stroke of 55.15 inches. Tests were made on it, before leaving the makers' works; and, in the presence of an International Committee of experts, it was

found that it developed 900 indicated horse power, with a consumption of 100.8 cubic feet per hour. The gas used was delivered from five Bessemer blast-furnaces. The engines and apparatus of the Blast-Furnace Power Company are also fully described; and the means to be adopted for utilizing blast-furnace gases in gas-engines are dwelt upon. The great economy that may be made by such employment is emphasized.

One article is devoted to "Gas Exhibits and Lighting." It is contributed by Mr. C. E. Brackenbury, Assoc. M. Inst. C. E. After describing the Gas Pavilion, and the general arrangement of the exhibits, attention is called to models that are of interest to gas engineers. There are situated close at hand to one another three models of settings of inclined retorts—an unpretentious one by Messrs. Graham, Morton, and Co., Limited; a more ambitious one by the Société de Cornues Inclinaées; and a more imposing one still by the Stettiner-Chamotte-Fabrik. These represent the ideas on this carbonizing question of English, French, and German. The approximate cost of the models may be taken respectively at £50, £400, and £3000! The differences between these figures may be considered in the light of what has already been said on German enterprise. The writer of the article, however, pointedly asks: "What about their merits, not as examples of the model-maker's art, but from the point of view of the practical gas engineer?" Reference having been made to the well-placed exhibits of French firms, Mr. Brackenbury inquires, "Where are the stalls of our English manufacturers of gas plant? . . . Where may gas engineers of other nations find our latest and best example of exhauster? Where our washer-scrubbers? Where may models of our admirable purifier valves, and one-hundred-and-one other things be seen? And where do we show our acknowledged superiority of gasholder workmanship, and our up-to-date columnless holders? Where? *Nowhere!*"

Among miscellaneous appliances of interest to gas engineers, mentioned in this admirable engineering record of the Paris Exhibition, may be cited the well-known Temperley Transporter, a good working model of which was on view, and soon met with an offer of purchase. It showed a travelling tower transporter, by means of which apparatus coal can be lifted from a vessel, carried along the beam, lowered, and deposited, and the empty skip returned, within the space of 45 seconds. Avery's automatic weighing machine is also described and illustrated; and its successful working with coal is recorded. Among the "Instruments of Precision and Measurement," we find mention of the platinum thermometers, or pyrometers, made by the Cambridge Scientific Instrument Company, Limited, to which attention was called by Mr. Leather, of Burnley, in the discussion on Mr. Alten S. Miller's Congress paper on the "Measurement of High Temperatures." (See *ante*, pp. 631 and 643.) Their advantages are stated to be: The varying positions in which they can be used; the measuring of temperatures as high as 1200° C.; the placing at a distance of the indicator (of which a photograph is given); and lastly, their accuracy.

Although, naturally enough, but a small part of the work reviewed deals directly with gas and subjects connected therewith, yet enough has been said to show that it contains matter of considerable interest to all connected with the gas industry, and it forms, as it claims to be, a valuable and permanent and attractive scientific engineering record of the Paris Exhibition of 1900.

### CHEMISTRY APPLIED TO GAS LIGHTING.\*

GAS Lighting deserves a foremost place in any work on Chemical Technology; and we are glad to find that its claims have been adequately recognized by Mr. C. E. Groves and the late Mr. W. Thorp in the volume which is now before us. The Publishers and Editors, moreover, must be congratulated on having been able to secure the invaluable services of Mr. Charles Hunt in the preparation of this section of the work. Mr. Hunt needs no introduction to readers of the "JOURNAL"; and we will therefore at once proceed to indicate the manner in which he has dealt with his subject.

"Gas Lighting" has been interpreted in a liberal spirit; and the volume treats of the manufacture of gas, as well as its application as an illuminant. Chapter I. covers the early history of gas manufacture, and concludes with a brief exposition of the sliding-scale enactments. Some statistical information is quoted from the Board of Trade returns for 1898, with the object of showing the magnitude of the operations of large gas undertakings. Chapters II. and III. contain a general account of the process of gas manufacture, and notes on the composition of gas coals, of which several pages of analyses—many taken from "King's Treatise on Coal Gas"—are given.

We then come to the important chapter on carbonization, which is very well treated. It is explained that the portions of coal in a gas-retort, which are actually undergoing decomposition, are probably always at a temperature of about 400° C. (752° Fahr.), and the primary products of the decomposition are the same, notwithstanding wide variations in the temperature

\* "Chemical Technology, or Chemistry in its Applications to Arts and Manufactures." Edited by Charles Edward Groves, F.R.S., Lecturer in Chemistry, Guy's Hospital, and William Thorp, B.Sc. Vol. III. "Gas Lighting." By Charles Hunt, Engineer of the Birmingham Corporation Gas-Works. London: J. & A. Churchill; 1900.



of the retort. It is only on these products that the full heat of the retort comes into play, and produces secondary products, the nature of which varies with the heat of the retort. In order to illustrate the effect of increasing temperature on the gas produced from a particular coal, the results of nine trials are quoted; but assuming that the make and illuminating power are correctly stated, the "candles per ton" given are miscalculated or misprinted in four out of the nine examples! It is, of course, impossible, in the case of the majority of the figures in the book, to test their accuracy in this manner; but if anything approaching such a degree of error prevails generally, we think the whole of the present edition should be withheld from sale pending correction and revision.

Strangely enough, stopped ascension-pipes and naphthalene obstructions are not dealt with in this chapter, but later in the work, in connection with service-pipes, where we are told: "High heats, then, appear to be accountable for the following: (1) Reduction in the quantity of light oils, by reason of the formation of naphthalene, &c., from decomposition of benzene, &c.; (2) stopped pipes, resulting from a deficiency of light oil; (3) withdrawal of light oils from the gas, consequent on the necessity for removing naphthalene, thus involving considerable loss of illuminating matter." Surely such a summary of the effects of high heats ought to have been given in connection with carbonization rather than services.

When dealing with the nitrogen products of carbonization, the author states that it is a curious fact that the amount of cyanogen obtained on the Continent is, as a rule, much higher than that obtained in this country, probably on account of higher temperatures there used in carbonizing. We hope he has really assured himself that the amount of cyanogen produced in carbonization is higher on the Continent before making this statement, and that he has not been guided only by statements of the amount of cyanogen recovered from the gas. Curiously enough, English coal is believed to afford a higher yield of cyanogen than most of the Continental coals; and therefore the amount made per ton of coal on English works ought not to fall short of that made on the Continent. But, as we shall have occasion to point out later, the author does not appear to be very familiar with cyanogen recovery, even as it is practised in this country.

Chapters V. and VI. treat of retorts and furnaces. Good illustrations are given of several regenerative furnaces—e.g., the Schilling, the Liegel, the Klönne (and Hunt's modification of it), the Siemens, and Valon's. We have, however, failed to find any general account of the actions which take place in generators; and technical terms such as "primary" and "secondary" air are freely used without explanation. In this, as in other parts of the work, chemical reactions are left unconsidered, while mechanical details are described at length. In a treatise on Chemical Technology, the chemistry of processes should be given predominance. Bunte's burette is briefly described, and recommended for the analysis of furnace gases; but the draughtsman responsible for the illustration of the "suction bottle" to be used in connection with it, cannot have had a proper conception of its mode of operation, as he has carried the inlet-tube to the bottom of the bottle, thereby making suction almost, if not quite, impossible.

Chapter VII. is chiefly on stoking machinery, of which the Arrol-Foulis, the West, and the Ross are described with the aid of illustrations. Then we come to two-thirds of a page devoted to the inclined retort system, and an illustration of the Coventry installation. At the present day, such treatment of this system in a book of the scope and size of that now before us is absurdly inadequate. Five, or even perhaps two, years ago, so brief a reference to inclined retorts would perhaps have been excusable; but now, with hundreds coming into use all over the country—and notably in Birmingham—the author must be well aware of its insufficiency. Actually, it gives us the impression, which is confirmed in subsequent chapters, that the greater part of the book has been written at least two years, and has not been subjected to revision by the author since. The only references of later origin, which we have noticed, are the quotation, to which we have already referred, from the Board of Trade returns for 1898, and some statistics on the use of prepayment meters. But naturally figures such as these would not be filled in until the work was in the press. For the rest, there is nothing to indicate that the author's labours did not end at least two years ago. In view of the many technical advances which have come into prominence during the last two or three years, the work is clearly already out of date at the time of publication. To particularize, it has no mention of the Dellwik water-gas process, the Burnley process for the removal of naphthalene, the Botley carburation process, the Beckton or Bueb cyanogen recovery process, high-pressure incandescent gas lighting, or the method of photometry introduced in London in 1898. All these subjects ought to be discussed in a work dealing with the chemical technology of gas, published at the present time. These omissions are the more regrettable as Mr. Hunt's comments on such matters would have been highly appreciated and could not have failed to be instructive.

Chapters VIII. and IX. treat of condensers and tar-extractors in an adequate manner. Exhausters are dealt with in the following chapter quite satisfactorily. It is noteworthy that the portions of the work which deal with machinery or construction are extremely good, though the treatment at times appears to be

somewhat superficial—perhaps owing to the author's conviction that engineering matters must not have undue prominence in a text-book purporting to deal primarily with the chemistry of gas lighting. But it is impossible to give a consecutive and instructive account of the chemistry of gas manufacture without introducing descriptions of the various types of plant in use; and Mr. Hunt might well have been pardoned had he strayed even more than he has done from the technological chemist's point of view of the gas industry. As it is, he describes plant in a good but superficial manner, and rarely, if ever, gives the reader the benefit of his own ripe experience of the merits of different types. Where fuller description or comment is given, as often as not the words of other gas engineers are quoted at considerable length from our columns or the proceedings of the technical associations. Compilation of this nature, however, does not require a man of Mr. Hunt's experience and ability for its adequate execution; and we confess to a sense of disappointment that in this work he has rarely risen to the level of the better-class technological authors.

Chapter XII., on washers and scrubbers, is one of the best in the book, though we doubt the wisdom of using an experimental meter for measuring *crude* gas in making estimations of ammonia at the inlet of scrubbers, notwithstanding that Mr. Hunt suggests it. On most works aspirators would be used instead of experimental meters until after the gas had been purified.

The following chapter is on ammoniacal liquor and the manufacture of sulphate, concluding with some account of the recovery of cyanogen from coal gas. But the Beckton process, by which more cyanogen products have probably been recovered from gas in this country than by any other system, is not mentioned, though it came into operation about the date of the patent taken out by Mr. Foulis for a different process, which is described by Mr. Hunt. Dr. Bueb's independent discovery of the Beckton process, or a slight modification of it, some time later, which was described in the "JOURNAL" more than twelve months ago (see Vol. LXXIV., p. 308), is, of course, also not referred to.

Chapter XIII. deals with purifiers and centre-valves quite well, and the following two chapters with purification and purifying materials. Here, and elsewhere, the author speaks of 20 grains per 100 cubic feet of gas as the maximum amount of sulphur allowed in the winter by the Gas Referees in the supply to the Metropolis; whereas we believe their winter maximum has been 22 grains from 1881-1882 to the present time. Very full details are given of the author's trials of the Claus method of purification in closed vessels. Strangely enough, the author makes no mention of Weldon Mud as a purifying agent.

Chapter XVI. gives methods for estimating various impurities in coal gas. The following chapter is on station meters and gas-holders. Here Mr. Hunt is at his best, as, for the moment, he gives himself up to purely engineering work. By mischance, an illustration of the 12 million cubic feet gasholder at East Greenwich appears as a "Gasholder at Rotherhithe." Governors and pressure-changers are also well treated in the next chapter; and in Chapter XIX. distribution is tackled in a good, even if a rather superficial, manner. Here we find the comments on the effects of high heats in carbonizing, which in our opinion should be transferred to the chapter on carbonization. Chapter XX., on gas-meters, both wet and dry, is also good, and in one respect is tolerably up to date, as the number [86,000] of prepayment meters in use in June, 1899, in the South Metropolitan Company's district is given.

Chapter XXI. is one of the most comprehensive, and withal, (notwithstanding grave defects) one of the best, in the book. It deals with gas enrichment processes. In his remarks on the carburetted value of various hydrocarbons, we are disposed to think that the author was mindful of the remarks he made in our "Correspondence" columns on the series of articles on the "Enrichment of Coal Gas" which appeared in Vol. LXX. of the "JOURNAL." But inasmuch as the writer of those articles was then justified in claiming that tests of enrichment value should be made under the standard photometric conditions of that date—i.e., at a fixed rate of consumption of 5 cubic feet per hour—so now should tests be made under the photometric conditions introduced by the Gas Referees in 1898, which allow of a variation of the rate of consumption to suit the quality of the gas. This change in the Referees' method of photometry unfortunately rendered the articles referred to comparatively valueless within a year of their publication; but it gave effect to Mr. Hunt's views on the testing of rich and poor gas. Why does he, in the book before us, write as though there had been no change in 1898 in the Gas Referees' method of photometry? He speaks more than once of the "gas consumed in the usual way at the Referees' standard 5 cubic feet per hour rate;" whereas the Referees actually prescribe that the rate of consumption is to be varied until a 16-candle power flame is obtained. This chapter would have been excellent in 1897; but it is now out of date, as the author must know full well. Much—probably more than it deserves—is said about the Dinsmore process. Then we have some account of oil-gas manufacture, concluding with a description of the Peebles process. Next we come to carburetted water gas. Several types of present and past plant for water-gas manufacture are described. We do not think, however, that the chemistry of the water-gas process is anywhere adequately dealt with. Moreover, no mention is made of the Dellwik system, nor of the report of the Home Office



Committee on Carburetted Water Gas, though something is said about the toxic properties of the gas. The account of enriching processes concludes with a little about acetylene.

Chapter XXI. treats of combustion, and contains descriptions of Hartley's and Junkers' calorimeters. The following chapter, which is the last in the book, deals with gas-burners. Nothing better could be desired in so far as the older classes of burners are concerned; and there are some useful comparisons of the value of Welsbach, Sunlight, and other incandescent mantles. The Kern burner is mentioned as a novelty, and values obtained with it do not appear to be included in the comparisons made with various mantles. We have not found any reference to high-pressure incandescent lighting, which has lately developed so considerably. A brief index concludes the work.

There are upwards of 300 illustrations, for the most part of plant and mechanical appliances. The few illustrations there are of chemical or analytical apparatus are, on the whole, not particularly good.

The work will, we fear, prove a disappointment to most readers. Much is expected of a man of Mr. Hunt's experience, knowledge, and ability; while this book might well have been compiled by a moderately capable mediocrity, for aught it contains of internal evidence to the contrary. But perhaps its worst fault is that it is out of date.

## OBITUARY.

### WILLIAM LIVESEY.

One who was known to gas engineers of the present day only by name passed away last Tuesday, at the ripe age of 88. Mr. William Livesey (uncle of Mr. George Livesey and the late Mr. Frank Livesey) ceased his active connection with gas affairs some seven years ago, though to the very last we understand he took a lively interest in gas matters, but not from the manufacturing point of view. Mr. Livesey was for a considerable number of years connected with the firm (long since dissolved) of Messrs. Baxter, Rose, and Norton, Parliamentary Agents and Solicitors to a large number of Railway, Gas, and Water Companies. When the firm dissolved partnership, and the railway and gas and water interests were severed, Mr. Livesey remained with Messrs. Baxters and Co., as head of their parliamentary department—being eminently qualified for this position by his lifelong acquaintance with parliamentary and legal proceedings affecting the industries with which the "JOURNAL" is identified. Mr. Livesey was a pretty constant contributor to our pages, as Secretary of the Gas and Water Companies' Association; and he never failed to enlighten readers regarding points on which any doubt existed as to their rights and responsibilities. His last letter to the "JOURNAL" appeared on Dec. 4, 1894; his retirement from active work having taken place some twelve months before. To mark the sense of their indebtedness to Mr. Livesey's able counsel and advice, a Committee was formed, consisting of representatives of a large number of Gas and Water Companies throughout the country, with Mr. Howard C. Ward, the Deputy-Governor of the Gaslight and Coke Company, as Chairman, and Mr. Corbet Woodall as Hon. Secretary and Treasurer, to present Mr. Livesey with a testimonial; and a sum of over £700 was collected. Since his retirement, Mr. Livesey has lived in the enjoyment of good health and the possession of all his faculties, except that he suffered from chronic deafness. He was active and busy in his garden at Hammersmith up to a week before his death, which took place quite peacefully as the result of extreme old age. The funeral on Friday last was at Hammersmith Cemetery.

Mr. JOHN JARRATT, the Town Clerk of Loughborough, died last Sunday week, at the age of 58 years. The sad event calls for notice here from the fact that Mr. Jarratt was in large measure responsible for the promotion, at different periods, of the Bills in Parliament which authorized the transfer of the gas and water works and the construction of reservoirs at Nanpantan and Blackbrook. In March last year, the Town Council paid Mr. Jarratt a handsome tribute for his work in providing the borough water supply.

Death has removed an old and respected official of the Devonport Gas Company. Mr. RICHARD CLARK, who was Engineer and Manager of the works for 24 years, died on Sunday week. He had been unwell for a short time; but the end came suddenly, to the regret of a large circle of friends. Mr. Clark was born in London, and was Manager of the Truro Gas-Works when he was appointed to take charge of the Devonport works. Under his management the gas-works have been practically rebuilt, and the undertaking greatly developed. The funeral took place on Thursday, and was attended by the Directors, officials, and workmen of the Gas Company and many private friends of the deceased. Mr. Clark is the third official of the Company who has died within the past few months; the others being Mr. John Williams, who was Secretary for so many years, and Mr. R. C. Smith, who was Chairman for half-a-century.

The estate of the late Mr. W. BROWN, J.P., the Chairman of the Chester and Hawarden Water Companies, has been valued at £65,052 gross, including personalty of the net value of £43,437.

## NOTES.

### Carbolic Acid Classified as a Poison.

It is sensibly argued, in the "Chemical Trade Journal," that the new season opens with several troublesome problems confronting the wholesale chemical trade. One of these is alleged to be the necessity, in the interests of manufacturers and druggists, for watching the "meddlesomeness" of the Pharmaceutical Society in procuring the scheduling of "carbolic acid and its homologues" as a poison. This declaration is a useful reminder that there are other dangerous (if improperly employed) commodities in extensive sale and use besides carburetted water gas and petroleum. The question is asked, Where is this scheduling to stop? Doubtless, carbolic acid and its homologues are poisons; and, not only so, but the mischief-making public have manifested a decided predilection for using them as such. A singular taste, perhaps; and, it might be argued, a very painful way of escaping from the world of the living. But it is certain that, for one fatality accidentally caused or deliberately brought about by the agency of towns' gas or lamp oil, several are yearly traceable to the careless or intentional misuse of carbolic acid. Ordinary coal-tar creosote contains much carbolic acid, and is a fluid. This might be scheduled; and so might ammonia. Perhaps when a paternal Government has successfully placed obstacles in the way of the development of the illuminating gas and mineral oil industries, it may be encouraged to devote more attention to the equally dangerous products of chemical industry actually sold freely in the market.

### Fireproof Building Construction and Gas-Piping.

Considerable progress has been made of late in the matter-of-course adoption of fire-resisting construction for town buildings. The simplest and cheapest method is coke breeze concrete rammed between wooden joists, with flooring-boards nailed directly upon it, and the underside plastered for a ceiling. An improvement upon this is expanded metal in thinner concrete, lying upon steel joists—the underside of the joists being protected by another layer of expanded metal, plastered. These constructions are all very well in their way; but a difficulty arises when gas-pipes, or telephone and other electric wires, have to be fixed in buildings so constructed. The tendency of modern building design is to multiply these accessories of housing; and no general solution of the problem of inoffensive piping or wiring has ever been suggested. Some of these means of communication can be exposed conveniently; but others must be put out of sight. Sir John Taylor, the Architect of the Record Office, has challenged architects to meet this difficulty; but although the gravity of the subject is generally admitted, there does not seem to be any sign of the embodiment of any accepted rules of practice in this regard. While this uncertainty remains, errors of detail leading to possible disaster are to be dreaded. Those whose experience lies among these matters, should give the public the benefit of any success that may be proved to attach to methods of piping and wiring buildings in accordance with the conditions imposed by fireproof, or fire-resisting, construction. In view of the fact that the suppression of all hollow spaces in walls and floors, where pipes and wires have been wont to lie, is a common requirement of the sanitary reformer and the fire protectionist, this question of where to put the pipes becomes anything but a trifling problem.

### The Taylor-White Tool Steel Process.

One of the novelties of mechanical science for the year is the Taylor-White tool steel process, a display of which has been made at the Paris Exhibition. The process originated at the works of the Bethlehem Steel Company, of the United States; and the first public account of it appeared in the "Engineering Record." It was devised by Mr. F. W. Taylor and Mr. Maunsel White, both Engineers in the Company's service, with the object of increasing the working capacity of the machine-shop to keep pace with that of the forge. A preliminary investigation into the reasons of this discrepancy, revealed the fact that the men in the machine-shop used a miscellaneous assortment of steels for making their tools, the working speed of which depended, in the last place, upon the character of the steel composing them. The next step was a series of experiments on special tool steels in a particular lathe, which led to the discovery of a method of treating the steel that greatly increased its cutting capacity. For the present, considerations of the patents forbid any full disclosure of the nature of the process, the effect of which is to impart to steel tools an extraordinarily serviceable degree of hardness, which they are able to retain even at a red heat. Consequently it is possible, with one of these tools, to cut steel at a speed high enough to bring the cutting edge to a bright red heat, when it still goes on cutting, and leaves an unusually smooth finish. All the tool steel now used at the Bethlehem Works is of this kind, with the immediate result that the tables are turned, and the forge has been enlarged to keep pace with the machine-shop. Ordinary hardened steel tools will not stand for five seconds a rate and depth of cut which the new process tools will keep up for twenty minutes at a stretch. One advantage claimed for the use of these tools in actual work is that when they are cutting dry at the rate of maximum efficiency, the chips come off blue, so that the foreman can tell at a glance whether the work is being done at the proper speed.



# THE INTERNATIONAL GAS CONGRESS.

## COAL-HANDLING MACHINERY.

By F. D. MARSHALL, of Copenhagen.

[A Paper read before the International Gas Congress at Paris.]

The mighty problem ever vexing men's minds is that concerning the relations of Capital to Labour. During the latter part of the Nineteenth Century, this problem has reached an acute stage; and the fate of great industries—yea, indeed, the welfare of nations—is resting on this great social economic question. Looking at the matter broadly, it cannot be supposed for one moment that coming generations of men will be content to toil, manually, as their forefathers have done, through successive ages. It is unreasonable to expect that, with steadily developing brain culture, men will be content to dig and delve, or to depend for an existence on mere manual labour. It is against the ethics of mental and economic progress to expect that it should be so.

Social Democracy and Trades Unionism have endeavoured to create a creed or cult to the effect that Capital is inimical to Labour, and that the advent of machinery to perform work hitherto executed manually must be to the undoing of the working population. What a wicked fallacy this is! Look at that great country America, where the use of machinery for industrial and domestic purposes has reached a stage beyond the dreams of man even fifty years ago. Has the introduction of such labour-saving machinery been to the undoing of its teeming peoples? Far from it; for the introduction of labour-saving appliances has tended to elevate the nation as a whole, and to place it in that forward position it now holds among the nations of the world. Labour-saving machinery tends to the mental elevation of the masses; it signifies the development of the brain as against the development of the muscle or brute force.

Take the coalheaver as synonymous of muscle. He must give way to the higher creation, the trained mechanic, until by natural evolution the coalheaver himself becomes trained to use his brain in preference to his muscles. The handling of great masses of coal is a pretty problem, affording a vast battlefield for the struggle between mind and matter. It is a fascinating problem. The writer has made it a special study—as, indeed, others have done—and in the great coal-producing and coal-using centres manual labour is being gradually superseded.

The contents of this paper present no very original features, as the writer has had the honour of placing his views and a description of his appliances before other technical societies at an earlier stage; but the question is of such vast interest that a repetition of some of his experience, and a dilation on the results achieved, may not be unacceptable to an international gathering of experts.

Naturally, the selection of the particular appliance for handling coal must be determined by local conditions; and an appliance admirably suited for one locality would fail in another. Take the writer's experience, for instance, and the problems he had to solve. In dealing with one particular locality, two distinct systems of discharging and storing coal have been adopted. The problem was to receive and store coal in bulk at one spot, and to transport by degrees, discharge, and re-store at another. At the Copenhagen Free Harbour, the coal required by the Frederiksberg works of the Danish Gas Company is received in bulk, and is raised from the steamer and stored by the beautiful Hunt system—mainly the invention of C. W. Hunt, of the United States.

Let me describe this installation, and the financial results achieved. We lift the coal from 2000-ton steamers by means of moveable elevators or cranes six in number, 75 feet high, and running on rails parallel with the quay. The cranes are furnished with outrigger-booms, projecting 32 feet over the water. The outrigger-boom is parabolic in shape, and so constructed that the pull of the chain from a 100-horse power steam-winch fixed in the head of the crane-tower causes the boom truck or carriage to run up the boom as soon as the steam-shovel is hoisted as high as the outer extremity.

*Steam Winches.*—The steam winches are each of 100-horse power, and are fitted with two flat-link steel chains of special construction. The one is the lifting chain, and the other the "dumping" or discharging chain. To lighten the load on the steam-winch, and to compensate for the 5 tons dead-weight, a counterweight wound on a conical pulley attached to the steam-winch is arranged.

*Steam Shovels.*—The steam shovels employed are of the very simplest description; the opening and shutting of the same being effected by the "dumping" chain being wound around a drum or wheel fixed in the axis of the two halves of the shovels. When open, the shovels gape 6 feet, lift 2 tons of coal, and the weight, together with the load and the lifting and dumping chains, is 5 tons.

*Automatic Cars and Tracks.\**—These cars are of peculiar construction, and are made to discharge their load and to return to their starting-point quite automatically. The cars in question can turn a curve of 30 feet radius, can run on an uneven track, and carry a dead-load of 2 tons. Their speed of running is 300 feet in 35 seconds. After being started by a push down the incline by the hopper man, they "dump" their load at any required spot, and return quite automatically to the starting-point for a new load.

The method by which the car returns to the starting-point, after automatically discharging its load, is both novel and ingenious. When the loaded car has reached the end of its journey, it has raised a weight (W on the diagram) to a certain height by means of a wire-rope cable, which the car picks up on its journey. The details may be more fully explained as follows.

The car has fixed on the front two horns or grabs; and these, a little before the car arrives at the "tripping-block" E, where it is emptied, catch on to a sledge S attached to the cable, which passes over the pulleys A B. The ends of the cable, after passing round the moveable pulley C, are fixed at the points D D. The moveable pulley C runs on a rail fixed to a beam under the railway; and to the axle of the pulley a triangular wooden box W is attached by one corner, the opposite corner being hinged to an upright post, and the box weighted with stones.

Now the loaded car having been started, it runs at full speed until the projecting horns catch the sledge S, carrying this along until the tripping-block E is reached. By this action, the pulley C is moved in the direction of arrow No. 1; and at the same time the weight W is lifted into position, as indicated by the dotted lines. The car having dumped its load by the tripping-block loosening the wire-rope "trippers" attached to the car, has no longer any power to keep the weight W elevated; and this, in falling, causes the direction of the cable to be reversed—the pulley C returning in the direction of arrow No. 2. By this action, the sledge S gives the car a good push, powerful enough for it to overcome the resistance of the incline and to return it to its starting-place under the hopper. Wherever the tripping-block is placed on the track, there will the car unfailingly discharge its load. The weight W may be fixed at any convenient spot, and the weight of stones required can be ascertained by experiment.

*Coal-Pockets.*—The arrangement of coal-pockets consists of three separate buildings (one of the buildings is shown on the plan), each containing 18 pockets, or "silos." These pockets will hold, roughly, 550 tons of coal, or 10,000 tons in each building; the total quantity in the three buildings being about 30,000 tons when quite full. Over each pocket run two sets of automatic tracks, 36 in all. Eighteen of these tracks are continued through the buildings to the large covered space beyond. This space is calculated to store another 50,000 tons, making the total storage 80,000 tons. The designing of the pockets was the occasion of much earnest consideration; there being a choice between iron, wood, and composite structures.

Iron is objectionable, on account of expansion and contraction in the event of the coal becoming heated; while a wholly wooden structure (as adopted in America) is unsightly. The surroundings in the Free Harbour possess a large degree of architectural merit; and as it was necessary that the pocket buildings should follow the style, it was determined to construct the outer walls of Monier cement work, resting on brick and granite foundations, and the internal division-walls of timber. The outer Monier walls are made 11 cm. thick; the wire-work netting embedded in the cement consisting of tension-rods 12 mm. thick, kept apart by distance-rods 5 mm. thick, interlaced in the manner of basket work. The walls are calculated to stand a lateral thrust of 461 kilos. per square metre at the top, 800 kilos. per square metre in the middle, and 1077 kilos. per square metre at the bottom. When the pockets are quite full, and although they may perhaps bulge under this great strain, there is no fear of their giving way. The walls are tapered; being thicker at bottom than top. The bottoms of the walls are anchored in the pediment of brickwork in cement. The walls are strengthened vertically and laterally by I-irons, and by wall-plates through which  $\frac{3}{4}$ -inch bolts are passed, bolting the whole of the outside shell to the framework of strong wooden beams forming the interior. These beams likewise support the divisions of the pockets.

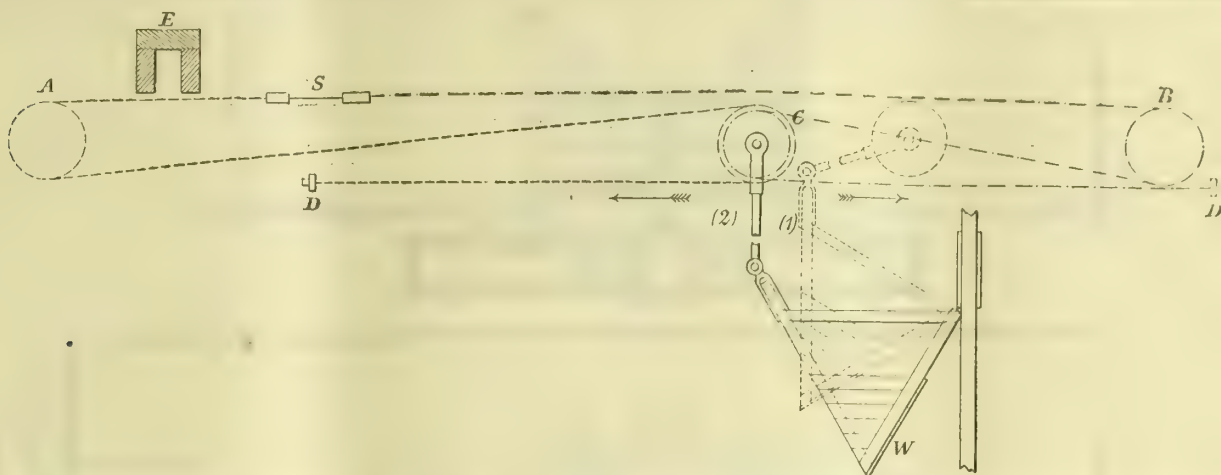
The bottoms, or floors, of the pockets consist of series of Monier arches, 10 ft. 6 in. span by 2 ft. 6 in. rise, springing from channel-irons resting on concrete piers. The arches at the crown are only  $5\frac{1}{2}$  inches thick, and are calculated to stand a strain of  $\frac{3}{4}$  ton per square foot. The Monier network of the arches consists of tension-rods, 8 mm. thick, and spacing rods 5 mm. thick. To prevent the arches flattening out, a series of tie-rods,  $1\frac{1}{2}$  inches diameter, spaced 14 inches centre to centre, are employed; the ends screwed and bolted to the channel-irons previously mentioned.

Now the question naturally arises: Does this installation pay? The cost was some £55,000; and assuming the six cranes to be at work, 300 tons per hour can be discharged—3000 tons per working day. The cost of discharging has been found by experience to be not higher than 2d. per ton, from the time the coal is raised from the ship's hold until it is deposited in the store-pockets or "bins." The installation has now been working for three years with the most satisfactory results.

From these large stores, the coal required for the gas-works at Frederiksberg is sent daily by rail, in 10-ton trucks. These

\* For the sake of making clear Mr. Marshall's description, his diagram showing the working of the automatic cars and tracks is reproduced. The other diagrams exhibited by Mr. Marshall at Paris during the reading of his paper were similar to those published in the "JOURNAL" to accompany his various papers read before the Institution of Gas Engineers—see "JOURNAL," Vol. LXV., pp. 1248-9; Vol. LXIX., p. 1121; and Vol. LXXI., p. 1452-3.





trucks are of peculiar shape, and open at the bottom. On arrival at the gas-works, the 10 tons are dumped at once into a hopper, and in less than ten minutes are elevated and, by a band conveyor, deposited in the overhead stores or bins. From the bins or stores, the coal is transferred by a lower conveyor band to the elevators supplying the hoppers for the inclined retorts in the retort-house.

This installation—the invention of the writer—may thus be described: 120 tons of coal are handled by the aid of two men—that is to say, the coals are received, crushed, and stored at the rate of a ton a minute, and can be simultaneously removed from the store and conveyed to the retort-house at a similar rate. The train conveying the coal to the works consists generally of ten to fourteen waggons, containing 100 to 140 tons; and this quantity of coal, allowing time for shifting trucks, can be stored by two men in from three to three-and-a-half hours.

The coal pockets or bins are like four-sided inverted pyramids. The sides, however, are not flat, but each formed of an arch. The lower ends of the pockets are fitted with emptying regulators, worked by ratchet and pinion wheels; so that by only adjusting the speed of their revolution, a larger or smaller quantity of coal may be ground out—no coal being able to pass until the regulators are in motion. From the regulators, the coal drops on to the lower cotton band conveyor, which carries the coal to the hoppers of the elevators, which, in their turn, elevate it to the overhead tanks in the retort-house, destined to feed the inclined retorts with which the house is fitted. The lower conveyor bands being in gear with the regulators, the speed of emptying and conveying is nicely adjusted. The coal-store, with pockets all filled, will contain 1000 tons, or about a week's supply for the house as at present erected—about 1,250,000 cubic feet per diem maximum.

All the machinery is worked from the engine-room; and one man can receive and empty waggons, and fill the overhead coal-tanks in the retort-house, at the rate of 120 tons per day. The machinery and coal-store will cost £3500; but considering the enormous saving in labour, there can be no question that the outlay will be speedily recouped.

Such is the general design of the store at present erected; but the special point with which this paper is connected is the construction of the coal bins or pockets. The weight of coal to be supported amounts to 3 tons per square foot; and to support this weight in the air in an economical and practical manner, presented many difficulties. Of course, the pockets could have rested on the ground, and a small tunnel have been excavated underneath for the conveyor bands and machinery. But it was necessary that the openings of the pockets and regulators should be easily accessible; and it was deemed requisite to raise the bottom of the pockets above the ground. This involved very careful consideration, when the great weight of the superincumbent coal is taken into account. Brickwork and wooden framings were all duly considered, and abandoned on account of cost and cumbersomeness. Resource was at last had to the Monier principle as a solution of the difficulty. The Monier arches composing the bottoms of the pockets spring from the ordinary concrete arch foundations, as they are only subject to compressive strain, whereas the pockets themselves are subjected to enormous tensile strain. The arches underneath the pockets form an excellent subway; and all parts of the machinery, bands, and regulators are easy of access. The section of the Monier arches involved much calculation, as the pressure of the coal pyramids is very curiously and unequally distributed. No material, however, has been wasted in their construction.

Referring to the matter of prime cost, the question will be asked, Can such an installation really pay? Here are figures, based on the fact of the installation having cost complete £3500, and been destined to handle 30,000 tons of coal annually.

One man, storing, three hours daily, supplying hoppers in retort-house and clearing up, looking to engine, &c., three hours daily, at 3½d. per hour, say, annually	£33
Two men shifting trucks, three hours each, at 3½d.	33
Oil, waste, brooms, annually	30
2 per cent. depreciation on £3500.	70
4 per cent. interest on ditto	140
<b>Total</b>	<b>£306</b>

On an annual quantity of 30,000 tons = 2'44d. per ton, for unloading, storing, supplying the retort-house, and including wear and tear and interest on capital.

The two installations described are eminently successful, and have not failed for a single hour since started some years ago. The wear and tear is inappreciable; and the question of labour (sorrowful as it is to say so) is reduced to a vanishing point.

Before concluding this paper, the writer wishes to bear testimony to, and express his admiration for, the work of others in the same direction. Herr Possehl's "Kolenhof," at Hamburg, is a splendid installation, designed principally for handling nut coals. The elevating machinery is of the corn-elevator type, and the pockets or bins are supplied by quick-running conveyor bands similar to those designed by the writer for the Frederiksberg works. The pockets or storage bins are beautifully constructed of Monier work. The whole installation is driven by electricity, and is perfect in every respect. Messrs. Graham, Morton, and Co., of Leeds, have also erected several excellent installations for the transport and storage of coal, principally for collieries; while in America much has been done in this direction. The writer has unfortunately no knowledge of what is being done in France.

Beyond the pioneer installation described, the writer is unaware that automatic coal-stores have been erected at any other works than those at the new Stadt Gas-Works at Zürich, by Herr Weiss; and the design of these stores closely follows those of the writer. The coals are lifted and stored by the automatic railway just described. The difference between the writer's and Herr Weiss's emptying arrangement is the form of the emptying conveyor, which, in Herr Weiss's case, is of the grasshopper or shuttle description, while the bottom of the stores containing the emptying machinery is excavated, instead of being constructed overhead as in the case of the writer's. It would be of extreme interest to hear from Herr Weiss an account of the working of the Zürich apparatus, more especially the results achieved by the shuttle conveyor.

## SEPARATE GAS-PRODUCERS FOR THE HEATING OF RETORT-BENCHES.

By G. EICHELBRENNER.

[A Paper read before the International Gas Congress at Paris.]

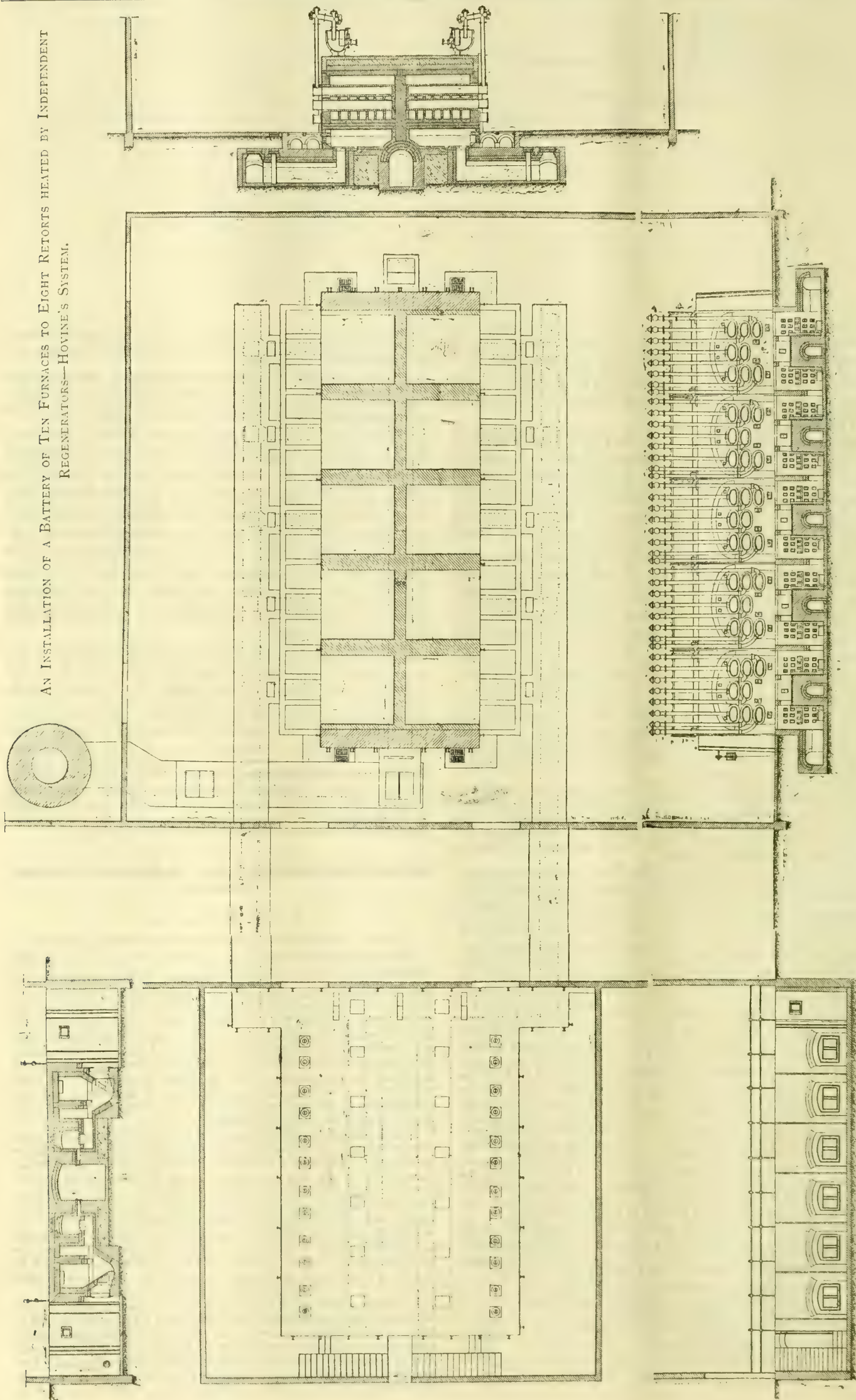
The installation which I here describe presents some notable differences from those commonly in use. These departures are due to certain special causes; yet I believe that applications of this system can frequently be found. It fell to my lot to completely reinstate a works established near some coal mines on ground which, in consequence of the subterranean operations, was continually undergoing subsidence. Although a foundation of concrete was very thoroughly laid, a completely stable sub-soil could not be guaranteed. One therefore foresaw trouble from the settling of the furnace masonry, and it was of the greatest importance to reduce the results of these irregular subsidences of the ground as much as possible.

This I sought to do by separating the gas-producers from the recuperators. The producers are very solid, and scarcely liable to damage. The furnaces and recuperators, on the other hand, can easily be put out of working order by portions of three-recuperators or the retorts getting out of place. But, it ought to be added, the repair of such accidental damage can be done easily and quickly when it does not involve also repairs to worn-out portions of the furnaces or gas-producers. Having a sufficient number of spare furnaces, it is enough, in the case of a damaged furnace, to shut off the gas from this furnace, to supply it to another, and, after examining the damaged furnace and closing up any fissures, to put it to work again.

It will be admitted at once that it is the almost general custom, when regenerative furnaces are being used for the distillation of coal, to place the producers close to the retort-benches—generally below, or at any rate in front of, the furnace, in the sub-soil, and at some very short distance from the main installation. The aim of the constructor is to arrange furnace, producer, and recuperators in the smallest possible space, with the object of

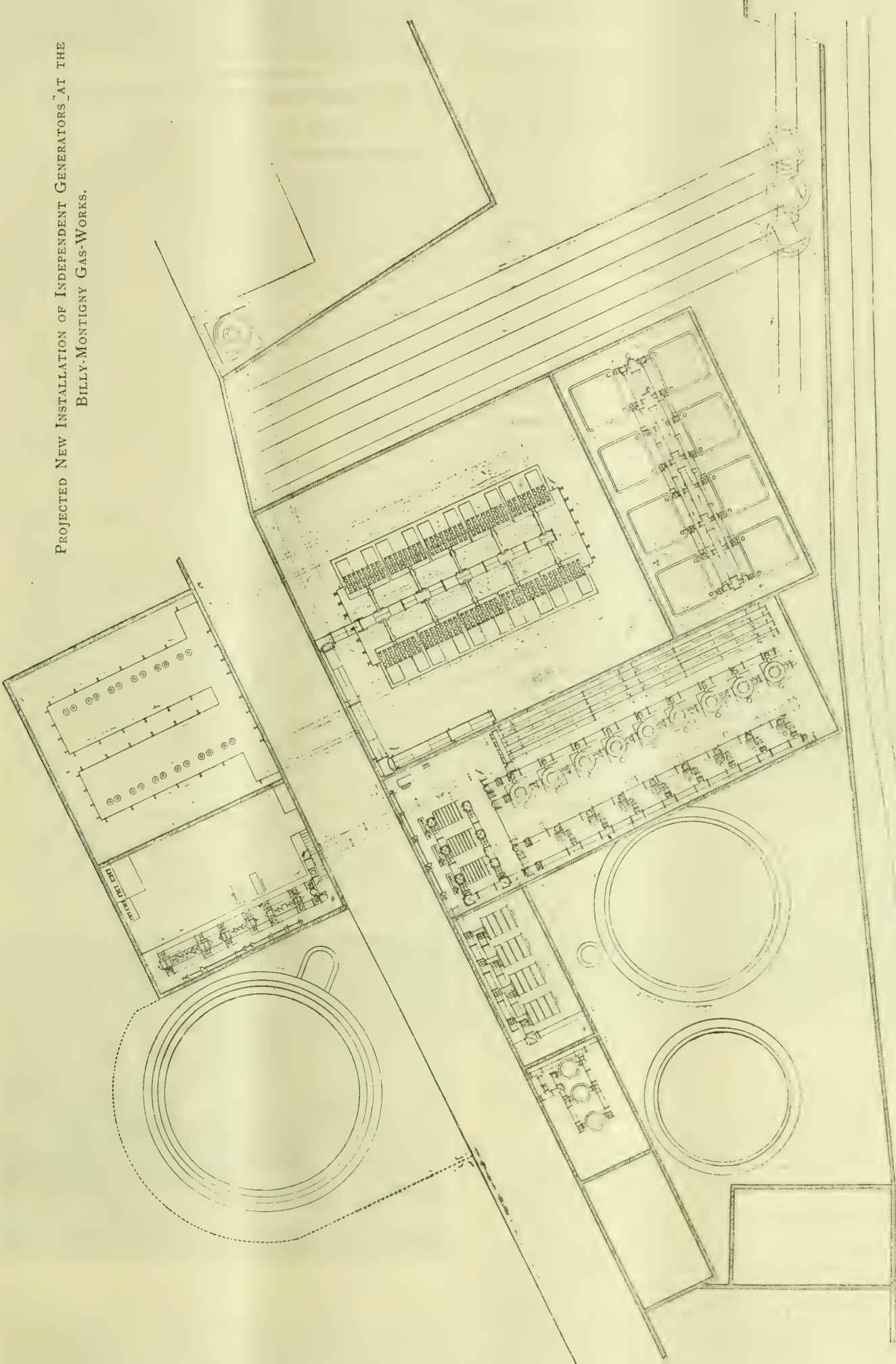


AN INSTALLATION OF A BATTERY OF TEN FURNACES TO EIGHT RETORTS HEATED BY INDEPENDENT  
REGENERATORS—HOVINE'S SYSTEM.





PROJECTED NEW INSTALLATION OF INDEPENDENT GENERATORS AT THE  
BILLY-MONTIGNY GAS-WORKS.





avoiding loss of heat, which may be very considerable if the surfaces of the apparatus are exposed to the air. Nevertheless, many of the furnaces used for regenerative heating in glass making, metallurgy, &c., have the producers quite separate from the heating-chambers. A pipe distributes the gas (from the battery of producers) among the different furnaces, which have near to them only the recuperative plants.

This system, which I have adopted in connection with coal-gas distillation, presents several points of advantage, which are not to be despised: (1) It dispenses entirely with the room required for stoking the furnaces, leaving the space around the retorts free for the operations necessary to this stage of the process. (2) It allows the feeding of the producers to be done in the open air. High temperature, dust, carbonic oxide, and steam are thus avoided in the retort-house, which cannot be completely free when the furnaces are charged there. (3) It permits the use of fuels of lower quality—such as lignite, peat, and waste material from shale—the combustion of which requires a furnace area for which space could not be found within the limits of the furnaces. Besides, to bring such special fuels into the retort-house would prove a serious inconvenience. This use of inferior kinds of fuel, considered alongside the advances in price of coal and coke, is an important advantage. (4) The furnace, and the producer which supplies it, are rendered quite independent of each other. Owing to the way in which the yield of gas from a producer can be increased, and to the comparatively slight wear and tear of the apparatus when fed with coke, there need not be so many producers as there are furnaces to heat. Six or eight producers will supply eight to ten furnaces. (5) Lastly (and this is a point of which advantage has been taken in many works), heating by producer gas can be done, even when there is water at a short distance below the surface; for the producers can be used at such a distance as not to be touched by the water, whereas if placed underneath the furnace they might be flooded.

Two objections may be urged against this system: (1) Less economy in fuel, owing to the loss of heat in transit. (2) Greater cost of plant. We will take these two points in turn.

(1) This objection falls to the ground where the arrangement of the producers in batteries permits the employment of cheap fuels—such as peats, lignites, &c. The economy in weight may be nil or negative; but the economy in money is a fact. Then, if the distance to be traversed by the gas is considerable, and it reaches the furnace cooled, it is easy to re-heat it, without any further cost, in a recuperator connected with the recuperator of the secondary air. Supposing that the gas reaches the furnace at 250°, instead of 500° (the temperature at which it leaves the producer). There will be a loss of heat, it is true; but compensation exists in the fact that the waste gases from the furnace are cooled to 250°, whereas if they were used to heat only the secondary air, the temperature on exit would be 500°. If the intervening distance is less, or if the pipe is well insulated, the loss is very slight. It is known that the gasification of coke into carbonic oxide absorbs 23 per cent. of the heat which is needed to raise the temperature of the gaseous product to 850°.\* If the gas is cooled instead of at once passing to the furnace, there is a loss. Suppose the cooling reduces the temperature to 200°, the loss is—

$$0.23 \times \frac{200}{850} = 5.5 \text{ per cent.}$$

of the total heat. But, as Ebelmen has shown, the proportion of the total heat used in a high-temperature furnace is very small (4 to 35 per cent.); and hence we come to the conclusion that the loss resulting from the cooling of the gas is of little importance. Yet, as it is a real diminution of the heat realized, it is well to insulate the gas-main as thoroughly as possible. In the case above referred to, I laid the pipe in the sub-soil surrounded by refractory earth, and kept it dry. Irregular subsidences of the soil may allow these pipes to sink; but they will not on this account give rise to appreciable leakage, and the escape is very easily put right. It is possible, of course, to make the walls of the producer and the protective coating of the main of such thickness as to prevent loss of heat from the parts above ground. In collecting information on installations of this kind already in use in gas-works, I find that the cost per 100 kilos. of coal distilled does not appreciably differ from that when the furnace is placed underneath—a fact confirming the theoretical considerations advanced above.

(2) The construction of this battery, made in the north of France, and during a period of high prices in materials, works out to 1,435 frs. per retort for the installation shown, in which a producer for every furnace has been provided, in view of possible accidents from subsidence. Under normal conditions, eight producers would be sufficient; and the cost per retort would be 1,355 frs.

A similar battery, but with producers underneath the furnaces, would cost, under the same local conditions, 1,250 frs. per retort. The difference in the original cost is thus from 100 to 110 frs. per retort, or 8000 to 9000 frs. on the total cost, which is about 8 per cent. more. Recollecting that this plant can burn coal as well as the coke for which it was designed (which cannot be done with sub-furnace gas producers), I am inclined to believe that the advantages of the system are distinctly practical, and that the method can be successfully applied in numerous other cases.

In these experiments, I have collaborated with M. Hovine, an expert in matters of this kind; and I am sure that we shall obtain excellent results in the regular use of the furnaces, an account of which I shall be happy to give next year. All my condensing and purifying plant is arranged in series; and I can therefore make use of those necessary at a given moment. I shall have others put up as the make increases, without altering the buildings, plant, or mains already existent.

## RESULTS WITH PREPAYMENT METERS IN HOLLAND.

By P. BOLSUS, of Bois-le-Duc.

[A Paper read before the International Gas Congress at Paris.]

Gas lighting took its rise from the discovery of Jean Pierre Minckelers, a professor in the University of Louvain, who, in 1784, was engaged in experiments on the production of a light and cheap gas which could be used for the inflation of balloons, and who found that the distillation of coal in a closed vessel yielded a new kind of "inflammable air," which he afterwards applied to lighting purposes. In the latter years of the Eighteenth Century, the labours of Lebon and Murdoch gave birth to the new industry; and these three names must be given the places of honour in one of the greatest achievements of modern times. Since their day, the gas industry has made many advances, technically and commercially; and among the notable chapters in its history, must be mentioned the considerable lowering of prices which took place about twenty years ago. At that time, gas in Holland cost on the average 12 cents (about 2½d.) per cubic metre, with special rates to factories, barracks, and other large consumers. Now the price is about half the above figure. The average in Holland is 6 to 7 cents per cubic metre; while in certain towns the price is still lower. In Kampen, for example, gas for lighting is 5 cents per cubic metre; and gas for heating or motive power 3.5 cents. The startling results of lower prices are well known; and many a gas manager who is not yet grey haired has seen his output multiplied five times and more.

Among the various systems according to which gas is sold—such as reduced rates for large consumers, for gas burnt in the daytime, and for gas for heating and motive power—the prepayment plan is the latest; and some particulars of the results attending its adoption may not be without interest. There are about 100 gas-works, large and small, in Holland, 43 of which have adopted prepayment meters since their introduction some five years ago. The number of people in towns and villages, according to the latest returns, served by gas companies is 2,337,149, out of a total population (1897) of 5,074,632. The total make of these works last year was 173,675,493 cubic metres, which implies a consumption of 655,000,000 kilos. of coal. This figure possesses some interest in the calculations and statistics relating to the high price of fuels which I will discuss later. The population of the 43 towns where the meters are in use is 1,950,829; that of the remainder, who do not adopt the prepayment system, only 386,320.

Utrecht was the first town in Holland to adopt prepayment meters; and the innovation must be credited to Heer van der Horst, who has since taken charge of the Amsterdam Gas-Works. He has stated in "Het Gas" that he commenced the new system in 1895, with the greatest caution. For two months new meters made by the Compagnie pour la Fabrication des Compteurs et autres Appareils, of Paris and Dordrecht,



FIG. 1.

were under trial, and improvements were made, especially in dry meters. Lamps and stoves (see fig. 1) were chosen at the same time, so that when the introduction took place the meters, &c., could be properly fitted by a staff commensurate with the demand. The number of consumers has since undergone a remarkable increase. In addition to 7746 ordinary gas-meters, Utrecht possessed on Dec. 31 last, 5773 prepayment meters.

\* See Lencauchez, "Traité des Combustibles," pp. 225 et seq.



At Rotterdam, there are 8086 prepayment and 13,840 ordinary meters; and many other towns—such as Arnhem, Tilbourg, Leiden, and Hilversum—show equally favourable figures.

In Amsterdam, where at first the introduction of the meters was restricted by the excise regulations, the system has gained great popularity. On Aug. 10, 1898, when the gas-works were disposed of by the Imperial Continental Gas Association, there were 915 prepayment meters. At the end of the year there were 934; and during the following year the total rose to 1869. The promptness displayed in keeping pace with this demand will be understood when it is stated that at the present time 100 meters per week are being fixed.

Heer Geerling, Assistant Engineer at the Amsterdam works, sends me some detailed particulars, which will be of interest, as will also the photograph here reproduced. Fig. 2 shows the inspection of the staff of foremen held every Saturday about 3 p.m., at the Linnaeusstraat works. At this time, all tools are shown on their respective handcars, for checking the contents of each against the total plant used by the foremen. Storage room being limited (in comparison with the quantities of material to be stored), only that which can be packed with the maximum of compactness is kept here. Three stations serve for the delivery of the materials to the foremen; the quantity being

noted at the time. Each station is allotted to a gang of six foremen, who come up in turn. Much loss of time occurred at first in this distribution of apparatus. The different requirements, particulars of which had been sent in by the foremen the previous evening in writing, had to be collected the same night in large baskets, and in the morning had to be re-handled when applied for by the foremen, in order that the latter might check what they received.

For some time this system has been stopped; and an arrangement is now in vogue whereby the different pieces of apparatus are arranged in wooden trays, so that the requisition forms can be checked in a few seconds. A special receptacle is reserved for "lyres," branches, globes, burners, &c. A similar plan is followed in connection with the iron pipes, which are measured off in the evening, so that every morning the foremen get the quantities which they requested the preceding evening, with a note of the amount supplied. This latter is checked by a workman who signs a receipt in the storekeeper's book.

A similar time-saving arrangement is adopted for the distribution of tar, fir-wood gutters in which pipes are laid, coke, &c., which are arranged in systematic order during the evening. The watchman notes the numbers of the workmen and the times at which they leave the factory. His register goes after-



FIG. 2.

wards to the chief inspector, who explains any delay, and passes it on to the engineer's office. Up to the present, prepayment meters are fitted only from the Linnaeusstraat works; but the Haarlemmerweg factory will very shortly be in a position to deal with them.

On Oct. 16, 1899, the staff comprised only two men and a handcart. Now 46 workmen and 23 handcars are in use; and this staff will soon be greatly increased, for the requests for meters already reach 6000, and seem likely to keep coming in up to a possible total of 30,000. In May about 65 installations were made per week (about 100 are now being done per week). This, considering the staff, is not a large number; but several causes have combined to keep down more rapid progress.

First, the foremen are drawn from all ranks, and are not all acquainted with the craft. Others are weak in clerical work, and lose much time in getting out reports on material used and hours worked. Others, again, have not been used to working exclusively with drawn iron pipes. There are also the making of trenches up to 75 cm. in diameter, laying on of service-pipes, putting in the gutters for the protection of the pipes, fitting the vertical supply-pipe which passes through the various storeys, trial of connections, &c.—to all of which the new hands have

to become accustomed. Then the time for the work is comparatively short. There are only five days available per week; and much time is unavoidably spent in going about.

Another difficulty is the character of the premises in which the meters are to be fixed. The dwellings of those who desire them fitted are mostly too slight to stand a supply-pipe fitting; and some amusing incidents have occurred in which parties have claimed damages for injury to their premises or property. A still further difficulty is the habits of the residents themselves, who, in many quarters, are distinguished by their conspicuous disregard of the eighth commandment, inasmuch that the workman must never let his tools out of his sight, or he will never see them again.

Reverting to the difficulty of obtaining a suitable staff for the work, it is anticipated that foremen may be recruited from the students of the special schools for workmen, and that the assistance of the professors in this direction will soon enable the Company to meet the extraordinary demand. The annual consumption in prepayment meters is as follows: Maximum, 640 cubic metres; minimum, 190 cubic metres; average, 400 cubic metres.

We now come to the most important points in connection with



the prepayment system—viz., the rates and conditions in regard to which the gas is supplied. Although the mains and apparatus, fittings, and stoves used by the consumers are approximately of the same value and number in the various towns where the system prevails, opinions differ on the question of depreciation which the capital invested in the installation and working of the new system demands. Different tariffs have resulted from a degree of caution on the one hand, and a certain optimism on the other. The surcharge varies from  $1\frac{1}{2}$  cents to zero, compared with the usual price. In some instances, even, a lower price is charged.

In the information placed before me by my colleagues, I notice that some of them are of opinion that the prepayment system—considered from a financial point of view—can be adopted and worked with gas at such a figure that, after subtracting the expenses of depreciation and interest on the capital in mains, meters, &c., as well as extra expenses, a certain profit on the cost price of the gas is obtained. Now, I have never been able to agree to these propositions; and I hold to the conviction that it is the surcharge on the usual price of the gas which, for the most part at any rate, ought to cover both depreciation and extraordinary expenses.

The Chairman of the South Metropolitan Gas Company, of London (Mr. George Livesey), who has kindly given me his opinion on this subject, looks for the recovery of the expenses mentioned above in the surcharge on the gas. I need not speak of the authority with which Mr. Livesey's utterances on this question are associated. The prepayment system has found favour with him; and the great Company which he directs possess as many consumers by the one system as by the other—say, 100,000 for each. To obtain 100,000 consumers required



FIG. 3.

28 years; the prepayment consumers have become customers within the past eight years. He adds that no injustice should be done to the older *clientèle*, and all should be treated alike.

In London, a prepayment outfit costs 74'35 fl. (equal to, say, £6 3s.), and demands, according to Mr. Livesey, a depreciation fund of 10 per cent. for interest, working, &c. The extra expenses of inspection, administration, &c., are placed at 1'60 fl. (2s. 8d.) per annum. The average consumption in London being 510 cubic metres per annum, the surcharge should be 1'77 cents per cubic metre. The extra charge made, however, is 9d. per 1000 cubic feet—say, 1'59 cent per cubic metre.

General expenditure and cost of installations are, on the whole, greater in London than in provincial towns, where they vary from 40 fl. to 70 fl.; but it is wise in any case not to rest satisfied with depreciations of  $3\frac{1}{2}$  per cent., &c., in which the expenses of working, removal, and constant changing, which are unavoidable in dealing with the floating population using prepayment meters, are not included.

It would be unfair to leave unemphasized the great influence of prepayment meters on the consumption of gas in general. All my colleagues in Holland agree that no better incentive to the consumption of gas—especially for cooking—can be found. For this reason, the surcharge should not be made too high. On the other hand, however, in consideration of the wide field open to the new system, and the amount of capital sunk in it, it is unwise to fix too small an excess. To levy no additional charge, or even to charge less—as is done in some instances already cited—is an action which discredits itself. No commercial or municipal association can play a philanthropic rôle.

The surcharge should therefore be from 1 to  $1\frac{1}{2}$  cents per cubic metre. Almelo, with an extra charge of  $1\frac{1}{2}$  cents, has an

average consumption which differs only very slightly from that of Hilversum, where there is no excess. The great virtue of the system is in the readiness with which apparatus and mains are placed at the disposal of those of modest means, and in the mode of payment. From this point of view, the price of the gas is a secondary consideration.

I have already said that the system requires more extensive organization in the matter of receipts; and I ought to add that administration is more cumbrous than with the ordinary meters. Fig. 3 shows the method adopted at Utrecht to simplify the manipulation of the numbers of  $2\frac{1}{2}$  cent pieces received. The money is counted by means of a kind of draught-board holding 100 pieces. This plan reduces labour, and is very exact. The coins are packed in paper, and sent to the banks for conversion into silver or notes.

My colleague, Heer Liefde, of Hoorn, has acquainted me with a device for protecting the meter when it is installed in the houses of (say) workmen where the walls are far from solid. It is a kind of wooden box, open at the two sides, and provided with a vertical partition in the plane of the wall. This box, being fixed at the desired height in the separating wall of two houses, permits of two meters being placed in it.

The general conclusion is that the results in Holland have fully confirmed the statements of prepayment meter promoters. Conducted wisely and liberally, and with attention to the lessons of experience, the system draws a new circle of customers, and gives a fresh source of profit; while the workman and the lower-class *bourgeois* can obtain good and cheap light and fuel always ready to his hand, and contributing to the comfort of his home.

I must, in conclusion, thank my Dutch friends for the many ways in which they have assisted me to prepare this paper—in particular, Heer Van der Horst, Dr. Neurdenburg, Heer Geerling, and Heer Van de Waereld.

### FUEL FOR GAS-MOTORS.

By AIMÉ WITZ, of Lille.

[A Paper read before the International Gas Congress at Paris.]

Among the advantages of gas-motors, is the fact that they can be fed with the most diverse of gaseous fuels, from rich combustibles like acetylene to gases as poor in calorific power as blast-furnace gas. In order to burn these different substances, the proportion of gas and air must be adjusted, a perfect mixture of the two obtained, and the degree of compression and mode of firing properly arranged. With a suitable carburetter, even liquid hydrocarbons of very different density and volatility—from petroleum ethers or gasolines to petroleum burning oils—can be used.

To this great adaptability of the motor is due the fact of its use, in town and country, in the vicinity of a coal-gas works, or other gas-making plant, either as a stationary engine or for automobile purposes, and in sizes the capacity of which vary from a few kilogram-metres to 1000-horse power. The 1000-horse power motor is to-day a practical realization of the dreams of inventors; for it is possible to connect, in series or otherwise, two cylinders similar to that of the motor shown in the Belgian Section by the John Cockerill Company of Seraing.

This machine is on the Delamare-Cockerill system of monocylindric type. Its cylinder measures 1'300 metres in diameter; and its stroke is 1'400 metres. Before a commission of expert engineers, it has proved itself equal to producing from 560 to 670 horse power when burning blast-furnace gas of 985 calories per cubic metre. It absorbs about 2120 cubic metres per hour to give 670-horse power. According to the original statement of a famous inventor, smelting is really a secondary operation of a blast-furnace, which may be regarded as a gigantic gas-producer yielding 150 tons of pig-iron on the one hand, and 600,000 cubic metres of gas on the other. Reckoning half this gas for heating the blast and for other purposes, there remains a surplus of gas, from a blast-furnace of 150 tons, sufficient to produce 3500-horse power in gas motors. One thousand horse power, and sometimes not so much, is obtained with difficulty when the gases are used to raise steam.

The gas-motor has thus taken up its place as an adjunct to the blast-furnace, and produces the most satisfactory results. Similar success awaits the engineers who shall use it with gas from coke-furnaces. The producers of Dowson, Gardie, Lencauchez, Deutz, Pierson, Fichet and Heurtey, Bénier, and others, have paved the way for the future success of the gas-motor.

In the earlier period of producer-gas making, it was necessary to use special coals, preferably anthracite, freed from powder, non-caking, with little ash, and yielding no fusible clinker—in short a coal of such special character that only a high price could procure. But now it has gradually become possible to use ordinary anthracite coals of moderate price, so that the cost of the producer-gas has been greatly diminished, and the possibilities of the producers greatly increased. Electric power works, pumping-stations, printing presses, looms, and spinning and other mills have taken their motive power from it with most satisfactory results. A 100-horse power motor, working 3000 hours per annum, fed with anthracite coal costing 25 frs. per tonne, furnishes 1 horse-power-hour for at any rate 4 c.\*

\* I reckon 5 per cent. for interest, 3 per cent. for depreciation of buildings, and 6 per cent. for that of machines and materials.



an advantage of about  $\frac{1}{2}$  c. over a good steam-engine in which coal at 20 frs. is burnt. Its first cost is much less. The producer-gas varies from 1200 to 1600 calories per cubic metre. Gas producers are very suitable for coke; but the present high price of this fuel is not likely to encourage its use.

A producer has recently been put down in Messrs. Brunner, Mond, and Co.'s chemical works at Northwich, in which small and bituminous coal can be consumed; and the recovery of the bye-products has proved most satisfactory. The complete apparatus is really a miniature gas-works; but the cost of the kilowatt-hour is placed at about 4 c. (excluding interest and depreciation of plant), with Crossley motors of 25-horse power, a figure which justifies the expense of a complete plant.

The Riché producer, using wood, gives a comparatively rich gas of 3000 calories, which has been found to work well in Charon motors. It is an apparatus susceptible of many different uses in districts where wood for fuel can be found, and for this reason ought to extend the usefulness of the gas-motor.

The water gas of Tessie du Motay has not been much used as a fuel for gas-motors. The facts that the plant must have coke, and that it acts intermittently, are, no doubt, the explanation. The Dellwik producers, which give a gas of 2000 calories, have had a measure of success in Germany; while the tendency in America is to revert to the Lowe producer, as modified by Merrifield. Few experiments on the feeding of motors with water gas have been made; yet it has been shown that the engines behave as well with water gases as with mixtures of the latter and Siemens gas, whatever may be the proportion of nitrogen.

MM. Biedermann and Harvey have suggested the supply of carbon dioxide to gas-producers. The gas ( $\text{CO}_2$ ) would be reduced to carbon monoxide by contact with the incandescent coke. Should this idea become practicable, it would be possible to regenerate the waste gas of the motor, and so complete the cycle of changes involved in the use of producer or water gas as fuel. The high temperature of the escaping gas would doubtless be enough to maintain the reaction; and the heat of the waste gases would thus be recovered. Unfortunately, the nitrogen would accumulate in the recovered gas (due to the air supplied to the motor); and the whole volume of waste gas could not therefore be operated upon. The outline of this process, which has been mentioned in the third volume of "*Traité des Moteurs à Gaz*," suggests experiments which would be perhaps more interesting than practically useful, but which would nevertheless bear upon the theory of the question.

In regard to gases obtained by destructive distillation, their calorific power varies from 3500 for gas from dried wood, to 5350 for coal gas and 7500 for cannel gas. These are average figures; but I have found coal gas—the so-called house gas—to vary from 5000 to 6000 calories.\* Ordinary house gas was that first supplied to motors, for which they were designed and made, from the machines of Philippe Lebon to those of Lenoir and Otto.

With gases at 10, 15, 20, and 25 c. and motors of 4, 10, or 30 horse power, the cost per horse power per hour can be found from the following table:—

Horse Power of Motors.	Cost per Horse-Power per Hour, with Gas Costing			
	10 centimes.	15 centimes.	20 centimes.	25 centimes.
4	11 centimes	14 centimes	17 centimes	20 centimes
10	9'7 "	12'7 "	15'7 "	18'7 "
30	8'5 "	11'5 "	14'5 "	17'5 "

These figures—which are not advanced as exact, since the factors are variable—show, at any rate, that up to 10-horse power the gas-motor has nothing to fear from any other motive power, even with gas at 20 c.; while for 30-horse power the price of the gas ought not to exceed 15 c.

It is true that the gas-motor on the town main possesses advantages which would obtain support for it, even if the cost per unit of energy were greater. These are briefly: No other plant, no furnace or fireman, no stock of fuel, put in or out of action at once, and no expense when not actually in use. Moreover, it can be placed practically anywhere; and, if properly constructed, it is so nearly noiseless as not to raise objection from neighbours. The last point has not always been realized; but this has more often been due to the fixing of the motor and its accessories than to the machine itself.

In towns, the applications of gas-motors have not developed to the extent which might reasonably have been anticipated from the improvements of the past ten years. Now that 1-horse power per hour can be obtained by the consumption of 500 litres of gas of 5350 calories per cubic metre at  $0^\circ\text{C}$ . and 760 mm., the use of such motors ought to be profitable and economical in many industries. It is astonishing to find that the Paris Gas Company sold only 10,013,000 cubic metres of gas in 1899 for use in motors in Paris and the suburbs. This is scarcely 1-33rd of the total make—say, about 3 per cent. In Germany, certain works supply 17 per cent. of their gas for motors, although the

price of gas is not less than here, nor the motors superior. It may, therefore, be hoped that the progress in this direction which has been evident in Paris in the present year, owing to the Exhibition, will continue, and that there will be an increasing demand for gas for use in motors.

The enrichment of house gas by carburetting has been tried; but it seems as though this is of no advantage to the consumer who uses the gas as a motive power. Acetylene gas, of which premature hopes were entertained, has not given any very encouraging results, in spite of the able work of MM. Ravel, Cuinat, Franck, and many others. I am not aware of a single application in this direction. All that has been done has been to show that the gas-motor can work with such a rich gas; but it still remains to make it practical.

Experimental results confirming the preceding statement are in favour of the gas-motor which, as has been mentioned, can be fed with blast-furnace gas of 900 calories, or with acetylene of 14,000 calories per cubic metre. M. Lencauchez has also shown (in the analysis of a number of more or less official reports) that the thermal yield of motors varies appreciably with the richness of the gaseous fuel. The trials I have made at Seraing and Differdange confirm this statement, inasmuch as the horse power per hour could be obtained with 3 metres of gas of 980 calories, equivalent to 549 litres of gas of 5350 calories. This number corresponds to a yield in actual work of 21·7 per cent., and in indicated work of 25·5 per cent. But I have never obtained more than 21·1 and 26 per cent.

### THE REDUCTION OF THE COST OF DISTRIBUTION BY THE USE OF HIGH PRESSURES.

By FREDERICK H. SHELTON, of Philadelphia.

[A Paper read before the International Gas Congress in Paris.]

For many years gas engineers have been steadily reducing both the operating and the investment costs necessary in the manufacturing department of the gas business. The increased yield and efficiency of retort-benches, the improvement of water-gas apparatus over early forms, the utilization of residuals, the use of oxide of iron, and the increasing use of mechanical conveyors and devices, with other progressive steps, have all resulted in recent years, as is well known, in greatly decreasing the cost of making gas. But if inquiry is made as to what material reduction of necessary investment, or what advance, has been made in the department of distribution, it is difficult to point out anything very different from, or notably better than, the practice of twenty, or even more years ago. Substantially the same cast-iron pipes, the same hub-and-spigot joints, the same service-pipes, the same meters, the same equipments in general, and the same low ranges of pressures, are in use to-day as were used years ago. Improvement in distribution practice seems to have been limited to details such as an increased use of governors for the reduction of leakage, a greater tendency to coat wrought-iron mains and service-pipes as a safeguard against corrosion, and a growing use of cement joints instead of lead, hitherto usually employed with cast-iron pipe. While it is a compliment to the efficiency of standard gas distribution appliances that the inventive minds of many years have been unable to bring forth better forms, it is none the less a fact that—because of the continuation of settled forms, and of a lack of improvement—the cost of our distribution systems is to-day, for given volumes of business to be handled, practically as great as ever.

In the United States, the average price at which gas is sold is for various reasons generally decreasing—making it imperative that the cost of gas plants, or any portion of them, be kept down to the least possible amount. Lowering prices and the growing use of gas for fuel are resulting in the handling of larger volumes of gas than heretofore; and the increasing difficulty of laying large new mains, for increased volumes, in streets of the principal cities already well filled with water pipes, sewers, underground conduits of various descriptions, and surface railway tracks, is well recognized. The consolidation of manufacture at central stations is also necessitating larger mains; and the recent rise in the price of iron pipes is making them more expensive than ever. All of these conditions afford the greatest opportunity for some improvement in methods of distribution; and any practical plan that will, in particular, decrease the size and cost of street pipes will be a great progressive step.

Perhaps the most striking feature in the present practice of gas distribution is the extremely low pressure at which gas is delivered—average pressures of 2 to 6 inches of water pressure equalling but one-tenth or one-fifth of 1 lb. steam pressure. If customary pressures could be increased so that pipes of given size would deliver ten to fifteen times the volume of gas now handled, would it not enormously cheapen the costs of distributing systems?

I have given this matter much thought for upwards of two years past, and some time ago reached the conclusion that illuminating gas could just as well as not be distributed satisfactorily at a number of pounds pressure—say, from 10 to 30 lbs.—instead of at but a small fraction of a pound; and that by such plan of working either present pipes could be made to handle several times the quantity of gas now delivered, or else much smaller pipes would serve as well.

\* This relates to the calorific power at constant volume (steam condensed), as determined by means of my eudiometric bomb. I obtain complete combustion, which is not always the case with poor gases in calorimeters which burn the gas at constant pressure.



On the basis that quadrupling the pressure doubles the flow, other conditions being the same, 27.75 inches of water pressure or 1 lb. steam pressure would double the flow of gas delivered at a pressure of 6 to 7 inches—a not uncommon distributing pressure. And if this 1 lb. be quadrupled, and the pressure be increased until 20 or 30 lbs. be reached, such pressure would deliver ten or twelve times the amount of gas now sent through given sized pipes. While such pressure is enormous, compared with usual illuminating gas pressures, it is very moderate indeed if viewed from the standpoint of (say) steam or water pressures; and if by a simple increase of pressure, by some practical working plan, the capacity of gas-pipes can be so greatly increased, does it not follow that the construction costs of distributing systems may be very greatly decreased, reducing the earning power necessary, and thus, indirectly, the expense of distribution? Appreciation of the saving that may be made may be shown by a few examples.

According to the formula of Dr. Pole, usually employed in such matters, an 8-inch pipe 4 miles long, under present customary pressures of 6 or 8 inches, will deliver at the far end 8000 to 9500 cubic feet of gas per hour. Under a range of 20 to 30 lbs. pressure, and operating (as later described) by well-accepted formulæ for the flow of gas of '650 gravity in such range of pressure, it could deliver 140,000 cubic feet per hour. A 2-inch pipe 1000 yards long, would deliver 650 to 750 cubic feet, compared with 4600 cubic feet. A 12-inch pipe, 2 miles long, would deliver 33,000 to 38,000 cubic feet, compared with 550,000 cubic feet. To supply gas to a point  $4\frac{1}{2}$  miles distant, at the rate of 10,000 cubic feet per hour, on present lines, in a recent instance figured upon, would have required a 10-inch pipe, costing about \$26,000. With high pressure, however, a 3-inch pipe, costing but \$10,000, gives equal capacity. To supply 15,000 cubic feet an hour at a point 6 miles distant in another instance, required a 12-inch main at a cost of \$40,000. While, with high pressure, as hereafter described, a main of only 4 inches diameter would have given the same capacity at a cost of \$16,000.

I have recently had occasion to figure upon the construction of a distributing system including 25 miles of pipe in the usual amounts of sizes from 3 to 12 inches in diameter, the estimated cost of which was \$82,000. The construction cost of a high-pressure system in the same locality, with pipes ranging from  $1\frac{1}{2}$  to 4 inches in size, and including the extra cost of complete pumping equipment and consumers' house regulators, &c., was only \$43,000—a saving of about 47 per cent.

This paper is more particularly directed to showing the feasibility of working at high pressure, rather than to the figuring of savings to be made in assumed cases, each of which, whether real or imaginary, would differ from its neighbour, and would have to be figured upon its own conditions. I am assuming that the saving is so obvious, in a system that would make gas-mains of a dozen times their present capacity, that it is not the exact degree of gain to be made that may interest you so much as it is the manner of so operating, and the practicability of such a system. For, on the one hand is an investment which, even after the cost of the requisite pumping machinery and high-pressure regulators and appliances is allowed for, is yet but one-half of that ordinarily necessary; while, on the other hand, the increased operating expense of a high-pressure system—chiefly involved in the running of a moderate sized gas-compressing pump—is so slight as to only fractionally offset, and so small as not to begin to neutralize, the advantage gained.

Illuminating gas, it should be remembered, is the only extensively handled commercial fluid that is delivered at a very low pressure. Water, steam, compressed air, natural gas, Pintsch gas, refrigerating fluids, &c., have been and are being widely distributed, sold, or handled for years in public places, in various of the principal cities of the civilized world, and to such extent and in so many ways as to fully justify the statement that a number of pounds pressure in itself, in such matters, is neither unsafe nor unfeasible. The mechanism and appliances for controlling these various fluids, even at pressures up to several hundreds of pounds, have been well worked out into adequate and standard forms that fully serve the purposes of commercial industries. It is indeed curious, when one reflects upon it, that for so many years illuminating gas has continued to be distributed at but a small fraction of a pound pressure, when all other liquids served by public companies are sent out usually at far greater pressures, and the universal tendency in such things is to increased tension. The reason for the continuance of low pressure with illuminating gas is no doubt the fact that relatively, and in the past before the advent of any great volume of fuel business, the actual quantities of gas required to be handled have been small, and it has been found comparatively easy to provide pipes of sufficient size, and without undue cost, that would convey all the gas required. While such conditions have existed in the past, it is a question whether in the near future, for the reasons already stated, gas engineers will not find it both necessary and profitable to replace pipe diameter—convenient but expensive—with readily supplied pressure to best distribute large volumes.

While some companies in the United States have slightly increased their pressures to increase the carrying capacity of their street-mains, by the introduction of mechanical appliances, such as rotary blowers, to reinforce the pressure given by the gasholders, it has almost invariably been solely for the purpose

of transmitting gas from one distributing point to another, and within pressures not exceeding 50 inches and measured in inches of water pressure; and no general delivery of gas to the customer direct and through all the mains at some pounds pressure has been undertaken to my knowledge. The only instances among the 1000 companies in the United States of which I have been able to learn, wherein gas is being noticeably compressed, in connection with public supply or service are the following.

In Louisville, Kentucky, coal gas has been pumped for about two-and-half years, by a piston compressor of about 30-inch by 36-inch cylinder size, at the rate of about 140,000 cubic feet per hour, through a 10-inch wrought-iron pipe, a distance of some  $2\frac{3}{4}$  miles, for the purpose of filling outlying gasholders—throwing a pressure of 10 inches. In this case no consumers are served along the line; and no loss of candle power has been observed. The initial pressure of 5 to 7 lbs. is only that sufficient to overcome the friction of the pipe while filling the holder against 10 inches pressure at the rate per hour designated.

In Oakland, California, for about ten years a mixed coal and water gas has been pumped by a piston compressor a distance of 8 miles to Alameda, through an 8-inch cast-iron pipe with lead joints; also for the purpose of filling a gasholder at an outlying point. In this instance, the initial pressure carried is 5 lbs.; the terminal holder pressure is 4 inches. No individual consumers are taken off the line, although midway a governor of the Connelly type controls a supply of gas taken from the main for the district of East Oakland. The loss of candle power observed, due to compression, &c., is said to be slight, and not to exceed a quarter of a candle.

In Chicago, Illinois, for some years water gas has been pumped in the southern portion of the city from the plant of the Mutual Company's works, a distance of about 23,000 feet, through an 8-inch pipe-line, for the purpose of filling an outlying holder. In this instance, a rotary exhauster of the Root pattern is used, giving an initial pressure of 10 lbs. and passing gas at the rate of about 60,000 cubic feet per hour into the holder against a pressure of  $7\frac{1}{2}$  inches. No consumers are taken off *en route*.

In Danbury, Connecticut, for ten years past a 35-candle power oil-water gas has been pumped under 40 lbs. pressure through a 2-inch wrought-iron pipe by a piston compressor, a distance of 3 miles into stationary wrought-iron tanks. From these tanks the gas, controlled by a governor, is supplied to the small town of Bethel, at the customary low pressure. No consumers are taken off *en route*; and no loss of candle power is observed.

The above cases are far short of the distribution of gas direct to the customer at high pressure; but they are yet of interest in showing that compressing illuminating gas to several pounds pressure causes no noticeable loss of candle power. The well-known Pintsch system of car lighting, so extensively used in both the United States and Europe, for very many years, has more-over fully demonstrated that pumping machinery for compressing gas to almost any pressure can be dependably used in gas undertakings if desired. The hundreds of natural gas companies in the fields of the United States further, have also fully demonstrated that wrought-iron pipes will satisfactorily convey gas any distance, at any pressure, and that mechanical regulating devices or governors will reliably reduce and control pressures to any degree desired.

If, therefore, the compression of illuminating gases to a few pounds pressure does not objectionably reduce their candle power (as indicated in the Louisville, Chicago, Oakland, and Danbury instances cited), and if compressors will readily pump gas (as shown by the Pintsch system), and if wrought-iron pipes and mechanical regulators will suitably convey, handle, and control it (as shown by natural gas undertakings), does it not necessarily and logically follow that by using the compressors of the Pintsch people and the wrought-iron pipes and regulators of the natural gas people, illuminating gas can also be similarly compressed and delivered at high pressure through small pipes if desired? There is but one answer to this question: Illuminating gas can be so served, easily, dependably, safely, and economically, although the realization of this is but dawning.

Considering the above general proposition in more detail, it is clear that the satisfactory distribution of gas direct from the gas-works to consumers at some pounds pressure, in order that they may be safely and well served through mains much smaller than the ordinary, would specifically require: 1. Street mains of long life, with joints originally made tight, and that will stay tight. 2. Machinery for compressing and pumping, in which the likelihood of breaking down is remote. 3. Regulating main governors, reliable in character, for reducing the pressure of the high-pressure line to any desired low (ordinary) pressure in any given district. 4. Individual house governors reliable in character, to enable the supply of customers anywhere along the high-pressure line. 5. Adequate safety appliances; so that in the possible event of any pressure regulating mechanism failing to work, no damage can result other than loss of gas. 6. Means for safely and easily putting in additional service-pipes at any time on the high-pressure pipes while under pressure, without shutting off the supply to existing customers. 7. Freedom from loss of candle-power to any serious extent because of the compression.

Without consuming time unnecessarily by the relation of the detail of extended investigation, I became, and am, convinced: 1. That for high-pressure gas work, wrought-iron screw pipe, well coated against corrosion and carefully laid, will afford a



practically tight system of gas-mains, and will last in most situations sufficiently well. The experience of ten to fifteen years of the natural gas companies and others in the United States, with wrought-iron pipe, gives warrant for this conclusion. 2. That the standard types of air-compressors, built to withstand severe usage in distant mining districts, are, with slight modifications, entirely suitable for pumping gas at some pounds pressure. They are no more liable to breakdowns than ordinary steam-engines; and they can be installed in duplicate at such moderate cost as to completely cover the fullest requirements of safety and insurance of supply. The thousands of air compressors in use throughout the world, as well as the many Pintsch compressing stations, give full warrant for this conclusion. 3. That the district governors and regulators used for years in the natural gas fields in the United States, will control any volume of illuminating gas from and to any range of given and desired pressure. They are so moderate in cost, simple in form, and so compact, as to enable their ready arrangement in duplicate, giving ample opportunity for inspection, cleaning, adjustment, &c. The very extended and satisfactory experience with such regulators by natural gas companies gives warrant for this assumption. 4. That the inexpensive, individual house governors—also used throughout the natural gas districts, with great reliance and satisfaction—will equally well serve with illuminating gas. These governors are practically the same in type as those used on the Pintsch system of car lighting in about 100,000 cars throughout the world, and for many years with an almost entire absence of accident or trouble. 5. That the use of simple forms of oil-seals, or safety vents, will fully protect, as desired, either a district at large or one or more individual customers from danger or damage in the remote (though possible) event of a defective pressure-regulating device working improperly. Such precaution is used in the natural gas fields, and is believed to give entire protection, and has so far been found to do so. 6. That by the use of a saddle or lug bolted on to the gas-main, and a suitable pressure tapping device, service-pipes can be easily added as desired without inserting a T, interrupting the supply of gas, or increasing the expense, and with less danger and trouble than are involved in the present practice. 7. That where high compression—to say 200 lbs.—would seriously affect the candle power of the gas, compression to but 20 or 30 lbs. (provided the gas is an ordinary coal gas or well made water gas) will not decrease the candle power visibly, or over the fraction of a candle, or enough to be an objection commercially.

Having satisfied myself upon all the points as above, fully and in general, that illuminating gas could, with proper equipment, be readily distributed at 20 lbs. pressure, and an opportunity offering, within the past year demonstration was made of my belief.

The towns of Phoenixville and Royersford, 28 miles from Philadelphia, are about five miles apart, and together contain about 16,000 people. Each of these towns has had a Gas Company for many years. Both of the Companies were purchased last summer by the Consolidated Schuylkill Gas Company, controlled by myself and some associates. It was decided to lay a high-pressure connecting main from one to the other, in order that the operation of the smaller gas plant could be discontinued, and all gas making be centred at one point. Between the two stations a 3-inch wrought-iron pipe, 23,015 feet in length, was laid—special care being taken in making the joints and in testing throughout. When finished, it was tight under 60 lbs. pressure. The pipe was laid about  $3\frac{1}{2}$  to 4 feet deep along the line of a moderately hilly country road. It crosses a river 600 feet

wide, and railroad tracks and stone culverts at various points. Tees were inserted for customers' service-pipes along the line, together with drips and valves. At the starting point, a compressing pump was installed, having a working capacity of about 5000 cubic feet of free gas per hour. Suitable governors, gauges, and small parts and details were provided. The duty of the compressor is to draw gas from the gasholder and compress and force it through the pipe-line at a pressure of from 10 to 25 lbs., according to requirements, to the town at the other end of the line. At the farther end of the line two regulators or governors, set tandem, are used to reduce the varying pressure of several pounds in the pipe-line to that desired in the low-pressure existing mains—namely, a uniform 2.7 inches. The first governor is adjusted to reduce any pressure ranging up to 50 lbs., down to 1 lb.; and the second governor—more sensitive in its action—is set to reduce the gas at 1 lb. to the 2.7 inches named. Both governors are of the non-freezing, dry-diaphragm type. Suitable gauges for indicating and recording the various high and low pressures, as well as other necessary appurtenances, were provided at the terminal pressure regulating station. Figs. 1 and 2 illustrate the compressing pump and the pressure regulating mechanism respectively.

Construction was finished and operation commenced Dec. 29 last; and from that date since, the supply to Royersford by this pipe-line has been maintained satisfactorily. In the first few weeks, some readjustment of the regulating mechanism was from time to time necessary, until its working and best action were fully understood; and the gas-pump was operated in various ways in order to ascertain the best method of running. No difficulties whatever of importance developed; and, in fact, there was less trouble experienced and experiment required than was really anticipated, or is ordinarily involved in commencing the operation of something out of the ordinary. For the first two months a small gasholder at Royersford was used in connection with the pipe-line, to insure the safety of supply, and until it was felt that the system as a whole was in complete running order. This condition being reached within that period, the gasholder was shut off; and since that time the town has been served with its illuminating gas direct from the high-pressure main through the regulators, from a point nearly 5 miles away, and without the use of a holder or storage receptacle. It is my understanding that this is the first instance of this being done. The gas served is an ordinary illuminating water gas of about 20 to 22 candle power, made from naphtha. The generating apparatus is an old one of the Lowe type, and of inferior design; the superheating capacity being much less than it should be, with the result that the gas made is but partially "fixed." Under these conditions, it would be expected that the compression would result in considerably reducing the candle power by the throwing down of the unfixed illuminants. No particular depreciation in candle power, however, has been observed; the gas at the far end of the line being, generally speaking, of good commercial quality, and of practically the same grade as that delivered at the starting point. While variations in candle power have been noticed, they are due to irregularity in the quality of gas made in, and because of the poor machine so far necessarily used, and not to the fact of compression. I regret to say that, owing to local and other reasons, it has not yet been possible to have close photometrical observations made.

The gas-pump has a capacity of about 100,000 cubic feet per day, at a speed only 75 per cent. of its rated speed. As this quantity of gas, however, is as yet not required, it has been found the most desirable plan to operate it for from 30 to 45 minutes every two hours or so—pumping and storing gas in the pipe-line to a pressure of 25 lbs., and letting that gas furnish the supply until the pressure falls to 5 lbs., when pumping is resumed. The temperature of the gas is increased by the compression to about 120° Fahr. The volume of drip or condensation removed from the pipe-line is about  $\frac{1}{8}$  gallon per 1000 cubic feet. The

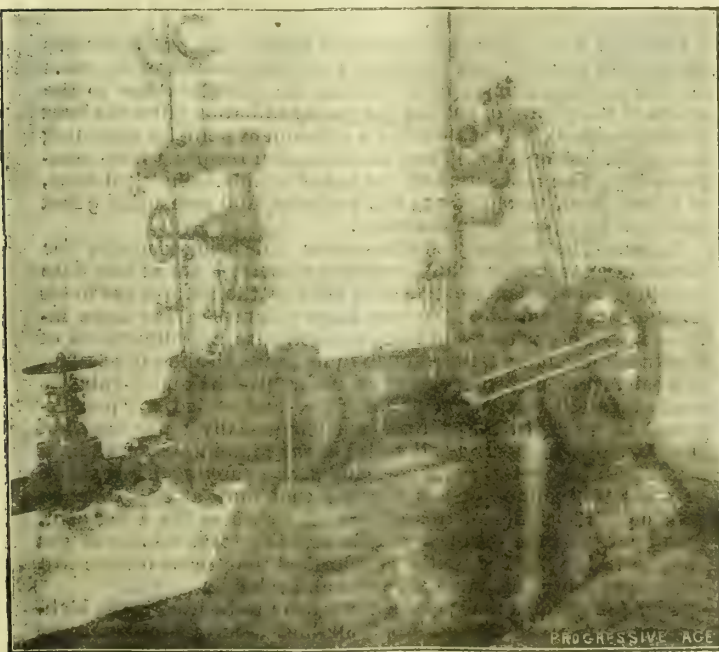


FIG. 1.



FIG. 2.



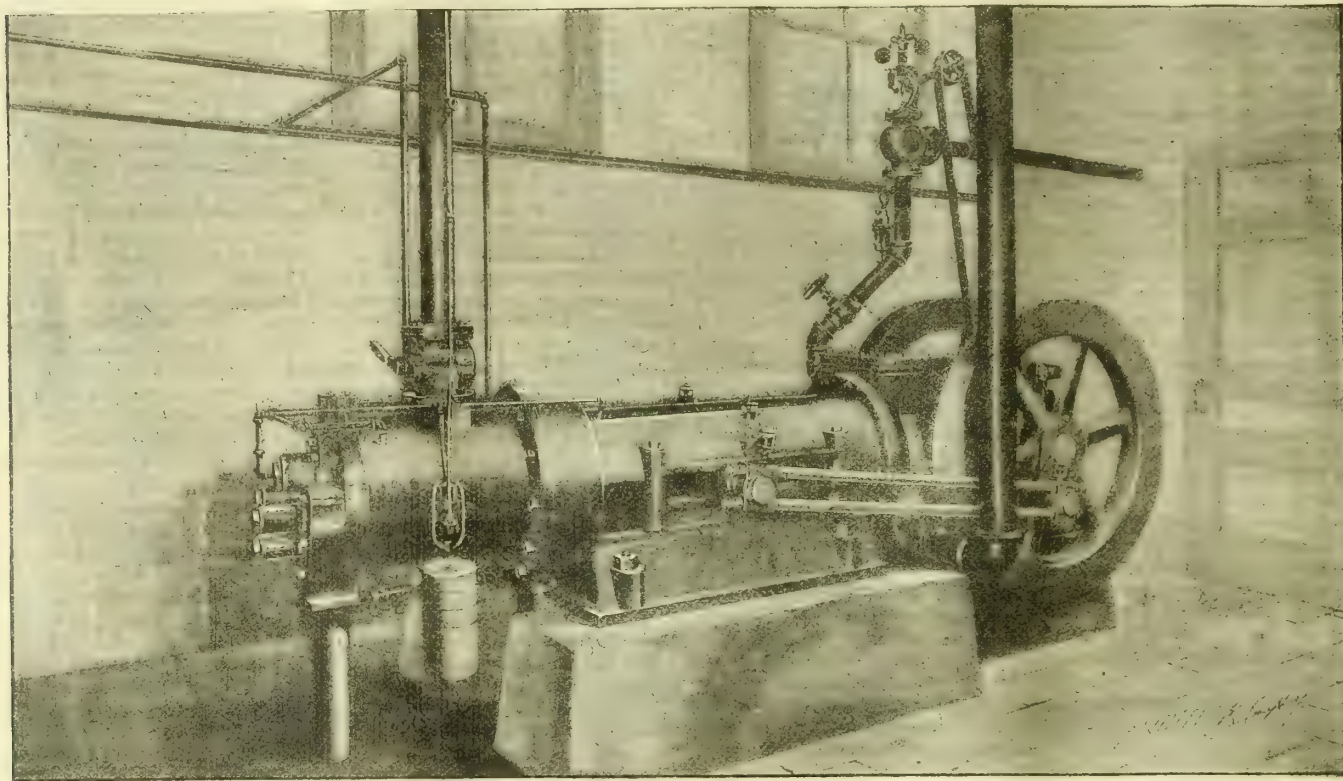


FIG. 3.

loss of pressure, due to friction in the pipe-line, is from 2 to 3 lbs. While the general capacity at present is about 4000 cubic feet per hour, by increasing the speed, governor adjustment, &c., and by the use of a larger pump, the line will handle two or three times that amount in the future, if desired. Along the high-pressure pipe-line a number of customers are served by means of individual house regulators, reducing the pipe-line pressure, whatever it may be, to 17-10ths water pressure. One regulator controls a single lamp-post only; another a large county almshouse; a third a run of 800 feet of pipe serving about seventeen houses; a fourth the lighting of a bridge. All these regulators have worked satisfactorily continuously.

The sceptics as to the success of pumping illuminating gas at high pressure predicted that there would be a considerable loss of candle power due to the compression; that the governors would not be reliable; that condensation would give trouble; that the high pressure in the pipe would be dangerous; and that break-downs of the pumping machinery would imperil the general supply. Neither these nor other troubles have materialized or appear to be in sight.

The operation of the system has been so continuously and so generally satisfactory that the owners of the Company have decided to duplicate it on a much larger scale in the extensive suburban districts of Darby and vicinity, immediately adjoining the city of Philadelphia. Work is under way in the district upon an initial system of about 22 miles of high-pressure pipe. The trunk-line from the gas-works is 6 inches in size, and extends to a point 3 miles distant; and from that point two lines of 3-inch and 4-inch pipe further extend respectively to points 7 and 8 miles away from the gas-works. It is expected that upwards of a thousand customers will be receiving and using gas from this system within a year's time, and that it will make a still further demonstration of the low investment with which gas can be served at a distance and in a scattered district, by means of high pressure. The various towns and villages within the territory in question (which is about 8 miles long by 3 to 4 miles wide) are as yet but thinly built up, and are so scattered that it would not have paid to pipe and connect them together, or been possible to lay the large and expensive cast-iron mains that the distances would have made necessary on ordinary lines.

The operation of the Phoenixville high-pressure distributing system has further been so satisfactory that the owners also of the River Shore Gas Company, serving gas in several small towns not far from Philadelphia, in the state of New Jersey, are now completing, under my supervision, a pipe-line for the purpose of transmitting gas from their works at Riverton to the town of Moorestown, about  $4\frac{1}{2}$  miles distant. This equipment is almost identical with that at Phoenixville in the use of a 3-inch wrought-iron coated screw-joint connecting pipe, in the use of governors along the line and at the far end for controlling all pressures, and in the entire absence of the use of any storage holder or receptacle whatever at the far end.

The equipment of high-pressure lines as above, with the accompanying minor parts, either necessary or desirable, may be conveniently divided into three principal parts: 1. The compressing machinery (in duplicate), including a continuous steam

supply, water jacket, speed and pressure governing mechanism, recording pressure-gauges, thermometers, low-pressure safety-alarms, pulsation and condensing tank, and meter. 2. The pipe-line, including the matters of coating, joints, testing, drips, valves, service saddles, house pressure-regulators, high-pressure house-meters, and individual house safety appliances. 3. Main line regulators (in duplicate) and terminal station, including indicating gauges, recording pressure-gauges, thermometers, test-lights, purge and vent facilities, photometer, safety seals (main line), high and low pressure alarms, bye-passes, &c.

A description and illustration of the principal items above will perhaps convey a fair idea of the design and character of the machinery now being used by the writer and those associated with him in the United States for high-pressure illuminating gas distribution.

*The Compressors.*—Straight-line, steam-driven, water-jacketed, horizontal Rand compressors are used, of the type shown in fig. 3. A machine having a gas cylinder 8 inches in diameter by 12-inch stroke, operating at 140 revolutions a minute, has a practical working capacity of about 5000 cubic feet per hour, weighs 2100 lbs., occupies a floor-space of about 2 feet by 8 feet, and requires 18-horse power at full load. A machine of about eight times this capacity, or over 1,000,000 cubic feet per 24 hours, would have a steam cylinder probably of 16 inches diameter, a gas cylinder of 21 inches, and a stroke of 24 inches. It would weigh about 18,000 lbs., occupy a space of about 16 feet by 4 feet, and at 95 revolutions, with full load, would require a little over 100-horse power.

*Pulsation Tank.*—Immediately upon leaving the pump, the gas passes into a small tank of about 140 cubic feet capacity, used for the triple purposes of absorbing the pulsation due to the action of the pump, of cooling the gas by radiation (after the heat of compression), and of affording a convenient point for collecting and withdrawing the drip and condensation resulting from compression. The tanks used by me are of simple cylindrical form, of  $\frac{3}{8}$ -inch steel, tested to 125 lbs. pressure, and measuring 9 feet in length by 55 inches in diameter.

*Meters.*—The ordinary station-meter not being suitable for measuring gas under many pounds pressure, I am at this date installing an appliance extensively used in the natural gas fields for the measurement of the very large volumes of gas there involved. In order to avoid the great expense and difficulties of constructing meters large enough to measure all the gas passing, a most ingenious arrangement of differential balanced-valve is used, inserted in the run of the pipe, and styled a "proportional meter." In this a fixed portion (usually 1 per cent.) of the passing gas is always diverted through, and measured in, a small positive meter, connected and accompanying, irrespective of what the volume of gas may be that may at any time be passing. The index of the meter that measures the 1 per cent. also multiplies the result, and indicates the total volume of gas that is passing. The writer is informed that these meters are ordinarily and reasonably accurate and reliable.

Fig. 4 illustrates the Westinghouse form to be used in the high-pressure plant at Darby, now building. Fig. 5 illustrates the Wylie form, to be used in the Riverton works mentioned. These meters are generally similar in purpose and result.



They are practically of all metal construction, will withstand 50 lbs. pressure, and are each very compact—a space of not

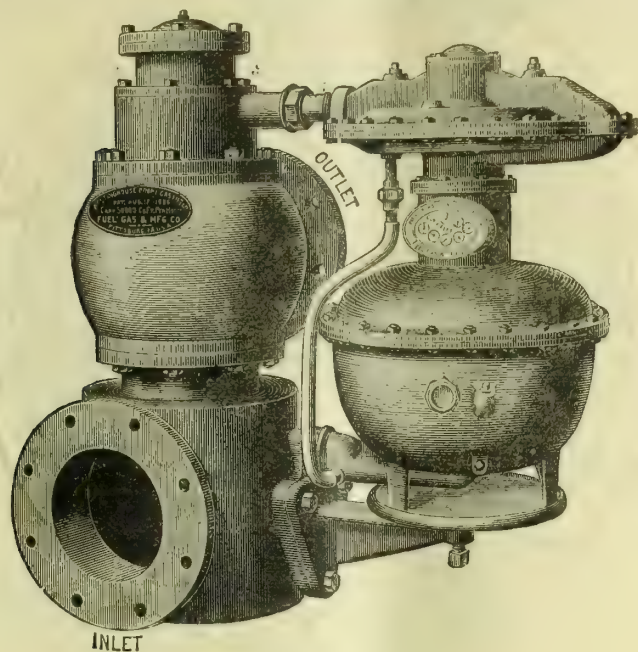


FIG. 4.

exceeding 3½ feet square by 3½ feet in height being sufficient to contain one of a capacity of 50,000 cubic feet per hour. Connections run from 3 inches to 16 inches.

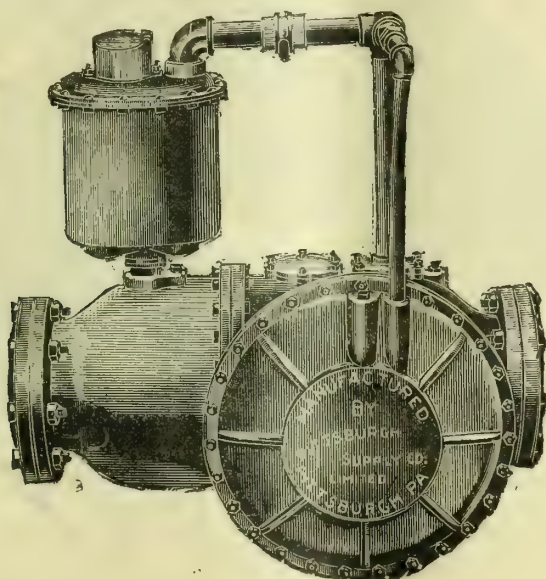


FIG. 5.

**Main-Line Regulators and Governors.**—For the purpose of reducing pressures from 50 lbs. or 100 lbs. down to a very few pounds, say 5 lbs. or so, the appliance used in the Phoenixville plant, and perhaps the most common one in the natural gas fields, is that known as the Fulton regulator—fig. 6. This is

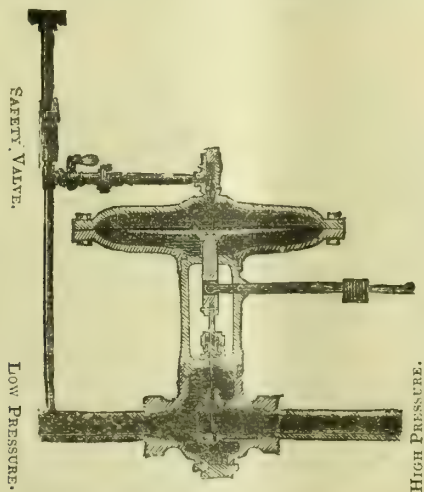


FIG. 6.

an automatic, vertically moving valve, operated by the action of a diaphragm above, which in turn is actuated by the gas pressure from the low side of the regulator. The action of the

mechanism is very perfect and complete. It is made with connections of from 1 to 16 inches; and the smaller sizes occupy a space of less than 3 feet square. For the regulation of pressures of a few pounds only, ranging from 2 to 10 or 20 lbs., a form of diaphragm governor is also commonly used, which reduces such pressures to a few inches water pressure, and holds the same very accurately to any point desired. Fig. 7 illustrates another

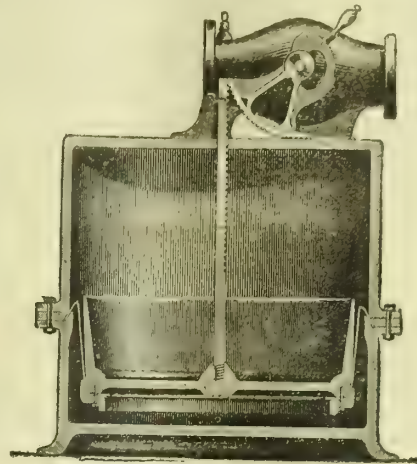


FIG. 7.

form, known as the Union, in which the valve is operated by a floating bell in the tank adjacent. Fig. 8 illustrates a very convenient arrangement of diaphragm governors in duplicate, used

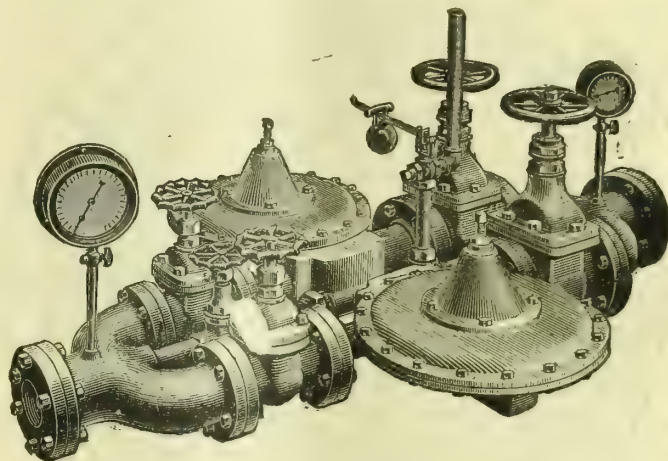


FIG. 8.

by the River Shore Gas Company, at the terminus of the 3-inch pipe-line. The entering gas at high pressure can be diverted through whichever governor it is desired to have in use, the other governor being out of use and affording every opportunity for cleaning, examination, adjustment, &c. Bye-pass safety vents, pressure-gauges, &c., are all conveniently provided in this equipment, which is known as the Johnson-Reynolds "double low-pressure station."

The sensitiveness of operation of such governors as are above described may be clearly seen in the reproduction of sheets from the recording pressure-gauge, shown in fig. 9—next page. These show the pressure maintained at Royersford on the far side of the low-pressure governor, for example, for the week ending May 23 last. The record for the 19th and 20th was made on the same disc. It will be observed that the ink-line for the 20th was super-imposed over that for the 19th; and that all the lines for the entire week could be super-imposed one over another without showing the slightest deviation from the true circle that records the fact of the maintenance of 27-10ths pressure continuously. The variation in pressure is so slight that the marking pencil does not show more than one-half of a tenth of an inch water pressure, which variation amounts to nothing. This is in spite of the fact that the pressure controlled by the regulating governors is constantly varying according to whether the compressor at Phoenixville is pumping gas into the line and increasing the pressure, or whether it has ceased and the pressure is falling by reason of consumption. The record of such constantly rising and falling pressure in the pipe-line is well shown in a sample sheet for May 23—in fig. 10, p. 775. It will be observed as ranging from 5 to 30 lbs.

**Main Line Safety Seal.**—Immediately beyond the second regulator at Royersford, a side connection or spur from the low-pressure main is taken off in the regulator-house, and led into a small pot or vessel near by containing oil. This pipe seals a few inches in the oil, precisely as the dip-pipe of a bench seals in the hydraulic main. From the crown of the vessel, an open discharge pipe leads through the roof. The oil-seal forms a safeguard against the possibility of the high pressure of the pipe-line getting into the low-pressure pipes beyond, to the



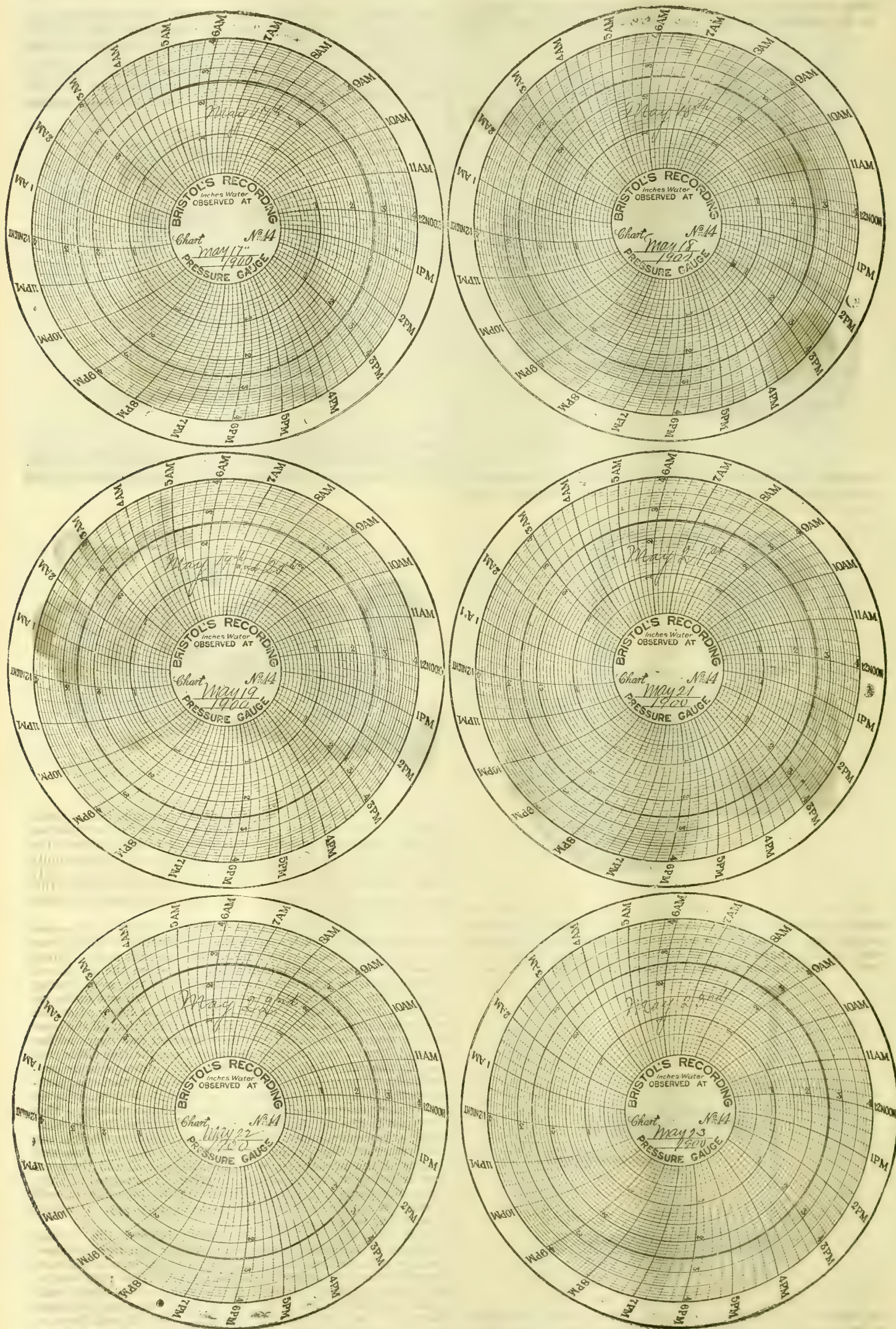


FIG. 9.



damage of the meters, &c.; as, if the regulators should at any time get out of order and fail to work, and the high pressure should get by, it would immediately break the oil-seal and discharge through the stand-pipe into the atmosphere. This

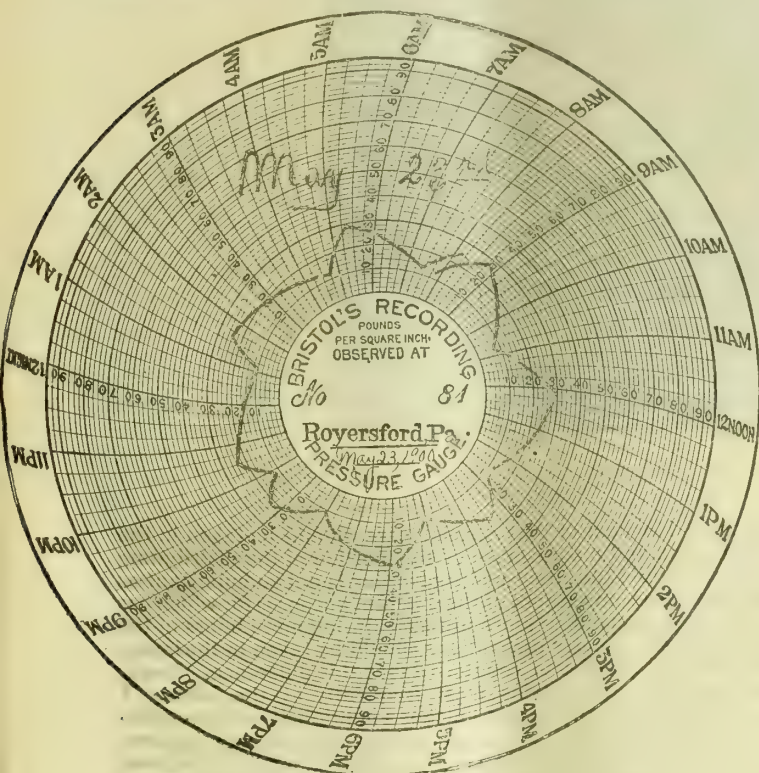


FIG. 10.

simple provision, it is felt, affords entire safety against serious accidents that could otherwise be possible. The oil used in the seals is of a character that will neither evaporate nor freeze.

**Services.**—Consumers' service connections on the high-pressure pipes are made by the use of saddles, as illustrated by fig. 11, bolted on to the pipe. The saddle is threaded for receiving the connecting fittings; and after being placed in position it requires only the boring of a hole through the wrought-iron pipe to give a full supply of gas. Special tools used entirely prevent the escape of gas in making connections.

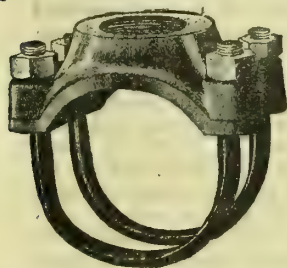


FIG. 11.

**House Regulators.**—Small sizes of the low-pressure main-line regulators are used universally for controlling the pressure in houses along the line of high-pressure mains wherever desired. These are made in a variety of forms; but they have nearly always a cast-iron case of from 5 to 15 inches in diameter, and stand any ordinary pressure. They contain the governing valve and diaphragm. Threaded to fit the standard pipe from 1/2 inch to 2 inches size, they are readily connected in the run of any service-pipe taken off a high-pressure

main, and afford a capacity according to size of from (say) 25 to 2000 cubic feet per hour. As a class, they are extremely sensitive, simple, accurate, and reliable in operation.

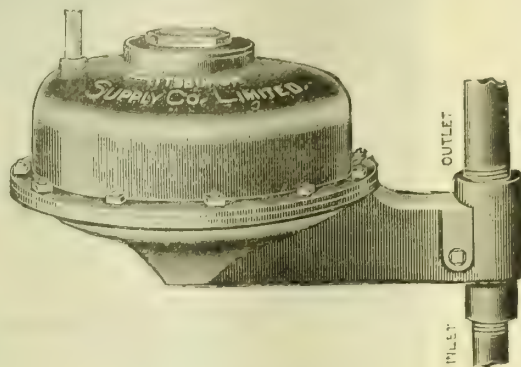


FIG. 12.



FIG. 13.

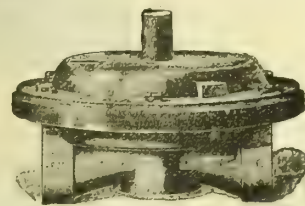


FIG. 14.

Fig. 12 illustrates the "Equitable," fig. 13 the "Johnson-Reynolds," and fig. 14 the "Westinghouse"—all representative and widely-used patterns.

**High-Pressure Meters.**—While I have so far used the ordinary tin-case meters, following the house regulators as above, and protected by safety-seals intervening to guard against the possibility of pressure getting past the regulators and into the consumers' meters, it is likely that there will later be used, to a greater or less extent, some of the forms of cast-iron meters built to withstand 20 or 30 lbs. pressure in general use in the natural gas regions. Fig. 15 illustrates the Westinghouse meter of this character.

The iron case contains a floating inverted bell, divided into chambers and sealed in oil in the lower half. This bell rotates with an undulating motion; the compartments filling and emptying in succession through a central common valve. This form of meter has no leather diaphragms, is made entirely of metal, in sizes of from 200 to 40,000 cubic feet capacity per hour, and in diameters ranging from 1 to 5 feet.

The Equitable meter, illustrated in fig. 16, is also made with a cast-iron case, but is of the dry pattern, with leather diaphragms, arranged vertically around the periphery—in turn filling and discharging on the lines of the ordinary meter. This pattern is made in sizes of 300 to 1200 cubic feet capacity per hour.

A very extensively used form, shown in fig. 17, is known as the "Tobey," in which the cast-iron case is globular, and contains three diaphragms connected with a central spindle operating the index above, and valve mechanism in the base of the meter.

**Recording Gauges, &c.**—Fig. 18 shows the arrangement of gauges at the terminal stations of the high-pressure station at Royersford. An ordinary steam-gauge indicates the high line pressure of 10 to 20 lbs.; an ordinary syphon-gauge the low pressure of 27-10ths; a similar gauge, with mercury, the intermediate pressure between the high and low pressure regulators

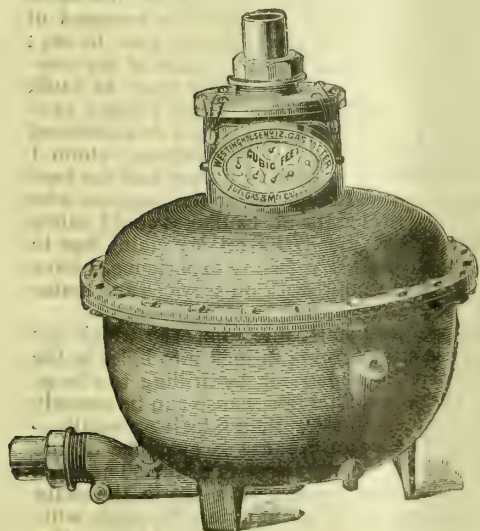


FIG. 15.

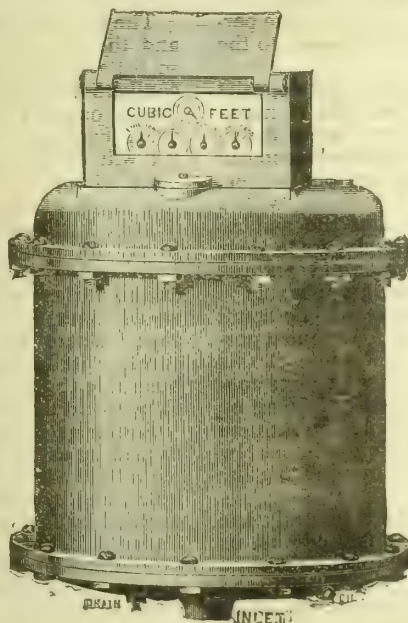


FIG. 16.

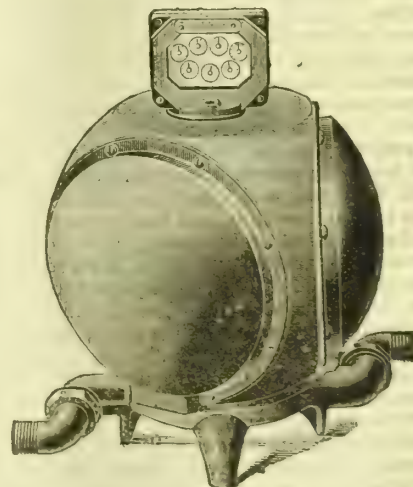


FIG. 17.



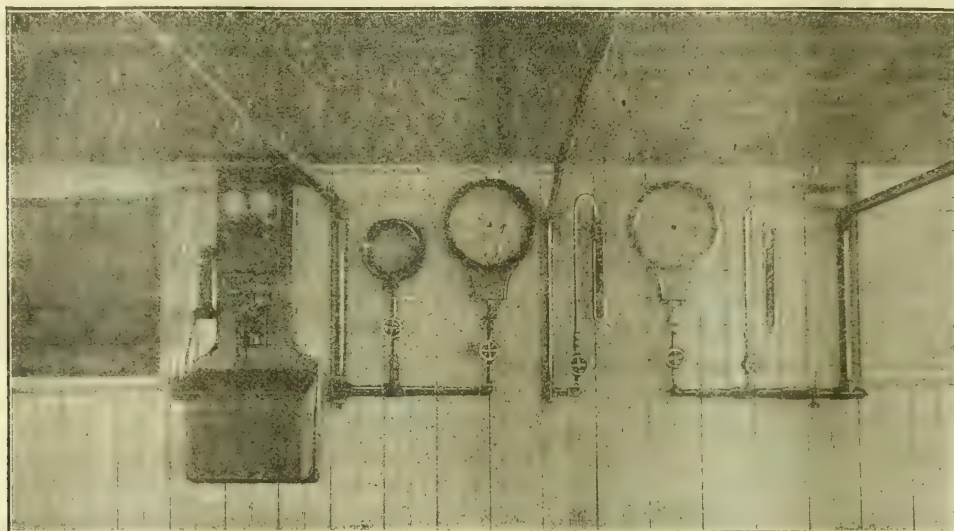


FIG. 18.

Bristol recording gauges (registering the high and low pressures and test lights, telephones, &c.) are conveniently near.

Enough has now been said to show that distribution at high pressure is not only a matter of theory, but, to some extent at least, is already an accomplished fact as well. The Phoenixville plant since Dec. 29 last has been so operating and distributing gas at many pounds pressure some miles away, through small wrought-iron pipes and without storage holders or tanks—precisely as natural gas is distributed. The two other plants named will also, before this paper will be publicly read, be so operating.

High-pressure distribution (crude and rough compared with the future, but yet effective and satisfactory) has been commenced; and if what I have suggested and described shall be the means of interesting the attention of the members of the Congress, and shall lead to the adoption and improvement of the plan by others, and the expansion of "high-pressure" working, with the economy and satisfaction that I am so certain will be found, my gratification will be great.

#### IN WHAT MANNER CAN THE NORMAL LOSS OF GAS IN DISTRIBUTION BE MOST LARGELY DIMINISHED?

By P. H. GIBBONS, of Philadelphia.

[A Paper prepared for the International Gas Congress at Paris.]

The question of loss of gas in distribution engages the earnest thought of the gas engineer as he looks around for a suitable site upon which to erect a manufacturing station; and it remains a subject of his solicitude until the last pound of coal is carbonized, and the last foot of gas passes the consumer's meter. Fortunate is he, indeed, whose station commands the lowest point in the district to be supplied. For him, the law of gravity renders valuable assistance in furnishing gas to his patrons at a minimum of pressure. Lowness of the site, however, is not the only point to be considered for the economy of distribution. It should be near the centre of consumption as well; for it is a well-known fact that gas decreases in illuminating power in proportion to the length of mains through which it travels, and in proportion to the loss in illuminating power has been the percentage of loss of those gases which impart luminosity to the flame.

There are ample evidences of this fact in the oily deposits found in the drips and meters, and in the deposits of naphthalene crystals observed everywhere along the line of distribution. I have noticed that naphthalene is most troublesome in a coal-gas works between the months of June and September; and this fact, coupled with my five years' experience with a steam-jet exhaustor, has led me to believe that the sudden appearance of naphthalene, so often told by engineers in their works, clogging holder inlets and outlets and mains and services, is entirely due to the fact that their condensing apparatus is not receiving proper attention. Steam is keeping too late hours with their gas; and I feel like saying to all such: "Spend a portion of the time that you take to worry over the pranks of this pesky naphthalene in looking after those in charge of your condensing apparatus, and I feel assured that, instead of filling up your pipes and fittings, this hydrocarbon will journey on through the consumer's meter—contributing to his contentment by increasing the power of his light, to your joy by reducing the normal loss in distribution."

Gas-holders, as they are now built, maintain constantly the maximum of pressure; and from any little chinks, cracks, or crevices in the seams and around the rivet-heads of their crowns and circumferences, gas will escape in amazing quantities in the course of a year. Here there is no clay, no gravel, no ashes to impede its progress. Once out, it is freer than the air. It is up and away beyond the reach of the olfactory organs of the

gasman. Hence it is that special care should be taken in the construction and maintenance of this portion of the distributing system. While the street-main governor is not so important as it formerly was, on account of the different purposes for which gas is now used demanding more pressure during more hours of the day and night, greater precautions should be taken in the laying of mains and services to counterbalance this difference. Leaks are found in street-mains most frequently at the joints. A multiplicity of joints, therefore, means a multiplicity of opportunities for leakage; and I consider it sheer folly for any engineer to lay parallel mains to help supply a district when the old one becomes too small to meet demands upon it. He simply multiplies by two (*plus* the extra joints where connection is made at intersections) the opportunity for leakage. He should abandon the old main entirely, and replace it by one of ample size.

Leaks at the joints in gas-mains are caused by contraction, unequal sagging or settling, and incompetent or indifferent workmen. Leaks are caused by contraction of metal, either through ignorance or carelessness of those left in charge of the operation. I have seen length after length of gas-main exposed to the rays of the hot sun for several hours quickly lowered into the trench, and as quickly yarned, cast, and caulked, and then left exposed to the sun's rays for several more hours before a shovelful of covering was thrown upon it. I am morally certain that, when the temperature of those pipes was reduced, the contraction of the metal started the lead, and leaky joints followed. As soon as a pipe is laid in the trench and set to grade and direction, it should have a light covering of earth thrown over a portion of its surface before the joint is cast. Sags in gas-mains are usually due to improper blocking, to excavations made below its bed for sewers, water-mains, conduits, &c. Leaks from this source can be greatly reduced by having a tacit understanding with the city authorities that a certain defined portion of each new street shall be reserved for gas-mains, and shall not be encroached upon by sewers, water-mains, and the various electrical conduits; and by keeping a competent inspector constantly on the ground where excavations are being made in the vicinity of gas-mains, who should be provided with ample material and assistants for shoring the pipe and re-caulking the joints where necessary.

The fact that pipes laid in the earth are quickly hid from view, and the character of workmanship expended on the laying is so little criticized, encourages many men to seek positions as caulkers and pipelayers who are totally unfitted for the work. There ought to be some standard of efficiency required of every caulker. For example, if a gas engineer were to say: "I will hire no man to caulk a joint on the mains of my company whom I would not and could not freely trust to caulk the joints of the sanitary plumbing of my own private residence; I will retain in my employ no man who is so indifferent to my interests and the interests of the company whom I represent as to make frequent trips to the gin shop and the beer saloon during working hours"—I believe that the engineer who would exact these two requirements of caulkers could safely say: "There are no leaks at the joints on my mains due to careless or incompetent workmen." In my experience, I have been able to trace much of the poor work on services and mains to over-indulgence in intoxicants during working hours.

Leaks in gas-mains are frequently due to breaks which are caused by external pressure, by forcing fittings into holes in the main that are not sufficiently tapped out, by drilling too large holes, and by uneven sagging. The first cause can be entirely avoided by laying the mains—smaller than 6-inch especially—under 3 feet of cover. The second cause is evidence of the fitter's incompetence, and the remedy suggests itself. The third cause can be entirely obliterated by placing a tee in the main where a large tap is required, or by re-enforcing the main with a split sleeve, with a hole of the desired size tapped in it. The loss of gas from the making of taps for services, repairs, and



extensions, which was considerable a few years ago, can be greatly reduced by the use of combination taps, gas-cups, tallow, cloth, rubber bags, plugs, soap, and other devices that are familiar to modern gasmen. I believe that it would be a wise precaution to place vent-boxes over all mains at intervals, for the future detection of leaks, on all streets where traction, telegraph, and telephone conduits and electric light cables make it extremely dangerous to bare the mains for leaks. The same precaution should be taken on all streets that are paved with asphalt, cement, and vitrified brick, that have a concrete base. These vents need not necessarily be large; and I am sure they would materially aid the gas engineer in keeping down his percentage of loss where those conditions exist.

Leaks are found more frequently on the smaller-sized mains, which is entirely due to their fragility and the want of the same care taken in laying and caulking them that is bestowed on mains of greater dimensions. Cast-iron mains and services under 3 inches are too small, and fail for use underground; and they should not be employed, for they will sooner or later cause trouble and expense. A large percentage of the loss of gas in distribution occurs in the service-pipes; and much of this leakage can be traced to incompetent and indifferent workmen. Here, again, the knowledge that bungling work can be quickly hidden from the eye of competent critics induces men with little or no mechanical skill to apply for positions that they would not dare to fill if the result of their labour was to be exposed to constant view. It is an important work to lay services, and competent men should be engaged to do it; for not only the profits of the gas company are influenced by the manner in which it is done, but precious lives are menaced as well. This latter fact has been forcibly impressed upon my mind during the past nineteen months. I have had ample opportunity to note the character of the service work done in this city. I have seen thousands of service-pipes uncovered for renewal. Many of them were lashed to the main with wire and twine, to keep them in place; other fittings were wrapped as you would wrap a poorly-fitting bung for a barrel, and then pressed into the hole in the main, with a smear of white lead and clay to complete the joint; and in very many cases the formality of screwing the ells, nipples, and spring bends into the main was dispensed with. They were simply driven into the main with a hammer.

Leaks in service-pipes are found most frequently at their connection to the main, at the curb-cock, and in the malleable fittings. Leaks at the juncture of service and main are usually due to the main pipe settling, to tapping a hole too large for the fitting, and to sand holes in the malleable fittings. When a hole in the main is too large to make a safe joint, it should be reamed and tapped to the next size. The danger of pulling services by sagging mains can be minimized by the use of the swing joint or service tee and ell. Too much care cannot be taken in the selection of curb-cocks. They should be well made, and of extra heavy material. Many engineers have abandoned their use entirely, except on services of the largest size. This practice, however, can hardly be considered safe in large cities, where big fires are frequent, which often spread so rapidly as to preclude the possibility of shutting the gas off from the inside of the buildings. I confidently look forward to the time when the curb-cock will be substituted by one that will do the work better, and that will be less liable to leak and less troublesome to get at. In this age, we have automatic fire extinguishers and automatic gas-meters; why not have automatic gas-service cocks?

Since a difference in the temperature of gas registered at the station meter and the same gas registered at the consumer's meter makes a difference in its volume, care should be taken in the laying of services, the connecting of street-lamps, and the placing of meters, to avoid changes of temperature that would adversely affect the interests of your company. This can to some measure be done by laying the services under a good depth of covering—in this latitude not less than 18 inches in the shallowest place; by the use of the anti-freezer or enlarged pipe at the bottom of the lamp-post; and by impressing upon every consumer the importance of having a suitable place provided for the meter. The running of service-pipes through cold vaults and area ways should be avoided as much as possible; and where it is necessary to so run them, they should be protected with a covering of some kind.

Instead of having a number of services and meters scattered around in odd corners and awkward places in buildings that have been enlarged or remodelled, put in one service of ample size, and connect all the meters to it by means of a header. If the house-risers are scattered along the front walls of the building, bring them to your meters and one service. It will be more economical for you to do this. Your meters placed side by side on an even shelf look businesslike, and become an advertisement of your mechanical skill. In this way, you lessen the opportunities for leakage by reducing the number of joints and fittings and the number of taps in your mains. You lessen the amount of condensation by decreasing the number of feet of pipe through which the gas travels before reaching the consumer's meter. You lessen the loss in distribution by the opportunity afforded to so place the meters where a difference of temperature will least adversely affect the percentage of gas accounted for. You also lessen the liability of loss of meters and gas in case of fire. The turning of one stop shuts off all the gas entering the building; and the meters being concentrated, their removal can be more quickly accomplished.

Malleable iron fittings frequently contain small sand holes, which, being filled with dust and grease, often escape the eye of the most careful observer. For this reason, I would advocate the use of galvanized malleable fittings for service work, because in the process of galvanization these small holes are completely filled with metal.

I have noticed that the life of plain iron pipe laid in coal ashes and ground that has been filled with the ordinary refuse of a city is very limited (sometimes not extending over a period of five or six years), while galvanized water-pipe laid in the same earth at the same time is still in a fair state of preservation—indicating that its life will cover a period of three or four years longer. And from these observations I am led to believe that galvanized pipe should be used exclusively for gas-service work, especially in districts where made-earth of this character is known to occur frequently.

The practice in vogue here at present is to apply several coatings of a tar preparation to the plain iron pipe, after which the service is wrapped with muslin, over which another coating of the tar preparation is spread. This process seems to be very effective. I have examined service-pipes that were two years buried in coal ashes, and found them in an excellent state of preservation. The cloth wrapping was nearly all rotted away; but the pipe had no sign of rust on any part of its surface. The regrettable feature of the process is that you cannot always apply the wrapping and the additional coating to the whole of the service-pipe. It frequently happens that where the pipe needs protection most it gets none—a contingency that does not arise where galvanized pipe is used.

People spend considerable sums of money to have fine cement and flagstone footways laid before their residences and places of business. Once down they are averse to having them broken or disturbed; and we are obliged to respect their wishes. In the event of either driving or boring the service-pipe through the ashes, brick-bats, and broken stone which usually form a base for these footways, the first coating of the tar preparation is worn off. The result is that one-half of the service may remain for twenty or even thirty years in an excellent state of preservation, while the life of the portion imbedded in the ashes without protection will not extend beyond five or six years.

I have frequently observed that service-pipes rust out and leak just inside the cellar wall, while the rest of the pipe is in good condition. Leaks at this point, which are quite frequent, could be greatly reduced by applying a coat of paint to the service at this point from time to time.

Gas-meters—like clocks, watches, and other mechanical contrivances—are very apt indeed to run slow much oftener than they do fast, when their mechanism becomes worn and old and sometimes a very considerable portion of the loss in distribution can be traced to this source, which can be minimized by systematically overhauling all meters that are in use at least once in every four years.

I believe much good can be accomplished by noting on the record of each service the kind of earth in which it is imbedded. If this were done, you would in a few years, by careful observation, be enabled to determine with some degree of exactness the life of your services along the line of distribution. I have uncovered service-pipes said to have been down forty years, and found them in a fair state of preservation; others, again, that had only been down ten years, had not a sound spot in them. Hence the importance of knowing what part the soil in the different sections of the district is playing in the ruin of your distributing system. Much good can be accomplished by encouraging people to promptly enter complaints at the gas office as soon as they detect the odour of escaping gas on their premises or in the street, and by systematic examinations of all joints, pipes, and fittings exposed by the gas companies employees at all times.

Before closing, I feel I ought to say that I am not insensible to the fact that some writers attribute much of the leakage in the joints of gas-mains to expansion and contraction due to the difference in the temperature of the earth in summer and winter seasons. In proof of this theory, they call attention to the fact that small leaks are more frequent in gas-mains than they are in water-mains, which is due (so they contend) to the difference of temperature being greater in the gas than in the water mains. I have always questioned their proof, and therefore have not taken kindly to their theory.

He is a very dull plumber or water department employee who has not discovered that a small quantity of common salt applied to a weeping joint at the bell or ferrule of a water-main will stop the weeping long before its presence can be detected from the surface. The fact is frequently made use of by plumbers and water departments. And even if small leaks of this character escape their observation, the earth surrounding the leaky joint furnishes sufficient corrosive substances to stop small leaks in water-mains. These, in my judgment, are the best reasons why small leaks are less frequent in water than in gas mains. Gas is a more subtle prisoner than water. It spreads an oily film over the small aperture through which it escapes into the earth, that defies corrosion.

In concluding, let me hope that I have expressed some thought, or made some suggestion, that will aid the gasman in reducing the normal loss of gas in distribution. This much accomplished, I shall feel amply repaid for the time spent in preparing this paper for the International Congress of the Gas Industry.



## TECHNICAL RECORD.

### EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Twenty-fourth General Meeting of the Association was held last Wednesday at Spalding, of which town the President, Mr. J. G. HAWKINS, is the Gas Engineer and Manager. Assembling at the gas-works about one o'clock, the visitors were received by Mr. G. F. Birch, J.P., the Chairman of the District Council (who are the owners of the undertaking), other members of that body, and the President.

Although not of great magnitude, in his works Mr. Hawkins had much of interest to show the members. Under his guidance, the works have been practically remodelled. Throughout they bear the imprint of a progressive gas-engineering mind; and there is something about them which reveals an almost affectionate regard on the part of the chief. On entering the works, the members came across a relic of the past in the shape of an old bench of direct-fired retorts, which in an integral state will soon be known no more—in fact, the process of dissolution has already commenced. The reason for this is not far to seek; for a few steps away the visitors were taken into a splendidly designed and well-equipped retort-house, which was built under Mr. Hawkins's direction, and was brought into use some two years since. The house contains seven beds of seven retorts each, heated on Chester's system. Two scoops full of coal (or  $3\frac{1}{4}$  cwt.) form the charge. One of the features of the house are the "home-made" devices for lightening the work of the men, and which devices are the product of Mr. Hawkins's fertile brain. In front of the upper part of the bench is fixed a rail, along which runs an arrangement, composed of wheels, pulleys, and chains, which enables the men to elevate scoops of coal, and transport them before any retort; and then, by means of a detachable roller carriage, which is expeditiously affixed to each mouthpiece as required, the retorts are charged by two men with remarkable celerity. The men exhibited to the visitors certain proof of the utility of the arrangement. Another simple device modifies the labour of drawing the retorts; and the usefulness of the appliances used in facilitating the feeding of the furnaces was also demonstrated. The cellar beneath the house is light and cool; and it is so arranged that it gets a refreshing current of air passing through, which makes the work of the men there far less fatiguing than it must be in some of the retort-houses it has been our lot to visit. On the works there are three holders, with a total storage accommodation for 250,000 cubic feet. The largest holder, which has been only recently constructed, has a capacity of 150,000 cubic feet. Mr. Hawkins has adopted the good idea of having all his holder valves in one building, in pairs; so that there is no excuse for a man closing one valve before he opens another. This gives an almost absolute insurance of safety. Four new purifiers, 18 ft. by 20 ft., have also lately been installed; and a 12-inch governor has been added to the works equipment. Formerly the works only possessed an 8-inch governor; but, with the new one, the district can be supplied in two different directions. A river runs through the town; and more pressure is required on one side than on the other. Consequently one side of the river is fed through the new governor; and the other through the old one.

After a thorough inspection of the plant had been made, the President very kindly entertained the members to luncheon in a marquee; and, the weather being fine and warm, the repast under such conditions was immensely enjoyed. Mrs. Hawkins, Mrs. and Miss Barton, and other ladies very gracefully attended to the wants of the President's visitors. Subsequently the party was grouped, and photographic records taken of the visit.

#### THE BUSINESS MEETING.

From the works, the members walked to the Council Chamber, where the business portion of the day's programme was taken in hand.

Mr. H. WIMHURST (Sleaford), the retiring President, occupied the chair at the commencement of the proceedings, which he opened by remarking that the Chairman of the District Council (Mr. Birch) was present, and would offer a word of welcome.

Mr. BIRCH said it was with very great pleasure that he welcomed the members to the town. It was the first time they had been honoured by the Association meeting in Spalding; and he believed the town was very highly flattered in having the President residing in the town. Mr. Hawkins took a deep interest in producing gas of a superfine character; and they were very proud to have such a Manager as him conducting their works. He was sure they had made, as the members had seen, great progress at the works since they had the honour of having Mr. Hawkins as their Manager; and he believed the gas engineers present would fall in with the view that they had works which, for the size of Spalding, were equalled by none. He reiterated the pleasure it gave him to welcome the Association.

Mr. WIMHURST thanked Mr. Birch for his exceedingly kind remarks.

#### MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. J. H. Troughton, of Newmarket) read the minutes of the meeting held at Cambridge on April 18 last; and they were confirmed.

#### ADDITIONS TO THE ROLL.

On the proposition of Mr. J. T. JOLLIFFE (Ipswich), seconded by Mr. JOHN BARTON (Peterborough), Mr. C. J. P. Wadman-Smith, of Brigg, and Mr. J. Croxall, of Witham, were elected members.

#### THE NEW PRESIDENT.

Mr. WIMHURST said his next duty was to vacate the chair in favour of Mr. J. G. Hawkins. No words in the way of introduction were required, as all the members knew Mr. Hawkins so well. He (Mr. Wimhurst) was sure he would conduct the affairs of the Association with satisfaction to the members, and with credit to himself.

Mr. HAWKINS was installed in the chair amid much applause; and, having thanked the members for their hearty greeting, he at once delivered his

#### INAUGURAL ADDRESS.

Gentlemen,—My first duty in addressing this meeting is to express my grateful appreciation of the high honour you have done me in electing me as your President for the present year, and for the compliment bestowed in selecting Spalding as your place of meeting. In occupying the chair to-day, I feel I can rely upon the same kindly help and support of the members present that has characterized all our meetings in the past. The annual report of the Association will, I believe, be considered as highly satisfactory. The receipts during the year are fully equal to the expenditure; while the list of members continues to increase. During the past year, several well known and very highly respected members of the Gas Institute have gone over to the great majority, whose loss we all regret.

It is not my intention to weary you with a long address, especially as there is a considerable amount of business to come before the meeting that will require your attention; neither is there any need for it, seeing how well our technical journals perform their part in publishing all matters interesting to our profession. I have therefore selected a few subjects only on which I might offer some observations.

The published parliamentary returns just issued show an enormous increase in the consumption of gas for the past year, notwithstanding the continued demand there is for electric light. It seems remarkable, but it is nevertheless a fact, that the installation of electric light in towns invariably results in a larger increase than usual in the consumption of gas in those places. This may be accounted for in several ways—chiefly because of cooking and heating by gas, motive power, incandescent lighting, and the ever-growing desire there is for more light. The electric light, therefore, though a powerful competitor, is by no means an enemy; both forms of light may go on in friendly competition with each other and prosper. One thing I might mention, however, is that at present the percentage of increase in the consumption of gas is far greater than it is with the electric light. How long this will continue time alone can tell.

The march of improvement in the method of carbonization has grown apace during recent times. Regenerator and semi-regenerator settings have now almost entirely superseded the old form of direct-fired ones. Inclined settings have, in many instances, taken the place of horizontals; and a number of other minor improvements might be mentioned, all aiming at the same end—that of cheapening the cost of production. It is only a very short time since when anything from 9000 to 9500 cubic feet of gas per ton of coal was considered an excellent result, and very few aimed at anything above that. But now, with the improvements I have named, we are accustomed to obtain 10,000 to 11,000 cubic feet per ton—indeed, we sometimes hear of even better results than these being obtained. Anyway, the retort-house is undoubtedly the place which settles the question of profit and loss.

Carburetted water gas seems to have suffered a slight check lately, owing, no doubt, partly to the increased value of coke, and partly (though, I think I may say, chiefly) to the increased price of oil. That it will soon recover from this check nothing can, I think, be more certain; and that in the near future it will be used more largely than ever—mixed, of course, with coal gas. It has several features that commend themselves to our notice, such as the short time it takes to get the process in full work, and when in full work the great rapidity with which the gas is produced; also the small amount of labour it takes to work the process, all of which are matters of the highest importance in times of sudden fog, or from some cause or other when the production is less than the consumption, and the stock getting uncomfortably low. Again, it commends itself because of the great saving of hard laborious work compared with that in the manufacture of coal gas. The actual cost of production of both gases is practically the same, so there is nothing to choose on that head.

The introduction of stoking machinery has made rapid progress the last few years. How to save labour, or to make the work more pleasing to the workman, has for some time past been receiving considerable attention. The arduous work of the stokers, and the great heat under which they labour, is far from satisfactory; and whatever appliances are introduced that will render this work easier, will be welcomed with satisfaction both by employers and employed. So much progress has been made lately in this direction, that suitable machinery is now available for works of all sizes—from the very smallest to the largest—so that there is no reason now why shovel charging



should not be a thing of the past. A simple, yet very efficient, form of stoking machinery for medium-sized works was recently introduced at the gas-works here in Spalding; and those of you who have not already seen it, are invited to do so. It has been in operation about three months; and I am glad to say that it has greatly exceeded my expectations. The work is done quicker and better, and the stokers are relieved of a lot of heavy monotonous labour, as compared with charging with the shovel. The system is very popular with the men; and as an example of what they can do with it, I may say that two men will draw and charge seven oval  $\square$  retorts, 10 feet long,  $3\frac{1}{2}$  cwt. charges, wheel out and quench the coke, and do all else belonging to the draw in 20 minutes—being an average of less than 3 minutes per retort, or about one-third of the time it takes to do it with the shovel.

In addition to stoking machinery, many other forms of labour-saving appliances have been brought out—notably the coal conveyor, for conveying the coal from railway truck or barge into the stores; also machinery for conveying the hot coke from the retorts to the coke-yard, quenching it on the way, screening it, and, when necessary, loading it into trucks or carts, all without being once touched by hand labour. The saving effected by these two improvements alone amounts to at least 5d. per 1000 cubic feet as wages now go, besides the work being done more easily and better in every way.

The continued progress shown by the prepayment-meter system is astounding. In some towns it now forms almost one-fourth of the total consumption—especially where extra facilities are afforded as regard free fitting and stoves, &c. The rule adopted in Spalding, and which I find answers very well, is: On receipt of an application for a supply of gas, an inspection of the premises is made, and if satisfactory, gas is laid on, and two lights and a kettle-stove fixed free; the whole to remain the property of the Gas Department. The quantity of gas we supply is 22 cubic feet for a penny, with one penny in every six pence returned as discount each time the box is cleared, which makes it actually 26.4 cubic feet for one penny net, or at the rate of 3s. 2d. per 1000 cubic feet; as against 2s. 6d. charged to ordinary consumers. The difference of 8d. per 1000 cubic feet is, I find, about the right amount required to cover the cost of fittings, meter-rent, and the extra trouble of collection. I may say that the reason why we allow this class of consumers discount is because, since the system was first introduced, the price of gas has been reduced; and rather than be at the trouble and expense of altering the dial of the meters, it was decided to allow a discount instead, which is found to answer exceedingly well—indeed, it is liked by the consumers, as they enjoy having something to be going on with each time the meter is emptied. Taken as a whole, I consider these consumers fairly profitable and well worth the outlay incurred. The system brings us in touch with an entirely new class of consumers, who, in many cases, are unable to bear the cost of fittings and perhaps pay a deposit in addition, and then at the quarter-day have to reckon up with that dreadful man the gas collector.

The present high price of coal is the most serious question with us just now. In some cases, prices have doubled within the past four years; the result being that in most towns the price of gas has had to be raised. In considering the extra price we are now paying, credit, I think, should be given to the colliery owner for what he undersold the coal in years gone by. This is only fair; but the extra price now charged is, of course, very much greater than this. It is a most difficult question, and one that supply and demand alone can settle; and in the meantime, we must try and meet the difficulty as best we can. These exceedingly high prices cannot last much longer, for stocks are increasing everywhere, and buyers are being flooded out with it, and are at a loss to know what to do with the coal or where to put it; showing clearly that the supply is now quite equal to, if not in excess of, the demand. Iron has also dropped 10s. per ton already; and coal is certain to follow suit. Had all of us held off a short time ago from making contracts, and bought lightly as required, prices to-day would very likely have been lower than they are. Those who have not yet contracted have, I think, the best of the deal.

It is pleasing to note that very excellent reports have resulted from the labours of the Sulphate of Ammonia Committee during the past year. So far as the experiments on growing oats at Woburn and Dalmeny have gone, everything at present points decidedly in favour of sulphate of ammonia as against nitrate of soda; the crops being heavier and of better quality with sulphate than with nitrate. This is very gratifying indeed to us; and let us hope that it will result in a much greater use of sulphate among our agriculturists in the future than there has been in the past.

The Workmen's Compensation Act has now been in operation sufficiently long to enable us to form some idea of its effect on employers of labour. That considerable alarm was felt at the time the Act was passed was only natural; but a very short experience of its working has been sufficient to prove that the results are not nearly so serious as were supposed. The risks appear to be so trifling that insurances can be effected for covering them at very little cost. The Act has proved a friend in disguise in our case at Spalding; for the amount we pay the Insurance Company is less than we paid formerly in cases of injury to workmen.

There are a few other matters I should like to have touched

upon; but I fear I have already trespassed upon your time, and therefore I will conclude by again thanking you most cordially for giving me the opportunity of addressing you here to-day.

At its close, the address was well applauded.

Mr. R. BROWN (Cambridge) then read the following paper on

#### THE WORKING OF INCLINED RETORTS AT CAMBRIDGE.

When asked by your Committee to contribute a paper on this subject, I felt somewhat diffident on the matter, as inclined retorts have been dealt with so fully in other Societies, that it is impossible for anyone but a genius to put forth anything that is quite original. But seeing that this important subject has not been before our Association, I consented to contribute a paper to form part of your "Transactions."

In 1897, it was imperative that some extra retort power should be immediately provided; and the question which exercised my mind was, "Should I advise a new retort-house on the present lines, or improve the plant in the existing houses?" The two retort-houses were originally constructed to make 1,200,000 cubic feet per day; and I found that, by substituting inclined retorts for horizontals, we should be able to make 1,900,000 cubic feet per day on the same ground space, and with a great reduction in the cost of labour—a no inconsiderable advantage in these days.

The horizontal retort-house to be converted to inclines was 27 feet high to the eaves. It was therefore necessary to raise the walls to the required height of 50 feet, as shown on the drawing. Fortunately, the buildings are of a substantial nature, and readily lend themselves to any extra weight which it is necessary to put upon them. On the completion of the alterations to the building, five horizontal settings were pulled down, and five benches of inclines were constructed on the same site, consisting of six oval  $\square$  retorts in a setting, set at an angle of  $32^\circ$ . This has been found the most suitable angle for the repose of the coals, and is now generally adopted. The retorts have a uniform taper throughout; their cross section being 4 inches wider at the bottom than at the top.

The section of the retorts is 20 in. by 15 in. at the top, and 24 in. by 15 in. at the bottom; and the length is 20 feet. There has been a great diversity of opinion as to the proper length of the retorts; but there is no doubt that 20 feet is the right measurement. It is quite evident that anything less must diminish the amount of coal carbonized; and, further than this, the labour in charging is the same, whether the length is 15 or 20 feet.

The coal (which should be as dry as possible) is brought into the works in carts, and tipped into the coal-breaker, which has two sets of teeth. But one set is ample for all requirements, as it is a disadvantage to break the coal too fine. When using "nuts," no breaking is allowed; they being permitted to fall through a screen into the elevator boot. While on the subject of coal, I am of opinion, from experience, that nuts are the most suitable for inclines, which is another argument in favour of this system of carbonizing; nuts costing us from 3d. to 1s. per ton less than ordinary coal.

The coal is taken to the top of the house by an elevator of the chain type, and distributed in a continuous coal-hopper by a push-plate conveyor; the speed of the elevator and conveyor being about 90 feet per minute. About 45 tons of coal are dealt with each day; and the whole plant is worked by an 8-horse power steam-engine.

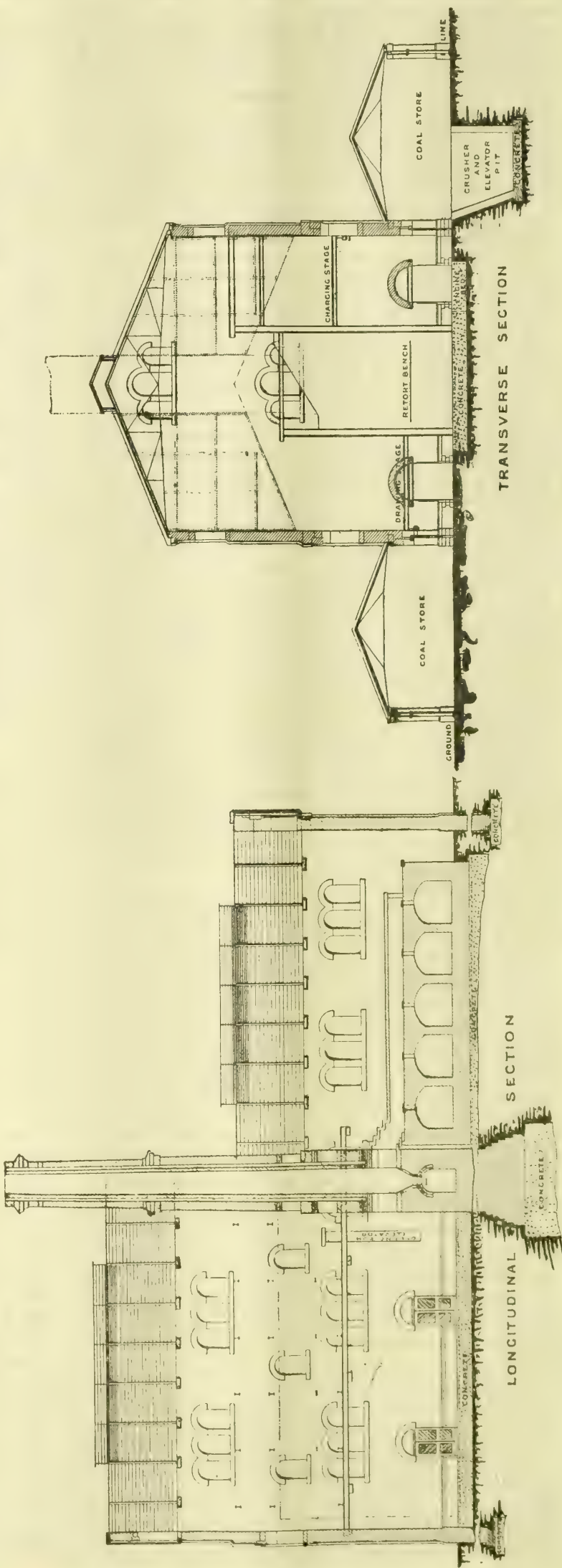
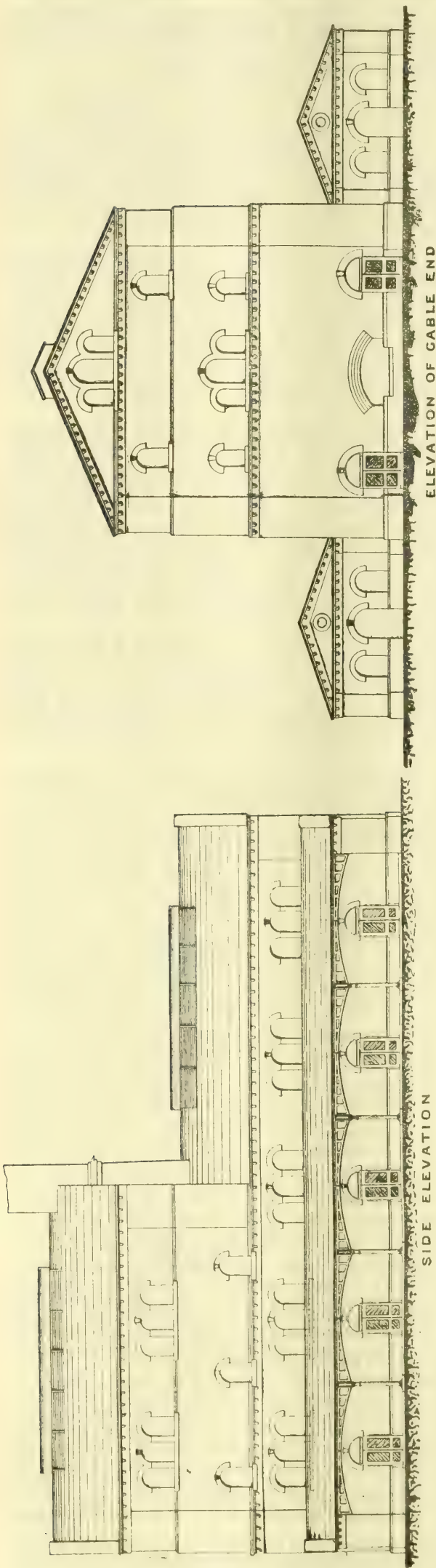
Underneath the coal-hoppers are fixed the measuring chambers; and here the charge can be altered to any amount from  $7\frac{1}{2}$  cwt., by means of a swing flap. Ours are set to give  $7\frac{1}{4}$  cwt. of coal per six-hour charge. When the stoker pulls the lever in connection with the measuring chambers, the slide at the top closes, and the bottom one opens, allowing the coal to fall down into the charging shoot. This shoot has baffle-plates to prevent the coal from running down too fast. The stoker is also provided with a plate which he carries along the charging-stage, and places in the mouth of the retort. This provides a smooth surface for the coal to fall upon, and gives it a greater impetus. When the charge has run out, the stoker replaces the lever to its original position, which closes the bottom slide and opens the top one; the coal filling the measuring chamber from the hopper above, when the same process is repeated at the next charge.

I am unable to give any information about what is known as the "creeping" of the charges, never having been troubled with the coals being too thick at the bottom end. The difficulty we had in the first instance was to get the coals to the bottom of the retorts. But we have now mastered this; and the charges lie perfectly even from top to bottom.

It is said that on opening the doors on the drawing-stage, and removing the stopper, the coke will fall out of its own accord. It does so when the retorts are new, and the bottom surface perfectly smooth. But after they are worn, and get an uneven surface, the coke will require a certain amount of tickling; and the man on the charging-stage has to give it several pushes with a T-headed rake. It is a great mistake to claim for this system that it is perfectly automatic, both for charging and self-discharging; but the labour is infinitesimal compared with drawing horizontals.

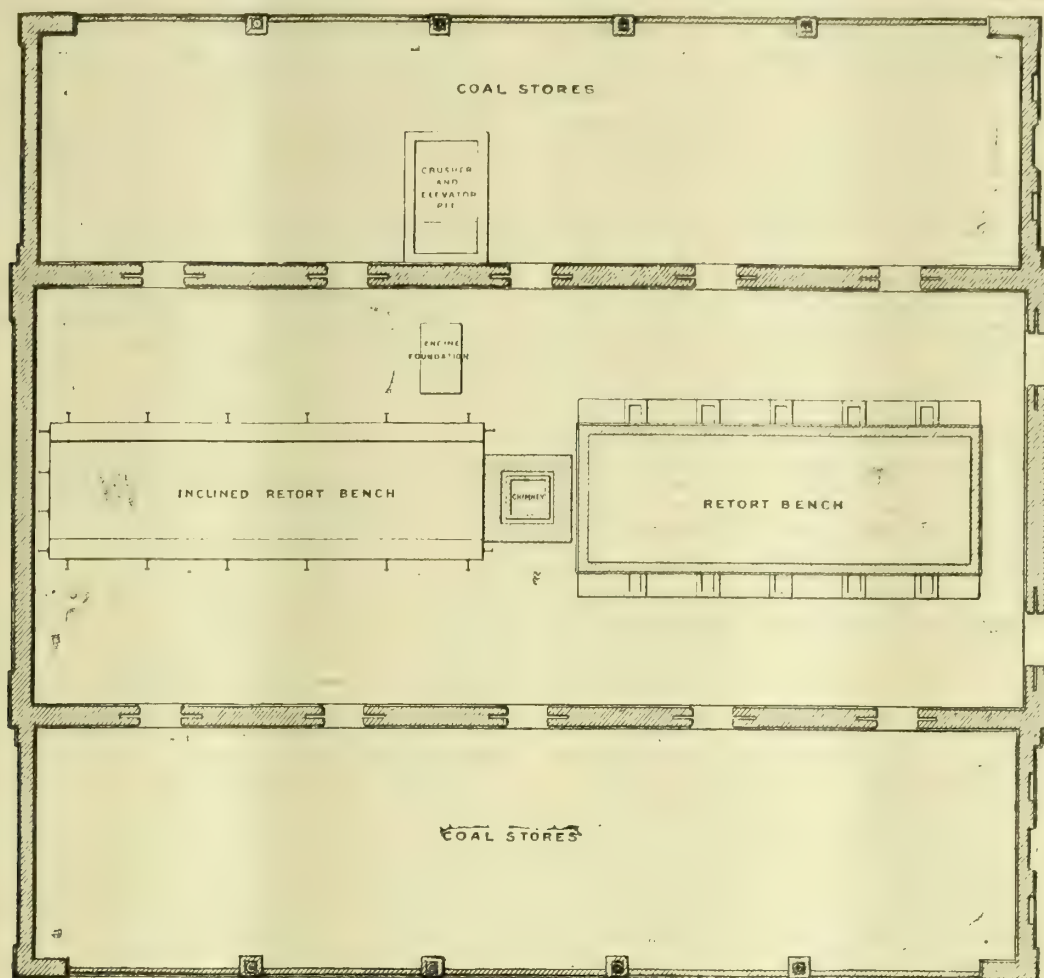
The gas is all taken off at the bottom end, as it would be very inconvenient to have ascension-pipes and hydraulic mains on the charging side, owing to the charging apparatus. There





THE RETORT-HOUSE AT THE CAMBRIDGE GAS-WORKS, AS ALTERED FOR THE INCLINED RETORT SYSTEM.





PLAN OF THE RETORT-HOUSE AT THE CAMBRIDGE GAS-WORKS.

would also be a difficulty with stopped pipes, through the great heat rushing to the top. Taking the gas off at one end only has opened up a question as to the effect on the illuminating power of the gas having to travel over the hot coke. I have found there is no depreciation in illuminating value. The official tests for a month, when I was working inclines alone, averaged 16.44 candles, tested a mile from the works; and no enrichment of any sort was used. If we consider the passage of the gas in horizontals, this can be readily understood. Here it is supposed to traverse two ascension-pipes; but only one is working at a time, owing to the pressure first on one side and then on the other. Therefore the gas has to pass over the hot coke as much in horizontals as it does in inclines.

The retorts are worked with a light seal. Consequently the amount of carbon is small; and when scurfing is necessary, it is easily accomplished by leaving the top and bottom lids open. The current of air rushing up soon frees the carbon.

The great secret of success in working inclines is to have a properly constructed furnace. Ours are of the regenerative type, one producer to each set. They are easily manipulated; and the heat is regularly distributed throughout the settings. Some of the earlier failures were not due to the inclined retorts, but to the want of proper knowledge in the heating arrangements. The top end would get too hot, while at the bottom the coals were not properly carbonized.

The charging doors for the producers are on a level with the drawing-stage; the clinkering doors being on the ground level. The coke is discharged from the top retorts direct into the producers, by the aid of a portable shoot.

I do not admit that there is any falling off in the make of gas per ton of coal in working inclined retorts; but even if there was, the saving in the cost of labour would more than compensate for it. Owing to the mechanical means described, the men are enabled to do double the work with the same physical exertion.

The following is a statement showing the difference in the working of inclines and horizontals:—

*Comparative Statement showing Cost of Working Five Sets of Inclines and Five Sets of Horizontals, Twenty-four Hours' Working.*

INCLINED RETORTS.				HORIZONTAL RETORTS.					
8 stokers, at 5s.	each	2	0	0	12 stokers at 5s.	each	3	0	0
2 pipe jumpers, at 4s.	"	0	8	0	2 pipe jumpers at 4s.	"	0	8	0
2 foremen, at 6s.	"	0	12	0	2 foremen at 6s.	"	0	12	0
2 exhaustor men, at 5s.	"	0	10	0	2 exhaustor men at 5s.	"	0	10	0
<u>£3 10 0</u>				<u>£4 10 0</u>					
Coal carbonized per day, 45 tons.				Coal carbonized per day, 32 tons.					
£3 10s. od. ÷ 45 tons = 1s. 6.66d. per ton of coal carbonized.				£4 10s. od. ÷ 32 tons = 2s. 9.75d. per ton of coal carbonized.					

Taking the working results for the last half year, the total amount of gas made was 146,521,000 cubic feet, which cost to produce, in carbonizing wages, 2.48d. per 1000 cubic feet. Before the use of inclines, the average cost was 3.21d. per 1000 cubic feet; so if all the gas had had to be produced under the old conditions, the cost would have been £1959, instead of £1519, which was the actual figure paid—showing a saving in six months of £440. Surely these figures must convince anyone who has doubts as to the complete efficiency of the inclined system, that it is the right one, based as it is on gravity—one of the laws of Nature—and by the improvements made in the charging apparatus, whereby the coal can be checked in its fall from the measuring chambers, the chief difficulty has been surmounted.

After the stokers have overcome their usual prejudices to any improvement in the carbonizing plant apart from the shovel or the scoop, they are only too glad to be placed on the inclined work, where all heavy lifting of the coals into the retorts and drawing the coke by means of rakes is done away with. But it is not only the workmen who have been prejudiced in this direction; no radical change in a gas-works has received so much attention, and the true facts been so distorted, as in the case of inclined retorts.

Every little difficulty has been magnified from a mole-hill to a mountain; while any difficulties with horizontals are just passed over as quite ordinary occurrences, and nothing whatever is heard about them. That anyone working inclines will have small difficulties is certain; but all can be easily overcome by giving strict attention to minor details. Then the advantages I have placed before you can be easily obtained; and in these days of high prices of all materials in connection with our business, it is a duty that devolves upon us to decrease the cost of production to the lowest figure.

In conclusion, I cannot impress upon you too strongly that for medium-sized works—especially works which are not large enough to get full work out of expensive stoking machinery—a considerable saving can be made by introducing inclines, the most convenient and economical system of carbonizing of the present day.

#### Discussion.

The President said they were deeply indebted to Mr. Brown for his interesting paper. It was one they would have to read over in quiet moments, in order to digest the figures. He (the President) had seen several installations of inclined retorts, including the one at Cambridge; and he was very favourably impressed with the easy way the retorts were being worked there. He had no idea, however, until he saw Mr. Brown's installation, that they could be worked so simply. He had no doubt inclined retorts would be the carbonizing system of the future; but in small works the question of cost came in.



Mr. R. G. SHADBOLT (Grantham) thought that, as an Association, they were to be congratulated upon having the question of inclined retorts brought before them in such a clear and distinct manner. Mr. Brown had not elaborated too much. He had not wandered all over the subject; but he had given them very briefly and concisely the results of his own experience. On the other hand, Mr. Brown was also to be congratulated upon not having been troubled with what they had heard so much about in connection with the working of inclined retorts—that was, the creeping of the coal. In his (Mr. Shadbolt's) opinion, it must be a question more of coal than anything else; for they heard in some districts where these retorts had been tried that it was the greatest difficulty they had to contend with. Then they heard of them mixing one class of coal with another, and of various other remedies being tried—all with some amount of failure attaching to them. Mr. Brown, however, seemed happy in his choice of coal. Perhaps the size to which he broke it had something to do with it. At any rate, his experience was happier than that of many people who had tried the system. They often heard it stated that inclined retorts were applicable not only to large, but to medium and small sized works—more applicable than stoking machinery. He supposed by this was meant an expensive installation of power machinery. But the statement as to the applicability of the inclined-retort system would not apply to many of the works in the Eastern Counties. They might be called "medium-sized" works, and still come below the limit claimed for inclined retorts. There were not many of them, according to Mr. Brown's own showing, that could work inclined retorts. Consequently, they had to fall back upon the shovel, or some such improvements as they had seen that day at the Spalding Gas-Works. They had to apply information of the kind given in the paper to their own particular circumstances. Though inclined retorts might pay in works of the size of Mr. Brown's, he took it that in works much below that size they would not get much benefit. Mr. Brown had five arches of six retorts. This would be equal to, roughly speaking, a works of 160 million cubic feet per annum, supposing that was the entire carbonizing plant. Of course, in Mr. Brown's case, he had been using the inclined retorts altogether up to a certain stage, and had then fallen back upon the horizontal retorts to get up to his maximum make. If he had been working the five beds of inclines alone—that would be about equal to a works of 160 million cubic feet production—the figures would have been rendered more authentic. As it was, the two modes of carbonizing had been going on side by side.

Mr. BROWN: Quite so; but the figures given are for the inclined retorts working alone.

Mr. SHADBOLT: That is, for the entire bench?

Mr. BROWN: Yes.

Mr. SHADBOLT (continuing) said this brought him to the question of capital charges. Mr. Brown had given them a statement in his paper (and he took it the statement was absolutely correct) which showed a saving that was very striking—1s. 6d.\* per ton of coal carbonized; and no gas manager who was looking out for methods whereby he could economize in the production of gas could afford to overlook a saving like that. But, in securing such a saving as this, one must expect to find some disadvantages; and one of them, it appeared to him (Mr. Shadbolt) came in the increased capital charges. Mr. Brown had omitted all reference with respect to capital charges; but perhaps he had done this with the intention of drawing the members into a trap. (Laughter.) At any rate, in connection with inclined retort installations where he (Mr. Shadbolt) had been able to get the cost, he had come to the conclusion that, generally speaking, the cost of inclined retorts was about double that of horizontal retorts, with regenerative settings and shovel charging. Taking this imaginary works, producing 160 million cubic feet of gas (which Mr. Brown's five beds of retorts would be equal to), it would be found that something like from 2½d. to 3d. per ton of coal for capital charges would have to be taken off the saving—that was to say, they had a matter of £3000 to £3500 more capital expenditure upon the bench than they would have with ordinary hand-charged horizontal retorts and regenerative settings. Dividing the interest of (say) 5 per cent. upon this £3000 or £3500 by the coal carbonized, it would be found that it ran out to something like 2½d. or 3d. per ton. This, then, was a disadvantage that must be taken off the savings. Again, in dealing with the items of cost, Mr. Brown showed the cost for stokers, foremen, pipe jumpers, and exhaustor men. But he had also mentioned that he carted the coal into the works; and the coal had somehow or other to be broken and elevated into position for charging. The author told them that he was following a natural law in throwing the coal into the inclined retorts in this way. There was, of course, such a thing as the conservation of energy; but they must have a certain amount of energy for breaking and lifting the coal to the hoppers. This cost money; and besides there was generally a man set apart to see that the hoppers were kept full, and so on. This then was another disadvantage to be taken off the savings; and there might be other things. He had often wondered, too, how they managed the patching business with these 20 feet inclined retorts, set at an angle of 32°. They could not patch very well from the top; and if there was a hole

near the top, it could not be reached very well from the bottom. This was a disadvantage. He had never yet heard what was the cost of ordinary repairs and renewals, compared with the horizontal system. He should imagine it would be greater. With inclined retorts, they were not only following the law of gravity, but that same law was everlastingly tugging at the retorts and settings to bring them to the ground; and this meant stress. These were a few of the items that should be deducted from the savings shown, though in bringing his paper before the Association Mr. Brown had espoused a very good cause. Inclined retorts seemed to be worked much better now than formerly. The difficulties appeared to have been overcome; and they had an example in the working of the inclined system at Cambridge which ought to satisfy the most fastidious. If anyone had been considering the advisability of adopting them, and if anything was keeping him back as to the reliability of actual working, then he had, in Mr. Brown's paper, all the information he required.

Mr. J. T. JOLLIFFE (Ipswich) regretted that he had had no experience with inclined retorts, although he must confess he had a great love for them. He wished his position had been similar to Mr. Brown's. If he (Mr. Jolliffe) could have adapted his retort-house to the inclined system as readily as Mr. Brown had been able to do, he should long ere this have gone in for inclined retorts. On the face of it, it appeared to him to be undoubtedly a step in the right direction. It was only a question of hoisting coal to the proper height; and the rest of the work was done by gravitation. The costs must necessarily follow in proportion, as Mr. Brown had so lucidly shown them in his paper. The question of capital charges was one that had to be considered very closely; but, with such a saving in so short a space of time, Mr. Brown clearly proved, to his mind, that capital interest and increased capital charges could be well and fairly made. The question of the creeping of the coal was the one that had given more trouble than any other; and, in this respect, Mr. Brown had been very favourably situated. He (Mr. Jolliffe) saw that he had to deal, or could deal, almost exclusively with nut coal; and with such a coal as this, one would not expect there would be any creeping at all in the retorts. Mr. Brown also said that he got this coal cheaper; but if they all wanted nut coal, they would, instead of having it 3d. per ton cheaper, have it 1s. or so per ton dearer. He was glad to see that Mr. Brown tackled the little difficulties as they would all tackle them—they only arose to be overcome. He should like Mr. Brown to tell them the total cost of the alterations. He not only meant the cost of the inclined retorts themselves, but the total cost—such as the extra foundations, heightening of building, and everything incidental to the general installation. If the author would supply this information, it would be valuable to many of them.

Mr. W. D. CHILD (Romford) was pleased Mr. Brown had given the members an opportunity of becoming better acquainted with some of the costs of working with inclined retorts. He had had no experience with them; and he was therefore the more obliged to Mr. Brown or any other gentleman who placed before them the result of his own personal experience. It was for this reason that he should like to ask Mr. Brown if he would give them a little further explanation of the figures he had quoted in his paper. They showed on the cost of the stokers and other labourers, a total saving of 1s. 3d. per ton of coal carbonized. But the author afterwards gave them the total saving in the carbonizing wages for the year; and they hardly agreed with the figures previously given. Instead of coming out at 1s. 3d. per ton, he (Mr. Child) took it they would not amount to more than 8d. per ton. Perhaps, however, the difference would be covered by some of the other outlay that had been suggested by Mr. Shadbolt—such as the elevating of coal, and other things. What he meant was this, the author stated that before the use of inclines, the average cost was 3'21d. per 1000 cubic feet, and afterwards, with inclines, it was 2'48d. This gave them a difference of 0'73d.; and if they allowed Mr. Brown a make of 11,000 cubic feet of gas per ton, the difference was only 8d. per ton.

Mr. J. CARTER (Lincoln), invited by the President, said it seemed to him the ground had been pretty well covered. Their difficulty from the point of view of critics was that the paper was the result of experience. It was full of information; and therefore it did not seem to him, seeing it was a statement of results that had been actually obtained, there was very much any of them could criticize. Rather as a seeker for information, he should be glad if Mr. Brown could assure them that the saving, or apparent saving, of 3d. to 1s. a ton by buying nuts was an eventual saving—in other words, whether he could get the same results from nuts as from the best screened coal.

Mr. J. BARTON (Peterborough) asked whether the cost per 1000 cubic feet was per 1000 cubic feet made or sold.

Mr. BROWN: Made.

Mr. BARTON said he must say the cost was a very reasonable one.

Mr. BROWN, replying to the discussion, said Mr. Shadbolt had raised a question as to the size of works for which inclined retorts would be suitable. He (Mr. Brown) thought he should not go in for inclined retorts, with the necessary elevating and conveying plant, in works of less than 100 million cubic feet. Mr. Shadbolt took him to task somewhat about the question of capital; but, of course, he (Mr. Brown) had to leave him something to say, and so he gave him a little opportunity on this point. (Laughter.) But he might state that the raising of the

\* Mr. Shadbolt asks us to say that quoting the saving on the inclined retorts as 1s. 6d. per ton, instead of 1s. 3d., was an oversight; but, as will be seen, it does not affect his subsequent argument.—ED. J.G.L.



retort-house had now been completed throughout; and the whole of the alterations to the house complete had cost £1260. The beds worked out at nearly £1100 each; but then they must take into consideration that there were heavy royalty charges which were now done away with. Mr. Shadbolt made one little slip in saying the saving was 1s. 6d. per ton. The only saving he (Mr. Brown) claimed was 1s. 3d. The 1s. 6d. was the cost of carbonizing; but the saving in favour of inclined retorts was 1s. 3d. per ton. Then Mr. Shadbolt went on to say that the cost of getting the coal to the elevator and above into the coal-hoppers had not been taken into consideration in giving the cost. He (Mr. Brown) did not think it was hardly necessary, because with horizontals the coal was shot down, and had to be wheeled into the retort-house. Therefore, if he gave the cost of putting the coal into the elevator, and the cost of wheeling the coal for the horizontals, he thought he could claim a little more than he had already done. Then Mr. Shadbolt spoke about the patching of retorts. There was nothing more difficult in patching inclines than horizontals. It was perhaps a little awkward until the men got used to it; but by the aid of a moveable platform on the charging-stage the retorts were quite as easily patched as horizontals. With regard to the wear and tear of the retorts, there was no wear and tear owing to the coal going down. If they took into consideration that with horizontal retorts they had not only the coal going in and out, but scoops and rakes passing in and out, whereas—

Mr. SHADBOLT: I was speaking of repairs and renewals as compared with horizontals. Not the internal wear.

Mr. BROWN (proceeding) said that the retorts were put to work in December, 1898; and, excepting for a brief period (for about a month they were let down for the purpose of re-lining the furnaces), they had been at work ever since, and likely to be for some little time. Mr. Jolliffe had asked about the total cost of the alterations. The total cost for the five beds alone was £6145. This included everything—house, elevator, plant, furnaces, retorts, and everything. He did not want to claim anything for this system that really it did not possess. He wished the members to understand this—that, when he first went to Cambridge, it was necessary to make some alterations; and it came to this, Should there be a large capital expenditure on a new retort-house, or should they do something to improve the working? It occurred to him that the best way would be to go in for inclines, and so decrease the cost of labour and so on without raising a lot of capital, because the original cost of the five beds of horizontals would then be charged against revenue account. In this way, they had decreased the capital expenditure, and increased the make on the ground formerly occupied. He could not give the total cost of the ten beds, simply because they had not gone in for the additional five beds at present; and he was not able to say what the next contract would be. Mr. Child spoke about the saving only working out to 8d. per ton. Very likely not; but Mr. Child must understand that the two systems were in operation the whole of the six months. Twelve or thirteen beds of horizontals had to be worked with the five beds of inclines to furnish sufficient gas. The figures given represented the total working of the two systems together for six months. As to Mr. Carter's question, he might say that from screened nuts he obtained quite as good results as from ordinary coal.

#### THE SPRING MEETING.

Mr. WIMHURST proposed that the next meeting be held in the city of Norwich. He explained that, during the past few years, the spring meetings had been held at Cambridge. But seeing that Mr. Brown would be their next President, and would like to read his Inaugural Address in his own town, it was thought advisable that the Association should depart from their usual course, and journey next spring to the eastern side of their division, so that the autumn meeting could be held at Cambridge.

Mr. JOLLIFFE seconded the motion, which was unanimously agreed to.

#### VOTES OF THANKS.

Mr. JOLLIFFE said he had been asked to propose a vote of thanks to the President for his address. He did so with very great pleasure. The Chairman of the District Council had been good enough to say how fortunate the people of Spalding were in having such an eminent gentleman as Mr. Hawkins to manage their gas undertaking; and he (Mr. Jolliffe) thought the Association were equally fortunate in having him for their President. The address, although not long, conveyed a great many points of interest. He was unfortunate in not having arrived in time to look over the works to see what Mr. Hawkins had done; but judging from what the Chairman of the District Council had said, Mr. Hawkins must have accomplished valuable work indeed. He should particularly have liked to have seen his method of charging retorts. He was in time, however, to partake of Mr. Hawkins's hospitality; and he believed the whole of the members felt they were greatly indebted to him for his thoughtfulness. He therefore proposed a vote of thanks to him both for his address and for the way he had entertained the members.

Mr. SHADBOLT, in seconding the motion, said there was something very happy in the arrangement that they should visit their President in his own town at the time he delivered his Inaugural Address, because then they had an opportunity of not only hearing what he had to say for himself, but of seeing what he

had done for himself and for those for whom he laboured. If they considered the works in conjunction with the address, they got a better idea of the man, of his work, and of his town. Mr. Hawkins was a man whom they were proud to have as President. In the vote he thought they ought to include Mrs. Hawkins, Mrs. Barton, and the other ladies who had assisted in so hospitably entertaining them.

The motion was very cordially agreed to.

The PRESIDENT, in responding, said he was extremely obliged to the members for their vote. If he had done anything to contribute to their happiness at this meeting, he was amply repaid.

Mr. CHILD moved a vote of thanks to Mr. Brown for his paper. The paper and the plans would be very useful to any of them who were considering this subject in the future. Proposing this vote, enabled him to explain that he asked the question he did, with reference to the difference in the figures, as he felt sure Mr. Brown would be able to give a satisfactory explanation. It was only right he should have an opportunity of doing so before the paper reached others who might have fallen into the same error as he (Mr. Child) appeared to have done.

Mr. BARTON seconded the motion, which was heartily passed.

Mr. BROWN said it had been a pleasure to him to put before the members a few points of interest from his own experience with the inclined-retort system. If any member was going in for this system at any time, and required information, he should be only too glad to render him what assistance he could.

On the proposition of Mr. CARTER, seconded by Mr. WIMHURST, a hearty vote of thanks was accorded to the Chairman and the District Council for the kindness and courtesy they had shown to the Association.

Mr. G. HALL, responding for the District Council, remarked that they were honoured by the visit of the Association.

#### THE SCOTT-SNELL-PHILLIPS SELF-INTENSIFYING LAMP.

By the invitation of the Committee, Mr. C. W. Phillips (of the Scott-Snell-Phillips Syndicate) had on view a specimen of the self-intensifying lamp of which we gave an extended notice on the 14th ult. The lamp was the same one that was on view at the offices of the Paris Gas Company at the time of the International Gas Congress, and since at Bradford during the meeting of the British Association; but these considerable journeys had evidently had no detrimental effect upon it.

The PRESIDENT called attention to the lamp, remarking that it was a highly powerful light. He suggested that Mr. Phillips should give the members an explanation as to its construction and mode of compressing the gas.

Mr. PHILLIPS complied, supplying a detailed description by the aid of three diagrams. He also pointed out that the lamp was self-intensifying, and contained no mechanism other than the one moving part in the head of the lamp. What was claimed for the lamp was that by it they could raise the ordinary gas pressure up to from 4 to 24 inches at will. Of course, they burnt rather more gas than would be consumed with an ordinary mantle giving about 60 candles; but still there was a vast economy when it was considered that they realized (say) an illuminating power of 300 to 350 candles from a single mantle. The principle of the lamp he explained as follows: (1) Pressure (4 inches to 20 inches of water) was obtained by the expansion of the gas in the lamp body due to heat. (2) The heat was obtained from the waste products of combustion. (3) Suction was caused by cooling the remnant of gas in the body after process No. 1. (4) Cold was obtained by a water jacket. (5) Pressure and suction heat and cold alternately followed as the displacer was raised or lowered. (The displacer, he incidentally remarked, was not a piston, and had not a pumping action.) (6) Motion necessary to reciprocate the displacer was obtained from the alternate pressure and vacuum in the body. These acted upon a diaphragm to which the displacer was made fast. In fact, the whole working was automatic, and more like the lungs of a human being than anything else one could imagine. The gas container arranged above the reflector had a capacity of (say) 80 cubic inches. It contained a displacer of (say) 30 cubic inches capacity. This left a space of 50 cubic inches always available for gas. This space remained constant whatever the position of the displacer might be. But if the displacer was raised to the upper part of the container, the gas was caused to assemble at the lower part. *Per contra*, if the displacer was lowered, the gas assembled at the upper part of the container. The lower part of the container was heated by the products of combustion; and the upper part was cooled by a water-head. It therefore followed that (1) if gas was assembled at the bottom or hot part of the container, it became heated and tended to expand, and (2) if gas was assembled at the top or cool part it became cooled and contracted. The vertical oscillation of the displacer therefore caused alternate pressure and vacuum (partial) to obtain. But when pressure obtained, some of the gas blew out through the outlet check-valve into the reservoir and fed the burner. When vacuum obtained, a similar quantity of gas was sucked in through the inlet check-valve. Such an action, continuously maintained, produced the equivalent to a pump; and thus the reservoir was kept charged with gas at any desirable pressure within reason. A definite pressure was obtained by simply operating the gas-tap so that the amount of gas drawn was limited. A governor would, of course, automatically control this in all regular installations. The



vertical reciprocation of the displacer was effected by attaching it to a diaphragm, which was responsive to the variation of pressure within the container. A spring was added to support the weight of the displacer. The range of action of the spring was limited so that, when the displacer was lifted by pressure on the diaphragm, the support of the spring gradually ceased, and the initial impulse or "kick" which set the displacer in motion being exhausted—that was to say, the momentum being lost—the displacer tended by gravity to fall back again upon the spring. The slightest movement in this backward direction must be followed by a complete fall, because a part of the expanded gas (that was, heated gas) was assembled at the cold upper part about the displacer and condensed; thus causing a further fall in pressure, and, by finally producing vacuum, causing the atmospheric pressure to be felt upon the diaphragm, and to drive it down. This very much depressed the supporting spring as long as vacuum obtained; but when fresh gas was sucked in, the atmospheric pressure on the diaphragm was counterbalanced, and the spring asserted its power, causing a rebound or lifting up of the displacer, and the cycle commenced once more. The outlet check-valve was slightly weighted, so that a certain amount of pressure should accumulate in the container, and press upon the diaphragm before it blew out into the reservoir. Among other points, Mr. Phillips mentioned that, in order to increase the efficiency of the lamps, they were corrugating the head to give extra radiating surface, and altering the shape so as to cool from the bottom side of the head. And, further, to obviate the shadows thrown by the gas-pipes in the first pattern of lamp, they were now leading the gas by pipes embedded in the stays of the lantern. Every part of the lamp was also being made interchangeable.

The PRESIDENT having invited criticism or questions by the members as to the lamp,

Mr. JOLLIFFE said he had been deeply interested in the intensified system of gas lighting; but the drawback hitherto had been the need of convenient means of some sort for increasing the pressure. Although they, as gas engineers, might perhaps by-and-by deliver their gas at a considerably higher pressure than they did now (he hoped they would), yet this lamp struck him as being a very valuable invention, and one, indeed, that was likely to be of great interest and service to the gas industry. He did not know if any of the members had been to Paris, and seen the splendid installation of intensified gas lighting in the Champ de Mars; but really and truly there was no electric lighting in Paris to compare with it in the slightest degree. This lamp seemed to him to give them a way out of the difficulty of introducing an auxiliary motor. He should like to know the material of which the diaphragm was constructed at the top, and also as to the continuous length of time that one of the lamps had been in use. He asked this question because it struck him, on the face of it, that the chamber at the top which was filled with water would gradually get heated, and would do away with the pretty system that caused the increase of pressure.

The PRESIDENT remarked that there was one little point that occurred to him, and that was as to replenishing the water. Would the water be likely to evaporate quickly, or was it condensed and thrown back again?

Mr. PHILLIPS: Yes, Sir. Replenishing about once a year will be found quite sufficient.

Mr. BARTON asked what effect a severe frost would have on the top chamber?

Mr. PHILLIPS replied that they only used the water for cooling; and, in answer to Mr. Best, he said they did not mind if the water did freeze.

Mr. BARTON: So long as the chamber containing it does not burst?

Mr. PHILLIPS: Exactly.

Mr. WIMHURST: The lamp is made of copper?

Mr. PHILLIPS said it was. He might explain that the water had no other function than the cooling of the gas; and the cooler they could keep it, the better pleased they were. As a matter of fact, heat was their great enemy.

The PRESIDENT: Does the displacer work up and down in the water?

Mr. PHILLIPS said it did not. The water was in a chamber round the head of the lamp, and nothing touched it. He understood Mr. Jolliffe to ask how long they had the lamp running continuously. In the "JOURNAL OF GAS LIGHTING" for Aug. 14 would be found a diagram showing the results of a twelve-hours' continuous run. At the end of that time, the maximum water temperature was only 184°, although, for a great part of the time, the gas pressure had been 22 inches. So far as the diaphragm was concerned, the one in this lamp was made of a material supplied by Messrs. Cowan, who informed them that it had a life of twenty years in their meters. He believed it was manufactured of some special skin. Various suggestions had been made as to this diaphragm. Some would like it to be of metal, and others preferred the material that Messrs. Cowan supplied.

Mr. E. W. SMITH (Chelmsford) inquired whether the lamp had stood the test of a winter. Although Mr. Phillips assured them that it did not matter whether the water froze in the chamber, still it seemed to him (Mr. Smith) that, unless there was another means of supplying gas to the burner, they might some evening, after a severe day's frost, find the small valve stuck fast, and the moisture which had condensed in the tubes frozen solid.

Mr. PHILLIPS: There is no connection between the valves and the water.

Mr. SMITH: But the gas passes round through the valves. Do you keep a small bye-pass jet burning? Perhaps it is not proposed to do so?

Mr. PHILLIPS: No. Of course, it would be easy enough to put something in the water to prevent freezing.

Mr. SMITH also inquired whether Mr. Phillips could tell them the cost of the lamp on view. It was really a very interesting invention.

Mr. CHILD asked whether the amount of pressure at which it was wished to consume the gas could be determined, or whether it would vary—say, at one time 6 inches pressure, and at another 20 inches? Or could they have a constant increased pressure such as they might desire to use the gas at?

Mr. PHILLIPS said, as far as he knew, there was nothing abnormal about this lamp that would in any way affect the valves, or the action of the gas on the valves, in cold weather. They had not yet had a lamp running during the winter. As to the cost, obviously, if the top to the lantern was merely a matter of metal stamping, the manufacture would not cost very much; and then there would be their own profit on the sale. As from one mantle, an illuminating power of something between 300 and 400 candles could be obtained, he thought they could get a fair profit on their lamps, and at the same time do a good deal for the people who purchased them. Regarding the pressure, it was quite easy to govern it. It could be governed to 8, 9, 10, or 12 inches, or to any pressure within reason. Moreover, if it was desired (say) at midnight to cut down the quantity of light, simple means were provided for putting the arrangement out of action, and obtaining the ordinary 60-candle power light.

The PRESIDENT thanked Mr. Phillips for his kindness in bringing the lamp to the meeting, and for the interesting explanation he had given the members.

An acknowledgment by Mr. Phillips ended the technical portion of the day's proceedings.

#### A PLEASANT CONCLUSION.

The interval between the meeting and the dinner was whiled away by the members paying a visit to Ayscoughfee Hall and Gardens, which are celebrated for their magnificent yew trees. Dinner was served at the White Hart Hotel, and about fifty members and friends sat down. The President occupied the chair; and the vice-chairs were filled by Messrs. Brown, Carter, and Troughton. The Chairman and other members of the Local Authority honoured the Association by their presence. Mine host provided a dinner which sustained the reputation of his house, and this and the festive spirit which reigned led to one and all deriving the maximum enjoyment out of this little relaxation from business affairs. The usual toast-list was duly passed through.

#### POWER GENERATION BY STEAM-ENGINE, WATER TURBINE, AND GAS-ENGINE.

Before the Mechanical Science Section—in future to be called the Engineering Section—of the British Association, at the recent Bradford meeting, a paper on the above subject was read by Mr. John B. C. Kershaw, F.I.C. We have no space to reproduce in the "JOURNAL" the full text of the paper; but the portion relating to gas-engines, and the conclusions arrived at by the author, merit publication in our pages.

The author pointed out that there is no question of greater importance at the present moment to those engaged in the management of our manufacturing industries than that of power generation. The supremacy which the steam-engine has so long enjoyed is now assailed from two sides. The water turbine and the gas-engine have become dangerous rivals; and there are those who assert that early in the twentieth century we may expect to find the steam-engine ousted from its place as the most economical prime mover by one or other of these later forms of power generators.

During the past ten years, a most remarkable development of hydraulic power has been taking place on the continent of Europe and in America. The large power installations in the Haute-Savoie, in France, in Rheinfelden, in Germany, and at Niagara, in America, have already become of considerable industrial importance. The success which has attended these earlier installations of turbines and dynamos, operated by water power, has led to the exploitation of numberless schemes of a similar character. The aggregate amount of power at the present date, generated from falling water, forms no inconsiderable portion of the total power utilized in manufacturing industries; and two years ago it was estimated by the writer to be between 236,000 and 350,000 horse power.

On the other hand, gas engineers have been busily engaged in working out the problems presented by large gas-engines, and by the utilization of the waste gases of blast-furnaces. Trials which have been made during recent years show that both of these problems are capable of successful solution. Gas-engines up to 650-horse power have been built and have worked smoothly and economically; while at Seraing, in Belgium, and at other



places the blast-furnace gases have been utilized for driving the engines which supply the blast.

The question, therefore, which the engineer now has to settle, when deciding upon the site and locality for a new factory, or when deciding upon the system of power generation to adopt for extensions of the old, is no longer so simple as when only one method of power generation in large units was open to him. It is no doubt true that the choice between the three possible sources of power is one which in many cases will be settled purely by local considerations; and the proximity of a large waterfall, or of an extensive coal-field, to the factory, will be held to point to the turbine, or to the steam-engine, as the most economical power generator. In a great number of cases, however, especially when the decision of the engineer covers the choice of a site for the factory, the problem is capable of no such easy solution; and the most economical source of power can only be determined after an exhaustive study of comparative costs data.

The third section of the paper (that which deal with "Gas Power") was as follows:—

1. By the use of gas-engines and Mond's latest form of producer, 23·8 per cent. of the energy of bituminous coal can be converted into mechanical energy. The actual figures for a 25-horse power Crossley gas-engine are 2166-horse-power hours per ton of fuel.—("Proceedings of the Institution of Civil Engineers," March, 1897.)

2. Statement by Dr. Bowman that with gas-engines of the best type, 1 lb. of coal yields 1-horse-power-hour. With a 300-horse-power plant the horse-power-year (apparently of 2825 hours) costs only 30s. The capital outlay per horse-power for producers and engines is £12, or 20 per cent. higher than with a modern steam plant; but the thermal efficiency is 50 per cent. greater.—("Journal of the Society of Chemical Industry," December, 1897.)

3. At Lausanne, in Switzerland, a 390-horse power gas-engine plant has run satisfactorily for over two years for the supply of the electric power to the tramway system. The plant consists of three 130-horse power Crossley engines, working with an expenditure of 1137 lbs. of coal per horse-power-hour.—("Electrical Review," Nov. 11, 1898.)

4. Statement by Dowson that at Halifax the consumption of fuel is 1·01 lb. per horse-power-hour.—("Mechanical Engineer," 1898, p. 703.)

5. Statement that by the Thwaite-Gardner system of utilizing the waste gases of blast-furnaces, 1 indicated horse power is obtained per 1·3 lbs. of coke charged into the furnace.—("Electrical Review," Dec. 30, 1898.)

6. Results of trials of the above system at the Wishaw Iron Works, Glasgow; 10-horse power can be obtained per ton of fuel charged into the furnaces per week (6 × 24 hours).—"Electrical Review," May 6, 1898.)

7. Results of tests by Professor Meyer of 60-horse power gas-engine at Differdingen, run on blast-furnace gases. The thermal efficiency varied between 27·4 and 30·2 per cent.—(Abstracted, "Engineering Magazine," July, 1899.)

8. A 1500-horse power Westinghouse gas-engine, now building, is expected to develop a thermal efficiency of 30 per cent., or 1 brake-horse-power per pound of coal charged into the producer.—("Electrical Review," July 28, 1899.)

9. At Northwich, a 300-horse power gas-engine has been running on producer gas for a considerable period, and yielding 1 brake-horse-power per pound of coal charged.—("Journal of the Society of Chemical Industry," July, 1899.)

10. Meyer has estimated that in Germany, using blast-furnace gases, the horse-power-hour could be generated at a cost of 0·699 pfg.—("Revue Universelle des Mines," July, 1899.)

11. Lencauchez has estimated that using producer gas generated from French anthracite coal, 1-horse power hour would cost 0·0163 fr.—("Journal de Société des Ingenieurs de France," 1899.)

12. Estimate by Humphreys of the cost of an electrical horse-power hour, using Mond producer gas, based upon a plant of 10,000-horse power = 7000 electrical horse power. Capital expenditure estimated to be £140,000, and total running expenses, £35,000. Interest taken at 8 per cent.—("Proceedings of the Institution of Civil Engineers," March, 1897.)

Converting these data into comparable form, and gathering the results together, we have the figures presented in the following tables:—

Fuel Consumption of Gas-Engine Plants.

Place.	Pounds of Fuel per Horse-Power Hour.	Authority.	Reference No.
Pittsburg . . . . .	1·00	Westinghouse Engineers . . . . .	8
	1·00	Dr. Bowman . . . . .	2
Northwich . . . . .	1·00	Beilby . . . . .	9
Halifax . . . . .	1·01	Dowson . . . . .	4
	1·03	Humphreys . . . . .	1
Lausanne . . . . .	1·137	Thwaite . . . . .	3
	1·300*	Booth . . . . .	5
Glasgow . . . . .	1·555*		6

\* These refer to coke and blast-furnace gases.

Estimated Costs of the Electrical Horse-Power-Year of 8760 Hours when Generated by Gas Power.

Authority.	Cost.	Remarks.	Reference No.
Meyer . . . . .	£ s. d. 4 1 7	Blast-furnace gases . . . . .	10
Humphreys . . . . .	5 0 0	Mond producer gas . . . . .	12
Bowman . . . . .	6 2 0	Ditto . . . . .	2
Lencauchez . . . . .	7 12 2	French anthracite used in gas producer . . . . .	11

CONCLUSION.

Taking the best figures for each of the three sources of power dealt with, and bringing them all to a common basis of comparison (namely, the cost of the electrical horse-power-year of 8760 hours), we obtain the following figures:—

Comparative Costs of Electrical Power. Lowest Recorded Costs per Electrical Horse-Power-Year of 8760 Hours.

Source of Power.	Lowest Estimated Cost.	Country.	Lowest Actual Cost.	Country.
Water . . . . .	£ s. d. 1 5 5	Canada	£ s. d. 1 19 0	Switzerland
Steam . . . . .	4 18 8	England	4 17 7	United States
Gas (blast-furnace) . . . . .	4 1 7	Germany		
Gas (producer) . . . . .	5 0 0	England		

The figures support the opinion now generally held, that water, when developed without excessive capital expenditure, is the cheapest source of mechanical or electrical energy. When, however, the hydraulic engineering expenditure has been heavy, or when the power after generation has required to be transmitted over long distances, the margin between the relative costs of water and steam power is greatly narrowed, and in some cases disappears altogether.

Turning to a consideration of the relative position of gas power, the question of the practicability of large engines may be taken as settled; but until further experience has been gained with these large engines under constant work, it is unsafe to prophesy upon the place they will occupy in the future industrial development of this and other countries.

If they do not cost excessive sums for maintenance and repairs, large gas-engines—in conjunction with coke-ovens and blast-furnaces—may entirely alter the present position of affairs; and new industries which at present are being established in the neighbourhood of water-power stations, may find themselves in severe competition with similar manufactures carried on in the coal and iron districts of the older manufacturing countries.

It has been calculated that 2,000,000-horse power is annually wasted in the gases issuing from the blast-furnaces of the United Kingdom. If these waste gases could be industrially utilized in the manner suggested, we should to a large extent be compensated for our lack of natural water power. But blast-furnaces demand coke, and coal beds are exhaustible; so that "even if this source of mechanical and electrical energy be tapped, it can only postpone, but not avert, the final triumph of the waterfall and of the turbine."

**The Calcium Carbide Industry in the United States.**—This is said to be controlled by the Union Carbide Company, which operates two plants—the larger at Niagara Falls, the other at Marie, Michigan. In Canada, two plants are also in operation—one at St. Catherine, and a new one at Ottawa. The output at Niagara for 1898 was from 8 to 10 tons a day, using 2500 electrical horse-power. In 1899 the yield was increased to from 20 to 30 tons a day, with the use of 5000 electrical horse-power. The present production of the Union Carbide Company is about 1000 tons a month. The continuous Horrey furnaces are in operation in the two plants; and the present price of carbide is £14 a ton. The carbide is guaranteed to yield 5 cubic feet of acetylene per pound. At St. Catherine, Canada, with the use of 1200 electrical horse-power, the output is 1200 tons of carbide per year. At both Ottawa and St. Catherine the Willson pot-furnace is employed. The export price is £12 per ton, in cartload lots.

**The Lighting of Next Year's Glasgow International Exhibition.**—Our advertisement pages the last few weeks have contained an intimation that the Executive Council of the Glasgow Exhibition, 1901, were wishful to receive proposals for exhibits of incandescent and other systems of novel gas lighting for illuminating the grounds and detached buildings of the exhibition; it being stated that for such exhibits gas would be supplied free of charge. It is to be regretted that this offer has not been more generally accepted by firms in this particular line of business. As a matter of fact, up to a few days since no proposals had been made to the exhibition authorities by any firms who supply high-power burners. In view of the splendid show in Paris, this is most unfortunate; but possibly these remarks may lead to dealers in high-power gas-burners at all events making the necessary preliminary inquiries, so as to see what they are able to do, not only to help forward their own business, but also to render more attractive what promises to be a most successful exhibition in other respects. It is certainly to be hoped that the largest portion of the grounds will be illuminated by gas.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Why Should Not Gas Companies Mine Their Own Coal?

SIR,—A question has been recently discussed by more than one local authority owning their own gas-works (though, so far as I am aware, without leading to any definite result, or the formulating of any plan), which has probably suggested itself of late to many concerned in the gas industry—namely, whether it might not be practicable, and, further, be sound policy, for some at any rate of the largest of the gas undertakings in this country, or a combination of the smaller companies, to acquire and work collieries for the production of their requirements of coal. The *prima facie* advantage to those undertakings of purchasing at a reasonable figure—for it is not, of course, suggested that the present is the time at which the acquirement should take place—a property containing sufficient coal to provide for the whole, or greater part, of the consumption at the works for, say, fifty years to come, thereby making it independent of the state of the general coal market (except in so far as the rates of wages to the miners fluctuated in sympathy with those paid throughout the trade), need not be enlarged upon to gas managers in this present year of grace. Would Mr. Livesey have had to raise his price 7d. this year, if last winter he had had sole control of the right to the output of the Seaham Collieries?

It is, it seems to me, a suggestion that at least merits consideration by the heads of the industry, who will have, it is true, plenty of time to discuss the question before coal falls to a price at which it would be policy to buy up any mines. The policy would not be absolutely novel—it is, indeed, only an extension of the plan of growing one's own potatoes, not, it must be admitted, always a profitable speculation—for it has been largely adopted by the ironmasters, in this and other countries. And it is these very companies who own collieries that at present stand on firm ground, while others feel their foundations shake. Ironmasters also, in many instances, acquire their own iron-ore mines. The great firm of Carnegie may be said to be the leading case in point. In order for the transaction to be sound economy, it would, of course, be necessary for a company to buy, upon expert advice, at a price which would ensure that the average cost of production, *plus* interest on capital and a charge for sinking fund (to provide against the day when the seams should be exhausted), should equal, or not considerably exceed, the average price of coal for the past ten or twelve years. Should the cost to the gas company slightly exceed that average, the advantages arising from uniformity of price might, and probably would be found to, more than compensate for such small excess.

The consent of Parliament would, of course, be required; and it is a very open question whether it could be obtained. The refusal of powers to manufacture—in distinction from supplying—gas fittings, stoves, &c., may be held to point to a probable rejection of proposals to acquire and work collieries. But if, as I take it, Parliament's objection to gas undertakings manufacturing fittings, &c., for sale be based on the ground that such manufacture would be in the nature of unfair competition with ordinary traders in such goods, a different view might be taken of the proposal to buy and work coal mines, as the latter proceeding would not be for the purpose of competing with other coal merchants for any custom but one's own. A difficulty might arise as to the disposal of coal unsuited for gas-making purposes, if Parliament gave a sanction qualified by the proviso that no coal should be raised for sale by the gas company. But this could be met by a clause permitting the company to dispose of an annual quantity not exceeding some specified percentage of the output. If a company can, like the South Metropolitan, do their own lighterage, or, like the Gaslight and Coke Company, do their own lime burning and their own foundry work, why should they not buy their coal by the seam instead of by the ship load, and do their own mining?

With gas coal selling at 18s. 6d. a ton f.o.b. Tyne, the question may well be asked; and it would be interesting to hear the answers thereto of some of the heads of the gas industry. *Yours truly, N. R.*

Sept. 21, 1900.

## Calcium Carbide Works in England.

SIR,—I note in your issue of the 18th inst., that you say that you have been asked to state that there never have been calcium carbide works at Blackburn. About eighteen months ago, I believe that carbide was manufactured on a small scale at Chathurn, which is near Clitheroe, and perhaps these are the works to which reference was intended.

HY. FOWLER.

Derby, Sept. 21, 1900.

## The Allowance to be Made for Fast and Slow Meters.

SIR,—I recognize the misunderstanding on which "Gas-Meter" based his calculations, and agree with your correspondents on the matter, in last week's issue, as to the correct mode of testing gas-meters—*i.e.*, by completing one revolution of the proving-wheel, and noting the comparison with the test-holder. "W. H. A." mentions having had some difficulty with tables. These are the tables which I presume are issued at the instigation of the Metropolitan Board of Works, for the use of the official inspectors. I also have had some difficulty with these tables. If we take for instance, a meter whose proving-wheel is marked for 100 cubic feet per revolution, at the completion of which the test-holder registers, say 50 cubic feet, by the table the result would be shown as follows:—

Meter registration . . . . .	100 cubic feet.
Test-holder registration . . . . .	50 " "

Difference . . . . .	50 cubic feet
Then 50 : 100 :: 50 : 100 per cent. fast.	

In this case, a consumer would be obtaining his gas free, if the gas authorities were to allow the deficiency according to the table rule. It will be observed that 50 cubic feet only has been used, as shown by the test-holder registration.

I should feel obliged if some of your readers could throw a little light on the method of compiling this table for gas-meter testing purposes, which up to the present time I have never been able to trace. *J. B. P.*

Sept. 21, 1900.

## MISCELLANEOUS NEWS.

## THE GAS POISONING FATALITIES AT TOTTENHAM.

## Inquest and Verdict.

The inquiry into the cause of the death of John Jonathan Sanders, aged 43, a house decorator, of 34, Markfield Road, Tottenham, and Arthur, his son, aged 17, who were poisoned by gas (as briefly noticed last week, p. 717), was opened at Tottenham on the 17th inst., by Mr. A. HODGKINSON.

Mr. J. AVERY appeared on behalf of the Tottenham and Edmonton Gas Company.

The CORONER, at the outset, said the case was one which he considered should be reported to the Inspector of Explosives; and therefore it would be necessary to have an adjournment. The Home Office, in a circular to coroners, pointed out that, under section 65 of the Explosives Act, accidents resulting from suffocation, or from poisoning or injury by the fumes of an explosive, were required to be notified. He proposed, therefore, merely to call evidence of identification, and the doctor's statement as to the cause of death.

Mrs. Sanders, the widow (who was found unconscious when the house was entered, but who had recovered), identified the bodies. She was not asked any questions as to the facts; the coroner saying he would leave her other evidence until the adjourned inquiry.

Dr. E. R. Hutton said he was called to the house, and found the father lying dead on the floor of the front bedroom, and the son dead in bed in the back room. The former appeared to have been suffocated on the floor, where he had fallen, and the latter in his sleep. The house, up and down, smelt strongly of gas; and before he could remain long in it, the windows had to be opened. There was a slight glimmer of light in the front room.

The CORONER: Was the burner fully turned on?

Witness: No.

Then there was no risk of an explosion?—I don't know anything about that.

Witness (continuing) said he had not made a post-mortem examination; but he was of opinion that the cause of death was suffocation.

The CORONER directed that a post-mortem examination should be made; and, at the request of Mr. Avery, it was agreed that Dr. Scott should be present on behalf of the Company.

The inquest was then adjourned.

At the adjourned inquest on Saturday Mr. AVERY again appeared on behalf of the Company; while Mr. WINDSOR represented the relatives.

Dr. E. R. Hutton was recalled, and gave the results of his *post-mortem* examinations of the two bodies, which were made in the presence of Dr. Scott, the Company's Medical Adviser. He was confirmed in his opinion that death in each case was due to suffocation.

In reply to Mr. AVERY, the witness said there were no particular signs of alcohol in the case of the father. The liver was slightly enlarged in the case of the father; but for a man of his size he would expect to find rather a large liver. He weighed nearly 20 stone. Witness stated that when he was called to the house he smelt the gas, and he asked the surviving son John where it was escaping. John immediately turned the gas off at the main service. Witness heard that a shilling had been put in the meter, and he believed it was the son who made the statement. The son was in a dazed condition at the time.

In an answer to Mr. WINDSOR, the Doctor said that was due to his having inhaled gas. All the symptoms pointed to the fact that the deaths of Mr. Sanders and Arthur were caused by inhaling gas.

Mrs. Sanders, the widow, said that on the Friday or Saturday before the occurrence, the Gas Company sent to the house to change the meter, with a view to testing the old one. A new shilling-in-the-slot meter was fixed on the following Tuesday (Sept. 16). Witness did not make use of it. She was told that a shilling had been found in it; but she did not put it in. They used a lamp on the Wednesday night. Her two sons went to bed at nine o'clock, and witness and her husband followed at about eleven o'clock. Witness was the first upstairs.

Further pressed on this point, witness said that she did not remember her husband coming to bed. He remained downstairs to lock up. She did not see him put a shilling in the meter; nor did she notice any smell. She fell asleep, and did not remember any more until she was in the hospital.

The CORONER: Had you been out together during the day?

Witness said they had, and got home at five o'clock.

Was your husband perfectly sober?—Yes.

Witness, continuing, denied that when the new meter was fixed the Gas Company's man asked her for a shilling to test it with, or that he told her not to use it without testing it. He did not say anything to her whatever.

Questioned by Mr. AVERY: They always burnt gas; but she was sure she did not use the meter from the time that it was fixed on the Tuesday afternoon until she went to bed on the Wednesday. The reason for that was because there had been some conversation with the fitter about having a penny-in-the-slot meter, and she thought he was going to ask if he could have one.

Mr. AVERY: On the Friday the man called with the meter, and you refused to allow him into the house until you had got your husband's instructions?

Witness: I was surprised; and I said I did not think it had better come down then. I knew the man called again on the Monday; but I was out.

I put it to you that he asked you more than once for a shilling to put in the new meter to test it with, and you refused to give one?—No; he did not.

As the man was leaving, did he not tell you, in consequence of your not giving him the necessary money, that if there was any escape you were to at once turn it off at the cock, and communicate with the Company?—No; he never spoke.

Further questioned by Mr. AVERY, witness said that on the Wednesday she and her husband were out all day. They went to the City. On their return, her husband went across to a public-house, where he



always went. He never stayed indoors. She also visited it once, or it might have been twice. She came home with Mr. Sanders when the house closed at eleven o'clock. Their sons were then in bed; and the house was in darkness. She went straight upstairs, and used a small piece of candle to light herself to bed. She could not account for the burner in her room being found alight the next day. She did not touch it, and she did not notice at any time during the night that it was alight. She could not say how many times her husband went into public-houses while in the City, but not more than two or three times.

When you left the public-house, was he sober?—He was not drunk.

I do not say he was. Was he quite sober?—I do not know. He appeared to be so to me.

In one of these rooms some shavings were stuffed up the chimney. Who put them there?

Witness replied that she placed them there to prevent the soot coming down on to the bed, which stood against the fire-place. She could not account for the register being down in her room. It ought to have been open. It must have slipped down of its own accord.

By Mr. WINDSOR: The gas fittings were all supplied by the Company.

John Sanders, the surviving son, said he and his brother got home on the Wednesday night at eight o'clock, and the house was then in darkness. They lighted a lamp, and did not touch the gas-meter. They went to bed at nine o'clock. The next he remembered was hearing somebody in the yard. He tried to get up, and felt peculiar. He did not recollect going into his mother's room and then going downstairs to open the door, or turning the gas off at the meter. He was taken to the hospital, and remained there until the Saturday. He did not hear his mother and father return home at night.

In answer to Mr. AVERY, the witness said that his mother came in on the Wednesday night to get their supper, and they left her downstairs when they went to bed. They had three or four lamps in the house. Witness understood there was no gas in the meter, and so did not try it. He did not know a new meter had been put there.

Mrs. Sanders, recalled, said they had only one lamp. To reach the meter they had to get on a chair.

William Shields, a gasfitter in the employ of the Gas Company, said that after he fixed the meter he asked Mrs. Sanders on two or three occasions for a shilling with which to test it, and she refused him. He did not feel inclined to put his own shilling in, and therefore left it untested. On the Monday following the occurrence, witness examined the meter, and found an escape at the outlet, to the extent of a foot in twenty minutes. There was a shilling in the slot. A burner in the front parlour was also turned on. The leakage at the meter was one that he would have found out directly if he had put a shilling in the slot. The fitters were not supplied with coins by the Company with which to test the meters. That would be paying for gas for the consumer. As she declined to give him the shilling he turned the cock off, and gave Mrs. Sanders to understand that if there was any leakage she was at once to write to the Company.

By Mr. AVERY: The escape was such that a person standing on a chair to put a shilling in the slot would smell the gas before he could get down.

Mr. WINDSOR: Is it your duty to leave the meter in such a state as to be safe for the inmates of the house?

Witness: Yes.

But you made no test?—I could not make any test. I could not get the shilling.

But if you put a shilling in, and had a key, you could get it out again?—Yes; but we are not supplied with keys.

Witness, further questioned, said he did not consider he left the meter in a dangerous state. He turned the gas off; and he fatted the joint with white fat. It was not their practice to use white lead.

Mr. AVERY: If you had a key, and chose to be dishonest, you could do a good day's work by going from house to house and emptying the meters?

Witness: Yes.

A JUROR: Ought you not to have tested the meter, and then told Mrs. Sanders if she found a leak to write to the Company. That is what has been done when I have had a meter fixed.

The CORONER: The man could not have done more than he did. Do you suggest that because Mrs. Sanders did not give him the shilling, he should have taken the meter away again.

The JUROR: Yes; rather than have left it to the mercy of anybody. It was not Mrs. Sanders's duty to test the meter.

Inspector Peckover, who went to the house on hearing of the affair, said that the gas in the meter was nearly exhausted.

Frederick Lambert, who assisted Shields to fix the meter, confirmed the statement that Mrs. Sanders declined on two or three occasions to give Shields a shilling to test it with, and that she was told to write to the Company if there was an escape when she used it. Shields also directed her to turn the gas off. Witness had never known anyone before refuse to give a coin.

The CORONER, in directing the Jury, pointed out that their duty was simply to find the cause of death. They had nothing to do with any other proceedings which might be taken. There was no doubt the deceased were suffocated by gas. The fact that the mother and other son were not, was probably because they were stronger in the chest. It was extraordinary that a gas-jet should have been alight, and yet that there should have been no explosion, although the escape was sufficient to suffocate. He understood from the medical men—and he had looked up the question himself—that gas would suffocate at a lower point than that at which it would explode. Evidently the deceased had been suffocated when there was insufficient gas to produce an explosion. The Jury must consider whether the affair was an accident, or whether anyone was to blame. It had been suggested by Mr. Avery in his questions that Mr. and Mrs. Sanders were more or less the worse for drink, and that one of them put the shilling in without knowing it. What probably happened was that Mr. Sanders put it in before he went upstairs, and lit the gas in his bedroom to see to get into bed, and afterwards fell asleep before the escaping gas penetrated the upper rooms. The fitter Shields did all that he possibly could to do, unless he had taken the meter away again.

The Jury retired; and on their return, the foreman gave their verdict as "Accidental Death," and it was entered accordingly. They wished to add a rider; but Mr. Avery objected to it, as being *ultra vires*, and the Coroner upheld the objection.

## THE SOUTH METROPOLITAN COMPANY'S TEST OF AMERICAN GAS COAL.

Pending the publication of the results of the trial of American gas coal by the South Metropolitan Gas Company, it is interesting to know how the prospect of a call for coal this side, in any quantity, is regarded in the States.

The "New York Commercial" of the 7th inst. said: In the volume of discussion exploiting the possibilities of an American export coal trade comparatively little has been said of gas coal, for which eventually there will be an enormous demand from abroad. The first indication of the fact that English gas makers are beginning to see the futility of paying more for domestic gas coal of poor quality than they would have to pay for really first-class coal imported from this country, was the shipment three weeks ago of 4000 tons of gas coal from Newport News to the South Metropolitan Gas Company, of London. It was intended to keep this deal quiet; and it did not gain publicity until this week. It is not known what price was paid for the coal; but the experiment has been so successful that similar transactions are expected this month. The English gas producer is now paying between \$6.50 and \$7 a ton for a very poor quality of gas coal. The British home supply has been gradually reduced until now the gas maker is losing money not only on the price of his coal, but on the consumption thereof, owing to its poor quality. First-class gas coal is now selling in New York at about \$3.10 a ton. It can be laid down at Newport News for export at \$2.60 a ton; and figuring the cost of ocean transportation at \$3 a ton, it is seen that for \$5.75 a ton at most the English gas manufacturer can get an American coal which is far superior to the degenerated product for which he is now paying between \$6.50 and \$7. The best American gas coal comes from the Youghiogheny Valley region, or from the Virginias, Pennsylvania, or some parts of Maryland. The American gas trade is not pleased at the prospects of a heavy foreign demand for gas coal, because it would likely increase prices on the home market.

In this connection, it may also be of interest to give the following notes by the London Correspondent of the "Yorkshire Post" upon an interview which he had last Friday afternoon with Mr. C. C. Carpenter in regard to the use of American gas coal. He writes:—

With a view to ascertaining the results of the experiments carried out by the South Metropolitan Gas Company with the object of deciding the relative merits of the American coal imported into this country from America, and of the products of the Durham and other British coal-fields, I took an opportunity this afternoon of talking over the whole question with Mr. C. C. Carpenter, the skilled Engineer to the Gas Company, under whose superintendence the experiments are being conducted. The position, it will be remembered, is practically this: English gas coal costs the consumers just about 20s. a ton. American coal can be bought much cheaper on ship at Philadelphia; but, when freightage is added, the cost in the English market is something like 27s. per ton. Thus, to make the use of the imported coal economically possible, it will have to be shown that the amount of gas it produces is as much more in volume or in purity as will justify the extra expenditure. If the word of the agents of the Transatlantic coalowner might be taken as scientifically correct, there would be no doubt on the economic question. They allege that a ton of American coal will produce 15,000 feet of gas; whereas the English article yields only 10,000 feet. These figures are not likely to be confirmed by the test being made at the Deptford works; but it is certain they will give results which will have a very important effect on the future of gas manufacture in this country, and of the coal consumption in many other parts of the world.

"I cannot tell you the results of our experiments statistically," began Mr. Carpenter, "for the reason that they are not yet complete, nor will they be for ten days or a fortnight yet. But you may take it that the high opinion we formed of the coal after the first week's use is well maintained. The American coal is excellent—certainly we have never found any so good. From whatever point you view it, it is a remarkably good coal for the gas maker. The yield of gas is copious; it is very free from sulphur, which with us is a great consideration; and the residuals are also good."

"Upon those you depend much for profit?"—"Very much indeed. The cheapness of gas in England depends to a very great extent on the residuals, and especially upon coke. The coke from the American coal is a very fine, hard production, and will be greatly appreciated in the market."

"But it is a dearer coal?"—"Dearer in the English market; and so far as its use in England goes, everything depends on the practical results. We are not hurrying our tests. We are determined they shall be accurate. But our action in buying American coal has already had two remarkable results. The first is that it will lead to the very general use of American coal in places where it has never been used before. Take France and Portugal, for instance. They are large buyers of English coal. It costs them not only the price at the port of loading, but also the freightage. Therefore, the American coal is to them just about as cheap as the English coal, and they will now find that the yield is better. All the ports along the Mediterranean will find American coal actually cheaper. More remarkable is the state of affairs in South America. Hitherto South American gas-works, speaking generally, have been supplied with English coal. Their managers do not seem to have dreamt that a coal was procurable in the north of their own continent which was not only as good a coal generally, but for their purpose better. Now they are ordering coal from the United States, and to that extent the English coalowner must suffer."

"This must have an effect on prices?"—"Yes, prices are already slightly affected—not much, because the thing is in its infancy, and the strike of colliers in America has kept up prices there. But eventually prices must be very much affected, to the great advantage of gas makers in this country."

"You mentioned a second notable result of your action?"—"I was referring to offers we have had to supply us with coal from Canada. We have already had visits from the representatives of coal-fields in Canada submitting samples of coal which promise to be equally as good



as that we have received from the States. The position is attended with great possibilities. We have one offer from a part of British North America some hundreds of miles nearer England than the States, where coal is comparatively low, and freightage less than from Philadelphia. Into this offer we shall go with care."

The view of the officials (says the "Yorkshire Post" correspondent in conclusion) at the great gas-works in South London is evidently that the price of coal in London is unduly inflated, and that the reaction will not be long delayed.

### THE LEAMINGTON GAS-WORKS PURCHASE QUESTION.

#### The Corporation Forward the Steps Necessary to Obtain Release.

The Meeting of the Leamington Town Council specially convened for the purpose of receiving a report from the General Purposes Committee on the letter of Mr. Hassall, the Solicitor to the Gas Company, regarding the Council's application to withdraw their notice to purchase the gas undertaking, was held on Monday last week. The Committee stated that they had considered the letter, and recommended "that the Town Clerk be instructed to officially communicate to the Company that it is the desire of the Council, as a body, to withdraw the notice of purchase of the Gas Company's works, and, if necessary, they will be prepared to promote a Bill to obtain parliamentary sanction to this, and pay such costs of the Gas Company since the notice was served upon them to purchase, to the conclusion of the matter, including, if necessary, the cost of the representation of the Company by Counsel before any Parliamentary Committee." The Mayor (Mr. J. M. Molesworth) moved the adoption of the report; and it was seconded by Mr. Heath Stubbs. Alderman Bright followed with an unnecessarily long speech in which he reviewed the history of the affair, for the purpose of showing that a charge of vacillation which had been made against him was unfounded. The Council had, in his opinion, made a mistake; and therefore the suggestion of the Gas Company was a very liberal one, seeing that they had the Council in their fingers. The demands of the Company were such that they would not injure the Council much if they paid them. They would thereby get rid of an incubus which was troubling them, and had troubled them for some years. If the works were acquired by the Corporation, both the price of gas and the rates would be increased. He did not agree with the system of the municipalization of businesses, which was becoming so common. Mr. Barratt was convinced that the moment for the purchase of the works had not arrived—not because he thought the price prohibitive, but because of the rise in the money market. When the Council passed the resolution making the offer to purchase, they were not aware they were going to have a South African war, nor that the prices of money and materials were going up so considerably. Alderman Davis pointed out that money was dearer last November than it was now. The report was carried *nem. con.* It is evident the Council are prepared to cheerfully pay whatever is necessary to get rid of their obligation to take over the works.

### ST. HELENS CORPORATION GAS AND WATER SUPPLY.

The annual statement of the St. Helens Corporation accounts, prepared by Mr. John Brown, the Borough Treasurer, shows that on the gas-works account, the total income, including £35,805 from the sale of gas and £13,562 from residual products, was £49,790; the total expenditure, £40,934—leaving a balance profit for the year of £8855. The expenditure included £22,052 for the manufacture of gas, £2142 for distribution, £2316 for rents, rates, &c., and £1624 for management. Out of the reserve fund there had been expended £3461 in the repair of the boiler smashed in the explosion in May last year, and of other damage caused by the occurrence. The present reserve fund is £7802.

On the water-works account, the total income, mainly from water rents and charges, was £24,145; and the expenditure £23,548—leaving a surplus balance of £596. The expenditure was principally on repairs and management expenses at the various pumping stations. The balance in the reserve fund is £8417.

### DAVIS GAS-STOVE COMPANY, LIMITED.

The Statutory Meeting of this Company was held on Thursday last at Winchester House, E.C.—Mr. HENRY J. DAVIS in the chair.

The SECRETARY (Mr. C. S. Barber) having read the notice convening the meeting,

The CHAIRMAN said they would all be aware that this was merely the statutory meeting of the Company, which they were compelled to hold within four months of incorporation. There was no business to discuss; but it was customary on such occasions to inform the proprietors whether or not the shares publicly offered had been subscribed for, and to tell them whether things were in a satisfactory condition. First, he might say that all the shares—both ordinary and preference—which were offered to the public in the prospectus had been subscribed for; and at as early a date as might be convenient, a settlement on the Stock Exchange would be applied for, which would enable proprietors to judge of the value of their holdings. With regard to the second point—how they were progressing—he could only say that at no period during the existence of the business had they done so much work in the time as the present year. But he must add that, had they been able to execute their orders more promptly, the business done would have been even greater. Their inability in this respect was the reason that compelled them to ask the public to join in the undertaking. He would go back some years, and give the shareholders a short *résumé* of the history of the concern. He believed that it was in 1875, when his brother Mr. C. W. Davis and his cousin Mr. Price, in partnership with himself, were trading as ironmongers in Camberwell and Clapham, that they first took up the manufacture of gas-stoves. At the time gas companies were realizing that a very considerable increase in consumption would ensue from letting-out gas-stoves on hire. His firm, therefore, made a sample cooker, which they submitted to Mr. George Livesey, who suggested certain modifications. The result was the production of a stove which was practically the type of all gas-

stoves now manufactured by every maker. The firm were at the time in a comparatively small way; but when once a good stove, answering all necessary requirements, was brought forward, it was wonderful how the business progressed. They soon came to the conclusion that it was desirable to carry on this branch of their trade as a separate business; and they accordingly secured manufacturing premises at No. 200, Camberwell Road. Each year since they had had to make some addition, until at the present time they had six houses in the Camberwell Road and four others in the near neighbourhood, as well as thirteen railway arches. So it had gone on, each year finding them in the same predicament as the preceding one—that was to say, in the height of the season they were always in arrear with their deliveries. In 1895, they found it necessary to purchase a large interest in a foundry at Luton; but even after this, they were in the same position. Last year, therefore, they saw that it had become necessary to obtain financial assistance, to enable them to still further develop the business. With the funds obtained from the shares that had been taken up, they had purchased not only the Luton foundry, but also a larger one at Falkirk; and a substantial balance still remained to provide for further expected developments. With regard to the Scotch works, it was not their intention to use these as a foundry only, for they were erecting extensive fitting shops there. Up to the present they had done little or no business in Scotland, owing to the cost of carriage; but when the new fitting shops were in full swing, they would be able to supply stoves there, as well as in the North of England, cheaper than they could now do. He might mention that his son, Mr. Harold Davis, would take over the management of the two foundries. Almost all, if not all, the members of the staff were shareholders in the Company; so that no effort would be wanting on their part to make the concern a success. He thought, therefore, that from every point of view—effective management, faithful service, and the general outlook of trade—the proprietors had reason to look forward to a brilliant future for the Company, and a satisfactory return on their investment.

There being no questions asked, the proceedings then terminated.

### THE LIGHTING OF BALTIMORE.

The Secretary of the Baltimore Lighting Committee has communicated to the "Annals of the American Academy of Political Science" the following particulars from the report of the Municipal Lighting Commission appointed by the City Council to inquire into the cost of lighting the city.

The present movement of inquiry into the question of municipal construction and control of an electric lighting plant in Baltimore was started in the summer of 1899. It was not until Jan. 4 of the present year that the Municipal Lighting Commission was created, and its course outlined in a resolution of the Mayor and City Council. The duties of the Commission were to report as to the "feasibility, practicability, and expediency" of the establishment of a municipal lighting plant by the city as the principal matter, and to report by Feb. 15 as to the cost of public lighting, both by gas and electricity, in cities of the United States, equal to, or greater than, Baltimore in population, to be the subject of a preliminary investigation, together with recommendations as to the best method of reducing the price of lighting to the city.

This particular phase of the question was brought about by the general impression existing in the minds of the public that the people and the city were paying an extortionate rate for both private and public lighting; and the question was at the time being agitated before the Maryland Legislature to reduce the price of gas, from the present rate of \$1.25 per 1000 cubic feet to \$1. The actual result has been to reduce the price of gas to \$1.10.

The Municipal Lighting Commission had but one month in which to make this preliminary investigation, but secured results from cities in this country, which, together with a general knowledge of the situation as it existed in Baltimore, enabled the Commission to arrive at definite conclusions, and based upon these conclusions, to point out wherein it was possible for the city to secure a reduction in the price of its public lighting.

The first conclusion reached was that, with gas at \$1.25 per 1000 cubic feet, Baltimore paid more for its lighting than any city of large size in the country—15 per cent. more than the next highest in price. The second conclusion was that, despite the fact that there had been steady reductions in the price of both electric light and gas to the city for some years prior to 1890, and that economies in manufacture warranted a further reduction, there had been no reductions made in the price of electric light for ten years, or of gas for twelve years. This state of affairs was the result of the monopoly enjoyed by the Gas and Electric Companies. There was only one Gas Company; and while there were two Electric Companies furnishing street lights, there was no competition—the city lighting being divided between the two Companies; the price being 35c. per night, or \$127.75 per year, for each 2000-candle power arc light. A third conclusion was that, in comparing prices in Baltimore with those in other large cities, local conditions as to cost of material and labour entering into the manufacture were not unfavourable to Baltimore.

The Commission pointed out the means by which the price could be reduced to a reasonable amount; and they are here mentioned briefly: 1. Properly regulated competition—unrestricted competition being considered the least advisable of any method. As has happened heretofore, it surely results in further consolidation and aggravation of the evils. 2. By making contracts, and providing, if possible, for reductions in price as the number of lights increase. 3. Reduction of price by Legislature. This has been done in respect to gas lighting as heretofore mentioned. 4. Municipal plant.

The Commission makes no recommendation as to the expediency of municipal control, but indicates that, if all other methods fail, there is yet this question to be determined, which may or may not result in a reduction of cost to the city, and upon a determination of the matter of reduction in price would rest the advisability of a municipal plant.

The report recommends: First, the passage of a Bill then pending in the Legislature to appoint a Franchise Commission, with proper powers, and to represent the public in dealing with public service corporations.



This measure was defeated. Second, the passage of an Act enabling the city to issue bonds to provide the necessary funds to construct a lighting plant, after submission to a vote of the people.

This Act has become a law; and with this power in its hands, the city of Baltimore should be in a position to deal with Lighting Companies, and secure its lighting at a fair and reasonable price. If it fails in this purpose, there is yet the question of a public plant; and it is expected that the principal report of the Commission will determine this point, and that it will give good and sufficient reasons for its conclusions, whatever they may be.

### ELECTRIC LIGHTING NOTES.

With considerable ceremony, the "corner stone" of the electricity works for the Farnworth District Council has been laid. The station is intended for both lighting and tramway traction; and the combined scheme is estimated to cost £22,000. In addition to the requirements for the tramways, the generating station will be capable of supplying current for 6000 16-candle power lamps and a number of arc lights for public purposes.

Some time ago the Birstall District Council had pressed upon their notice, as the outcome of a discussion at a meeting of the Chamber of Commerce, the desirability of putting down an electric lighting plant. At that time, however, the Council thought that it would not be wise to take up the matter, especially seeing that the gas-works belonged to the town. Since then a private Company have given notice of their intention to apply for powers to supply electrical energy in the district; and in order to keep out the Company, the Council have now decided to themselves apply for a Provisional Order.

The members of the Committee of the Brighouse Corporation who manage the electrical business received quite a shock at a recent meeting. A special report was presented by the Electrical Engineer (Mr. E. Wilks), who, with some emphasis, drew attention to the fact that "the present electrical plant has now reached that stage when depreciation is taking place far greater than that allowed for in any preceding year." In other words, the members of the Committee were given to understand that the plant is totally inadequate for the work it is called upon to do; and, in consequence of the severe strain caused by overloading, the wastage is out of all reasonable proportions. What is worse, breakdowns are of such frequent occurrence as to endanger the public service. It has been decided to approach the Halifax Corporation as to the terms on which they will supply Brighouse with electricity.

Electricity consumers in Manchester continue to suffer; and many are the bitter complaints to which the officials of the department have to listen. Now and again, personal complaint not resulting in the mending of matters, public appeals are made in the correspondence columns of the local Press. Here is a sample, dated Sept. 20: "We are only just getting into dark days; and two evenings in succession the electric light has failed us. What will our condition be before the light evenings return to us? Last winter the electric light failed us so often that it began to be a nuisance, and compelled us to put in again gas-fittings that we were led to believe we could discard. Until our generating stations are in better working order, would it not be as well for our Corporation to cease extending? Evidently they are not able to cope with the demands made upon them." The failures referred to here are mentioned in our "Electric Lighting Memoranda."

According to the "Financial News," a new discovery by Edison—the production of electricity direct from coal—is imminent. Our contemporary says: "Edison's ingenuity seems inexhaustible! He is now credited with an invention 'which will eventually supplant the steam-engine and make electricity direct from coal—abolishing the necessity for dynamos.' The inventor has been working for some years on the solution of cheapening the manufacture of electricity. At present the details of the process are kept secret; but the machine, it is said, will be portable and inexpensive, and it is constructed on the principle that cold contracts and heat expands any substance. The new method is to be applicable to automobiles, electric launches, lighting plants, power houses, phonographs, and many other things. Naturally enough, a Company is being formed in New York to exploit the invention. The story is readable, at any rate, if untrue, at a time like the present, when any plan calculated to result in an economy of coal and lower prices for fuel makes a very direct appeal to the long-suffering householders on this side of the Atlantic. If Edison has solved a problem which has been exercising the wits of scientists and engineers for many years past, and made a discovery the value of which in hard cash is hardly calculable, it seems a little surprising that he should have allowed a New York Company to handle his invention at all."

"Notes and Comments" from the "Wakefield Express": "The Wakefield Corporation have got the Local Government Board's sanction for a loan to pay for the extension of the electric lighting plant. But they have not got all they asked for. Contingencies were put down at 20 per cent. on the proposed outlay. But only 10 per cent. has been allowed; and £60 for tools, &c., has been disallowed as a capital charge, and must come out of revenue. The Local Government Board have let off the Corporation very leniently in reference to the Committee's unwise and risky action in spending about £4000 beyond their original borrowing powers. A much-needed caution—'Don't do it again'—has been given, however. We believe that the Bristol Corporation recently trespassed in a similar way, and the money over-spent had to be replaced out of the rates. It would have been a serious thing for the ratepayers if the Local Government Board had been as strict with Wakefield as with Bristol, and required the surplus expenditure to be paid out of next year's rate, or by a special rate of 1s. in the pound." "The public are lamps in the city continue somewhat eccentric in the performance of their duty. Most nights one or another of them fails to shine; and, the gas-lamps in their vicinity having been done away, darkness is peculiarly visible. When first set up, irregularities of this sort were excusable, to a certain extent; but it is surely time that the apparatus should have been got to work with something approaching to certainty."

The troubles of the Hanley Corporation in connection with their electric lighting undertaking came under the notice of Mr. H. Percy Boulnois, one of the Inspectors of the Local Government Board, on Friday. The Corporation had asked the authority of the Board to the borrowing of £9500 for the provision of a refuse destructor, and £4000 for the purpose

of electric lighting. The portion of the inquiry relating to the destructor was quickly disposed of; and then, in connection with the requirement for electric lighting, it was explained that the sum named was needed for additional buildings—a chimney stack, two new boilers, and appurtenances. Previous loans sanctioned for electric lighting totalled £70,009; but the amount actually borrowed was £64,190, commencing with the original loan of £21,000 in February, 1893. The demand for the light was continually increasing, notwithstanding the fact that it had been necessary to advance the prices for the current on account of the deficiency occasioned by increasing wages and materials, lowering the price too soon, and other causes. The question of the financial results of the working of the undertaking was introduced by Mr. W. H. Folkes, who thought the fact that a year's working showed a loss of £2690, after paying instalments of loans and interest, went to show that the undertaking had been mismanaged. He did not think the Corporation should be allowed a further loan until an expert had been engaged. Alderman Hammersley, however, gave figures to show a better result during the present financial year. Further, the £2690 referred to could not, he said, be considered as a loss. In five years' working they had paid off £5000; and they could not regard a sinking fund as a loss at all. Mr. Folkes contended that the leakage of electricity was excessive at Hanley; but Mr. Cowell (the Electrical Engineer) said there was no leakage in the way that had been noised about. There was some loss in transmission, which was always the case. Dr. Adler supported Mr. Folkes's views, and said they simply wanted to be satisfied that the undertaking was being carried on with due skill, foresight, and capacity. He asked that the Local Government Board should attach to their sanction to the loan a condition that it would not be granted until an expert had been engaged, and had reported. The Inspector said much of the loan now applied for seemed to be urgently wanted. If they waited for an expert, it would require some considerable time before they could get the loan. He had made a note of the objections and recommendations.

### FALMOUTH CORPORATION AND THE WATER-WORKS.

The Corporation of Falmouth have received from Mr. A. F. Phillips a report on the condition of the water supply. Like Mr. Silverthorne, Mr. Phillips advises the Corporation to acquire the works from the Falmouth Water-Works Company, and to take steps for the protection and improvement of the supply. The sanitary arrangements of many of the farms and dwellings in the vicinity of the stream supplying the town is, he says, very unsatisfactory; and the arrangements for filtering the water are not good. In addition to works for protecting the water from contamination, he advises the raising of the level of the upper reservoir by at least 2 feet, which would increase the storage from 60 to 80 million gallons—equal to 160 days' supply of half-a-million gallons. A new set of filter-beds should be constructed, and a covered service reservoir. There should be a second pumping plant for the supply of the high-level district, in connection with which also there should be a covered service reservoir. A considerable length of larger main is necessary; and the whole of the mains require cleansing to remove the vegetable deposit. The cost of the proposed works is estimated at £23,500. Although the purchase and improvement of the water-works may entail a slight charge upon the rates, the benefits derived should more than compensate for this.

### THE NEW WATER RESERVOIRS FOR HALIFAX AT WALSHAW DEAN.

An important municipal function was carried out, on behalf of Halifax, at Walshaw Dean yesterday week. It was the cutting, by the Mayor (Mr. W. Brear), of the first sod of the new Walshaw Dean reservoirs. Something like 220 guests were conveyed to the scene of operations; but the actual ceremony was witnessed by, it is computed, about 800 persons. Arriving upon the site, the Engineer of the scheme (Mr. G. H. Hill) introduced the Mayor to the Contractor, Mr. Enoch Tempest, who presented his Worship with a silver spade and a silver-mounted ebonyed wheelbarrow commemorative of the occasion. The task of cutting the first sod and wheeling it away appeared to the onlookers to be a very easy duty to the practical Chief Magistrate; and he was loudly cheered. Afterwards the invited guests had luncheon in a marquee; the Mayor taking the head of the table. A number of toasts were honoured; and the speeches showed that there was a oneness of opinion as to the wisdom of the Corporation undertaking this great work.

Regarding the new reservoirs, it may be stated that, when the Walshaw Dean system is completed, the Halifax Corporation will be in possession of the entire drainage area from the Ovenden Moors on the north, over the Warley, Luddenden, Midgley, Walshaw, and Wadsworth moorland ridges, right to Boulsworth Hill. And, with the exception of a few peaty streamlets flowing from the Greave Clough Moors and a portion of the Warley Moor area, the water is of excellent quality, and the supply ample to satisfy all the wants of growing Halifax and its many dependent districts. The site of the new reservoirs is about 1150 feet above sea-level, and is situated on the fringe of the moorlands. The scheme comprises three reservoirs, of about equal size; and their combined capacity will be 650 million gallons. The surface area altogether will be about 155 acres. The sites of the three reservoirs occupy the northern end of the valley, and lie, as it were, one above the other. The Walshaw drainage area is some 2325 acres in extent, almost exclusively moorland. Of course, in acquiring the important water rights over so wide a drainage area, the Halifax Corporation have to undertake to supply an adequate compensation flow into the Walshaw stream, which empties itself into the Hebden at Blagden Bridge. The quantity of compensation water to be supplied is 1,600,000 gallons per day; and the stipulation has been imposed, at the instance of Lord Savile, that the compensation water shall be given in a continuous flow through each day of the year at the rate of 2½ cubic feet per second. Mr. Tempest's contract for the construction of the works is £170,000. The purchase of land, rights, &c., absorbs above £30,000; and it is expected that with extras, &c., the total outlay will be about £220,000. The scheme will add something like 2½ million gallons to the daily supply of the town.



### NEW RESERVOIR OF THE OLDHAM CORPORATION.

In the "JOURNAL" for the 14th ult. (p. 433), we recorded the opening of the Rooden reservoir of the Oldham Corporation. As this work completes the water scheme for which the Corporation obtained powers, it may be of interest to place on record some particulars respecting it.

The first turf was cut by Mr. Adam Lee, J.P., on July 30, 1894. The reservoir has a top water area of 21 acres, is at an elevation of 1068 feet above Ordnance datum, and has a capacity of 265 million gallons. The natural gathering-ground is only 25 acres, which is augmented by collecting the flood waters from 370 acres in the Denshaw Valley and 423 acres from the Piethorn Valley; making a total of 818 acres. The reservoir is situated at the division of two watersheds draining in opposite directions, which has necessitated the construction of two large embankments. On commencing the works, it was found that the interior of the reservoir was covered with peat varying in thickness from 2 to 14 feet; and its removal being considered advisable, it was excavated and tipped below the northern embankment. Being in a wet condition, the peat at once began to slide, and another embankment 270 feet long and 40 feet high, and containing 11,890 cubic yards of banking material, had to be constructed to prevent the peat flowing into, and filling up, the Hanging Lees reservoir, situated immediately below. This additional work has, of course, added considerably to the cost of the undertaking. The quantity of peat excavated amounted to 107,500 cubic yards.

The north embankment is 578 feet long, with a maximum width of 484 feet, and a maximum height of 83 feet, and contains 179,500 cubic yards of banking material. Its top width is 17 feet, the inclination of the outer slope, which is soiled, being  $2\frac{1}{2}$  to 1, and that of the inner slope, which is pitched and shingled, being 3 to 1. The puddle trench for this embankment is 12 feet wide and 676 feet long. It has been sunk to a maximum depth of 114 feet below the natural surface of the ground, involving 19,687 cubic yards of excavation, the filling in of which comprises 11,342 cubic yards of puddle, 7055 cubic yards of cement concrete, and 700 cubic yards of lime concrete. The puddle wall above the natural surface of the ground has a maximum height of 84 feet, is 8 feet wide at the top, and batters 1 in 12 on each side; the total quantity of puddle being 13,989 cubic yards. Some open strata being found in the west end of this trench, a wing trench 6 feet wide, 165 feet long, and averaging 20 feet deep, has been sunk to cut off any escape of water through this strata. The trench has been refilled with 285 cubic yards of cement concrete, and is surmounted by a masonry wall carried to a height of 2 ft. 6 in. above top water level. The quantities of shingling and pitching on the inner slope are respectively 6614 superficial yards and 5613 superficial yards; and the soiling on the outer slope amounts to 7024 superficial yards. The valve-shaft, which is reached from the embankment by a girder bridge, of 28 feet span, is constructed of masonry and cement concrete, and lined with white glazed bricks, is 89 ft. 9 in. high, 7 ft. 6 in. square to a height of 10 ft. 6 in. from the bottom, and 7 ft. 6 in. diameter from that height to the top. It is surmounted by an octagonal masonry valve-house, containing the capstans for working the valves controlling the flow of water from the reservoir. These consist of a 24-inch valve drawing off at a depth of 78 feet below the top water level, an 18-inch valve drawing off at a depth of 42 ft. 6 in. below, and an 18-inch valve drawing off at a depth of 18 ft. 6 in. below. The discharge tunnel from the reservoir to the valve-shaft is built in cement concrete 18 inches thick; the internal dimensions being 3 ft. 6 in. wide by 3 ft. 6 in. high. The tunnel under the outer slope of the embankment is composed of cast-iron pipes 42 inches in diameter, and discharges into a well at the foot of this embankment, where it is joined by the overflow channel. The overflow well, situated near the valve-shaft, is circular, 9 feet in diameter and 7 ft. 6 in. deep, built in masonry and concrete. The overflow channel commencing in this well, and running to a well at the foot of the outer slope, a distance of 462 feet, is built of cement concrete with flagged bottom, being 5 feet wide and 5 feet high. From the last-named well, into which the discharge tunnel is also conveyed, a culvert 5 feet wide and 5 feet high is constructed to convey the waters from either the overflow well or the discharge tunnel into a third well 5 feet square, and built in masonry and concrete, where they can be discharged into a line of pipes 28 inches in diameter, controlled by a 33-inch wall-sluice, and thence into the Hanging Lees reservoir, or be conveyed by means of a line of pipes 18 inches in diameter into the flood channel at the northerly side of the Piethorn reservoir.

The south embankment is 1518 feet long, with a maximum width of 365 feet and a maximum height of 69 feet, and contains 200,804 cubic yards of banking material. Its width, inclination of slopes, and the materials of which it is composed, are similar to those described for the north embankment. The puddle trench is 1550 feet long, and has been sunk to a maximum depth of 76 feet below the natural surface of the ground, involving 21,855 cubic yards of excavation, the filling in of which comprises 21,571 cubic yards of puddle and 284 cubic yards of cement concrete. The puddle wall itself above the natural surface of the ground has a maximum height of 69 feet, and varies in width from 6 feet at the top, battering 1 in 12 on each side; the total quantity of puddle in the wall being 18,456 cubic yards. The shingling and pitching on the inner slope of this bank amount to 6113 superficial yards and 7664 superficial yards respectively, and the soiling of the outer slope covers an area of 15,931 superficial yards.

The reservoir is supplied with water from the Denshaw Valley by means of a tunnel, into which the water is diverted by a masonry and concrete weir controlled by a sluice 5 feet wide and 2 ft. 6 in. high, worked by a capstan. The width of the weir is 20 feet, and is crossed by a girder bridge of the same span. The tunnel, which has been driven almost entirely through rock, is in the middle 150 feet below the surface of the ground, is 5 feet wide by 4 ft. 9 in. high, built throughout of cement concrete, with an inclination of 10 feet in a mile. The side walls and arch are 12 inches and the invert 9 inches in thickness. The length of the tunnel which has been driven and lined is 551 yards, and some 201 yards have been constructed as "cut and cover." This terminates in an open channel running into the bottom of the reservoir; a distance of 125 yards, having a top width of 10 feet, a bottom width of 5 feet, and a depth of 2 ft. 6 in., being built with a cement concrete lining, and covered with 9-inch pitching.

The whole of the works have been designed by Mr. George H. Hill,

M.Inst.C.E., of Manchester and London—the Resident Engineers being Mr. W. Watts, F.G.S. (at present the Engineer for the Langsett works of the Sheffield Corporation), during the first portion, and Mr. C. J. Batley, Assoc.M.Inst.C.E. (the present Manager), during the latter portion; and they have been carried out entirely by the administration.

### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Gas matters bulked largely in the business before the Glasgow Town Council at their meeting this week, when another toll was given to that bell which we were informed was to be kept ringing in the Council until they recognized the right of the gas workers to be represented by the officials of their Union. In another month, the municipal election will be over; and possibly after that the ringing will not be so vigorous for some time. The proceedings began by the announcement that a communication had been received from the Glasgow Trades' Council asking the Town Council to receive a deputation of gas workers. A question was raised as to whether it was customary for the Council to receive a deputation of their own employees; but it was brushed aside by Lord Provost Chisholm, who said it was usual for them to receive any deputation of citizens. The deputation, which consisted of over 100 gentlemen, was then introduced. Mr. W. Blackwood, the Secretary of the local branch of the Gas Workers' Union, said the object of the deputation was to draw the attention of the Council to the manner in which a deputation from the gas workers had been received by the Gas Committee, and also to see that the Council should form a true estimate of the grievances which existed. The deputation of gas workers received by the Gas Committee was not a proper deputation, owing to the fact that one-half of it consisted of men chosen at the instigation of the Managers of the works, and the other half of men who were elected by ballot of the workers. Only one-half of the deputation was received; and that half consisted, practically, of the men chosen by the Managers. He hoped the Council would see that the men had liberty to select their own deputation, without the interference of officials; and that the deputation so selected would be allowed to lay before the Gas Committee a true statement of the grievances which existed. Mr. J. McLaughlan, of the Glasgow Trades' Council, supported the position taken up by the gas workers. He considered their request a reasonable one, and thought that the deputation should be a *bonâ fide* one, appointed by the men themselves. Lord Provost Chisholm assured the deputation that their views would receive the attention of the Council.

The minutes of the Gas Committee contained a report of the conference which took place on June 28 between the Gas Committee and their workers, and stated that, by a majority, the Committee recommended that no further action be taken in regard thereto. Mr. R. M. Mitchell, the Convener of the Gas Committee, in moving the adoption of the minutes, said he was sure the Council would be convinced that the Committee had arrived at a wise decision in this matter. There was not one member of the Committee who did not desire that their workmen should be as well treated and as comfortable as any workmen in the city; and he believed that they had fairly succeeded. He made bold to say that there was no interference with the gas workers either on the part of the Engineer, the Managers, or the Committee. The Committee desired, in the interest, not only of the workers, but of the citizens, that the utmost harmony should prevail in regard to this department of their works. The Council were trustees for the public; they were not there to act in the interest of a section of the people. He made bold, also, to say that there had been no intimidation or oppression; and that nothing that would tend in any way to make their workers' lives uncomfortable or harsh would be tolerated either by the Gas Engineer or by the Committee. With regard to the deputation who had appeared before them that day, he only wished to say that neither the Engineer nor himself had the least indication that such a deputation was to be appointed. He did not know how they had approached the Council so unexpectedly; and he could only say that he hoped the Council would continue to have confidence in the Gas Committee, in their Engineer, and in their Managers, and that they would listen to no *ex parte* statement or anything that might for a moment stop the Committee in doing what they sought to do—namely, to discharge their duty in every respect to the satisfaction of the Council and the citizens. Mr. Shaw Maxwell said that those who supported the deputation had full confidence in the officials, and believed that they were very well served. But they also thought it was right and proper that, if the men in their employment were to be heard either by the Committee or the Manager, they should have the liberty of delegating the men to represent them, and that they should not be named by the Managers of the various works. This was all the men claimed; and he considered it was a very moderate claim. Mr. P. G. Stewart moved the amendment he had proposed in Committee—that a Special Sub-Committee be appointed to inquire further into the several matters referred to in the report. He agreed with the Convener that the councillors were there as custodians of the public interest, and not for any one section of the public. At the same time, it was their duty to see justice done to the men in their employ; and he contended that the statements made before the Committee justified his proposal. He further stated that for some time there had been in the gas-works victimization, which had been denied by Mr. Foulis and by certain members of the Gas Committee. Men, because they had taken up a certain attitude, had been dismissed; and surely there was some ground for his statement when these men were reinstated by Mr. Foulis. Even that was enough to show that there was need for inquiry. Treasurer Murray said this matter involved a vital and important principle in connection with the management of the gas-works. The men were before the Committee, and stated their case with great propriety. There were practically three grievances. The first was with regard to the Dalmar-nock works, when it was stated by one of the men that he and some others had been longer in the yard this season than in former years. The Manager assured the Committee that the matter would be inquired into; but, in any case, he held that these were details in connection with the gas-works which should be entrusted to the Manager. The second grievance was that of Sunday labour; and the Committee were told that this had already been remedied. The third matter was the *crux* of the



whole situation, and that was the question of signing on. This was the secret of all the grievances which had been brought before them on this and on previous occasions. Now, he would point out that gas-works were different from almost every other kind of employment. They were so recognized by the Legislature, which had made it criminal for workmen to leave without notice; and it was the duty of the Corporation to conduct their works in the interest of the whole community. This was not a question between Labour and Capital at all. It was a question as to the safety of the community; and if the Manager, under the direction of the Committee, did not take every precaution he possibly could to secure that the works were carried on continuously, and without danger of interruption from outside sources, he would not be doing his duty to the community. Nor would the Committee be doing their duty unless they took every means in their power to secure that the works were carried on continuously, and without fear of interruption such as they had last winter, when 200 or 300 men left the works at the instigation of outside people, and threatened to leave the city in darkness. What a situation it would be if these enormous works, on which the comfort and safety of the community largely depended, were to be at the mercy of some outside organization which could bring out men at an hour's notice. It was perfectly clear that the signing-on system was essential—or desirable at least—to the safe conducting of the works. He went further, and said that Mr. Foulis ought to give a privilege to men who signed on. Bailie J. W. Dick supported the amendment. With reference to the members of the deputation from Dawsholm, he made a statement with regard to the method adopted in their selection, the result of which was that when they came before the Gas Committee it was found that only one man had been selected under the ballot of the men, while two had been selected from shifts by the Manager. The man selected by ballot, and one of the men selected by shifts, left the meeting; and only one man from Dawsholm remained. The deputation who had appeared before the Corporation earlier in the day made the method of selection by the Manager their chief cause of complaint. As to signing on, this was the most important question of all; and, while he did not wish to speak of victimization, it did seem that favouritism had been shown. Mr. Battersby said all that was asked was that a Committee should be appointed to inquire into the whole matter; and this, he held, was a fair and reasonable request. Reference had been made to the signing-on; and it was true that this was the *crux* of the whole question. Treasurer Murray had spoken of putting the city in darkness. In doing so, he was "drawing the long bow." Did they suppose that any body of workmen would be permitted to put the city in darkness? Were any such attempt made, they would be able to fill the works twice over. Mr. R. M. Mitchell, in reply, stated that, so far as the representatives from Dawsholm were concerned, they were selected by the men themselves, without any interference or dictation by the Manager or anybody else. He would also like to say, with reference to the selection of delegates, that outside the gates papers were handed to the men, containing the names of three men for whom they were to vote. He did not wish to state by whom this was done. Then with regard to the signing-on, there was no compulsion of any kind applied to any man to sign-on or

not to sign-on; but those who did so, and were good workmen, naturally received preference when there was an opportunity of their continuing work. He hoped the Town Council would strengthen the hands of the Gas Committee, and would realize that this was not done from any vindictive spirit, but simply from a desire to do justly and fairly to every person whom they employed. The Council then divided, when 45 voted for the motion and 14 for the amendment.

I must say that the scheme of the promoters of this deputation was, on the surface of it, very adroitly formed. A motion for inquiry is always a difficult one to resist, because, if refused, it is open to the discontents to say afterwards that there was something to conceal. I have no doubt but that, if inquiry had been granted, it would have been found that the grievances were imaginary. But a step would have been taken towards the recognition of the Union; and this is one of those instances in which a step once taken cannot be retraced. The scheme was, however, only calculated to be effective with the portion of the community who do their thinking superficially. If a body of workers have permission to appear before the Town Council, they do not need to care much what the action of a Committee of the Council may have been. And if their complaint be simply that the Committee did not hear them, and instead of asking the Council to consider their case, they simply ask it to be sent back to the Committee, it may be taken for granted that they have very little to complain of. The deputation served its purpose; and I daresay the promoters of it are quite pleased with the result. They will have a try another time. It is fortunate that their tactics do not affect the working of the undertaking, the staffs of which, with the exception of a few, are quite contented with the existing conditions. To a workman who is disposed to be diligent, signing-on is no grievance. It is the opposite, because it ensures him in constant employment and better prospects.

The Council, at a later stage, remitted to the Gas Committee to consider the motion of which notice was given by Mr. O'Hare at the meeting in August, in which it is proposed that parliamentary powers be asked for the establishment of a superannuation fund in connection with the Gas Department, to be compulsory upon all officials except the General Manager and the Treasurer, and that the Corporation take over, and appropriate in connection therewith, any funds handed to the Corporation by the old Gas Companies for benevolent purposes.

The great mountain of discontent with the conducting of the Greenock Corporation gas undertaking has this week dwindled to the proverbial molehill. On Tuesday, at a meeting of the Police Board, it was reported that the total income of the Gas Trust for the past year amounted to £47,679, and the ordinary expenditure to £41,484—showing a gross profit of £6,195. But there was an extraordinary expenditure of £8,802; so that the net deficit on the year's working was £2,606. The estimated revenue for the current year has been put at £51,680, the ordinary expenditure at £43,110, the extraordinary expenditure at £7,900, and the estimated surplus at £670. The Sub-Committee appointed to inquire into the difference between the financial results and the estimates for the year reported that the price paid for cannel accounted to some extent for the deficiency shown in the balance-sheet. It was therefore recommended that there should be a system of check on the supply made by the coal

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 755.

Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	
£			p. c.				£ s. d.	£			p. c.				£ s. d.	
GAS COMPANIES.																
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	183-194	..	5 7 8	60,000	5	Feb. 23	7	Ottoman, Ltd.	5-5½	..	6 7 3	
100,000	10	"	7½	Do. 7 p.c.	133-141	..	5 3 5	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2	
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Apl. 27	7	River Plate Ord.	101-11	..	6 7 3	
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	99-101	..	3 19 8	
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	10	Apl. 11	8	San Paulo, Ltd.	11½-12½	..	6 8 0	
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	185,000	Stk.	Sept. 14	10	Sheffield A.	231-239	..	4 3 8	
270,000	"	"	9	Do. New	177-182	..	4 18 11	209,700	"	"	10	Do. B.	231-239	..	4 3 8	
50,000	"	"	9	Do. 5 p.c. Pref.	140-145	..	3 9 0	447,427	"	"	10	Do. C.	232-237	..	4 4 5	
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p.c. Ord.	127-129	..	4 2 7	
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	1,520,000	"	July 12	3	Do. 3 p.c. Deb.	91-97	..	3 1 10	
226,230	Stk.	Aug. 29	7	Do. A. Ord. Stk.	150-160	..	4 7 6	380,940	Stk.	May 16	5	Southampton Ord.	110-115	-5	4 6 11	
1,003,500	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	117-118	..	4 4 9	70,825	"	July 12	4	Do. 4 p.c. Deb.	117-122	..	3 5 7	
420,000	20	Mar. 29	10	British	40-42	..	4 15 3	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	112-117	..	5 2 7	
60,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	250,520	"	"	4½	and B. 3½ p.c.	80-85	..	5 5 11	
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	61,550	"	June 14	4	Edmonton 4 p.c. Deb.	111-115	..	3 9 7	
600,000	10	May 16	5	Buenos Ayres (New) Ltd.	82-92	..	4 6 9	182,380	"	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0	
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0	
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	6 12 0								WATER COMPANIES.	
100,000	10	June 14	8	Cape Town & Dis., Ltd.	134-144	..	5 10 4	780,404	Stk.	June 28	11	Chelsea, Ord.	310-305	+2	3 12 2	
60,000	50	May 2	8	Do. 6 p.c. 1st Mort.	54-56	..	5 7 2	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6	
550,000	Stk.	Apl. 11	13½	Commercial Old Stock.	270-280	..	4 16 5	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10	
236,425	"	"	10½	Do. New do.	205-215	..	4 17 8	175,785	"	Mar. 29	4½	Do. 4½ p.c. Deb.	145-150	..	3 0 0	
288,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3	1,720,560	Stk.	Apl. 11	7	East London, Ord.	193-198	+1	3 10 8	
800,000	Stk.	May 31	9	Continental Union, Ltd.	165-170	+5	5 5 11	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	147-152	..	2 19 8	
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	890,000	"	"	8	Do. 3 p.c. Deb.	96-98	..	3 1 3	
51,600	Stk.	"	14	Croydon A 10 p.c.	—	..	—	700,000	50	June 14	7½	Grand Junction 10 p.c. max.	107-110	..	3 8 2	
178,400	Stk.	Aug. 15	11	Do. B 7 p.c.	—	..	—	810,000	Stk.	Mar. 29	4	Junction 4 p.c. Deb.	130-135	..	2 19 3	
655,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	115-120	+3	4 7 6	708,000	Stk.	Aug. 30	14	Kent	295-305	..	4 11 10	
60,000	"	"	5	Do. 5 p.c. Pref.	130-135	..	3 14 1	1,043,800	100	June 28	10½	Do. New, 7 p.c. max.	200-210	..	3 6 8	
466,090	10	July 27	11	European, Ltd.	19-20	..	5 10 0	402,200	100	"	8	Lambeth, 10 p.c. max.	285-290	+1	3 12 5	
854,060	10	"	11	Do. £7 10s. paid.	14-15	..	5 10 0	850,000	Stk.	Mar. 29	4	Do. 7½ p.c. max.	205-210	..	3 16 2	
14,993,075	Stk.	Aug. 15	4½	Gas. 4 p.c. Ord.	97-99	..	4 8 10	600,000	100	Aug. 15	14	Do. 4 p.c. Deb.	128-132	..	3 0 7	
2,600,000	"	"	3½	light 3½ p.c. max.	92-94	..	3 14 6	1,000,000	Stk.	July 27	4	New River, New Shares	410-415	..	8 7 6	
8,799,785	"	"	4	and 4 p.c. Con. Pref.	114-117	..	3 8 5	902,300	Stk.	June 14	7½	Do. 4 p.c. Deb.	128-133	..	3 0 2	
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	98-95	..	3 8 2	126,500	100	"	7½	Southwark Ord.	195-200	+2	3 15 0	
70,000	10	May 31	8	Hongkong & China, Ltd.	134-144	..	5 10 4	126,500	100	"	7½	Do. 7½ p.c. max.	182-187	..	4 0 8	
3,800,000	Stk.	May 16	10	Imperial Continental	204-209	+1	4 15 8	489,200	Stk.	"	5	and 5 p.c. Pref.	155-160	..	3 2 6	
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	99-101	..	3 9 4	1,019,556	"	Apl. 11	4	Vauxhall 4 p.c. A Deb.	129-134	..	3 19 9	
75,000	5	June 14	6	Malta & Medn., Ltd.	44-5	..	6 0 0	1,155,066	Stk.	June 14	10	West Middlesex	274-279	+1	8 12 2	
560,000	100	Apl. 2	5	Met. of 15 p.c. Deb.	107-110	..	4 10 11	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 1	
260,000	100	"	4½	Melbourne 4½ p.c. Deb.	106-108	..	4 3 4	200,000	"	Sept. 14	8	Do. 8 p.c. Deb.	97-99*	..	3 0 7	
541,920	20	May 31	3½	Monte Video, Ltd.	103-111	..	6 1 8								*Ex div.	
657,946	Stk.	Aug. 30	9½	Newcastle & Gateshead Con.	210-215	..	4 6 1									
296,855	Stk.	June 28	8½	Do. 3½ p.c. Deb.	104-107	..	3 5 5									
160,000	5	May 16	8	Oriental, Ltd.	72-73	..	5 3 8									
135,000	5	"	8	Do. New, £4 10s. pd.	6-6½	..	5 10 10									
16,000	5	"	8	Do. do. 1879, £1 pd.	12-12½	..	4 11 5									



contractors. They stated that 4515 tons of coal contracted for were not delivered. The price of coal averaged 15s. 8½d. per ton for supplies other than on the original contracts; and this caused excess expenditure of £795 10s. 6d. The Sub-Committee, after making a number of recommendations, pointed out that the deficiency was accounted for by the increase in price of coals and the payment from revenue of several sums which might have been held over till the following year. They recommended that meantime the price of gas, as from the last collection in May, be 3s. 4d. per 1000 cubic feet. The Special Committee approved of the report, and expressed regret that the Police Board were not informed of the non-fulfilment of certain coal contracts. A report was also submitted by the Gas Manager on the financial results of last year's working. He pointed out that the quantity of gas to be made during the year was estimated at 290,000,000 cubic feet; and the coal to be used was estimated at 30,000 tons, giving an average make of gas of 9666 cubic feet per ton. The average price of this coal was estimated at 12s. per ton. The actual quantity of gas made, however, was 304,400,000 cubic feet; being an increase of 14,400,000 cubic feet over the estimated quantity. The coal used was 32,500 tons, or an increase of 2500 tons over the estimated quantity; and it gave only an average make of 9366 cubic feet of gas per ton. This average make per ton was due to deficiency in the quality of the coal during the hurry of winter months and difficulties of the coal supply. References were also made in this report to the difficulties of getting coal delivered in time; and this delay, it was stated, added to the shortness of retort power, forced him to use a greater quantity of the better class of coal than had been estimated for, so as to provide an efficient supply of gas. The report and recommendations were adopted. There was, however, some discussion upon the point of whether the increase in the price of gas should be made retrospective, and also upon a proposal that the collector should be required to give details of open accounts in the annual balance-sheet, in order that the sum in his hands should be disclosed. The Police Board were very evenly divided upon the latter subject; the motion being only adopted by 10 votes to 8. It was clear that it was founded upon some feeling; and it probably explains the high state of excitement which has prevailed in the town over the gas management. There is evidently a sharp cleavage among the members of the Board upon gas matters, which does not augur well for the appointment they are about to make. The short list they have selected, out of 40 applicants, is given below. Some names which I expected to see are not there; but probably these men retired. Let no one be surprised if, in the present state of mind among the members, the applicant whom they may consider best for the post should not be appointed.

The following have been selected by the Gas Committee of the Greenock Corporation as a short list of candidates for the post of Gas Manager: Mr. J. McNair, of Wishaw; Mr. William Ewing, of Hamilton; Mr. W. Mackie, of Port Glasgow; Mr. J. Ballantyne, of Rothesay; Mr. W. Currie, of Alexandria; Mr. T. Lighbody, of Renfrew; and Mr. J. McCubbin, of Chorley, near Manchester.

Before his departure from Forfar, Mr. Forbes Waddell has had the satisfaction of receiving a vote of the Corporation which must go far to remove many unpleasant recollections. At a meeting on Wednesday,

he was voted an honorarium of £30, as a recognition of the improvements he has effected upon the gas-works during his residence in the town. There was no direct opposition to the proposal; but his old antagonist Mr. Christie gave vent to some of his characteristic fulminations, and objected to the standing orders being suspended to allow the motion to be made, on the ground that they should have more time to consider such a proposal. He was defeated on this point, and did not move against the vote. Another member moved that the honorarium be £15; and Mr. Christie seconded this. They were the only two who supported the proposal; and the original motion was agreed to. On the evening of the same day, Mr. and Mrs. Waddell were presented by the employees in the gas-works with a cane and umbrella respectively, both articles heavily mounted, as tokens of esteem.

The accounts of the Arbroath Gas Corporation, dealing with the period from May 31, 1899, to July 15, 1900—being the period fixed for the closing of the accounts annually by their new Act—have been issued. In his report, Mr. R. S. Carlow, the Engineer and Manager, states that in this period the quantity of coal used was 7363 tons, as against 6623 tons in 1898-99; being an increase of 740 tons, or 11.17 per cent. The period is six weeks more than the year, and does not, therefore, show a fair comparison with the previous twelve months. Taking the figures for the year to May 31 last, the result is as follows: The quantity of coal used was 6940 tons, as against 6623 tons in 1898-99; being an increase of 317 tons, or 4.79 per cent., during the year ending May 31 last. In the longer period, the output of gas was 68,431,600 cubic feet, as against 62,887,900 feet in the previous year, which is an increase of 5,543,700 cubic feet, or 8.81 per cent. The result for the year to May 31 last was as follows: 64,651,500 cubic feet, as against 62,887,900 feet the previous year, an increase of 1,763,600 cubic feet, or 2.8 per cent. During the longer period, the make has been 9263 cubic feet per ton, which is a decrease of 202 feet, or 2.12 per cent.; and the gas sold has been 8140 cubic feet per ton, which is a decrease of 312 cubic feet, or 3.69 per cent. The result for the year to May 31 last was as follows: The make was 9314 cubic feet per ton, a decrease of 181 cubic feet, or 1.9 per cent.; and the gas sold was 8636 cubic feet per ton, an increase of 184 cubic feet, or 2.17 per cent. For the longer period unaccounted-for gas was 12.4 per cent., an increase of 2.87 per cent. The unaccounted-for gas for the year 1898-99 was 9.53 per cent. of the quantity made; last year it was 7.28 per cent., which was a decrease of 2.25 per cent. The illuminating power of the gas supplied to consumers has averaged 25.2 candles: The number of consumers for the year ending May, 1899, was 5759; for the period to July 15 last, the number was 5945—an increase of 186. In presenting the accounts at a meeting of the Corporation on Thursday night, Mr. Dundas said that the revenue for the period amounted to £13,842, of which £12,271 was derived from gas, £1268 from chemicals, and £214 from coke. The expenditure amounted to £14,093; and there was thus a deficiency of £251. The deficiency, however, was more apparent than real, and was caused mainly by the addition of the six weeks to the year; as during this time their expenditure on wages and coal had been going on, while the gas consumed had not yet been entered in the books. The matter would right itself during the current

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHADE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETTFORD	500,600
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

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year. Under the new Act, a sum of £245 had been paid to the Harbour Trustees. The accounts were approved of. The Finance Committee submitted estimates for the current year, which show an expected surplus of £128; and they recommended that the price of gas be raised by 2½d., making it 4s. 4½d. per 1000 cubic feet. Provost Grant said they were fortunate that the increase in the price of gas was not larger. It was much less than in many other places; and had the Manager not had a very large stock of coal on hand, which was purchased at a low rate, the increase would have required to have been much more than it was. The recommendation of the Committee was adopted.

The Burgh Commissioners of Milngavie have come to the conclusion that, in the meantime, they should not recommend the ratepayers to adopt the Burghs Gas Supply Acts, with a view to taking over the undertaking of the Gas Company; but they are of opinion that, if the Company were to quote a price, the matter might be further considered.

The Largs Burgh Commissioners have failed to adopt the Burghs Gas Supply Acts. At a meeting this week, the adoption was moved; and the voting for and against was equal. It requires a majority of three-fourths to carry the adoption of the Acts; and so the proposal fell through.

The Directors of the Cowdenbeath Gas Company met this week with an expert Engineer, and received his opinion as to the feasibility and the cost of re-converting the concern into a coal-gas works. They unanimously adopted his recommendations, and gave the Secretary instructions to raise the necessary capital. It is expected that coal gas will be supplied in about two months from now.

The Inverkeithing Gas Company have advanced the price of gas from 6s. 8d. to 6s. 10½d. per 1000 cubic feet. The increased cost of coal would have warranted a greater increase; but the Directors have resolved to reduce the dividend to be paid next year.

Bervie is a small and decaying town, in which there is an annual output of gas of about 330,000 cubic feet. The Gas Company have a debit balance of £111, of which £51 was incurred last year. The Town Council have been communicated with on the question of taking over the undertaking; and they have replied asking the terms proposed by the Company. A meeting of the shareholders is to be held to consider the matter. The price of gas was increased from 8s. 4d. to 9s. 2d. per 1000 cubic feet.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 22.

**Sulphate of Ammonia.**—Although there has been more business doing, it has not been sufficient to arrest the decline in values; the closing quotations being £10 10s. per ton f.o.b. Hull and Leith, and £10 15s. per ton f.o.b. Liverpool. There have been sales at second hand at £10 8s. 9d. per ton f.o.b. Leith. The particular weakness of the Scotch market has no doubt been occasioned by the blocking of shipments from Glasgow, owing to the plague; and the higher prices obtainable at Liverpool have been caused by the placing of additional orders at that point. In the forward position, there continues to be large inquiry; but buyers' ideas

are too low to admit of much business—makers being only anxious to sell for prompt or early delivery. For delivery up to the end of the year, they require a stiff premium on prompt prices, while for January-March, and January-June they decline to offer. There are, however, speculative sellers for October-December, or October-March, at £10 15s. per ton, f.o.b. Leith. London (Beckton terms) is offered at £10 15s. per ton; but this price is not so far obtainable.

**Nitrate of Soda** is quiet at 8s. 1½d. to 8s. 4½d. per cwt. according to quality on spot.

LONDON, Sept. 22.

**Tar Products.**—There is a somewhat better inquiry for benzol, and the make is well taken up. Prices for both 50's and 90's are better. Unexpectedly large quantities of benzol are now going into gas enrichment, apparently removing the surplus that has kept the market value down so long. In solvent naphtha there is more business doing; but for other kinds of naphtha, there is no improvement in price. Creosote is still dull. Pitch is moderately steady. Carbolic acid is firm. Naphthalene is also in better odour; but in the aggregate there is very little of an encouraging character.

Average quotations for the week are: Tar, 15s. to 23s. Pitch, east coast, 37s.; west coast, 32s. 6d. Benzol, 90's, 10½d.; 50's, 11½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2½d. Crude naphtha, 3¾d. Heavy naphtha, 1s. Creosote, 1½d. to 2d. Heavy oils, 2¾d. Carbolic acid, 60's, 2s. 11d. Naphthalene, 70s.; salts, 45s. Anthracene nominal, "A," 3½d. to 4d.; "B," 2½d.

**Sulphate of Ammonia.**—This market is very slack with only a little new business being reported. It looks very much as if sulphate has again got into the hands of the middlemen, who are operating the market much as they like. There are, however, no stocks in the country. The consumption is steadily increasing all over the world; and it is expected that the present low prices are only temporary. To-day's value at all ports will average about £10 11s. 3d. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The talk of a further advance in prices with the close of the present month, which was very rife in one or two quarters, has been definitely disposed of by the decision come to at a meeting of the Lancashire Coal Sales Association, held in Manchester on Tuesday last, and by the attitude taken up by the principal colliery firms in the Manchester district. At the Coal Sales Association meeting, several representatives from the West Lancashire district strongly urged that the owners would be justified in advancing round coal prices 1s. 8d. per ton on Oct. 1, when the first of the series of three 5 per cent. advances in wages would come into operation. In face, however, of the decision on the part of the leading Manchester coalowners not to make any move at all with the close of the present month, the proposal from West Lancashire for a further advance met with very little support; and



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upon application.



ultimately it was decided that the whole question of prices should be adjourned for five weeks. The better qualities of round coal continue in fairly active request for house-fire purposes; and in most cases collieries are readily disposing of all they are raising, with the result that no stocks are as yet accumulating, which undoubtedly is strengthening the position for the winter. But whether later on prices will be advanced, remains a very open question. At the pit mouth, list prices are firm at 16s. 6d. to 17s. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Common round coals are also in tolerably good inland demand for steam and forge purposes, with pit prices strong at 12s. 6d. to 13s. per ton. It is, however, probable that, but for the continued pressure of shipping orders, coalowners might just now have some surplus supplies on their hands. Anything, however, they have to offer beyond their inland demand, they can sell at much better prices for shipment; good qualities of steam coal fetching from 17s. to 18s. per ton delivered at the Mersey ports. The weak point in the market is the position as regards engine fuel, the demand for which has fallen off considerably, owing to the unsatisfactory outlook in the cotton trade; and there was an anticipation in the market that, at the meeting of the Coal Sales Association, some reduction in prices might be announced. The Lancashire coalowners, however, do not consider that the situation at all necessitates any reduction of prices, as, although many of them are putting down into stock, it is believed this will be required during the ensuing winter; and for the present they remain indifferent to the underselling which is going on, with slack coming in from other districts. The average prices quoted, however, show an easing down from the top figures which were asked a short time back; and 10s. 6d. represents a full average figure for good rough Lancashire slack at the pit, while the finer screened slacks can be bought at considerably below this figure, and in many cases have been sent away for shipment at low prices. For furnace cokes, a moderate demand is reported, with prices ranging from 20s. to 21s. per ton at the ovens. Foundry cokes are perhaps in rather better request; and for these prices are being well maintained, according to quality, at from 28s. to 31s. per ton at the ovens.

**Northern Coal Trade.**—There is rather a different aspect of the two branches of the northern coal trade at present. The steam coal trade is quieter, and with prices falling; but the Durham coal trade is active, with the output fully taken up. Best Northumbrian steam coals have fallen in price to about 18s. per ton f.o.b., since the beginning of the closing of the Baltic demand. Steam smalls are also lower, and are quoted at from 11s. to 11s. 6d. per ton f.o.b. It is possible that lower values may be known for this class of coal. In the gas coal trade, there is now a better demand; and the quantities that are taken on contracts have been appreciably raised. With rapid voyages of steamers, a large tonnage of coals is now being delivered to the great gas companies. For occasional cargoes, the price quoted is about 18s. per ton f.o.b.; but little is being sold in this way at present. Some new contracts are in treaty; and it is expected that about 16s. per ton f.o.b. will be the price. In coke, export qualities are quieter at about 30s. to 32s. 6d. per ton f.o.b. Blast-furnace coke has been quoted at 27s. 6d. to 28s., free on Teesside. As to gas

coke, the best test is found in the fact that the Newcastle School Board contracts have been placed at 25s. per ton, or about 7s. per ton above those of the past year.

**Scotch Coal Trade.**—The demand is still maintained, and prices are unchanged. These are quoted as: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 16s. 6d. to 17s. 6d., and splint 16s. to 17s. The shipments for the week amounted to 265,578 tons—an increase of 4076 tons over the previous week, and of 53,219 tons over the corresponding week of last year. For the year to date, the total shipments have been 7,742,704 tons—an increase of 1,455,324 tons.

**The Local Government Board and the Manufacture of Water Gas.**—The Darlington Corporation must be numbered among the authorities to whom the Local Government Board have refused to sanction loans for the erection of water-gas plant. In view of this, the Gas and Electric Lighting Committee have considered it desirable to put aside some of the profits of the past half year for the purpose of meeting the outlay. It is stated that the six months' profits on the undertakings controlled by the Committee are very satisfactory.

**Extension of Incandescent Gas Lighting at Oldham.**—Mr. Arthur Andrew, the Superintendent of the Oldham Corporation Gas Department, has reported to the Committee that the system of incandescent gas lighting adopted in Clegg Street and Wellington Street has been an improvement on the old method; and he therefore suggests that about 100 or 200 additional lamps of this description should be placed in the main thoroughfares of the town. The existing lamps, he adds, could be altered to suit the light, at a cost of about 20s. each. The suggestion has been adopted.

**Water-Works Improvements at Wellington.**—A Local Government inquiry has been held at Wellington, by Mr. H. P. Boulnois, relative to an application by the Council for sanction to borrow £4000 for the purposes of water supply, including the construction of works in the parish of Hadley. The facts bearing upon the matter were stated by the Clerk (Mr. J. W. Littlewood). He referred to the powers of the Council as water suppliers, and mentioned that the cost of purchasing the rights of the old Water Company amounted to £12,000. The balance of the loan obtained to acquire these rights now amounted to £7513. He further recounted the steps that the Council had had to take to prevent other authorities securing rights of supply in Hadley. Mr. M. Morley, Surveyor to the Council, said the present supply of water from the Wrekin and Steeraway reservoirs reached 160,000 gallons a day; and a considerable quantity ran to waste besides. The population already supplied numbered a little more than 7000; thus giving an average of about 23 gallons per head per day. The population the Council proposed to be able to provide for in future at Hadley was about 4000. It appeared clear from the evidence that Hadley required an improved supply; and, although there was a little opposition, the Inspector opined that the Wellington authority were the people who would ultimately be responsible for its provision.

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**Windsor Gaslight Company.**—Addressing the shareholders at the half-yearly meeting of this Company, the Chairman (Mr. J. L. Hollis) stated that sufficient had been earned to pay the maximum dividends on all classes of shares, notwithstanding that the cost of coal had risen from £3544 to £4077. The outlay on purifying materials and wages had increased; but the distribution expenses had decreased. The total expenditure for the half year amounted to £7736, against £7293. The amount carried to profit and loss was £2133, as compared with £2055. The consumption of gas by private consumers was 41,962,600 cubic feet, against 41,500,000 cubic feet. Then 346,500 cubic feet were supplied to lamps outside the Corporation district, against 1,225,000 feet consumed for public lighting last year. The receipts from residuals showed a marked improvement; coke bringing in £1844, as against £1458. The total revenue was £9869, as compared with £9348. Regarding the increase in the price of gas, he said the Directors had no alternative but to raise it. The last contract for coal was at 15s. 9d. per ton; and they now had to pay 22s. 9d. per ton—an increase of 7s. The consumption in the year was 10,000 tons; so that coal would cost them £3500 more. Putting sales of gas at 85,000,000 cubic feet for the year, the increase of 6d. per 1000 cubic feet would give them £2125, leaving £1375 to be realized from other sources. It was hoped the better price for residuals would make up the greater part of this; but anyhow it would be seen that they were not putting the whole of the great increase in the cost of coals on the consumers. The report was adopted.

**Shrewsbury Corporation Water Supply.**—For some years past the time has been opportune for an amendment in the water supply of Shrewsbury; but thinking that the present time is peculiarly so, Mr. Roff King, at the meeting of the Shrewsbury Town Council yesterday week, proposed the following resolution: "That the question of augmenting the drinking supply of the borough by obtaining additional water from an upland source, from springs in the conduit area, or other sources, is worthy of the careful consideration of this Council, and that the Water Committee be requested to investigate the same and report thereon." Mr. King carried his arguments to the point at which he held that it was necessary an upland source should be decided upon; and he suggested the Habberley Valley or the Castle Pulverbatch scheme, estimated to cost £59,000. He did not propose that this scheme could be carried out at the present time for that estimate. Instead of a reservoir to hold 42,000,000 gallons, as proposed by Mr. Baldwin Latham, a small one to hold (say) 200,000 gallons, and much nearer home, would answer their present purpose, and serve as a subsiding reservoir later on; while as to mains, he suggested that since they had to obtain their wayleave and open the ground, it would be as well to lay down a 12-inch pipe that would form part of the whole scheme. The Chairman of the Finance Committee had told them that they could spend £40,000 without any addition to the rates. Surely such works as he proposed could be carried out for a much less sum. There were also other means of augmenting their supply of water which he thought deserved careful consideration; and he named them. There was very little discussion on the resolution, which was rejected. Past experience evidently has prejudiced the Council against tinkering with the supply.

**Leeds Corporation Water-Works.**—It was reported to the Leeds Corporation Water Committee last Friday that a new 300-horse power Cornish engine has been set to work at the Arthington pumping-station, and is delivering water into the Eccup reservoir. In a few days twin engines of 300-horse power, which have been undergoing repairs, will be engaged on the same work. An 18-inch main for supplying Shadwell with water from the Moortown reservoir will shortly be completed; and steps are being taken to lay an additional 18-inch main from the pumping-station at Headingley to Bramley.

**Proposed New Water Supply for Harrogate.**—At the meeting of the Harrogate Town Council yesterday week, a report by the Water-Works Committee was presented on the question of securing an additional water supply for Harrogate. The Committee stated that they had visited the available districts of water supply in the watersheds of the Rivers Nidd and Ure, and the best available scheme was undoubtedly the one recommended by their Water Engineer (Mr. E. W. Dixon), at the junction of the Agill and the Arnagill, to utilize the water from these streams, and construct a reservoir near their junction, on the estate of Lord Masham. The Corporation instructed their Engineer to prepare the necessary plans to be presented to Parliament next session for the carrying out of such a scheme.

**Water-Works for Upper Greetland.**—On Friday, the 7th inst., the works which have been constructed for furnishing Upper Greetland with an adequate supply of pure water were formally opened by Sir George J. Armytage, Bart., the Chairman of the Halifax Rural District Council. They have been constructed on the verge of Norland Moor, near the springs, and just at the boundary between Norland and Upper Greetland. The plans were prepared by Mr. F. Gordon, the Engineer to the Council, who is responsible for the carrying out of the scheme. The reservoir, which is 50 feet long, 40 feet wide, and 5 feet deep, has a capacity of 66,000 gallons, and will contain 21 days' supply for 45 houses in Upper Greetland, allowing 15 gallons per head per day. The whole scheme has been carried out at an outlay of about £1500.

**Horwich Water Supply.**—At a recent special meeting of the Water Committee of the Horwich Urban District Council, the Chairman (Mr. J. Dickinson) moved that the seal of the Council should be affixed to certain agreements for leases for water rights. In doing so, he sketched the history of the undertaking, and stated that in 1897 the average daily consumption of water was 175,298 gallons; in 1898 it was 152,362 gallons (the reduction being due to the stoppage of leakage); in 1899 it was 151,131 gallons; for the first six months of the current year it was 165,832 gallons; while last month it was 179,000 gallons. In the draft scheme they had adopted, the additional yield of water would, on an average, be 325,000 gallons a day; making with their present supply 475,000 gallons. If anyone questioned the necessity for this additional supply, he replied that it was useless to ask the Local Government Board to sanction a scheme which only provided for present needs. They must make provision for years to come. The reservoir would be constructed at such an altitude as to serve the whole of the district by gravitation. The extra service of water had been obtained at a cost not exceeding about 1d. per 1000 gallons.

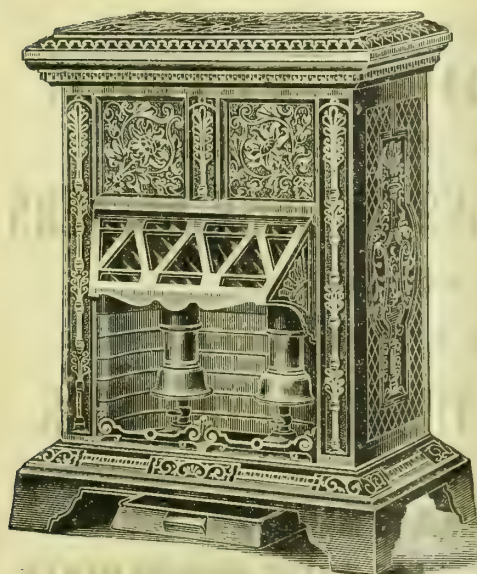
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**The Projected Water Scheme for Cumberland.**—On Tuesday, at the meeting of the Wigton Rural District Council an important decision was arrived at with regard to the Overwater and Head of Ellen water scheme. The meeting was asked to approve of a resolution in favour of the promotion of a Bill in the next session of Parliament for the constitution and incorporation of a Joint Water Board for the Aspatria, Holme Cultram, and Wigton districts, with a view to carrying out a joint scheme. The resolution was supported by fourteen members; but as a majority vote of all the councillors was not forthcoming, it fell to the ground. This decision practically excludes the Wigton rural district from taking further action, as a body, in the promotion of the scheme. The Holme Cultram and Aspatria Councils have, however, adopted the resolution; and meetings of the ratepayers will be held to confirm their action.

**Conviction for an Extensive Theft of Water.**—At the Sessions of the Central Criminal Court, just concluded, Joseph Holland, a builder, was charged with stealing 900,000 gallons of water, the property of the East London Water-Works Company. The hearing of the case was commenced at the previous sessions; but, owing to illness in the family of one of the Jurymen, it was adjourned. From the evidence adduced, it appeared that the defendant was engaged in building some houses on an estate in the neighbourhood of West Ham; and it was alleged that he had surreptitiously used water belonging to the Company for the purpose of the building operations. For the defence it was contended that there was absolutely no foundation for the charge. The defendant had an income of £2000 a year; and his Counsel ridiculed the suggestion that he would have taken water without paying for it. The defendant gave evidence denying the charge. He said that he got water for his building operations from two wells and a ballast-hole which he dug on the estate. After a two days' trial, the Jury found the prisoner "Guilty," and he was sentenced to nine months' imprisonment in the second division.

**Association for Amending the Law Regarding the Rating of Reservoirs.**—The Thames Ditton District Council recently sought the advice of the Local Government Board as to their power to contribute to the funds of the Association formed for the purpose of amending the law relating to the rating of reservoirs. The Board, in their reply, state that they are not aware of any statutory power enabling the Council to make such a contribution. It will be a matter for the District Auditor to decide; and the Board may then be appealed to against his decision. Upon this the Council, with commendable caution, have resolved to hear the result of Sunbury's action in subscribing; and meanwhile for the edification of the Sunbury Council, they have forwarded to them a copy of the Local Government Board's communication. On the matter being mentioned at a meeting of the Sunbury Council yesterday week, it was stated that a pamphlet was being prepared dealing with the subject of the rating of reservoirs, which was of a non-party nature, but contained questions which might be asked of parliamentary candidates. No less than 647 circulars had been posted to different rating authorities in the United Kingdom; and replies, he was pleased to say, were coming in pretty freely at present.

**The Thames Ditton District Council and the Lambeth Water Company's Bill.**—In reply to inquiries by the Thames Ditton District Council as to whether their costs in opposing the Lambeth Water Bill last session could be provided for by a loan, the Local Government Board have written that, on the information furnished, it did not appear that they had the power to sanction a loan for such a purpose. The Council intend submitting to the Board a statement of circumstances and reasons why a loan should be granted.

**A Retrograde District Council.**—Not long since the District Council of Oakengates decided to adopt oil for public lighting, because the Gas Company would not allow them to fix their own price! Why they should be permitted to settle the price they should pay for gas any more than for any other commodity, is not at all clear, and so need not be discussed. But by this time, there is little doubt that, if the councillors possess sufficient common-sense, they have realized that many of their constituents regard their action as a retrograde one. The "reflections" on the subject of one correspondent of a local paper has led him to blossom out into verse, in which he foresees the time when the retrogression of these councillors will end in them "painting their corporeal frames, instead of wearing clothes." But on the oil lighting, he says—

The consequences of this scheme

There can be little doubt of;

For Oakengates most folk will deem

A fine place to live out of;

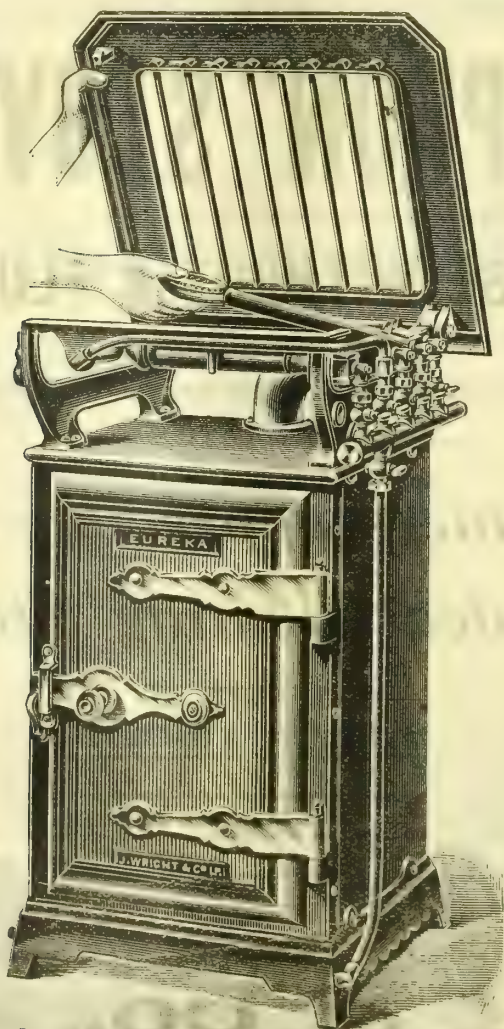
And those who "pay the piper" there

With natural amaze

Behold their town regarded as

A light of other days.

**Whaley Bridge Water Supply.**—Last Wednesday, Mr. H. Percy Boulnois, M.Inst.C.E., held a Local Government Board inquiry into an application by the Whaley Bridge Urban Council for powers to borrow £7000 for providing a water supply for the district. There was some opposition to the scheme on the grounds of the water supply of the works being imperilled. The Inspector stated that, of course, all existing water rights would have to be respected, or compensation allowed. The Stockport Corporation (through the Town Clerk) stated that an arrangement had been made satisfactory to the Urban Council; and Stockport's opposition had been withdrawn. It was agreed that the former body should furnish the Corporation with a daily supply of water, not exceeding 10,000 gallons, for the Furness Vale portion of the Disley township, which adjoins that of the Whaley Bridge Council's district, for 15 years, or so long as they were able—the price to be based upon 1d. per 1000 gallons profit on the actual cost of such water to the Council. Subsequently details of the scheme were given by Mr. Stirling, the Engineer, showing that, in addition to the Council acquiring the existing plant and works of Colonel Cotton Jodrell at Slow Heads for £900, it was proposed to secure an underground water supply from a bore-hole at Dig Lee Clough, Furness Vale, and to make a reservoir of sufficient area to furnish 400 houses and a population of 1450 with 20 gallons of water per head—with provision to increase the supply when required. The assessable value of the district was stated to be £5448; and the acreage 1322.



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**Rothwell Gas Company.**—At the half-yearly meeting of this Company, it was reported that the gross profit was £2746, being more by £263 than at the same period last year; but the expenses were greater by £479, caused by heavier charges for coal, &c. The net profit was less by £215 than for the corresponding half last year. The advance of 5s. per ton in the price of coal under the new contracts would, it was stated, mean an increased cost of production of 8d. per 1000 cubic feet of gas sold; but it was estimated that an increase of 3d. in the price of gas and the additional value of coke would to a large extent cover this higher expenditure. Resolutions were passed adopting the report and accounts and agreeing to the payment of the maximum dividend of 10 per cent. The shareholders also authorized the Directors to borrow £1000 additional loan capital.

**The Bury Joint Water Board.**—The Bury Joint Water Board has been duly formed, and the first meeting of the new authority held. Alderman Brierley, who has been Chairman of the Water-Works Committee of the Bury Corporation for some years, is Chairman of the Board, and Mr. J. Cunliffe, a member of the Radcliffe District Council, is Deputy-Chairman. Mr. J. Haslam, the Town Clerk of Bury, is Clerk; Mr. R. W. Buxton, Treasurer; and Mr. R. Rigby, Acting Manager. The newly-constituted Board comprise representatives of the Bury Corporation, and the Little Lever, Haslingden, Rawtenstall, Radcliffe, Whitefield, Tottington, and Bury Rural District Councils. The Board have taken over the water undertaking from the Bury Corporation, refunding the amounts expended from the borough fund and the special water-rate by Bury since 1872, to make good the losses incurred in working the undertaking—in all amounting to £150,000.

**A Mendacious Gas-Meter.**—During the past week, the daily Press, both London and Provincial, have been trying to amuse their readers over the strange case of a gas-meter which has been slothful in duty at the public baths and wash-houses of the Rotherhithe Vestry for the last eighteen years. The matter first obtained publicity at the meeting of the Vestry last Tuesday evening, when a letter was read from the South Metropolitan Gas Company, stating that it had just been discovered that the gas-meter at the public baths and wash-houses had been recording only one-tenth of the actual quantity consumed during the past eighteen years. The dial had registered hundreds for thousands, and thousands for tens of thousands. The Company, therefore, sent in a bill for these arrears, which amounted to £2927 14s. 9d. The Directors, it was added, would be willing to accept payment of this amount by instalments. It was stated that the Baths Committee had observed the small quantity of gas registered, and had even gone to the trouble of having the meter tested some years ago. It was then returned as quite correct. The letter having been read, the members of the Vestry grew quite facetious over the matter. But amid the humorous remarks, it was observed by the Chairman that, even if the Company were entitled to anything, they could not claim for more than six years; the prior period being covered by the Statute of Limitations. But there would certainly be a desperate fight to get even the six years. The matter was referred to the Baths Committee.

**Margate and its Water Supply.**—At last week's meeting of the Margate Town Council, a long discussion took place as to the water supply of the borough. It originated in a proposal that the opinion of two engineers and a geologist should be taken on a report prepared by the Borough Engineer, Mr. A. Latham. He estimated that the requirements of the town at the height of the season amounted to 1,225,000 gallons per day, and suggested that the present supply should not be depended upon for more than 650,000 gallons per day, to prevent over-pumping at the two stations. At the present rate of increase, he estimated that in 20 years' time the daily consumption would amount to 2,000,000 gallons, and any new scheme undertaken should be capable of yielding this quantity, so as to make the town independent of the present sources of supply, if at any time it was found necessary to abandon them. After pointing out the impossibility of securing a new area in the Isle of Thanet from which such a supply could be procured in a dry summer, Mr. Latham placed before the Council two alternative schemes—one to obtain an independent supply from the North Stream, Sandwich, at an estimated cost of £100,760, and the other for obtaining a supply from Wingham, at an estimated cost of £90,829. Both these estimates were based on a supply of a million gallons per day. In the course of the debate, an alternative scheme—using sea water for flushing and street watering purposes—was suggested; it being contended that in this way the present supply of water for potable purposes is far ahead of what would be required for many years to come.

Alderman Hayday (West Ham) has been appointed official organizer to the Gas Workers and General Labourers' Union.

Messrs. R. Laidlaw and Son, of Edinburgh, have secured the contract for the whole of the gas-meters required by the Glasgow Corporation during the next twelve months.

Orders have just been received by Messrs. Kirkham, Hulett, and Chandler, Limited, for their "Standard" Washer-Scrubbers from the Clay Cross Company, the Herne Bay Gas Company, and the Clacton Urban District Council.

Last week, the Great Northern Railway began running a train between King's Cross and Hatfield fitted with a new gas apparatus for lighting the carriages. The taps are connected with the vacuum brake, so that when the train pulls up at a station the lights in the carriages are automatically lowered.

The accounts of the East London Water Company for the half year ended Midsummer show a net balance of £64,098 available for dividend, out of which the Directors recommend a dividend on the ordinary stock at the rate of 7 per cent. per annum, less income-tax; leaving a balance of £3879 to be carried forward.

Owing to the alarming report of an analyst on the water supply, the Ilford District Council have passed a resolution urging that Ilford should unite with the adjoining Councils of Romford and Barking to promote a Bill in Parliament authorizing them to buy up the South Essex Water Company and to construct new works.

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Sept. 18, 1900.

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THE SIXTH (AND CENTENARY) EDITION OF THE

# HANDBOOK

FOR

# GAS ENGINEERS and MANAGERS.

By THOMAS NEWBIGGING, M.Inst.C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.



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## EDITORIAL NOTES.

## The Tottenham Gas Suffocation Case.

THE proceedings at the Coroner's inquest on the bodies of the victims of the sad gas poisoning case at Tottenham, which were reported in last week's "JOURNAL," possess a painful interest for all those who were immediately concerned in the affair, and a high degree of general interest for gas companies and consumers. The facts of the occurrence are clear enough. A new shilling-prepayment meter was fixed by the Tottenham and Edmonton Gas Company in the house of the Sanders family on Tuesday, Sept. 11. The Company's gas-fitter asked Mrs. Sanders to give him a shilling to start the meter with, which was refused him; and he therefore went away, after turning off the main-cock and warning the woman, if a leak should be discovered when the meter was put in action, to turn off the gas by the main-cock and give notice to the Company. The comment of the Coroner, "The man could not have done 'more than he did,' will be endorsed by the majority of reasonable people. It was given in evidence that, after the occurrence of the casualty to the two Sanders, father and son, on the following night, a shilling was discovered in the cash-box of the meter, and two burners were found turned on. Nobody owned to having put in the shilling; and the inference is that the elder Sanders must have done it after everybody else in the house had gone to bed. The wife's evidence further goes to show that the man was probably not in a condition at the time to notice whether the meter leaked or not. At any rate, she did not remember his coming to bed, or anything else until she woke up in the hospital. The verdict of "Accidental death" was the only possible one upon the evidence.

The most salient point of general interest in this mournful story is the proof that an escape of town's gas can prove fatal to sleeping human beings, while insufficient in quantity to make a mixture that will ignite at a naked flame in the same tightly-closed room. There does not appear to have been any means of ventilation whatever here. Blind chance arranges some striking experiments, sometimes. It can be easily understood that Dr. Haldane would have given much to have been the first to enter this house of Death, with his air-testing implements. It is not surprising that the Coroner's Jury wished to add a rider to their verdict; nor that the Company objected, and with success. In view of the possibility of civil proceedings against the Company, nothing ought to be said or done to prejudice the questions that may be raised.

We notice, however, that the "Lancet" has been moved to express some surprise at "the extraordinary method of 'the Company,' which it trusts is not 'the universal rule,'" and remarks that "clearly it was the duty of the Company's official to have tested the meter and to have 'ascertained that it was fixed properly.'" The common law of liability for the consequences of an act of proved negligence has frequently been laid down. Persons are bound to exercise ordinary and reasonable care and forethought in whatever they may do; but nothing more. The Gas Company in this case are responsible for the acts of their servant; but so is the consumer, with whom they do business, for the actions of his wife. It may be for the Court to determine whether there was legal negligence on the part of the Company, in not taking the meter away again when there was no coin forthcoming to completely test the soundness of the connections on both sides; or whether there was contributory negligence on the part of the consumer in not providing the wherewithal to make the test. It is obviously no part of a gas company's duty to supply consumers with coins to put into the cash-boxes of their meters. And the objection to allowing gas-fitters to have access to the cash-boxes under pretence of testing is equally obvious. There would be a loud outcry against a cast-iron rule that a prepayment meter must in no case be left in a poor man's house just because the wife did not happen for the moment to have the needful coin wherewith to start it.

The "Lancet," moreover, tackles us for having, in our "Editorial Notes" for the 18th ult., laid stress on the circumstance that the work of gas-fitting for the users of prepayment meters being done for them by the gas company, "is an effectual protection against any mishap 'attributable to flimsiness of material, unsafe design, 'or fraudulent workmanship on the part of some local 'fitter.'" Upon this our medical contemporary remarks:

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"We take it that the writer was referring to the ordinary 'gas-meter'; but surely the same 'effectual protection' should be afforded (if such is the case) when slot-meters are fixed. If not, the Company should be held responsible for any accidents which arise through the defective 'fitting of the meter which they supply.'" It has escaped the writer of these perfectly fair lines that we used the term "prepayment meters," which applies to what he calls "slot-meters," and also to other devices having the same object with which he is not familiar, not being in the business. Our words were carefully chosen, and do not refer to cases of pure accident, against which, of course, there can be no complete safeguard. We were merely claiming that a gas company's work is absolutely free from the shortcomings which are not unknown in that of the "jerry" gas-fitter. Lastly, gas companies already are fully responsible for any accidents that arise through their own defective work, whatever it may be; but the question of fact has, of course, to be settled in every case. It would be a great loss to the community if the prepayment meter branch of gas companies' business were to be so burdened with excessive financial risk that the companies found themselves driven out of it. There is a certain additional risk, of course, in this class of business, let it be never so carefully managed. Workmen will be careless sometimes, even in the best-regulated undertakings. All this gas companies are prepared for; but they do ask for simple justice, and protest against cases of "The Gas Company and the Public" being dealt with on the "rich company and poor consumer" principle. They have had ample experience of this Robin Hood's kind of equity in respect of other matters.

#### The Rumoured Rise in the Price of Coal.

It was rumoured in some of the daily papers last week that the price of coal was to be advanced at the beginning of this month, in view of the fact that, under the arrangement made recently between the owners and the miners, the latter would then be receiving an increase of 5 per cent. in their wages. The reports of the proceedings on the Coal Exchange yesterday are not to hand at the time of writing; but we hardly think it likely that the rumour will prove well founded. The suggested reason for an advance in price is, of course, altogether inadequate, as in the coal trade wages are directly governed by prices, and not *vice versa*. If, wages having been increased because prices are high, prices were advanced because wages had gone up, it is difficult to see where the process would stop. The excuse put forward is, in fact, only an excuse; and the rumour was, we believe, circulated with the idea of creating a ground for a rise in price by scaring the public into the market to buy. The public, however, are getting used to the cry of "Wolf;" and those who have not already bought their winter's stock have concluded that they may as well wait a bit, because, as they say, things cannot be much worse, and they may be better.

That they will be better before long we do not doubt—provided that the Parisian meteorologists prove false prophets. They tell us the coming winter is to be abnormally severe; but perhaps they are only acting on the principle that if you keep on prophesying that which must ultimately come to pass, you will some day be correct, for they predicted precisely the same last year. True, the holly is already full of berry, which the country-folk maintain is a sure sign of a hard winter; but we have seen that forecast falsified before now, and believe the question of the weather for the next six months to be still an open one. At any rate, there is no possible justification now existing for putting up the price of coal; and it will be interesting to see whether the recent expressions of regret from coalowners, that such full advantage has been taken of the temporary scarcity, to the hurt of trade in general, were genuine, or were only crocodile's tears. The "Iron and Coal Trades Review" now joins the chorus of mourners over the sad necessity which has compelled iron and coal merchants, so greatly against their will, to charge the public such prices as have lately ruled. "The boom," says our contemporary, "has gone a little too far. It has involved a certain amount of abuse of prosperity, which 'may be attended with a corresponding Nemesis at a later period.'" We presume the writer means that Nemesis will mete out a corresponding punishment to the abusers of prosperity. However, it is at any rate clear the prospect is not regarded with equanimity by the organ of the allied trades. It is true that "the men at the helm" are told that

they "need not be much afraid;" but this sounds somewhat like whistling to keep up one's courage.

We do not, be it understood, prophesy a heavy fall in prices this side of Christmas—that would, we fear, be imagining a vain thing. But we do believe that the tide has turned, and that the worst is passed. The probability of an early settlement of the big strike in America is favourable to an easing of the situation; and the great efforts that are being made to increase the output in Germany, where the scarcity is most marked at present, will go to remove by degrees one of the obstacles in the way of cheaper coal here. Italy, too—one of our own large customers—is reported to be having recourse more freely to water-generated electric power in lieu of steam power, thereby reducing her coal requirements. Every mickle makes a muckle; and coal contracts next spring will be closed at figures very different from those at which the current agreements were negotiated.

#### Socialists in Congress.

To the meeting of congresses in Paris at the present time there appears to be no end. All industries and professions are having their foregatherings; and the air is filled with the reading of many papers, and the making of many speeches—some of practical value, others of no value at all. In the latter category may be placed the vapourings at the Congress of the Socialists, who had their innings last week. The Socialists have, it appears from the report of their debates, decided to form an International Committee "to meet occasionally in some Central European town." What they are to do when they meet, we are not clearly told; but we can only say that if they accomplish nothing more practical and useful than passing resolutions similar to those adopted by the Paris Congress last week, the delegates had better reconsider the matter and save their travelling expenses.

The Congress first unanimously adopted a resolution in favour of eight hours as the maximum limit of the day's work in all trades. Well, of course, there was no harm in their doing this; but one had begun to hope that the obviously absurd proposal for an arbitrary limitation of the hours in all trades had already died of ridicule. The letter of a correspondent to the current number of the "Spectator," reporting a conversation with a Yorkshire farm hand, supplies just one, but that an all-sufficient, instance of the utter impracticability of the idea. "On a 'farm,'" said the speaker, "even if you go to bed at eight 'o'clock, you never know that you mayn't have to get up 'to a cow calving, a horse ill, or something of that sort. 'The Eight-Hour Bill would do no good to us; for you 'can't have two men for every job, and, in farming, so 'many things happen that you can't fix a man's time.'" Just so: "You can't have two men for every job;" and what would the mover of the aforesaid resolution say if the doctor left his bedside at a critical moment because his eight-hour day was up?

A corollary to this precious resolution was one in favour of a minimum or "living" wage. In the discussion that took place, the German delegates were guilty of a gross piece of impertinence. They talked common-sense; and where is common-sense more out of place than at a Socialists' Congress? The Germans "pointed out that it was "of no use fixing a rate of wages unless the price of the 'necessities of life could likewise be regulated.'" It was really most inconsiderate of them to so neatly prick the bubble of that meaningless phrase "a living wage." However, nothing daunted—apparently regulating the price of the necessities of life was deemed to be a matter that could be arranged in a spare half-hour—the Congress passed resolutions declaring the need of having "strong 'Trade Unions to fix and maintain the minimum wage,' which should be sufficient to procure the means of a decent and healthy existence. Then a motion in favour of a universal First of May Demonstration was carried; but its passing led to the termination of that session of the Congress under somewhat amusing circumstances. So far, we read, the proceedings had been conducted with the greatest order; but a French delegate having proposed that the resolution should be printed, "Signor Costa retorted that the organizers of the Congress had dis-appeared, together with whatever cash might be available for this purpose." A tumult ensued, and the Congress adjourned "after giving vent to expressions of 'indignation at the cavalier treatment it had received.'" The practical step taken by the organizers to ensure the



redistribution of wealth was evidently not appreciated by the advocates of the process.

The only point worthy of serious consideration that is brought to notice by this assemblage of eccentrics and cranks is the growing tendency of the Socialists—observable especially in Germany—to leave their former attitude of “splendid isolation,” in which they were practically powerless, and to ally themselves with the extremists in the other political parties. This tendency clearly makes for danger and trouble, more particularly in the labour world. It is fortunate indeed for England that the philosophy of Socialism has never widely commended itself to the mass of working men in this country, who, be their faults never so many, are too well balanced and practical in mind to ever be carried far by the wind of empty theory.

#### A Scandalous Story from Dundee.

AN extraordinary story comes from Dundee, in the form of an article on “The Price of Gas” published by a local newspaper. It is reported that a very peculiar state of matters has been revealed in connection with increasing the charge for gas in Dundee, which was resolved upon at the annual meeting of the Gas Commissioners on June 20, when it was agreed to raise the price from 3s. 4d. to 3s. 10d. per 1000 cubic feet. Naturally, this increase was not regarded at the time with popular favour; but it passed. Now it appears that the gas bills just delivered throughout the burgh are made out at the higher price as from the previous rendering of accounts, somewhat vaguely stated as referring to “a certain date in March or April.” This discovery is described as an unpleasant surprise for those householders who fondly believed that the price of gas stood at the old figure until it was increased on the date named. This is an old sore. The law as to payment for gas supply exists in several forms, and is very often summarized in the agreements with undertakers which prospective consumers are required to sign. These generally stipulate that the supply shall be paid for at the prices from time to time in force in the district for the particular class of consumption. There is no necessary time connection between the administrative act of fixing the price of gas and the executive acts of taking the register of the consumer’s meter and sending in the account—except that they must affect accounts still to be rendered. There can be no such thing as making an increase in the price of gas retrospective, in the only proper sense of going behind the account previously rendered. Gas supply, however, is a thing in action, which goes on between certain regular periods for the making up and delivering of the accounts; and it would be a strong line to take that a statutory price may not legally be made and levied between any two meter takings. At the same time, one can sympathize with the view that a prudent gas administration would avoid giving occasion for raising any such question, by being beforehand with the notice of increase. A man likes to know the price of what he is about to purchase; and it is only fair to tell him. This grievance of the *pseudo*-retrospective operation of the Dundee increase is not the worst of the tale. It is asserted that the Commissioners “are actually granting” concessions to some, and leaving others to pay the full “amount.” Some of the big consumers, so the story goes, have bestirred themselves in the matter, and have obtained special rebates. “In one instance, where the gas bill was over £135, the rebate claimed was over £10; but the representatives of the Gas Commission contented themselves with offering a rebate of £4 or £5, in order to get the matter hushed up. According to these representatives, other parties have got a rebate to April 30; but in cases where no complaint was made, no rebate has been offered.” Well may the newspaper remark that this is “a pretty kettle of fish.” It is indeed, if the tale is true. Nothing like it has ever entered into the calculations of the partisans or even the opponents of the “principle” of municipal trading; and if the facts are as represented, the principle in question will have received a heavy blow and a great discouragement. But meanwhile we hold our belief in suspense. The whole narrative may be a scurrilous attack upon the Gas Commissioners and their Treasurer, Mr. Ritchie, whose alleged “unfair intentions” are supposed to be evidenced in this “exposure.” An adequate official explanation of the whole affair is obviously called for, and it is to be hoped will be quickly supplied. The admirers of the theory of municipal trading may stand aghast at the insensate temerity of those who dare assail a perfectly disinterested corporation official

with imputations of unfair dealing in his office, and a Board of Commissioners with “loose management” and “manœuvring.” Alas! This is part of the cost of turning the town hall into a commercial emporium; and it is never wholly liquidated.

#### M. Violle on Photometry.

THE trouble of reliable photometry is with the electricians, as it has long been with gas manufacturers. It speaks highly for the public spirit and disinterested devotion to science of our friends and rivals in the business of organized artificial lighting, that, though the photometer-room is not yet with them a possible stage on the road to the police court, they are sincerely solicitous for the improvement of the photometer. The subject has cropped up again through the presentation of a report on photometry by Professor J. Violle, to the Paris Exhibition Congress on Electricity. It is impossible to help sympathizing with Professor Violle’s position in regard to his so-called International Platinum Standard of Light, which was acclaimed as a triumph of French science, and has rarely been seen since. Meanwhile, in high scientific circles the platinum standard is known as the imaginary datum for computing the value of the “decimal candle,” which again has no corporeal existence, but is provisionally represented by the Hefner lamp, “subject to the necessary corrections.” Why it would not be equally scientific to take the Hefner lamp for its own sake, instead of merely getting it accepted in this roundabout fashion, does not appear. It is interesting news that, by taking an infinity of precautions, M. Petavel has succeeded in reproducing the Violle standard, and considers that it is constant within about 1 per cent. It seems open to question whether it is worth while going through so much to gain so little; because the Hefner standard does not vary more than this. Standard flames, on the whole, are not loved by M. Violle, who, as a good Frenchman, prefers the old carcel lamp after all, if a standard of this nature must be used. A photometer fitted with Lummer and Brodhun’s compound prism for bringing the illuminated surfaces together, and “Matthews’s recording device, which enables the observer “to take his readings in the dark,” is recommended by the “Electrician,” after consideration of M. Violle’s report.

#### The Lamp-Posts of London Town.

THE great question of street lamp-post design is still labouring towards a solution by the tedious and costly process of trial and error. If anybody interested in the subject, being also the possessor of a snap-shot photographing machine, will take the trouble to walk across Waterloo Bridge (by common consent one of the finest monuments in London), we can promise him some sport. Starting from the last ordinary street-kerb lamp-post on the Surrey side, which is one of Mr. Livesey’s new pattern columns with shadowless lantern for the incandescent gas-light, he can photograph, almost without moving from the spot, one of the ancient Georgian street lamp-posts, a 20 feet high arc lamp-post, one of the “birch-broom” design arc lamp-standards on the bridge parapet, and one of the original gas lamp-standards of the bridge. Nor does this variety exhaust the show. On the Middlesex shore there are half-a-dozen different patterns of lamp-posts in the hundred yards or so that separate the bridge head from the Strand, mostly (of course) hideous and very ill adapted to their purpose. Where could the pilgrim see the fellow to this exhibition? Echo answers, “Nowhere!” They manage these matters differently in Paris, in Berlin, in Vienna, and indeed wherever the streets are dealt with in an intelligent and dignified style. But anything is good enough for London—or so the Vestries and the London County Council appear to think. Will the new Municipalities do better by the streets? Doubtful. British public spirit is sadly lacking of artistic development.

#### Smoke Prevention Again.

It takes a very long time to educate our teachers. With the approach of the season for lighting up fires, the perennial subject of the “smoke nuisance” crops up again in popular periodicals and newspapers. This is quite right and proper; for the task of keeping the atmosphere of towns decently clean is too heavy for the authorities to perform without all possible support from the public. It is still with the cause of smoke prevention as it used to be with river pollution; all the pecuniary interest is on one side, and only the interest of the community on the other. Yet constant pressure and the power of instructed public



opinion proved effectual in the long run against the polluters; and so it will, and must, be with the owners of smoky chimneys, if the same degree of perseverance is exhibited. For a long time the work of river purification was hindered, rather than facilitated, by the prevalence of an illusion that the sewage of towns is possessed of some economic value. This seems a paradoxical statement; yet it is true. Empirical recipes for getting value out of sewage were tried during many years; and large sums of money were wasted in the endeavour. Meanwhile, many towns rested content to watch what others were doing, or amused the public with experiments of their own that were always tending towards a never-realized success. Manchester was like this. The Corporation had a "poudrette" factory which was a never-failing source of municipal entertainment; while it poured most of the sewage of the town into the available rivers, and eventually into the Ship Canal. After many years, a power even greater than the Manchester Corporation grew tired of this performance; and the Corporation have been fain to submit to the inevitable injunction to purify the effluent. Similarly, so long as the *dilettante* triflers with the problem of Smoke Abatement remained under the impression that what they called smoke consumption is a profitable thing to do, their very laudable cause hung in the wind. They relied on the force of persuasion and upon the imagined advocacy of the pocket; not knowing that the latter influence is all on the other side. Sir W. B. Richmond and his supporters of the present-day movement to the same end are better advised. They do not trouble themselves as to whether smokeless furnaces are or are not in point of fact more economical than smoky ones; they only know that all smoky chimneys are unlawful, and they put the law in motion against their owners. This being so, it is disconcerting to find the "Daily Graphic" last week, in a ladylike little editorial note on the subject, remarking that it is really very stupid of factory people to continue to emit smoke from their chimneys, because those who consume their own smoke have found it quite profitable to do so. It is a great pity that the professional leaders of public opinion in such matters do not pay more heed to the facts. It is not necessary to state for the hundredth time in these columns what the facts are; but the pity of it is that, while the general public are so ignorant of them, effective pressure will not be put upon offenders against the law. Besides, the suppression of smoke is as much a household as a factory-owner's question; and the same general solution—the employment of smokeless solid or gaseous fuel—is applicable to both branches of the problem.

**Duration of the World's Coal Supply.**—In his annual report (just published) on the Trade and Commerce of Germany, our Consul-General, Mr. Schwabach, calls attention to a further addition to the numerous estimates of the length of time that the coal resources of this country will last. This is contained in a publication which is the work of the celebrated Breslau geologist, Professor Dr. Frech, who also gives the result of his calculations as to the duration of the principal coalfields of Europe. According to those calculations, Germany, is the richest country in Europe in future stores of coal, and is only superseded in this respect by North America and North China. The following are Dr. Frech's estimates of the life of the various coal-beds. We are not told upon what principle the calculations are based; but it would, of course, be an entirely fallacious method to reckon the life of the richest fields at the number of years they could be depended upon to supply their present customers, as the tendency will naturally be for the whole world to draw its requirements from those mines as the poorer ones become exhausted. The question is, however, remote from present-day problems; and we quote Dr. Frech's figures chiefly to emphasize the fact that the exhaustion of our own coalfields (to say nothing of those as yet untouched in other lands) will not be witnessed by children of the youngest of us—

Duration (years).	Coalfields.
100 to 200 . . .	Durham, Northumberland, Central Bohemia, Kingdom and Province of Saxony (coal nearly exhausted), Central France.
200 " 250 . . .	All other British coalfields.
200 " 300 " . . .	Waldenburg Schatzlarer district.
300 " 400 " . . .	Northern France.
600 " 800 . . .	Saarbrücken, Belgium, Aix-la-Chapelle, and contiguous Westphalian districts, including the Ruhr.
1000 and upwards .	The greatest number of seams and the thickest are in Upper Silesia, Russian Poland, and Moravia.

Professor Frech concludes his paper with the remark that, "after a thousand years, when the European and North American coalfields are exhausted, it is possible that the coal and ironstone of Shansi may make this district a centre of the world's industry." Let us hope that the Far Eastern Question will have been settled by then!

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 826.)

THERE was no improvement in the state of things on the Stock Exchange last week, nor could any be expected, taking the circumstances into consideration. With the unpleasant aspect of affairs in China, with strikes and rumours of strikes in various parts, and with the throes of an election at home, it was impossible to extract a grain of comfort out of the general situation. Then there was the fortnightly settlement in progress, to check new business; and Jewish holidays helped to keep things quiet. The result was a dull week, with drooping prices. The fall in them was not considerable; but still they are down. The state of the Money Market also contributed to lower values; there being a strong demand for the end of the quarter, as well as for the Stock Exchange. Business in the Gas Market was fairly good for the time of year, and considering the general quietude. The tone was bright and cheerful; and several of the leading issues had a moderate advance in quotation, while *per contra* not one relapsed in the downward direction. In Gaslights, the ordinary was pretty brisk; and the closing day was the most active of the week. Prices steadily improved; the last marked being the best, and the quotation rose a point. The secured issues were moderately dealt in at good middle figures. South Metropolitan was much more active than it has been of late, and advanced a point, though the closing price seemed scarcely to justify it. Nothing at all was done in Commercials. The issue of their accounts to June 30 completes the record of the Metropolitan Companies to that date. They show that the Company have had a nice increase in their business, but that, like many other undertakings, they have not quite succeeded in earning their dividend in the teeth of ruling prices for coal. There was nothing of note to record among the Suburban and Provincial Companies. The Continental group, although very quiet, continued steadily on in the process of recovery; and both Union and Imperial advanced in quotation. Among the rest, Malta, Ottoman, and Cape Town had an advance. There was very little movement in Water; and only a few issues had a moderate improvement, while Southwark took a line of its own, as it does sometimes, and receded.

The daily operations were: The market opened steady on Monday, and, after moderate business, closed unchanged. The position on Tuesday and Wednesday was similar. On Thursday, Gas was quiet, and showed no variation; but in Water, Lambeth rose 2, and Southwark fell 1. On Friday, the volume of business was no greater; but several advances took place. Gaslight ordinary improved 1, Union and Imperial 2 each, and Malta 1. Saturday was the busiest day of the week, and very firm. Imperial and South Metropolitan gained 1 each.

### ELECTRIC LIGHTING MEMORANDA.

The Dynamo and the Dust-Cart: A Protest—The English Fashion of Electric Traction—Municipalism a Hindrance to Progress—The Mischievous Effect of Municipal Trading at a Profit.

RECENT remarks in this column upon the vanity of the idea of yoking the dust-cart to the dynamo, with the object of making the cost of central station electricity generation appear less in ratepayers' eyes, have drawn down upon us a small torrent of protestation from a firm who are interested in a different pattern of dust destructor from that in use at Bradford. We are asked, with much show of virtuous indignation, what we mean by laying so much stress on the experience of one man, who has never used but one type of destructor—and that one, of course, vastly inferior to a particular pattern of the apparatus which does wonders elsewhere. To all this tirade, we can only reply that our observations were based on a certain British Association paper, the conclusions of which were not contested. The point of this paper was the performance of a particular destructor plant at Bradford for a complete fortnight, which the author stated to be an unusually long test-period. General claims are as naught against these particulars of fact. It was not claimed in the paper that the plant in question was well adapted for steam raising—the contrary was, indeed, confessed. We have not the smallest objection to publish the results of the working, for the same period, of any other destructor plant in existence; and if they show that the combination of dust destruction and electricity generation for town lighting is good for anything else than the hoodwinking of ratepayers, we will confess the fact freely. Only, in fairness to Mr. M'Taggart and to ourselves, we cannot recognize the result of less than a fortnight's working; and if it could be the same fortnight, so much the better.

Many fluent persons habitually write about the comparative backwardness of electric traction facilities in the United Kingdom as compared with the United States, which circumstance (if they are English) they comfortably explain by referring to the stupidity and sluggishness of their countrymen. We all know the type, and few see anything admirable in it; because, as a rule, those who speak and write in this strain know nothing whatever about the subject. It is just as well to chronicle the fact that, notwithstanding our national conservatism, and all the rest of it, our Metropolitan system of underground electric rail-



ways is already far and away ahead of any service of the kind to be found elsewhere in the world. The success of the "twopenny tube" in London is indisputable; and it is not to be overlooked that English private enterprise has scored again, in this pioneer work, without invading the smallest of vested public or private interests. It sounds very fine to talk of the 18,000 miles of electric street railways in the United States; but notwithstanding the interested clamour of the electrical interests, the English people have had no use for that kind of electric transport. Neither has the British public seen the charm of overhead electric railways carried down the middle of business and residential streets. The useful dock railway in Liverpool is a special affair; and Londoners may well wish they had similar facilities for getting to and from their own docks. Apart from this exception, the right place for an electric railway is down out of the way of everything, while following the great natural lines of traffic on the surface; and that is where we have put them.

Strangely, and yet naturally enough, the progress of electric street railways, or tramways as we call them, throughout the United Kingdom generally has been retarded by the much-vaunted spirit of municipalism more than by any other influence. It is too much to expect recognition of the truth by our perfervid Progressives, who desire even a municipal milk supply; but practical statesmen, who regard facts more than talk, will be unable to take another view of the situation. It has been impossible for any electric traction company, whatever their resources, to cover the land with tramways on their system, after the American manner. Every independent local authority is supreme in its own district, be it large or small. And British local authorities, while they may be, and not infrequently are, deceived, can neither be bought over nor trodden underfoot in the rush of rival trading interests. Independence is at once the strength and the weakness of British local self-governing bodies. It is a commonplace how slow they are to learn of one another. They insist, very generally, in making their own experiments for themselves. Birmingham will not take pattern by Liverpool, nor Glasgow from Belfast. Years after a point of municipal engineering or sanitary practice has been satisfactorily established, or thoroughly discredited, as the case may be, in one or more parts of the United Kingdom, local authorities elsewhere will be found toying with it.

This has been very much the case with respect to the electric working of tramways. Private enterprise counts for nothing in this connection, because every English tramway is given over to municipalism from its cradle. Consequently, every corporation tramway department has looked at the matter exclusively from its own, sometimes small, standpoint. The result is, slow progress and chaos. Central municipalities have been unable, even where they might be willing, to survey the local tramway situation in its entirety. Municipal Manchester or Birmingham, for example, are not the same as Tramway Manchester or Birmingham. The creation of independent local authorities in the vicinity of large centres of industry and of population has been a very good thing in its way; but as regards the proper development of an adequate tramway service capable of being worked at the rate of 12 miles an hour, it has come to be very much in the way. The horse tramcar jogging along the mainroad is a different element from the electric car flying over the route with a speed and frequency that puts the usual suburban railway train to shame. Bristol is favourably situated in this regard, having no independent and possibly hostile outlying authorities to reckon with. And the tramway profits do not go to relieve the city rates. There's the rub! Perhaps, when the Lord Mayor or the Town Clerk of Manchester or Birmingham gives the world the benefit of his ripe judgment on the consequential effects of the introduction of electric tramway working, he will consider the influence of this common source of the dislike and distrust of central municipalities by outlying populations.

**American Gaslight Association.**—The number of the "American Gaslight Journal" just to hand contains the general announcement by the Secretary of the Association (Mr. Alfred E. Forstall) in regard to the forthcoming annual meeting, which will be held at Denver (Col.) from the 17th to the 23rd inst., under the presidency of Mr. George G. Ramsdell, of Philadelphia. The business will be transacted at the Brown Palace Hotel, which will be the head-quarters of the Association. The following is the list of papers: "The Use of Cards for Records and Accounts," by Mr. W. C. Anderson, of Norristown (Pa.); "Inclined Retorts," by Mr. A. H. Barret, of Louisville (Ky.); "Gas Advertising," by Mr. C. R. Collins, of Seattle (Wash.); "The Uses of Gas for Manufacturing Purposes," by Mr. J. H. Walker, of Milwaukee (Wis.); "Municipal Control of the Price of Gas," by Mr. Alfred E. Forstall, of Montclair (N.J.). There will also be a lecture by Dr. E. G. Love, of New York, on "The Theory of the Incandescent Gaslight." If the papers are of a sufficiently high standard, the Beal Medal will be awarded to the author of the one considered to be the best. In addition to the papers and lecture, the report of the Research Committee will deal with the question of the Edgerton standard, referred to them at the last meeting, as well as with other subjects. According to present arrangements, the entertainment portion of the programme includes an informal reception at the Brown Palace Hotel on the evening of the 18th inst., and a trip to Colorado Springs and vicinity the two following days.

## PROFIT-SHARING IN PRACTICE.

WE have in former articles\* dealt somewhat fully with those sections of Dr. N. P. Gilman's book, entitled "A Dividend to Labour," which treat of schemes adopted by employers for the advancement of the welfare of the working classes by means other than that of profit-sharing. It is now our purpose to review the section set apart for the consideration of the results of profit-sharing as exemplified by the experience of five large firms—one French, one English, and three American—who have given the system a fairly extended trial. In the advocacy of this system, Dr. Gilman has taken no small part; his book on the subject, published in 1889, having served to enlighten many employers as to what had been, and what might be, done by means of profit-sharing to improve the relations between those, on the one hand, who provide the capital and the organizing and administrative ability necessary to the successful working of an industrial undertaking, and those, on the other, who provide the equally necessary labour. Dr. Gilman now chiefly concerns himself with the experience of the ten years subsequent to the publication of the work to which we have just referred.

The first of the five firms whose schemes are dealt with is the well-known Paris house of Baille-Lemaire, the opera-glass manufacturers. The general policy pursued by them, of paying great attention to the training and welfare of their employees, is most admirable; but the profit-sharing arrangements made by them, while doubtless found to be well suited to the particular firm in question, are not such as would perhaps lend themselves to adoption by employers generally, and so need not be discussed at length. The effect of these arrangements, so far as the employees are concerned, is that the workmen take 25 per cent. of the profits; two-thirds of the amount going, in unequal shares, to the staff and the foremen, and one-third to the rank and file, according to wages and seniority. After this year, the proportion of profits taken by the employees will be increased to two-fifths. Features of the arrangements made to promote harmony between the firm and the workers are the three social gatherings—a summer outing at M. Baille's country house, a banquet and ball in the winter, and a New Year's Day festival.

The Bourne Cotton Mills of Fall River (Mass.) provides "a striking illustration of what profit-sharing can do . . . in a line of industry in which the rate of compensation to the worker is not high, comparatively, in which the first cost of the plant is large, the importance of hand labour by the side of machinery is low, and in which the average grade of intelligence is not up to the common level of the enviroing society." The latter point is of special interest and importance; as, of course, the essence of success in regard to profit-sharing is that the workers should appreciate its obligations, as well as its advantages. The Bourne mills were in this respect handicapped by the fact that many of their hands were "comparatively unintelligent" French Canadians. Yet, in spite of this initial drawback, and of the fact that of the ten years during which the profit-sharing scheme has been in vogue four have been years of extreme depression, the experiment, though subjected to continuous hostile criticism by the other mill-owners in the city, has really been most successful. The Directors, through their Treasurer, have taken every care to ensure that the men should rightly understand the system, and to emphasize the duty of every man contributing his share to the prosperity of the undertaking. This, as in every case where profit-sharing has been adopted, has been the chief difficulty—a difficulty which can only be removed by the exercise of much patient tact, combined with firmness. The better to bring home to each man his individual obligation, all employees in the Bourne mills desirous of participating in the profit-sharing are now required to sign the following contract:—

Please enter my name in the profit-sharing roll for the term ending . . . , upon the conditions named and hereby agreed upon—namely, that I will endeavour throughout the term—

- (1) To do faithful service as an employee of the corporation;
  - (2) To promote its interests as far as my acts and influence go, both in and out of the mill (knowing that its success will contribute to my own welfare, too); and
  - (3) To deposit some sum of money every month, if possible, in the Employees' Savings Fund, or in some savings-bank;
- It being further agreed that I shall forfeit all claim to any share of the profits if any of these conditions be infringed.

Every employee who has served six months, and who works faithfully during the year, has a share in the profits "in proportion to the dividends declared and paid to the stockholders." Their "divvy," as the men call it, varies according to the amount of their wages. The average for ten years has been 3.3 per cent. on the wages they have earned. Moreover, the average wages were 10 per cent. higher in 1897 than in 1889, though in the earlier year the standard rate was higher than in 1897, and the mills ran two hours more per week. "The tendency has been uniformly to increase;" while employment has been almost constant throughout—a matter of supreme importance to the workers. Not only, however, have the earnings of the employees risen steadily, but the dividends paid have been nearly double those earned by the competing mills of the district. No wonder that "the Superintendent and the Treasurer unite in declaring that it has been a pleasure rather than a task to do business under these conditions," which, be it noted, are declared to be in large measure due to profit-sharing.

\* *Ante*, pp. 406, 691, 756.



Another American firm—the Procter and Gamble Company—who, as soap makers, employ but little skilled labour and pay comparatively low rates of wages, have found profit-sharing to prove eventually successful. They had, however, uphill work at first. Having suffered much from strikes, due to all sorts of trivial causes, the Company adopted profit-sharing in 1887, “in order to secure relief and establish friendly relations with their employees. The plan gave a reasonable salary (\$4000) to each active member of the firm, as a portion of the expenses. The net profits were divided between the firm and the employees, in the proportion that the wages bore to the whole cost of production.” The scheme at first was viewed with suspicion, and only accepted in a half-hearted way by the hands; and, finding that even three half-yearly dividends averaging over 10 per cent. on wages failed to materially increase the interest taken by the employees in the successful working of the business, the Company took a step somewhat similar to that which the South Metropolitan Gas Company had to adopt for a like reason. They divided their hands into four classes: “Those who tried to prevent waste and do better work, and to advance the interests of the business, were to be paid twice the regular dividend. The bulk of the employees were to receive the regular dividend. Those who did not show much interest were cut down to one-half; and the careless, indifferent, and wasteful were to receive no bonus whatever.”

This step has been so successful that indifference has entirely disappeared. Fully 92 per cent. of the whole number employed now participate in the bonus—which has been amended to equal the same percentage on wages as the shareholders receive on their stock—and the Directors have found themselves able to abolish the classification, merely reserving their general right to refuse the bonus for any special cause. Any waste or loss of material due to carelessness or neglect by an employee, is charged against his bonus; but, owing to the much greater care taken, not 1 per cent. render themselves liable to any deduction. Every employee is encouraged to become a stockholder, though no obligation to do so is imposed. About 15 per cent. of the whole number of hands hold stock; and, “in order to induce the employees to become stockholders more generally, the Company . . . is intending to guarantee them against loss by making their stock a first lien upon the property. ‘A most marked improvement,’ says one of the firm, ‘is shown by those who have purchased stock, not only in their ability as employees of the Company, but in the general character of the men.’”

The Company have had no serious labour troubles since 1887—the year in which profit-sharing was inaugurated—and declare that they no longer have any such difficulties to fear. “On several occasions some troublesome fellow has tried to produce dissatisfaction. The men themselves have gone to the foreman, with details of the attempt, and the suggestion that the disturber be discharged.” One great advantage that has accrued is the permanency of the staff. “The expense of breaking-in new men has been almost done away with;” not more than 2 per cent. of the hands being changed in a twelvemonth. Moreover, a great deal has been accomplished in the direction of labour-saving; some of the improvements in the machinery being due to the interest taken by the workmen. The saving in material used is also considerable. Altogether, “the patience of the Company, in educating their employees up to appreciation of the plan, has had its just reward.”

The third American profit-sharing enterprise described is that of the Nelson Manufacturing Company, of Leclaire (Ill.), makers of plumbers' goods, bicycles, &c. The most noteworthy feature of their scheme is that since 1890 the bonus has been paid entirely in stock. The success of the introduction of profit-sharing in creating the best relations between the Company and their employees, was proved in the adverse times of 1893, when not only was no bonus paid, but wages were reduced 25 per cent. The unusual course was adopted of making a similar reduction in salaries and in interest on capital; the whole deduction from wages, salaries, and interest being made good out of subsequent profits, before any bonus was paid. The hands, “seeing the obvious fairness and the plain necessity of this arrangement, ratified it cordially.”

The one instance given of an English firm adopting profit-sharing is that of the South Metropolitan Gas Company, with the details and history of whose scheme our readers are so familiar that we need not enlarge thereon. Dr. Gilman makes one or two slips in his account of the Company and their scheme. For example, he speaks of their annual receipts as being about £700,000, which is less than half the actual figure. Again, although he gives the standard dividend correctly at the revised figure of 4 per cent., he says that “for every reduction of one penny in the price of gas, the Company may increase its dividend one quarter of one per cent.,” which was, of course, the increase allowed under the old sliding-scale applying to the Company. Apart from these unimportant mistakes, Dr. Gilman gives a very able account of the work accomplished by Mr. Livesey; especially calling attention to the unique feature of his profit-sharing scheme, the representation of the men on the Board of Directors.

In a further chapter, entitled “Profit-Sharing To-Day,” is given a brief summary of the position of the movement at the present time in the principal countries; while in an appendix will be found a full list of all the firms who have adopted some plans of granting a “dividend to labour.” Dr. Gilman has worked hard in the cause, has produced a most interesting and valuable book,

and deserves the gratitude of all true well-wishers of the working classes. His prime virtue is that he tells, not only of the ideal, but, most fully, of the practicable; and, *pace* the poet, it is better in things mundane to be the man who “goes on adding one to one, his hundreds soon hit,” than he who, “aiming at a million, misses an unit.” If only social reformers would leave aiming at millions, and add one practical unit to another, the world would be the better for it. Dr. Gilman points to some of the units.

## A SKETCH OF THE HISTORY OF THE GAS SUPPLY OF NEW YORK.

[FIRST ARTICLE.]

THE political and financial history of the gas undertakings of the United States has always been a mystery, not only for English observers from a distance, but also for many Americans connected with the gas industry. English students of gas supply systems have failed to penetrate through the surface of the American gas business, and therefore have never understood the jargon of “franchises,” “combines,” “deals,” and such-like terms which obscure the native literature of the subject. They know that a real or professed belief in the validity of competition in the gas supply of towns has survived in American public opinion, long after the abandonment of the idea in other lands, and regardless apparently of painful experience in this respect of almost every town in the United States. It is also known abroad that there is in the United States no such national, or even State, legislative regulation of the gas industry as exists in England; while the Continental concession system is equally unknown in America. The prevailing impression in the minds of foreign observers of the great American industry is, therefore, that in this land of liberty the gas companies carry on their business as they please. This impression is occasionally deepened by news of the sudden outbreak—say, in New York City, or Chicago—of a desperate “Gas-Rate War,” whereby two or more rival companies endeavour to cut one another's throats; only after awhile to make friends again at the expense of the helpless consumers. It is further strengthened by what is common knowledge of the irresponsible way in which the character of American towns' gas is occasionally changed altogether at the bidding of external “interests,” as when the carburetted water-gas manufacture was forced into vogue irrespective of industrial considerations. On the other hand, the existence of real legislative power over the gas companies of the United States is manifested now and again by the passing of State laws fixing the selling price of gas in a particular town, apparently on arbitrary presumptions.

It is not within our power to fully set out the base-conditions on which the gas industry of the United States is founded, though we can perhaps indicate the nature of some of them. While this industry is not bound in the same fetters in which the collective wisdom of other nations has, with the best intentions, seen fit to tie it up, it is far from being the “wild-cat” business which casual outbreaks would really seem to indicate. American gas finance is based, in the first and last place, upon the national belief that there should be no artificial limitation of the legitimate profits of industry and commerce. Hence American and British gas finance separates irreconcilably at the point where the latter comes under the rule of limited dividends. This rule is directly opposed to American business principles. American business men cannot see why a gas company, like any other commercial concern, should not pay 50 per cent. dividends, if it can earn them legitimately. They argue that the prospect of making this practically unlimited profit is the best incentive to good working that a gas company, in common with any other business firm, can have; and they remain strong in this opinion, notwithstanding the results of the operation of other principles exemplified in London, Paris, and the civilized world generally.

Americans point out that, although theoretically the profits of private commerce and industry are limitless, in practice they are very fairly kept within reasonable bounds by the play of natural forces. The same with one of their gas companies. Nobody cares what rate of dividend the original adventurers of capital take, so long as the service is good and the price reasonable. Where this is not the case, instead of there being local gas agitations and parliamentary contests, another party of adventurers applies for a gas “franchise”—which is only a bigger name for the formal permission to open the public roads and lay mains, familiar enough to the promoters of non-statutory gas undertakings in the United Kingdom—and either gets it and opens a competing business, or the prospect brings the old firm to its senses. This is, of course, the theory of the thing; and Americans contend that, on the whole, it has worked, and continues to work, better with them than the British system of lulling gas companies to sleep under the protection of their Acts of Parliament. An Act of Parliament, it is observed, is only needed by British gas companies for their protection from the possible withdrawal by the local highway authority of the permission to use the public streets for their mains. The price paid for this protection is, in American judgment, excessive. They point to the actual state of gas affairs in London, as proving that the whole British system of statutory interference with the commercial liberty of undertakers of gas supply is a failure. If it is replied to this judgment that the



test of satisfying the public with the quality and price of the service is hardly good enough for the purpose, they have the ready rejoinder that this is precisely the real and only standard accepted by gas-supplying English municipalities to-day. The trading municipalities fix this standard for themselves; and they pocket all the profit they can make under these conditions of their own choosing. The trail of the Act of Parliament is over them still. The consumers have no voice in the matter at all. In the American system, the public themselves set the standard of efficiency. There is no real call for the municipalization of gas undertakings in America.

There is not, in the United States Constitution, any superior authority over "franchises" to the local governing body, whatever it may be. Hence there can be nothing equivalent to a British Act of Parliament for the protection of a gas company in the enjoyment of dividends, limited or otherwise. The position of an American gas company, having a franchise, is, therefore, akin to that of the holder of a public-house licence in this country. Of course, this position is one of real advantage, notwithstanding the fact that it reposes on the pleasure of the grantors. The condition of the "licensed trade" in the United Kingdom offers ample evidence to prove that what is sometimes invidiously called a "monopoly" can be created without a Private Act of Parliament. The obvious fact of the matter is, of course, that, under favourable conditions, any special trading privilege becomes a valuable asset of the grantee; and people have a way of setting store by property of any kind.

This has been the source of the gas troubles of the United States, just as it has caused the question of the licensed drink trade to arise in this country. Where a gas franchise was patently valuable, there was the temptation to make "deals" in this easily created class of property. It was difficult, besides, for the local authorities, whose discretion in this regard was absolute, to perceive the limitation of the scope of ordinary commercial competition in respect of such undertakings as that of gas supply. Everybody, so to speak, wanted a franchise; and nobody wanted anybody else to have one. The local authorities (composed of commercial and professional men) knew that some sort of inducement was necessary to prevail upon people to sink money irrecoverably in a gas undertaking; and at the same time they felt that competition was the only security for the proper conduct of the business. Less instructed public opinion did not perceive the necessity for shielding any enterprise from competition. The mere fact of a franchise—an exclusive franchise—being a valuable asset for an undertaker, blinded the public to the consideration that, without some such asset, there could be no undertaking at all. There also arose the puzzling question, still with us, as to whether a valuable franchise or licence should be paid for, and, if so, in what manner. To ask this first question, is to elicit a loud answer in the affirmative from the cock-sure politician of the street corner and the trashy newspaper. Take the present English political question, already mentioned, of the licensed trade in drink. This is how a London newspaper put it last week: "Every year the State presents 'the trade' with almost uncounted wealth. It is the publican's unearned increment, the product of a monopoly created for him by the State, to which he has no more title than any other man, except that he asks for it, and the other does not." Then the statement follows that the value of the licences in the London County Council area is 60 millions sterling, all given *gratis*; and the indignant query is put: "Why should these vast sums of money go into the pockets of private individuals?" Why, indeed! What easier than to tax this huge vested interest in licences, and pay off the war bill, or endow an old-age pension scheme with the proceeds?

The answer to this contention is not easy to make convincing without going to the very bottom of a deep economic principle. To begin with, Where is the valuation of franchises or licences to trade or professional calling to stop? Is not a physician's diploma, a clergyman's admission to orders, an auctioneer's licence a franchise? Time was when every privilege or charter capable of profitable employment had to be paid for. It is not so long ago that Her Majesty's commissions to positions in the army were sold. This was the last vestige of a once general system; and experience condemned it. Enlightened opinion, it may shortly be said, is against the principle of the "purchase system," for more reasons than can be repeated here. In matters of business, moreover, which are done for profit, the undertaker always charges all his working expenses before he strikes his profit; and the cost of a concession never comes out of profits. Yet it is not true that holders of franchises or licences get this privilege for nothing, even where no direct charge is made for it. They have, in the first place, to render the service in respect to which the franchise is given—which is really the best and the only proper acknowledgment they can return to the community at large. In all cases, moreover, licencees are required to submit to certain obligations to which absolute free trade would not consent. Still, it is difficult for the small shopkeeping mind to grasp the economics of this matter.

Consequently, when the first Company proposing to supply gas in the City of New York, being incorporated by the State Legislature on March 26, 1823, with a share capital of \$1,000,000, applied to the Board of Aldermen for an exclusive privilege for thirty years of laying mains in what was then all the city, there were many heart-searchings as to the terms upon which so immensely valuable a franchise should be granted. [We obtain

the facts of this narrative from "A History of Public Franchises in New York City," by Gustavus Myers, appearing in the March number of "Municipal Affairs"—a quarterly publication of the New York Reform Club.] The city authority granted the franchise in the terms asked for; only stipulating that the street lighting should be done by gas at not exceeding the old oil-lamp rates, that the mains should be of cast iron, and so forth. The grant was strongly attacked by a ratepayers' party opposed to the aldermen, who denounced the granting of exclusive franchises. This view became popular; and in 1849, when the New York Gas Company's franchise was extended to nineteen years from 1853, nothing more was said about the privilege being an exclusive one. When New York was first lit with gas, in 1825, the price to the ordinary consumer was \$10 per 1000 cubic feet. It is now one-tenth of this figure—a progress which does not compare unfavourably with the course of gas prices in the United Kingdom for the same period.

The business and profits of the New York Company appear to have flourished and grown with the increase of the district in population and wealth. In 1833, the Manhattan Gaslight Company was formed, with a capital of \$500,000, and obtained from the Common Council the privilege of the highways to the north of the older Company's district, and also apparently a concurrent privilege in part of the latter area. These privileges were not exclusive. There was no payment for them; the city officials being solicitous only to get cheap public lighting, and to keep the gas-works at a respectful distance from the then city. With the advent of the second Company, the price of gas fell to \$7 per 1000 cubic feet; and matters went on quietly until 1848, when the consumers agitated for a Municipal Gas Department. The two old Companies were so badly scared at the prospect, that they dropped their price by one-half. This step did not hurt them much; and the Manhattan Company, having the growing outlying district, found it necessary, by 1855, to ask the Legislature to increase their capital to \$4,000,000. This needs some explanation. It has been stated earlier in this article that American gas companies do not have anything corresponding to our Special Acts of Parliament. This is true; but, as financial associations, they must register themselves according to the State laws, which, in New York, give the Legislature power to deal with applications for an increase of capital. Thus in the Manhattan Gas Company's case the Legislature only consented to the proposed increase of capital on the condition that within a year the price of gas should be \$2.50 per 1000 cubic feet. This, be it understood, was not a maximum, but an actual rate. It is the first example of anything like a statutory regulation of an American gas company's selling price; and the precedent has been followed ever since. The Company submitted, but tried to make things even by clapping on a meter-rent, which brought the price of gas up to \$3 per 1000 cubic feet. In 1867, the Legislature abolished meter-rent in the State. It is also important to note that these early New York Gas Companies were districted from the first; so much so, that the Harlem Company (formed in 1855) proposed to supply only the scantily-built region, as it was then, lying to the north of Seventy-Ninth Street. In this Company's franchise, however, was inserted a clause reserving the right on the part of the Municipality to acquire the real estate and plant at any time at cost price, with an addition of 10 per cent.

In the year 1858, the first explicitly competing Gas Company was organized, under the name of the Metropolitan Gaslight Company. After a short experience of conflict with the Manhattan Company, however, the new comers effected a strategic retreat to the vacant territory lying north of the Manhattan and south of the Harlem districts. By this move, all the city area became districted between the Companies named, each bounding the other and being bound on the north, with the two river fronts on its flanks. The price of gas generally was \$2.50 per 1000 cubic feet, with meter-rent as already mentioned. Then came the war; and in 1862 a census of the gas industry was taken for the purpose of levying a war-tax of 15 cents per 1000 cubic feet manufactured. The New York Companies were strong enough to surcharge this amount on the consumers. This proceeding made the Companies very unpopular; and an abortive agitation again sprang up for municipalizing the supply. With this era, or rather during the following year (1863), the first chapter of the history of the Gas Supply of New York by non-competing, districted Companies closed. It was followed by a period of corrupt trafficking by city officials and speculators in gas franchises, during which the American systems of city government and gas supply regulation exhibited themselves at their worst. But we must now break off for this week.

**Pipe Corrosion by the Earth.**—Tests of the corrosion of pipes by the earth along the route of the Coolgardie pipe-line have recently been made. Specimens of pipe, both coated and uncoated, were buried at several different points in November, 1898, and they were dug up and examined on the 24th of April last. In all cases the pipe coating was found to be dry and friable, with a thin film of rust in places on the metal under the coating. There was, however, no pitting of the metal. The pieces of uncoated pipe, where buried in sand or clay, were very slightly pitted; but a piece of uncoated pipe buried in the "salt lake pan" was very materially affected—being covered with pits about 0.05 inch deep over its whole surface.



## A VISIT TO THE BECKTON GAS-WORKS.

JUST before two o'clock last Wednesday afternoon, a party of the members of the Society of Engineers left Fenchurch Street Station, their destination being the Beckton works of the Gas-light and Coke Company, in which huge establishment they were going to spend two or three hours. Such a privilege as this is not an everyday occurrence; and as the members journeyed to the Gallions Station (which is the nearest point for the railway passenger to alight for the works), they were all very happy in the prospect of viewing the wonders of world-famed Beckton. For a visit of this kind, the party was a comfortably-sized one, numbering all told only thirty. The amiable and energetic President (Mr. Henry O'Connor) was, of course, of the number; and Mr. Perry F. Nursey, one of the old pillars of the Society, and now the Secretary, was also there looking after the comfort and convenience of his friends with the same activity and geniality which we remember as characteristics in days long ago.

Arriving at Gallions Station, the favoured company walked by the footpath across the low-lying land connecting the station and the works. To one of the party, the scene brought to memory incidents and impressions of visits to the works in years past. There was the curiosity with which he first approached this place so far removed from London, and yet upon which London depends in such a considerable measure for its gas supply. There was the fascination, too, with which he first saw the massive plant, the miles of railway lines intersecting the works, and the several diminutive but spirited locomotives darting to and fro, with their long trains of waggons—each and every part of which is necessary to the feeding of this big establishment with, or relieving it of, the material required, spent, or recovered, in the course of the vast manufacturing operations conducted therein. There were also the immense retort-houses, the thousands of retorts, the army of men, the extent of other portions of the plant, and the tact and method that the direction of such a colossal undertaking requires, all claiming admiration then as they do now. But after all it is the magnitude, and that alone, which attracts. To mind came also a walk across the same fields in company with Mr. John West some ten-and-a-half years since, when there were ominous murmurings and discontent among the men, and all the signs of a gathering storm—the irritant (for the moment anyway) then being the new stoking machinery which Mr. West had introduced into one of the retort-houses. The picture of Mr. West, aided by a few raw recruits and the machinery, industriously charging some of the Beckton retorts, with unfriendly, ill-visaged men passing in the neighbourhood, comes vividly to mind as the old house is again seen; and "Blackleg Square" and the other preparations for protection which the Directors of the Company made to meet the threatened insurrection in those days, are likewise recalled as clearly as though they were the happenings of yesterday.

But during this reverie, the party of visitors to the works on Wednesday reached the offices; and there they met with the only disappointment of the day. Through some misapprehension, the Engineer (Mr. T. Goulden), who had been anticipating this visit with pleasure, had expected the party on Thursday, and was temporarily absent from the works. But Mr. J. N. Reeson (Mr. Goulden's assistant) very cheerfully took his chief's place, acted as cicerone, and gave ample proof that he was capable of completely engineering an emergency of this kind. Under his guidance, the visitors saw the chief features of the place; and while they did not by any means exhaust what there was to be seen over the 300 or so acres on which the works stand, Mr. Reeson so traced his steps that the visitors inspected examples of all the plant from the mechanical appliances used for transferring the coal from barges right through to the holders in which part of the make of the gas is stored. By the way, it should be mentioned that those of the party who could not find place near Mr. Reeson found a good guide and friend in Mr. O'Connor, who, having spent three years on the works, was able to furnish much interesting information.

With the visitors, we will start at the beginning. The coal, which is principally seaborne, is brought to the works by steam colliers, and unloaded at two T-shaped piers by hydraulic cranes and lifting grabs or skips. The newer of the two piers (which was completed some five or six years ago) was ascended by the party; and then Mr. Reeson had ample assurance, before many minutes had elapsed, that his new friends were in quest of, and indeed were absolutely thirsting for, knowledge. The pier is a noble structure, jutting out some distance into the river, and its construction possesses much of interest to an engineer. It is fitted with hydraulic cranes, and Hone's self-locking power grabs; and the mechanism and working of these were carefully examined. Fortunately the barge *Camellia* was lying alongside the pier at the time; and a demonstration was made of the action and capabilities of the Hone grabs. A barge containing 1500 to 2000 tons is easily unloaded in about eight hours—the coal, as the visitors saw, being simply lifted from the barges and deposited in waggons running alongside the cranes. The waggons (which have moveable slides for discharging them) are weighed, and made up into trains for transport to any desired part of the works. The visitors also descended to the stage underneath the pier, and examined the system of high-pressure pipes, &c., required to convey the motive power to the cranes from the hydraulic engine-house on shore.

Leaving the pier, the party were able to make a general inspection of the long stretches of overhead railway which lead to different parts of the works where the coal is required for use or for storage. Nearly the whole length of the elevated railway provides underneath a vast store for coal, and that which is not required for immediate use is so deposited. There must be at the present time quite 170,000 tons of coal in stock at Beckton. The hydraulic engine-house next came in for inspection. Here were seen five of Tannett, Walker, and Co.'s hydraulic engines for producing power (about 800 lbs. pressure) for operating the cranes on the pier. At one end of the building is an accumulator; and there is another one on the pier. *En route* to the retort-houses, the party examined the construction of a new oil-tank which Messrs. Westwood and Wrights are now putting up, and which will have a capacity of about a million gallons. Pneumatic riveting and caulking machines which are being employed on the job were the objects of a good deal of attention. Incidentally, it may be stated that the storage of oil for the manufacture of carburetted water gas is at the present time equal to about 2½ million gallons. The first retort-house visited contains 598 mouthpieces; but this was one of the medium-sized houses—the largest containing 810 mouthpieces, and the smallest 480 mouthpieces, or thirty settings of eights. The house inspected is equipped with Arrol-Foulis drawing and charging machinery, and the method of working was illustrated. Of equal interest was the examination of another house in which the whole of the benches are being reconstructed; and, the beds being in various stages of advancement, the inspection was very instructive. Mr. C. C. Carpenter's "2000-day settings" have been adopted for this house; and 30 beds of tens (600 mouthpieces) are being put in. Holman's new patent mouthpieces are being used in this new work; and arrangements have been made for the furnishing of the house throughout with West's compressed-air stoking machinery.

The extent and isolation of Beckton demand that the works shall be in large measure self-reliant in the matter of repairs and maintenance; and for these purposes, the equipment includes a foundry, smiths', fitters', and carpenters' shops, stores, &c. Through some of the shops Mr. Reeson conducted the visitors on the way to view other parts of the manufacturing plant; and in these shops a few useful hints might be collected by other gas engineers. A speciality is made of stamping; all the cross-bars, bolts, levers, catches, iron handles to shovels, and nearly every little piece required on the works in the way of iron fittings being stamped out in the smiths' shop by means of steam-hammers. At Mr. Reeson's request, the men, with the utmost willingness, gave proof positive of the skill and rapidity with which they can turn out such articles as those enumerated. Leaving the shops, the washers and scrubbers were passed; and their respective duties were explained. One of the purifying-houses was inspected; and it was mentioned that each house has its eight vessels. The first pair are filled with lime, the second with Weldon Mud, and the third with sulphide of lime—the fourth pair (which are the catch vessels) being also loaded with Weldon Mud. The condensers were next viewed, and information given as to their action. A walk through the station meter house brought the party to the building containing the pumping-engines which send the gas, at high pressure, through two 48-inch mains to the storage stations in London. The gas-holders also came in for notice; but the largest and most modern one, of 8 million cubic feet capacity, really monopolized attention. The inspection of the water-gas plant formed the *finale* of a very interesting visit; and here Mr. Reeson took infinite pains to inculcate in his visitors' minds a better understanding of the principles of this method of gas manufacture than many of them previously possessed.

Mr. Goulden had kindly arranged to entertain his visitors at tea; and, although a mistake had been made in the date, the resources of Beckton were equal to the provision of refreshment of this kind at short notice. On returning to the offices, the party were exceedingly grateful, after their somewhat tiring, but instructive, perambulation to find that, with considerate forethought, Mr. Reeson had carried out to the fullest extent the plans of his chief for the comfort and pleasure of his guests. Due acknowledgment was made by Mr. O'Connor on behalf of the members; and Mr. Reeson, in replying, said his only regret was that Mr. Goulden was not present, as he had been looking forward with the greatest pleasure to this inspection. About five o'clock, the party, well satisfied with their visit, left these colossal works, with the building up and carrying on of which the names of Evans, Trewby, Beale, Methven, and Goulden will, in a greater or less degree, ever remain associated.

It may be of interest to many readers if we supplement the foregoing with the following particulars: The number of men employed at Beckton varies, according to the season, between 3300 and 5500. There are fourteen retort-houses, containing in all 8404 retorts, and about one-half are operated by power stoking and drawing machines. There are nine gasholders, with a total capacity of nearly 19 million cubic feet; but, at the storage stations, there is accommodation for 35 millions. A winter day's output at Beckton is about 50 million cubic feet of coal gas, and 8½ million cubic feet of carburetted oil gas. The quantity of coal carbonized is, in round figures, 1,150,000 tons per annum, and about 6 million gallons of oil are also used. The works produce about one-half of all the gas supplied by the Gaslight and Coke Company.



## SYSTEMATIC KEEPING OF GAS COMPANIES' ACCOUNTS.

THE value of uniformity in the method of keeping the accounts of large public undertakings such as those concerned with the supply of gas will, we think, be readily acknowledged, especially by anyone who has had to investigate them for the purposes of audit, analysis, or comparison. While varying circumstances and differences of opinion have prevented the attainment of uniformity so far as internal official arrangements are concerned, an endeavour was made by the framers of the Gas-Works Clauses Act of 1871 to ensure the presentation of half-yearly statements in one style, by appending to the Act a set of forms which could be easily adopted. Although the accounts of local authorities are not subject to the general suggestions contained in the Act above referred to, some Borough Accountants follow them; and consequently their working results can be more readily compared with those of other authorities whose officials adopt a similar course, as well as with those of statutory gas companies. As regards the form in which the accounts are presented, therefore, it may be said that something like uniformity prevails. In the keeping of the accounts, however, it appears to be lacking. This probably arises from the fact that hitherto no attempt has been made to deal with the scientific principles of double-entry book-keeping in the form of a treatise adapted to the accounts of gas-works. This want it has been the endeavour of Messrs. Brearley and Taylor to supply, in the work which, as already announced in the "JOURNAL," they have just published.\* The book is the result of a combined experience of gas and other accountancy extending over thirty-three years; and though the system set forth therein necessarily differs in several important details from that employed in many gas-works, the authors believe there is little that cannot be adapted to all.

The treatise is divided into two parts—the first consisting of three, and the second of thirteen chapters—with a copious appendix. In Part I., what are called the "record" books—the registers of shareholders, transfers, and mortgages, &c.—are dealt with, and some illustrations of the books and forms referred to are given. Part II. opens with a few preliminary remarks on double entry and an explanation of terms. These are followed by chapters dealing exhaustively with the books and forms necessary in carrying on the business portion of a gas company—viz., purchases, sales of gas, residual products, and fittings, the various books employed, balancing, the report and balance-sheet, &c. The subsidiary books are illustrated and explained together, and distinct from the financial books. The transactions with which the authors illustrate the latter are such as are met with in every-day work; the only difference between the set included in the treatise and an actual set being that the former have been abbreviated for conciseness. Facility in tracing the transactions is obtained by following the books of entry and the ledgers (in the set) consecutively. By this means one can tell where to look for the posting of any particular entry by merely following the folio. The tracing of the postings is simplicity itself, for the illustrated set of books is kept apart from the explanations and descriptive matter, although the folio of each book or ledger account is given with the latter for reference. Facsimile illustrations of actual business forms are furnished throughout the treatise. The frontispiece is a concise chart, showing the entire scheme of a gas company's financial books; the debit and credit being indicated by differentiated lines and arrows. The text has been carefully divided into paragraphs, which are numbered to facilitate reference. The important duty of "balancing the books" is illustrated by four different methods. In addition to carrying the transactions right up to the revenue account and balance-sheet, the final results are shown as they would appear in the statement of accounts as printed and sent to the shareholders. The authors have been so desirous of having the statement exactly like an actual one, that they have had it bound in a coloured cover, so as to distinguish it from the other contents of book. In the appendix, the book-keeping necessary for carburetted water gas, oil used for enrichment, laboratory tests, and the various funds which are created by the raising of capital by local authorities, are dealt with; while several very useful forms for outstanding gas accounts, applications for cookers and slot meters, &c., are included.

It is obvious that the extremes of large and small undertakings render difficult the task of preparing such a work as that of Messrs. Brearley and Taylor; and while being exhaustive, there is little in the book that will not, we believe, be found applicable to each class, in a greater or less degree. The main object of the authors has been to produce a handbook of gas companies' book-keeping. It is the first attempt—at all events, the first published attempt—to treat of this kind of book-keeping all round; and the work should prove really helpful to all whose knowledge of gas accountancy is limited, and who are desirous of extending it. Its careful study will reveal to the uninitiated how the various books in use by gas companies are linked together, until the results of the operations are presented in the condensed form of the annual or half-yearly statement of accounts.

\* "Gas Companies' Book-Keeping: A Practical Treatise on the Keeping of Gas Companies' Accounts." By John Henry Brearley, Engineer, Manager, and Secretary of the Longwood Gas Company, and Benjamin Taylor, F.I.P.S. (Honours), Accountant. London: Walter King; 1900.

## DONKIN ON THE GAS-ENGINE.\*

THE previous edition of Mr. Bryan Donkin's well-known work upon the gas-engine bears the date 1896, which is ample justification for the publication of a Third Edition of this instructive book. It has been our pleasurable duty to introduce every edition in due course to the public reached by the "JOURNAL;" and we have had many occasions for referring to the volumes, as placed in the handiest corner of that book-shelf which contains the books that are tools. This avowal will probably be taken by the author as the greatest of all possible compliments. It is, in point of fact, impossible to have too frequent editions of a good book relating to so active a department of mechanical industry as the production of gas-engines. When a competent authority undertakes to write a text-book of this character, he ought to bind his publisher to issue only such a number of one edition as may be reasonably expected to necessitate another before very long. The historical portions of such a book should be as full and as accurate as possible to start with, so as not to require much alteration. With every fresh edition, the historical chapters may be increased by one, as the newer developments of the subject supersede the older. Mr. Donkin has worked on these lines with some consistency, though he does not appear to have realized their binding force throughout.

Since his previous edition appeared, gas-engines have developed chiefly in one direction. They have grown larger, so as to more directly challenge competition with the steam-engine; and they have been adapted to work with combustible gases of low fuel value, especially the gas evolved by the blast-furnace during the reduction of iron ores. Mr. Donkin has accordingly followed this line, in his prefatory remarks; and the switching-off of the new branch from the old text is very noticeable. It would have been easier, probably, to have rewritten the preface altogether. This would have spared readers the shock of reading that "in France, where both gas and oil are more expensive, they gas [and oil engines] are not so much in request." This observation was never more than partly true of French practice, even under past conditions, and in the days of small engines. There has never been a period in the history of the gas-engine, from the time of Lenoir onward, when French engineers were not working upon its development; and French engineering has had most to do with the direct utilization for the production of power of blast-furnace gas, and with the application of the poorest class of artificial fuel-gas to the working of large motors.

Five years ago, the industrial future of the gas-engine appeared, in expert opinion, to hinge upon the possibility of so improving the design as to avoid the great waste incidental to the cooling of the working cylinder. All these years have passed, and the gas-engine has been made both bigger and smaller than ever. It now fills the vast field open for the employment of prime motors ranging from 1500-horse power to the little engine that drives a tricycle; but the cylinder still has to be cooled. The much-desired (in theory) hot-cylinder gas-engine has not come into sight. Practically, the gas-engine cylinder is hot enough, in all conscience. The initial compression of the charge has risen to 250 lbs.; and the "scavenging" of the cylinder is much better done. A cylinder lubricant has been found which stands even this hot work. The improvement has come, not from the direction looked for, but in the economizing of the charge and the cheapening of the fuel. Thus it is practicable still to lose the heat dissipated by the cooling of the cylinder, and yet run the motor to better economic advantage. Another disappointment is recorded by Mr. Donkin, in the non-appearance of a rotatory or "impulse" gas-engine. This, having regard to the success of the Laval and Parsons steam-turbines, of which Mr. Donkin is not unobservant, is rather more to be regretted than the other. And, as yet, there is no marine gas-engine. Apart from these failures of invention to fulfil expectations—which, of course, are not peculiar to gas-engine practice—the gas-engine has, during the past five years, made more headway than either steam or air motors. This is the more remarkable in view of the circumstance that the gas-engine cannot be compounded. Nothing else than pure mechanical engineering has proved competent to increase the intrinsic and relative utility of the gas-engine.

So much for general considerations. Coming down to the particular contents of Mr. Donkin's book, we could have wished he had rewritten his first chapter, with the object of getting rid of the old-fashioned term "explosion" as being something different from "expansion." In many places where the author writes of the "explosion" of the charge, he means its ignition. Comprehension of what goes on in the working cylinder of a modern gas-engine would be facilitated if the term "explosion" were relegated to the history of the Otto and Langen motor, which really did depend upon an explosion for its movement. It is impossible, in the case of modern gas-motors, to separate the ideas of explosion and expansion of the driving charge. Some of the author's historical matter has been re-arranged. In his account of the development of the Otto engine through the dual branches of the Deutz and Crossley firms, Mr. Donkin has brought his statistics up to date, even more thoroughly than

\* "A Text-Book on Gas, Oil, and Air Engines." By Bryan Donkin, M.Inst.C.E., &c. With 149 Illustrations, and Selected Tables of Trials, Third Edition, Revised and Largely Rewritten. London: Charles Griffin and Co., Limited.



his technical matter. Surely, a modern illustration or two might have been found for this section; and we should not have blamed the writer if he had gone very fully into the minor improvements that must have been introduced in the Crossley manufacture since 1894.

Descriptions of several makes of gas-engine once known to Fame are left out of this edition, and their successors are duly catalogued. Students of Mr. Donkin's pages are prudently left to make their choice among the crowd of aspirants for patronage on the score of having improved upon the Otto type. From this list, the reader is taken to a chapter on French gas-engines, which is one of the best in the volume. We are told all that it is necessary to know about the so-called "Simplex" engine, and why the makers have adopted electric ignition. It is much to be regretted, by the way, that Mr. Donkin has fallen into the weakness of literally translating the French technical term *haut fourneau*, and throughout his book speaking of engines using "high furnace" gases. He should have remembered that English people really know nothing of "high" furnaces. Blast-furnaces they do know; and it is to the utilization of blast-furnace gas that the big gas-engine is specially called in this as in other countries. "High furnace" smacks of the amateur.

The chapter on German gas-engines is not quite up to date. The blocks are mostly old, and the matter does not convey the impression that the intense preoccupation of German physicists and engineers with the problem of cheap power production has been adequately watched, and the results followed. The chapter on fuel-gas production is newly written, for the most part; and the actually surviving processes for making it are fully noticed. We fancy, however, that the water-gas men will protest against the statement, on p. 164, that the average heating value of water gas is 106 B.T.U. per cubic foot. This must be a piece of sheer carelessness, because on the opposite page Mr. T. O. Paterson is cited as having made some experiments with water gas which had a heating value of 276.4 B.T.U. per cubic foot. It is waste of space to reproduce, as Mr. Donkin does, information about the "Strong" water-gas system, or any other fossils of the order. We are not going to name them; but living processes are the only ones deserving of an instant's critical notice. There are dozens of pretty-looking devices of the kind, on paper, called by fond parents by various question-begging titles, which are not worth looking at outside a museum.

For one luminous statement Mr. Donkin deserves to be thanked and remembered with gratitude. It occurs on p. 203, after a table of heating value of various gases, and runs as follows: "The low heating value of the gas, as here shown, does not affect its efficiency in a gas-engine. The lower its calorific power, the higher the compression it will bear without danger of spontaneous ignition, or sudden explosive shocks. As is now well known, the thermal efficiency of an engine increases within certain limits with the degree of compression; and it is towards this higher compression that the efforts of gas engineers are continually tending." This clears up the field wonderfully.

Having given Mr. Donkin this high meed of praise, we are free to point out his grave omission to adequately criticize the Westinghouse gas-engine. This ought to have come in somewhere about or before his p. 215, where he discusses the question "whether large gas-engines, at the high temperatures and pressures developed in the interior of the cylinders, and their comparatively high piston speed, may be relied on to run safely and steadily for a long period without undue wear." True, he mentions the Westinghouse motor, but almost as an afterthought, or at any rate after his criticism of the whole class of motors had been finished. Yet this is just the place where the Westinghouse motor ought to have been noticed, because it discards the "hit-and-miss" system of governing, and governs by varying the quantity of the charge. There are no miss-fires. All that Mr. Donkin has to say about this motor is that "great regularity in running is said to be obtained." We submit that this is not nearly enough. Mr. Donkin puts the Westinghouse manufacture in the same category as half a score of commonplace American copies of Otto engines that the majority of his readers are never likely to hear of. This, again, is not fair. The besetting weakness of text-books is the lack of due observance of proportion. Nobody can usually learn from them whether the thing described is a mere curiosity, or is the most important commercial success of the time. It may be said, of course, in reply to this complaint, that science knows nothing of the volume of sales; but business men, and technical students, have to think of this element. Everybody "in the know," at the present day, is cognizant of the state of affairs as between the Otto and the Westinghouse types of gas-engine. No others count. But if the essentials of the Otto type of motors are adequately discriminated in Mr. Donkin's work, those of the Westinghouse motors certainly are not. The name does not even appear by itself in the index. This is a loss to the whole work, and clearly gives it an obsolescent aspect before it gets into circulation.

**The Gas Exhibits at the Paris Exhibition.**—Mr. C. E. Brackenbury, Assoc. M. Inst. C. E., has written a report for the London Chamber of Commerce on the gas exhibits at the Paris Exhibition. It may be remembered that the Chamber recently appointed an Exhibitions Committee to inquire into the representation of British interests, and to consider what steps, if any, should be taken to safeguard them.

## PERSONAL.

It will be remembered that Mr. CORBET WOODALL left England on Aug. 25 for a visit to the States, and thence to the Straits Settlements to fulfil a professional engagement. His numerous friends in the gas industry will be pleased to learn that he had a pleasant and interesting trip from New York to Vancouver, and that he arrived safely at Yokohama on the 24th ult.

On the occasion of the distribution of the awards at the Paris Exhibition, the following promotions were made in the Order of the Legion of Honour: To the grade of Commander, M. TROOST, Chairman of the Paris Gas Company. To the grade of Chevalier: MM. LÉON BERTRAND and AUGUSTE LÉVY, Engineers of the Paris Gas Company; M. BESNARD, member of the Jury of Class 75; and M. CHAMON, Director of the Compagnie pour la Fabrication des Compteurs, President of the Chambre Syndicate d'Eclairage et de Chauffage par le Gaz.

## OBITUARY.

The death is announced of Alderman J. F. WILEMAN, who for several years has been the Chairman of the Staffordshire Potteries Water Company. He has been in failing health for some time; but the immediate cause of death was heart disease.

We regret to record the recent death, in his 62nd year, after a short illness, of Mr. WALTER W. MONK, who for about ten years was Engineer and Manager of the Bournemouth Gas and Water Company, having previously held the position of Manager of the Port Louis Gas-Works. Acting under medical advice, he left England in 1890 for Australia, and for a few years represented Messrs. C. & W. Walker in that colony; but he returned some six years ago. At the time of his connection with the Bournemouth Company, Mr. Monk was a member of the South-West of England Association of Gas Managers; and those who attended the meeting of the Association in that town in September, 1884, will remember the hospitable reception they met with at his hands, and the personal attention given by Mrs. Monk and her daughter to the arrangements for the comfort of their guests.

**Lectures on Gas Manufacture.**—We have received a copy of the syllabus of a special course of lectures on "Gas Manufacture" which Mr. Walter Grafton, F.C.S., will deliver to students at the Regent Street Polytechnic, commencing on the 3rd inst. The lectures, so far as is practicable, will be illustrated by experiments and apparatus. Glancing through the syllabus, its comprehensiveness is striking. We can detect nothing in the way of omission from the site of a gas-works and the coal used up to the distributing-mains, domestic lighting, cooking, and heating appliances, and laboratory work. The lectures may be commended to those who desire to obtain (for a modest fee) a good general knowledge of the subject, and who intend sitting at the City and Guilds Examination.

**North of England Gas Managers' Association.**—The 47th half-yearly general meeting of the Association will be held in Durham next Saturday, under the presidency of Mr. E. H. Millard, the Engineer and Manager of the Durham Gas Company. We learn from the circular issued by the Hon. Secretary (Mr. J. H. Penney) that the members and associates will meet at the Gas Office at noon, where light refreshments will be provided; and the business will be proceeded with shortly afterwards. It will consist mainly of the delivery by the President of his Inaugural Address. By permission of the authorities, arrangements have been made for the members to visit the Cathedral after the meeting. On the invitation of the Chairman and Directors of the Gas Company, the Association will dine at the County Hotel in the afternoon.

**Early Instances of Oil-Gas Lighting.**—In an interesting article on "Early Oil-Gas Lighting" which appears in the current number of the "Engineer," it is pointed out that three-quarters of a century ago a considerable number of towns in the United Kingdom were illuminated by oil gas; and for a long while much competition prevailed between it and the older system of using gas produced from coal. The oil gas in question was usually made from whale oil—the material which, before any kind of gaslight was known, supplied the wretched little lamps of the public streets. In 1815, Mr. John Taylor, of Stratford, Essex, obtained a patent for the decomposition of oil and other animal substances, with a view to obtain from them an illuminating gas. The patent was acquired by Messrs. Taylor and Martineau, who in 1819 put up a small but complete and improved apparatus at Apothecaries' Hall, London. It was capable of producing from 1600 to 1800 cubic feet of gas at one operation—that is, without cleaning the retorts. The whole occupied a very small space, and was therefore thought to be eminently suitable for lighting large houses or factories; while practically very little trouble or labour was required. The gas gave a fine white light, did not contain any sulphuretted hydrogen unless bad coke was used, or require purification beyond passing through clean cold water. It was estimated that a gallon of common whale oil would produce 90 cubic feet of gas, though further experience showed that 80 cubic feet was nearer the average. Other forms of oil, or liquid grease, were also used, some of which were cheaper than whale oil; and the perfect practicability of obtaining an excellent light was soon put quite beyond question.



## NOTES.

**Expanded Metal and Concrete Construction.**

Mr. A. T. Walmisley read a paper at the British Association meeting on the "Use of Expanded Metal in Concrete," which he treated as an improvement on the Monier and similar systems of reinforced concrete construction. The author worked out the principle of the system, and gave many particulars of tests of beams and slabs prepared in accordance with it. He gave the preference to expanded-metal reinforcement for concrete, because it is lighter for the ultimate strength attained than any system of bars or wires, and moreover demands less care in the adjustment. Mr. Walmisley relied largely upon the results of tests of the system carried out by Mr. A. Baker, of Beckton, under Mr. G. C. Trewby's direction. It has since been used extensively at Beckton, with satisfactory results on a large scale. Mr. Walmisley notes that the introduction of metal into concrete as a tensile element, has become generally accepted as a point of modern engineering construction. Hitherto the principle has chiefly been used in cases where the steel framework of the floor construction has already been designed. It is remarked that the best and most economical results would be obtained by a disposition of framework calculated to suit the carrying power of the concrete with the aid of expanded metal, whereby the user could employ concrete of a wider span than when employing plain concrete. The full text of the paper appeared in the "Builder" for Sept. 15.

**The English Trade in Russian Petroleum.**

According to the "Petroleum Review," a new era has dawned for the English trade in Russian petroleum. This result is claimed to be due to the operation of natural forces and influences, which are far more potent than fiscal manoeuvring or market manipulation. In the natural order of things, it is pointed out, the export oil trade of the United States is being overtaken by that of Russia. The American importation still leads, with a total of upwards of 93½ million gallons for the first eight months of the current year. The Russian importation, however, has crept up to 59¼ million gallons, and is still growing. The first section of the long pipe-line which is to connect Batoum with the open sea has been completed and brought into use; and when it is entirely finished, the oil-consuming world is to see wonders. Meanwhile, much is expected from the circumstance, now announced, that the interests of Russian oil in this country are brought under the control of one company, who are going to establish an organization for transporting and supplying the products which will rival that of the Standard Oil Company. It is remarked, in justification of this combination, that petroleum is a product the cost of purveying which is in inverse ratio to the quantity distributed. A wide and ramified system of conveyance and supply is thus necessary to achieve a substantial result, to effect the greatest economies, and to bring the price of oil as low as possible.

**Moving Stairways and Platforms.**

The attention of works managers may be drawn to the rapid modern development of the idea of the saving of labour by mechanical elevators and conveyors, which is being extended to include human beings. The conviction is being forced upon practical-minded persons in commerce and industry, that the more saving of every form of unnecessary muscular labour that can be effected, the more and better work will be done to the desired purpose. One of the oldest and most familiar of muscular efforts is that of walking about and going up and down stairs. It is difficult to realize how much energy is commonly wasted in this way; but it is beginning to be understood that every man in his ordinary working trim, whatever his occupation, is only able to expend a fixed amount of energy during his hours of daily labour. If this amount is regularly or often exceeded, rapid deterioration of the human machine follows. To make a working man run about unnecessarily, or go up and down stairs often, as part of his day's work, is to use up energy that could be more profitably employed. Consequently, there is a greatly increased employment of lifts in all modern offices and commercial buildings; and this labour-saving device is being supplemented by moving stairways and travelling platforms. At the Crystal Palace, the galleries hitherto almost a desert because of the disinclination of tired sightseers to mount stairs, are being rendered more accessible by means of what is called the Reno Inclined Elevator. This kind of appliance has a future; for it avoids the interruptions and waits inseparable from the use of the ordinary lift. There are many situations, moreover, in which a travelling platform of people and goods would save much tramping to and fro.

**A Furnace for Burning Coke Dust.**

An interesting American consular report relates to the working of an invention of Paul Cornelius, a German, for effectively burning the finest coke dust in a boiler-furnace. By this device, the fuel has to be burnt in furnaces built separately from the boiler; the ordinary size for the fireplace being 10 feet by 4 feet. In addition, there is required a fan-blower, driven by an electrical motor, or its equivalent, of about ½-horse power, which drives air into a hollow iron chamber placed at the rear end of the furnace, where the heat is most intense. Into this chamber one end of the hollow grate-bars is fitted; the front end resting on ordinary bearings. These hollow fire-bars are round on the

bottom, but hexagonal on top, where they are pierced, on all three faces, with holes about 2 inches apart, beginning at the nearest end with a calibre of ⅛ inch, which is slightly increased throughout the length of the bar, so as to equalize, as far as possible, the delivery of the air. Not all the bars are hollow; these being interspaced with solid bars to help take the weight of the fuel. The idea is that the intensely heated air, being driven upwards in three rows of jets at different angles, keeps the whole bed of fuel in a highly incandescent state. Such a grate will burn with a white heat coke dust, the fine screenings of broken coke, or any description of carbonaceous rubbish that ordinarily goes to form roads and footpaths. The hollow grate-bars are cast in 3-foot lengths, with flanges for bolting together to form any desired length of grate. It is to be expected that there will be a good demand for all kinds of rubbish-burning grates for some time to come; and the claims made for this simple arrangement may well be tested. It does not appear to exhibit any specially novel feature.

**Self-Fleeting Rope-Drums.**

All hoisters and ironwork constructors have experience of the troublesome feature of drum-winding known by the name of the "fleeting" of the rope. It means the creeping of the rope, as it is being wound in, from one side of the drum to the other, by reason of the coils following one another always in the same direction. The two usual ways of dealing with this phenomenon, when the conditions do not permit of the use of a drum large enough to take all the length of hoisting rope, are either to stop heaving and "fleet over," by shifting the turns backwards—the load being meanwhile sustained by a tie on the main cable—or by sharply coning the drum, which causes the rope to slide sideways by itself. The latter is the safer expedient; but it causes a great deal of wear upon the rope—thus materially shortening its life. A better device is described in "Mines and Minerals." This consists of a pair of pulleys or drums placed tandem-wise, each having several grooves upon its face. Call these drums A and B, and number the grooves 1, 2, 3, 4, in order from the winding-on to the winding-off side. The rope is threaded underneath drum A, and winds into groove 1 of drum B, lying here for half the circumference, and then passing back underneath the pulleys and winding into groove 2 of drum A, which it likewise traverses for half a circumference to the upper side of the pulleys, whence it passes to the next groove of drum B. Thus the rope has an arc of contact of only one-half of a circumference upon each drum, for each complete round turn. Every round turn is divided between two drums, instead of being completed upon one. Hence there is no fleeting, because the turns do not complete themselves, and there is no riding nor slipping sideways. The friction of the rope is not quite so great on the two drums as on one; and another round turn or two may be needed to give the same grip. But this is a small consideration.

## COMMUNICATED ARTICLES.

**THE UNPROFITABLE CONSUMER.**

By NORTON H. HUMPHREYS, Assoc.M.Inst.C.E., F.C.S.

It is somewhat disappointing to find that the article on slot consumption and paying averages, communicated to this column by Mr. George Helps (*ante*, p. 523), has not been successful in drawing some discussion or expressions of opinion from the friends of the slot-meter consumer or from the advocates of the system, and especially from those who go so far as to claim that there should be one price for all—slot or ordinary—and that there should not be an extra charge on the slot-meter consumption. At the present time, when the unusually high price of coal leads the gas manager to scrutinize the expenditure side of the revenue account more anxiously and closely than ever, it is desirable that the slot meter should be placed upon its trial, to see whether it really does, in practice, come up to the standard of the paying average. So long as things are going well and easily, there is not much trouble in getting permission to incur outlay, if there is a reasonable prospect of further business; but when there is an awkward hiatus between the amount required for full dividends and the available balance for the purpose, the new proposal is more severely criticized, and there is a desire to know, not only what the proposed outlay will be, but also the actual return that may be looked for. A loading composed of unprofitable consumers that might escape notice at ordinary times, now becomes an important item. While new business is welcome, it is especially desirable that it should be, if anything, more remunerative than the existing lines; and certainly it should not be less so.

The noticeable sympathy between the topics discussed by gas managers in America and those that attract attention here, to which I have previously alluded, is again illustrated. For within a day or two of the publication of Mr. Helps's opinions—which are more remarkable as going beyond the usual standards of the number of appliances put out, or the quantity of gas consumed by them, than for specific considerations of profit and loss—Dr. Powers was asking the members of the Pacific Coast Gas Association, assembled at San Francisco, for some information, not only as to the number of stoves distributed and the quantity of gas used, but as to the actual position of the stove department as a paying concern. Undoubtedly there were increased sales,



which might be taken to mean increased profits; but he wanted to know the amount of net profit remaining, after paying all expenses, and suggested whether, after charging the gas-stove department with all expenses incurred on its behalf, there might not be a necessity for a subsidy from the general funds to meet a deficiency, rather than a balance available for profit. This criticism, being addressed to gentlemen who spend hundreds a year in advertising, or give stoves away *gratis*, might perhaps have greater force in California than in England. But it also applies here, for there is a noticeable tendency to incur special outlay in order to obtain new business, and this without actual proof that the new business may be expected to be remunerative. So the lines of reasoning laid down by Mr. Helps, which admit of an answer to Dr. Power's question being prepared from the accounts of any particular undertaking, are particularly pertinent under present circumstances of working; and they may be applied to any kind of special outlay undertaken with a view of opening up new lines in gas consumption. In place of "slot meters" we may read "cooking-stoves," and the arguments still hold good.

The practice of insisting on a written agreement from every customer has been dropped; and, on the whole, gas companies have done better since they discontinued it, as in some sense it involved thrusting their Act of Parliament upon public notice, and was no doubt largely concerned in securing for them the title of "monopolists." But it is quite possible for the pendulum to swing too far in the opposite direction; and one cannot go very deeply into questions of the kind now under consideration without being confronted by the fact that, while the company on their part accept onerous responsibilities, the consumer incurs no corresponding liability. In laying on a supply of gas, the company have to guarantee a great deal; but the consumer guarantees nothing. In putting down a 10-light meter, with its appropriate service-pipe, the company incur the liability of keeping on a continuous supply for 168 hours per week up to the full capacity of the meter. It would seem that, in order to preserve the two-sidedness which is a necessary feature of a fair bargain, the consumer should also be prepared to guarantee a fair minimum consumption. But he can please himself whether he uses gas for one hour or less, out of the 168, and at best cannot be compelled to do more than make a colourable imitation of using gas. The excess capacity of service and meter that the company are called upon to provide is enormous. A 10-light meter, working at full nominal capacity, would pass more than a million cubic feet a year; but in actual practice, the average annual consumption is less than 100,000 feet. Yet there are those who advocate free meters.

If a gas company decide to assist the consumer by providing a slot meter, stove, or gas lighting appliances, they make a known and definite addition to their obligations. They have to guarantee the interest on the capital so invested, and to take the risks of depreciation. But the consumer's position is not altered. Every working man may have, not his three acres and a cow, but three gas-burners and a stove. The only way of finding out how far the arrangement is likely to be remunerative to the gas company, is to try the experiment for a twelvemonth, and then strike the average, and see if it is a "paying one." The success or otherwise of the enterprise depends solely upon reaching a paying average; and whether this is attained or not rests entirely with the inclination of the consumers. It should be the business of every gas manager who introduces any scheme that adds to the expenditure per consumer, to ascertain his position in respect to this important factor. If it has not been secured, the question for consideration is the best means to adopt in order to convert loss into profit.

One accredited method of proving the success or otherwise of a new departure, is to compare the most recent available set of accounts with those of previous years; and to some extent the balance of income over expenditure is an indication of the prosperity of the concern. But unfortunately the times are not favourable to such a comparison, as this item is affected by variable factors that are outside the control of the management. The market prices of coal and other necessities have been steadily rising for some years; and it is not always good policy to advance the price of gas in sufficient proportion to maintain the *status quo*. Many who read these lines have experienced the annoyance and disappointment attending upon finding that the results of some improvement involving a large amount of time and trouble have been wiped out of the accounts by these means. They have introduced, let us say, regenerator firing, and have incurred considerable outlay on the faith of improved returns. After the usual difficulties and anxieties, the expected results are fully secured. But meanwhile up goes the price of coal; and the additional profit, which should appear in the form of increased net revenue, simply goes into the pocket of the coal suppliers. It is difficult to satisfy everybody that more profit has been earned, when a smaller return is shown in the profit and loss account. In a similar way, a comparison of the accounts for the year ended June 30, 1900, with those for the year ended June 30, 1896, is not likely to afford much useful information as to the success or otherwise of a new departure inaugurated in 1897. Yet we naturally want to know whether the introduction of the slot system has yielded a profit commensurate with the special expenses, trouble, and risk incurred in connection with the establishment of this new line of business. Whether equally good results might possibly have been attained by less costly methods, and whether the new venture has not

been allowed too prominent a place, to the detriment of other means of keeping and increasing business—such, for example, as a well-arranged maintenance scheme for incandescent lighting. One company may be very enterprising, and devote all their available strength to obtaining new business, while another may rather favour attention to the existing connection, and to keeping together the business already secured; and it is possible that the second may make as good a showing as the first.

A very usual joke at a Christy Minstrel entertainment is for "Massa Bones" to step forward, after a well-merited round of applause accorded to an artistic rendering of a chorus or orchestral performance, and, by elaborate bowings and gesticulations, to accept the same as a recognition of his own individual abilities. The slot meter stands in a somewhat similar position, when it is credited with going out by thousands, while the ordinary meter only went by hundreds. The introduction of the slot also means, in most cases, the inauguration of a grand new policy. It is a very long jump from unassisted gas-fitting and long-period irregular payments—the benefit of gas could not be obtained on any other terms—to short-period regular payments and fittings without trouble or initial cost. Under the ordinary arrangement, the intending consumer is practically loaded with all responsibility in respect to fittings on his side of the meter. He has to employ a gas-fitter, to exercise a certain amount of supervision, and then to foot the little bill. In some cases the gas company assist him in this matter to the extent of being prepared to carry out the gas-fitting at his expense. Then as regards payment for the gas consumed, until the introduction of the slot meter the idea of doing business on any other than "quarterly terms" was regarded, with very few exceptions, as impracticable. And to talk of quarterly payments does not quite cover the whole ground, as the impression is conveyed of *equal* payments, as is the custom with regard to the rent of a house or field. But the quarterly terms for gas really come, in practice, to paying one-third in January, one-third in April, one-sixth in July, and one-sixth in October. Thus a consumer using £10 worth of gas per annum is asked to pay about £3 in January, and a similar sum in April. There is no trouble about the summer instalments. But the small consumer and the weekly wage earner find their January and April payments are a heavy burden, coming just at a time when other expenses are highest and wages lowest. With the slot system, there is no heavy initial expense in the form of the gas-fitter's bill; and in regular working there is no quarterly bill looming in the distance, and no necessity for scraping together comparatively large sums during the winter months. As Mr. Helps appropriately points out, there are other ways of securing these advantages, apart from the slot meter; and in assessing the benefits claimed to have resulted from its introduction, it is right to discriminate between those due to the special feature of the appliance, and those due to fittings with no initial cost and to short-period payments.

There is a point where every consumer of gas—and, for that matter, every purchaser at any shop—ceases to be a source of profit. Let us suppose that a customer's account is subject to steady and continuous decrement. After a time, a point will be reached when the custom is so small that, to use everyday language, it is not worth having. The grocer would decline to sell sugar or soda by the ounce; and the publican would not care to retail beer or spirits by the halfpennyworth. The reason why they refuse to do so is that every transaction involves a certain special outlay, if only an assistant's time for a few minutes. In connection with the sale of any commodity, there are three classes of expenses—viz., liabilities, such as rent, which are entirely independent of the amount of business done, and have to be paid in any case; expenses, such as the purchase of materials, which are in direct ratio to the amount of business done; and expenses that vary according to the number of customers, such as the serving and delivery of goods. In regard to the supply of gas, there are certain establishment charges which must be met, even if the company did not sell 1000 cubic feet of gas. There is the cost of coal, wages, purifying, and other items of manufacture, which depend upon the quantity of gas made; and there are the salaries of meter inspectors, rental clerks, and collectors, cost of bills and receipt-books, which depend upon the number of consumers. We will call the establishment charges A, the manufacturing charges B, and the consumers' expenses C. It is a debatable question whether the establishment charges A should be allocated per consumer or per 1000 cubic feet of gas sold; but there can scarcely be any difference of opinion as to each consumer being charged with an aliquot share of C. If a consumer is to be of any value to the concern, we find that, calling his total annual payment D,

$$D - B > C;$$

and the difference will constitute a contribution to the profit and loss account. If this expression does not hold good, then the customer is a loss, and not a source of profit. The value of C can be readily calculated from any set of accounts. In order to illustrate the point, we will put D as representing 5000 cubic feet at 3s. 6d., B as equivalent to 2s. per 1000 cubic feet, and C as 4s. In this case,  $D - B = 7s. 6d.$ , leaving a margin of 3s. 6d. to be considered as profit. We also find that—

$$2\frac{2}{3} (D - B) = C;$$

and it follows that the above expression would become a minus quantity at about 2600 cubic feet. This is exclusive of special expense incurred in the way of meter, stove, or other appliance for the special use of the consumer.



It is immaterial, for the moment, whether the turning point is 2s. or 10s. What I am now seeking to impress is that there is a turning point, or, as Mr. Helps calls it, a paying average, and that any customer whose account does not come up to the point is a source of loss. The question is: What is to be done with the unprofitable customer? No one likes the idea of refusing business, even if the profit is not very apparent. There is a vague impression that the injury incurred by refusing a customer can scarcely be estimated; and so any retail dealer would assure us that he works certain lines at a loss, because by this means he keeps business together. In a similar manner, all gas companies are loaded with a number of small and irregular customers whose business is not worth having; but under the terms of their concessions, they are supposed to supply anybody and everybody, irrespective of the "turning point" or of the paying average.

The best means of meeting this difficulty is the minimum charge, which is simply a *quid pro quo* for the special expenses and liability incurred by the company. One speaker at the Pacific Coast Association meeting above referred to, mentioned that he had put this system into operation, and that there had been absolutely no objection raised by his customers. Perhaps in England some might say at first that it was paying for nothing; but the error in this assertion can easily be proved. Such a procedure appears preferable to the absolute refusal to do business on any terms. It is difficult to show, in view of the liability undertaken by the gas company, that a minimum charge of, say, 20s. per annum is either a hardship or an injustice. The minimum charge has been recognized by Parliament in connection with the supply of electricity; and, in a general way, the prescription of length of service-pipe, and of guaranteeing to use the equivalent of at least 20 per cent. per annum on the cost, which is a feature of the Model Gas Acts, indicates a recognition of the right of the gas company to be preserved from the unprofitable consumer. In our principal towns, where the habits of the artisan classes are very different from those prevailing in rural districts, there appears to be no difficulty in reaching the paying average; but as much cannot be said in respect to small country towns, consisting chiefly of the class known as "residential," or a sort of centre of supply for an agricultural district, with no special manufacturing industry. Mr. Helps shows that the paying average comes in at somewhere about 10,000 cubic feet; and it is by no means certain that this can be obtained by the smaller gas undertakings. They must either adopt a high extra price or a minimum charge, if they wish to be secure from loss. A high extra price is a great injustice to a large slot consumer, and, if the ordinary price of gas is already 3s. 6d. or 4s., is likely to prove a hindrance to business. One essential to a successful slot department is that the gas should be moderately cheap.

While the unprofitable consumer may be got rid of by the drastic remedy of cutting him off, it should be remembered that at the best the company can only recover a portion of their outlay by this means. The meter and the stove may be brought in again, and also the fittings; but there will be a certain wastage of piping, and a considerable portion of the outlay consists of labour. Money paid as wages, when once disbursed, is clean gone; and no portion of it can be recovered. There is also not only the loss on putting in the fittings, &c., but a second expenditure by taking them out. Then there is always a hope that the unprofitable consumer may improve—that having once commenced to use gas, he will from time to time add to the number of burners, put in a gas-fire or other gas appliance, &c. It does not seem unreasonable to hope for an increase in the consumption per consumer. If the first year's working of the slot meter averages 8000 cubic feet per consumer, the second may show 8500 feet, and the third 9000 feet. It would therefore be preferable to guard, as far as possible, in the first place, against getting the unprofitable customer on the books; but when there, the cutting-off process should not be applied until there is absolute certainty that the case is hopeless.

Gas companies are apt to run too much on the lines of the British agriculturist, who, having been accustomed for years to grow corn on a particular plot of land, and finding he cannot sell the produce at what he regards as a remunerative price, sits helplessly down, grumbles about bad trade, and wants his rent and rates reduced. The American farmer does one of two things. If his corn will not sell as corn, he sets to work and extracts whisky, starch, sugar, or other marketable commodity from it; or he drops growing corn that will not yield a profit, and grows potatoes or something else that will. A great deal has been written and said about educating the gas consumer, in the sense of teaching him to avoid wasteful and inefficient appliances; but might not this expression be taken in a wider sense, as inducing the gas consumer to use 2000 cubic feet of gas where he only used 1000 feet before? Surely it is preferable to change the unprofitable consumer, by this sort of education, into a profitable one, than to cut him off. We sometimes hear that a clever shopkeeper will sell people things they do not want, but that any fool can sell them what they do want. This saying is true, not in the sense that the clever salesman induces the customer to buy useless articles, but that he sells some novelty previously unknown to the purchaser, and which affords a good return for the expenditure. Gas companies have kept too closely to the lines of selling "what they do want," and might with advantage study the tactics of the smart counter-hand.

## PRACTICAL NOTES ON GAS MANUFACTURE.

By S. CARPENTER, of East Ham.

The following notes have not been written for those managers of gas undertakings who have had the advantage of thorough training in all branches of the gas industry, but to assist in a modest way those who have obtained responsible positions in gas-works by virtue of their natural ability, but who have not had the valuable aid of a liberal education. To these, the operations connected with gas manufacture which involve the changes brought about by the force known as chemical action, are frequently shrouded in mystery; and to pierce these clouds slightly the writer has brought together a few notes and facts from his own practical experience, extending over a period of fifty years, and he submits them in the hope that they may be of some service to those who care to peruse them.

### CARBONIZATION.

In the manufacture of coal gas the retorts should be of a bright red heat before the coals are put in. Great care should be taken not to have the heat too high. The charge should be moderate in bulk; otherwise, if the retorts are overcharged, as soon as the coal is put in it begins to intumesce, and dense black smoke is produced the moment the lid of the retort is closed. This smoke is nothing more than the volatile constituents of the coal passing off as vapour containing the hydrocarbons and black viscid fluid called tar. As soon as the coal is in the retort, the heat to which it is subjected disturbs the normal position of the material, and a condition is set up resembling the boiling of water in a kettle. If there is too much water in the kettle, it will boil over; and if the retort is overcharged, when the coal begins to intumesce it will fill it, and cause it to scurf. The incrustation thus formed on the interior of the retort not only occupies space which should be available for the coal, but increases the cost of fuel for the furnace and labour in the retort-house. The coke should not be allowed to remain in the retorts too long after all the volatile constituents of the coal have passed off.

Coal gas, as it issues from the retorts, contains the following impurities: Tar, water vapour, ammonia ( $\text{NH}_3$ ), carbonic acid ( $\text{CO}_2$ ), sulphuretted hydrogen ( $\text{H}_2\text{S}$ ), and bisulphide of carbon ( $\text{CS}_2$ ). These impurities present themselves in various states of combination. Ammonia is generated during the decomposition of the coal, and it appears in two forms—one being met with in the ammoniacal liquor, and the other in the impure gas. Sulphuretted hydrogen is also found in the liquor and in the gas. Hydrogen presents itself in several ways, and combines with different ingredients, giving rise to various hydrocarbons, such as gas, naphtha, and tar, and with sulphur to form sulphuretted hydrogen. Part unites with nitrogen to produce ammonia, and part with oxygen to form water. The oxygen combines with carbon and carbonic oxide and carbonic acid result; and carbon unites with sulphur and bisulphide of carbon is produced. The constituent elements of coal are carbon, hydrogen, oxygen, nitrogen, sulphur, and iron; and they yield on distillation coke, carburetted hydrogen, hydrogen, various naphthas, carbonic oxide, carbonic acid, ammonia, sulphuretted hydrogen, bisulphuretted carbon, and protosulphuretted iron derived from the decomposition of the bisulphuretted. If the mouthpiece of the retort is opened, it will be seen that the excess of carbon remains as coke, which holds the protosulphuretted iron. Part of the hydrogen remains free, while part combines with carbon, giving rise to various kinds of hydrocarbons, such as gas, naphtha, and tar, and also to a little nitrogen, producing basic compounds and hydrocyanic acid. Another part of the hydrogen unites with half the sulphur of the bisulphuretted iron, and with any free sulphur present in the coal, to form sulphuretted hydrogen; while the remainder combines with oxygen to form water, or with nitrogen to produce ammonia—the rest of the oxygen being taken up by part of the carbon, generating carbonic oxide and carbonic acid.

### CONDENSATION AND PURIFICATION.

In considering these subjects, let us first notice the impurities which the gas contains as it leaves the retorts, and follow it as it passes to the condensers and purifiers. By so doing we shall better understand how its impurities, which have been already enumerated, can be removed, and the best material for doing the work. From the hydraulic main the gas passes on to the condensers, the function of which is to cool it, and reduce the vapours intermixed with it into ammoniacal liquor and tar, by which process the latter is prevented from passing forward to the other appliances. A large portion of the watery vapour, as well as some of the tar, is deposited at the bottom of the condensers, from the outlet of which the gas passes on to the exhauster, thence to the scrubbers, and from them to the lime and subsequently to the oxide of iron purifiers.

We will now glance at the work of the different appliances. Taking first the hydraulic main, the writer has found, in practical experience, the wet main to be the best, for several reasons. In the first place, it acts as a water-valve, and prevents the gas from returning down the ascension-pipes when the retorts are



open. Secondly, by having a 2-inch tar seal for the dip-pipes, the gas has to pass through this seal. To a certain extent tar is a purifying agent. At the same time, if its ingredients—the hydrocarbons or similarly constituted substances—did not combine and adhere, the perfect purification of gas would be almost an impossibility. When the gas bubbles through the tar, it loses its smoky colour. There are sulphuretted hydrogen and bisulphide of carbon, as well as other impurities too numerous to mention here, in the combination of hydrocarbon compounds called "tar." The hydraulic main thus acts as a water-valve, and also as a condenser and purifier. Hence we see the necessity for not separating the gas and tar before the condensers are reached, for there they will separate themselves.

Let us consider for a moment the work of the condenser—one of the most essential of the appliances used in the manufacture of gas, serving as it does to reduce the temperature of the gas to the degree most favourable for the deposition of its ammonia in the scrubber. In the writer's opinion, the tar in the condenser eliminates a portion of the sulphuretted hydrogen and bisulphide of carbon, as these impurities are found in the tar. The condenser may, without question, be regarded as part of the purifying plant; for when the gas issues therefrom it has lost its smoky colour, by which we know the purifying process has commenced. The condenser is an apparatus consisting of a double row of pipes about 18 feet high, the size and the number being in accordance with the make of gas per hour. These pipes stand vertically on a cast-iron box, having plates at each end bolted to flanges, so that they may be taken off at any time for cleaning. This is the simplest, and at the same time one of the best, forms of apparatus for slow condensation. Great care should be taken in cooling the gas before it enters the condensers. Do not cool it too suddenly, or convey it from the retorts in pipes in direct contact with atmospheric air; but, if possible, take it just under the floor of the retort-house. While excessive condensation has its disadvantages, insufficient condensation has also its evils. If the gas is gradually cooled, and the tar kept in contact with it until it has passed through the condensers, the writer is of opinion that there will be little or no trouble with naphthalene in the mains, whether before or after the gas has undergone the process of purification.

From the outlet of the condenser the gas passes on to the exhauster, and thence to the scrubbers. The work of these vessels is to remove the ammonia from the gas. The writer prefers what are known as "tower" scrubbers, for the reason that the gas enters at the bottom, and in passing through the scrubber is met by water falling from the top like rain. The stream of gas, in ascending, is divided up, so to speak, by a series of intervening wood grids or broken bricks, so as to present it in a finely-divided state to the descending water. If the temperature of the gas entering the scrubber is about 70° Fahr., and that of the fresh water 60°, the water is capable of absorbing about 780 times its volume of ammonia, fully 2½ volumes of sulphuretted hydrogen, and one volume of carbonic acid. The writer is speaking from practical experience with "tower" scrubbers, in which fresh water and then ammoniacal liquor were used.

The next step in the purification of coal gas is its treatment by passing it through vessels charged with dry lime. Two of these purifiers will be sufficient for the removal of all the carbonic acid and part of the bisulphide of carbon in the gas; but, of course, their size will vary according to the make of gas. The work of the first lime purifier is to decarbonate the gas, and at the same time remove part of the bisulphide of carbon and sulphuretted hydrogen. The gas which has been decarbonated in the first purifier is passed into the second, where more of the bisulphide will be removed. The gas is afterwards turned into vessels charged with oxide of iron, to take out the sulphuretted hydrogen remaining in it after the lime purification. If the gas is treated in the manner described, it will be purified in the way considered best at the present time.

A few remarks may now be offered on the working of lime purifiers. As already stated, it will be sufficient to have two in action at the same time. It is not so much the depth of lime as surface of material that is required for the removal of the impurities from the crude gas; and it is much more advantageous to have a large surface of lime in thin layers than a small one in thick layers. By "thick" layers, the writer means those from 7 to 9 or 10 inches; by "thin" layers, those from 4 to 4½ inches. His reason for preferring thin layers is that when the gas is first turned into the purifier it enters with considerable velocity; and if the lime is very thick, it offers great resistance. If there should happen to be a weak place in the layer, the gas would pass through it much more quickly than the other part; but if the lime is thin, it offers less obstruction to the progress of the gas. With four layers of lime, there are, of course, four surfaces for the gas to act upon.

When the crude gas is first admitted into the lime purifier, the valve should be opened very slowly, so as not to disturb the normal position of the material. Lime has a much greater affinity for carbonic acid than for sulphuretted hydrogen, and it is very active in taking out the former impurity. After the gas has gone through the lime in the first purifier, all the carbonic acid and part of the bisulphide of carbon have been taken out, as well as a portion of the sulphuretted hydrogen. The rest of the latter impurity passes on to the second purifier, and converts the lime into hydrogenated sulphide of calcium, which will

remove another portion of the bisulphide of carbon. The writer's advice is never to have thick layers of lime if it can possibly be prevented, as the impurities get very much intermixed with the material. When the crude gas first comes in contact with the lime, if there are four layers, most of the impurities will be deposited in the first two. The carbonic acid will be taken out by the first, and the second will remove another portion; while material in the third and fourth becomes for a time hydrogenated sulphide of calcium, which has great affinity for bisulphide of carbon. The decarbonated gas which passes into the second purifier will convert the lime therein into hydrogenated sulphide of calcium, which will take out another portion of the bisulphide.

No atmospheric air should be allowed to pass into the lime purifiers, as it would interfere with the efficacy of the lime for the removal of the bisulphide of carbon. If air is used at all, it should be passed in with the gas at the inlet of the first oxide of iron purifier, which is the only place where it can be employed without interfering with the process of purification. From 1½ to 2 per cent. of air may be admitted, which will be sufficient to keep the oxide in an active condition. As the result of practical experience, the writer has found that when sulphuretted hydrogen makes its appearance on the top of the first oxide purifier, it is a good thing to pass in a small quantity of air at the inlet of the second. If air is used in the way described, the oxide will last in the purifiers for months instead of weeks.

(To be continued.)

## THE INTERNATIONAL GAS CONGRESS.

### WET AND DRY METERS.

By P. BIGEARD, of Angers.

[A Paper read before the International Gas Congress at Paris.]

Gas companies now number among their customers so many workpeople and others who are frequently absent from their homes that it is almost impossible to undertake the regular inspection and watering of the wet meters used by this class of consumers. Besides, the inconveniences attendant on the use of these meters, and the difficulties experienced in finding a suitable place for them in every case, are strong arguments in favour of the employment of dry meters.

I have no intention of making any special claims for dry meters; I only wish to raise criticism of the two methods. Discussion of their relative merits is not new, for it has occupied the minds of gas companies ever since 1855; and in 1891 it was debated by the Eastern Counties (England) Association of Gas Managers.

In 1871, the Paris Gas Company were the subject of a petition to the Préfet de la Seine, who decided that "in future no dry meters should be placed in the houses of gas consumers." I may add also that in 1875, I was called upon to discontinue the use of this type of meter, of which the gas-works which I was then controlling was making extensive use. But since that time the question has assumed another aspect. The "Transactions" of the Société Technique de l'Industrie du Gaz en France from 1874 to 1898 show that forty papers on the measurement of gas were presented. Almost all these relate to wet meters, and to the many improvements it has been found necessary to introduce. Most of these improvements aim at an exact maintenance of the water level and accurate measurement.

If the Clegg meter (improved by Malam and Crosley) is still preferred by the large companies, and is the only one recognized by the City of Paris, it may likewise be remarked that meters of the same type—with differences according to local necessities—are in use in other large towns in France in which means of verifying the readings exist. The Siry-Lizars drum-meter has also met with many supporters in provincial works.

At the same time that efforts were being made to improve the wet meter of Clegg, similar endeavours were being made to perfect the dry meter. In the course of my work at Angers, I have arranged a special section of the distributing system, which is supplied by two meters which successively register the gas consumption. The wet meter is a 10-light unvarying water-line meter, the level of which is regularly checked. A dry meter of the same capacity is connected to it. The consumption has been read at different intervals; and after six months' observations we find that the two meters registered 728 and 733 cubic metres respectively. The table (next page) gives details of the readings.

The inconveniences occasioned by the cold weather of last winter at Angers must be mentioned. Many consumers had their gas supply cut off for periods varying from twenty-four hours to eight or ten days. Some, indeed, on the boundary of our district, could not get any gas during the whole of the cold season. In consequence of the number of meters put out of action by the frost as well other climatic conditions—such as snow, frost, &c.—we were compelled on some days to confine our attention to business consumers, and to neglect the purely domestic supplies. From carefully prepared reports, we found that, out of a total of 4500 meters, 250 were put out of order by



On Nov. 25, the Wet (Siry-Lizars) Meter stood at 47.			On Nov. 25, the Dry Meter stood at 0.		
Date.	Reading.	Consumption	Date.	Reading.	Consumption.
Nov. 25 . . .	47	..	Nov. 25 . . .	0	..
Nov. 30 . . .	64	17	Nov. 30 . . .	17	17
Dec. 31 . . .	190	126	Dec. 31 . . .	143	126
Jan. 31 . . .	368	178	Jan. 31 . . .	322	179
Feb. 28 . . .	593	135	Feb. 28 . . .	457	135
Mar. 31 . . .	693	100	Mar. 31 . . .	557	100
Ap. 23 . . .	667	64	Ap. 23 . . .	622	65
May 23 . . .	775	108	May 23 . . .	739	111
Total . . .		728	Total . . .		733

Reduction of pressure by the meter,  
2 to 3 mm.

Reduction of pressure by the meter,  
2, 3, and 4 mm. (4 mm. under  
inlet pressure of 23 mm., and  
consumption of 900 litres per  
hour).

the frost alone (the temperature remained 10° or 12° C. below zero for about a fortnight). We found also that the meters which were put in order after the first stoppage were frequently blocked up with ice, although they had been carefully thawed, supplied with a solution of calcium chloride of 15° Baumé, and otherwise protected.

If, to this annoyance of the total disorganization of the supply, we add the damage to the interior mechanism of the meters, the necessity of cleaning out the meters which were supplied with non-freezing liquid at the end of the winter, and the expense and waste of time entailed in these operations, it will be agreed, I am sure, that the evils of wet meters are by no means inconsiderable, and demand serious attention by the gas profession.

Of course, gas-meters should be placed in positions as little exposed to frost as possible, and consumers ought to assist in this. But unsuitable places and indifferent consumers have to be reckoned with. Whatever may be the good qualities of the wet meter, it is safe to say that its action is not always exact, and that the supplier of gas is always the party who suffers from its stoppages and irregularities.

There are few examples of meters which work to the disadvantage of the consumer. The permissible limit of 1 per cent., allowed for 5-light meters and above, is never exceeded to the advantage of the gas-maker. In the course of thirty years, I have come across scarcely any cases in which the consumer suffered.

In 1898, I undertook the testing of all the meters (of 5 lights and upwards) which had been in use at the Angers works for ten years. They were checked by a gasholder and experimental meter. The results on 2049 meters were as follows:—

In good condition . . . . .	1847
Measurement below real amount (4 to 15 per cent.) . . .	175
Measurement below real amount (more than 15 per cent.) . .	27
167 were replaced.	

Without naming the causes which bring about the lowering of the water-level in meters, it is worth while recalling the principal reasons for the improper action of these instruments. The employees do the levelling with insufficient care; most frequently they do not go to the trouble of opening a burner on the mains in order to allow the level to be correctly obtained. Further, after some years' use, the rod of the float becomes oxidized, and frequently sticks on its guide.\* Perforations in the wheel, and the latter getting off its axis, are the chief causes of cessation of action. The syphon tubes also give rise to frequent stoppages; while an intermittent supply is caused by too low a level.

It will be objected that careful inspection removes all the difficulties which have been brought forward—an argument with which I agree, though I believe none the less that many cases of imperfect action are inherent in the wet meters. Even supposing inspection is to solve these difficulties, regular visits of an inspector, say, every fortnight, are not likely to be met with favour by the company's clientèle.

Many Swiss managers use none but dry meters. In Germany, also, they form perhaps 90 per cent. of a town's supply. These managers are no doubt guided by certain reasons which it would be interesting to know.

Whatever may be the criticisms to which a discussion of this subject will give rise, our place as servants of the public as well as of the gas companies, and the fact that the official registration is a guarantee of the meter, lead me to propose—(1) The re-admission of dry meters to official registration. (2) The establishment of a gas-meter testing-station.

The following questions on the subject might be put: What inconveniences occur in connection with—

- 1.—The bellows after some use.
- 2.—The slide-valve.
- 3.—The jointed rods.

\* I have had an example of this during the present year. A large consumer was suddenly deprived of light. The valve-rod being left hung from one of the points caused by the oxidation of the metal, the evening pressure, or the opening of a neighbouring meter of 300 lights, had caused the valve in its fall to cut off the gas, though the level had been checked the previous evening.

- 4.—Naphthalene.
- 5.—Cleaning.
- 6.—Heat and cold.
- 7.—Condensation in the meter.
- 8.—What is the average diminution of pressure with 5, 10, and 20 light meters?
- 9.—Are larger than 20-light meters commonly used?
- 10.—What is the average life of a dry meter in constant use (a) when new, and (b) after repair?
- 11.—After what (approximate) period do difficulties commence to arise?

## THE BOULE LIGHT.

By ERNEST SALZENBERG, of Crefeld.

[A Paper read before the International Gas Congress at Paris.]

Since Dr. Auer von Welsbach placed the third model of his burner upon the market (in October, 1891), and obtained the efficiency of 2 litres of gas consumed per candle power, the general tendency of those engaged on this question has been in the direction of still further obtaining the heat energy in the form of light. Two methods have been followed. According to the first of these methods, special burners are provided, in which a higher efficiency is obtained by a more perfect admixture of the gases. I may mention the first Denayrouze burner (July, 1895), which works with a rapidly rotating fan. Lewes obtained with this, it would appear, 250-candle power with 252 litres; and, in another burner, 1-candle power per 1.5 litres.

In the burner of O. Kern, made in the same year, with a pressure of from 45 to 300 mm. one could obtain 1-candle power with a consumption of 1.4 litres of gas or even with less at a pressure of 400 mm. But this burner has never been introduced into Germany. In the St. Paul burner, the gas is superheated, and gives under pressures of 70, 152, and 200 mm. and gas consumptions of 350, 500, and 570 litres, respectively 265, 400, and 645 candle power—i.e., 1.32, 1.25, and 0.8 litres per candle. To detail others would take up too much space.

The second method sought to give the increased yield by raising the pressure of the gas, and also of the air. The connection between increased pressure and greater luminosity has already been dwelt upon. In the year 1892, Fahndrich, of Vienna, stated, in reference to the use of compressed Pintsch gas at Strasburg, that high pressure meant a great amount of light; and he predicted that the Welsbach burner would, in course of time, attain from 300 to 500 candle power. In the same year, Herr von Oechelhaeuser stated, in his report to the Industrial Association at Berlin, that every millimetre of pressure over and above the normal corresponded to an increase of about 1-candle power.

According to Fahndrich, there are only these two processes, but twelve arrangements of apparatus for increasing the light by means of increased pressure of the combustible gas, and four for achieving the same end by increasing the pressure of the air. The briefest mention of these will call to mind the technical history of the processes.

**Pintsch Process.**—German patent No. 61,314; annulled in 1896. Gas burnt under a pressure of 1.5 to 2 metres of water. Air at normal pressure.

**George Rothgiesser** claimed hydraulic compression of the gas in three patents of 1897 and 1898.

**Inderau and Co., of Dresden** (1896-7).—The patents simply claim the production of extra pressure by pumping the gas.

**Hausmann-Dortmund.**—Three patents (1897) claiming the use of a hydraulic motor.

**Adolph Rudolph, Stuttgart** (1899).—Compression by means of an air-pump worked by a weight.

**A. Lecomte and J. Loeser, of Paris.**—German patent (1898) for compression by means of a kind of meter used as an exhauster.

**Intensified Gas Syndicate, of London.**—A pressure of 230 mm. is used.

**James Keith.**—Automatic apparatus for simultaneously compressing gas and air.

**A. Ivan Vriesland, of Amsterdam.**—Compression by means of a kind of archimedean screw.

**Wenzel Knapp and Richard Steilberg, of Hamburg.**—Two reservoirs placed one above the other, for the compression of the gas by the different heights of the columns of water.

**C. S. Snell, of Saltash.**—Compression by means of the heat produced.

**William Sugg.**—Patented compressor and regulator. One litre per candle power.

**Yorkshire Intensified Gas Lighting Syndicate** and the *Société Anonyme d'Eclairage et de Chauffage Intensifs, of Brussels*, have likewise brought out installations.

**Lumière Boule, or Kugellicht**, is protected under the German patent No. 107,935, of December, 1899. Other different models were patented in the autumn of 1899 and the spring of 1900, for a noiseless high-pressure burner for supporting incandescent mantles. The Kugellicht Gesellschaft, of Dresden, by whom my appliances are made and handled, are about to obtain other patent rights for various burners. The principal patent claims simply a process, and especially the use of a pressure of one atmosphere.

To render complete this part of my paper, I may mention the



four different systems of incandescent lighting with compressed air, which have come under my notice. The oldest (September, 1891) is that of Hugel, who used carburetted air in rubber chambers under a weight. This was followed by the system of August Nagel, in which, however, the incandescent mantle soon deteriorated. The burner of Schülke, Brandholt, and Co., based on Oehlmann's patents, claimed to use only 0.8 litre per candle power. Lastly, the patents of Ferron, of Paris, provide a conical chamber for the mixing of the gases, and an injector for the compressed air. These methods are all dependent on certain details of construction; and, according to the German Patent Office, they cannot be called processes, with the exceptions only of those of Pintsch and Salzenberg (patent No. 107,935).

This latter claims: (1) Great luminosity. (2) High efficiency. (3) Yellowish white light. (4) Uniform distribution of the light in the horizontal plane. Hence the name "Kugellicht," or "Lumière Boule." (5) Compression of the gas to one atmosphere and upwards. The intensity of the light varies between 300 and 1200 candle power; the efficiency reaches 0.85 litre, and even 0.8 litre per candle power. An intensity of 1800 candles can be produced in a single burner.

Dr. Bunte finds that the most suitable pressure for my first and very primitive burner is 1.1 atmospheres, corresponding to 1 litre per candle power. But a glance over the figures will show that increase in the pressure and in the gas consumed in the unit of time corresponds to a decrease in the gas per candle power. The gas can be compressed quite well to 10 atmospheres in a metal reservoir, although for practical purposes the increased motive power required limits the compression to about 3.5 atmospheres. The actual pressure of combustion must not fall below 1.1 atmospheres.

It may be mentioned that, according to Botley, only 16.8 per cent. of lighting power is lost in burning gas compressed to 14 atmospheres in a butterfly burner, and less, of course, in a bunsen burner. I need not stay to comment on the cheapness of illumination requiring 0.8 to 0.9 litre per candle power—i.e., giving 1000-candle power with 800 to 900 litres of gas, according to comparative measurements made by Herr von Oechelhaeuser and others.

A "Globe" light consuming 850 litres of gas, at 16 pf. (say, 1<sup>3</sup>/<sub>4</sub>d.) per cubic metre, works out to 13.6 pf. per 1000-candle power per hour, and still less with gas at 15 pf. per cubic metre. Expenses for motive power must be added. Sixteen "Globe" lights of 1000-candle power require 1-horse power per hour. If the consumption of the gas for this purpose be placed at 720 litres per horse-power-hour, it will be seen that the total energy absorbed comes to 850 + 45, or 900 litres for 1000 candle-power-hours. The hourly cost can thus be compared with an electric arc lamp of 100 carrels. In these calculations, the two items of consumption of mantles and of carbons are not included, nor are the amounts of interest and depreciation, which are usually higher in central electric light stations—to an extent that a kilowatt-hour could be obtained with a force equal to the cost of 900 litres of gas only under very exceptional conditions.

The mixture of air and gas in my burner contains 86 per cent. air and 14 per cent. gas, when the admission of the air is being properly made. The following figures will show how much more uniformly the light is distributed by the "Globe" burner than by the Welsbach burner. The intensity of the light given by the burner exceeds that of the Welsbach, at angles below the horizontal, as follows:—

	Per Cent.
30° . . . . .	4.0
40° . . . . .	10.7
50° . . . . .	14.6
60° . . . . .	13.8
70° . . . . .	14.2

The colour of the light is more similar to sunlight than the bluish colour of the electric arc or the greenish tint of the Welsbach burner. The uniform distribution gives a wonderful absence of shadow compared with that observable in the case of an arc lamp, inasmuch that a friend of mine—a Professor in the High School at Charlottenburg—has wittily named my light "la lumière de Pierre Schmeil" or "the man without a shadow," after one of the well-known stories of the French poet, Adalbert de Chamisso.

There is, of course, divided opinion as to which is the best colour for a light. Some prefer white light in (say) shops, &c.; but the general preference is for a yellowish light, especially since it has been shown by Professor Hempel that white light exerts a stronger chemical action on the purple of the retina, and is therefore more fatiguing to the eyes. Dr. Bunte, who has made a number of photometric and spectro-photometric tests of this and other incandescent lights, concludes as follows: (1) Compression to 1.1 atmospheres is very economical in gas. (2) The distribution of the light at this pressure is much more uniform than in ordinary incandescent systems. (3) The light is of an agreeable yellowish colour, resembling sunlight, and the efficiency of the burners is very high.

A small installation (for a works supplying a town of, say, 100,000 inhabitants) to serve, say, 200 1000-candle power lamps, will consist of a plant as follows: A gas-motor, with meter for adjusting the gas to the motive power required; a compressor to deal with a maximum of 240 cubic metres per hour, and to deliver into the reservoir at 3.5 atmospheres; a station meter of 225 cubic metres per hour; an arrangement of valves between the station meter and the compressor; a reservoir of compressed

gas, of a capacity of 60 cubic metres; a principal main (400 mm.); a wrought-iron main (75 mm.) for the compressed gas; valves, safety valves, cocks, &c.

The gas is drawn from the works' holder or the mains, compressed, and passed to the reservoir through a non-return valve. The outlet from the reservoir is by way of a reducing valve. The principal main has an internal diameter of 76 mm.—thus involving a loss of 0.45 atmosphere in a length of twice the 3000 metres which supply the town. The pressure of the gas, therefore, on its delivery should be 1.45 atmospheres if it is to be still equivalent to 1 atmosphere at the most distant point. A smaller installation for 30 lamps of 1000-candle power is similarly arranged. The diameter of the inner tube of gas is 40 mm., and the maximum loss 0.23 atmosphere. A still smaller plant, for 10 lamps of 1000-candle power—such as is suitable for warehouses, hotels, &c., can have the compressor fixed in the cellar, and the other plant arranged as above.

There is nothing new in the employment of high-pressure mains of small dimensions, which is such an inexpensive arrangement. I may, however, direct attention to the fact that at Phoenixville and Royersford (North America) there are distributing systems of compressed gas to all consumers, the diameter of which is 76 mm. in a length of 7 kilometres. The pressure in these American towns is one atmosphere, and is obtained by means of a gas-engine of about 20-horse power. Where consumers do not require such a high pressure, it is easy to place a reducing valve in front of the meter. The loss of pressure is calculated from the tables given by Riedler and Gutermuth in their paper on the compressed-air plants of Paris—allowance being made for the difference between air and coal gas. This diminution of pressure can be kept very small if the system is carefully laid down, and the junctions are electrically soldered. Another important factor is the arrangement of the installation so that the main is under the pressure required by the bye-pass light. At other times, the gas is at the pressure under which lamps are usually burnt at night. A three-way cock provides a ready means of doing this.

The condensation products which collect in the reservoir in which the compressed gas is stored, should be tapped off every day, or every second day, by a blow-off cock. If the reservoir goes for long without emptying, these products (which are milky in appearance) may contain as much as 4 per cent. of benzene. The principal main is likewise provided with plugs at its lowest points, or better still with trapped boxes, for the removal of the liquid. The small quantity of naphthalene which is condensed can be removed by these plugs. A chamber containing chloride of calcium may be placed between the gas-reservoir and the reducing valve, so as to remove the last traces of moisture, and ensure freedom from any danger of water freezing in the distribution system.

There are two types of burners: (1) The "Universal" burner provides an annular outlet for the gas, and is applicable to illuminating powers of 300 to 1800 candle power. A conical chamber in it causes the gas to assume a whirling motion around a conical regulating needle, with the result that it mixes very perfectly with the air drawn into the burner. (2) The "Standard" burner is similar to the ordinary Welsbach burner, and is more specially used for 600 to 800 candle power work. The quantity of gas passed is determined by two small orifices at the foot of the burner.

No chimney is used on the burners, which are provided with a simple arrangement for regulating the air supply by means of moveable cylinder. Both burn extremely quietly. The "Standard" makes slightly less noise than the "Universal," and is therefore better adapted for halls and other interiors; while the other is most applicable to open-air premises, goods yards, &c. The lamps are suspended in a similar manner to electric arc lamps.

The pipes communicating directly with the burners and supplying the supplementary light kept going at night are protected by india-rubber of the special brand known as "Durite," which is proof against wear and tear.

The mantles are of the thorium-cerite type, and are woven of single or double fabric. In the latter case, they are, of course, much stronger. The height of the illuminating area is 12 centimetres. The mantles are burnt-off by means of a bunsen burner at ordinary pressure. Their life is about 100 to 150 hours in outside installations, or 350 hours or more indoors, with the small extra flash light.

The weight of the mantle when in use is about seven times that of the ordinary mantles—i.e., about 3.8 grammes. It is suspended by means of two supports, which can be moved in the vertical plane.

In order to prevent an excessive spreading of the mantles in the flame, asbestos threads are used to hold them in place after the manner of a balloon in course of inflation.

The use of collodionized mantles is not recommended for the "Globe" light any more than for Welsbach burners, on account of the decrease in the illuminating power. The best shape that the mantle can have, to hold the incandescent body completely in the cone of flame, is that of a sack of corn.

Transparent globes on the burners absorb about 6 per cent. of the light; opal globes, from 20 to 31 per cent. In the case of frosted globes, the absorption varies with the position of the centre of the globe in relation to the axis of the photometer.

The heating effect of the lamp has not been exaggerated.



According to my experience it is about 23 times that of 16-candle power incandescent electric lamps, with perhaps rather more when combustion is more rapid. If we reckon the heat radiated from a 16-candle power electric incandescent lamp as 1, the heat from a 16-candle power butterfly burner is about 20, and that from an ordinary incandescent gas-burner of 60-candle power burning 2 litres per candle power is 3.5. Hence the relative amounts of heat radiated by gas and electric incandescent illuminants producing 16-candle power are 0.9 and 1. Assuming a consumption of 1 litre per candle power in the "Globe" light ("Lumière Boule"), the heat radiated by this latter is equal to  $\frac{3.5 \times 1000}{60} \times \frac{1}{2} = 29$ , or equal to 35 times

that of an electric incandescent lamp—allowance being made for the increased heat from rapid combustion. It may, however, be said that the glass shade of the "Globe" lamp can easily be held between the hands. It can be used in an inclined position, without appreciable diminution of light, even up to an angle of 20° from the vertical.

The advantages of the "Lumière Boule" from the hygienic point of view are exactly comparable with those of the Welsbach. Neglecting the very slightly more favourable proportion of gas and air in the "Globe" light compared with that in the Welsbach (which produces, according to Gréhan, only three-tenths per cent. of carbonic oxide) a "Lumière Boule" of 1000-candle power and 850 litres gas consumption gives—

$$0.0003 \times \frac{850}{120} = 0.0021$$

i.e., two-thousandths per cent. of carbonic oxide. The maximum proportion permissible, according to Professor Vivian B. Lewes, is two-hundredths per cent.

The "Universal" lamps produce, as already stated, a certain noise, which is different from the "fizzing" of the electric arc. The precautions to be observed in the construction of the burners, that this noise may be reduced to a minimum, were set forth by Dr. Meipinger in 1891. They are: (1) The right proportion of gas and air. (2) Speed of the issuing gas. (3) Relative dimensions of the transverse section and the length of mixing-tube. Welsbach burners gave rise to a disagreeable noise in their early days; and similar causes may be responsible for the phenomenon in the case of the "Lumière Boule." It can be avoided to a large extent by placing the burner about one-third above or below the centre of the globe—not exactly at the centre.

In conclusion, this system is applicable to water gas and carburetted gas as well as to coal gas.

The Commission of engineers appointed by the Berlin War Department made an important series of tests of the "Lumière Boule" (used in conjunction with reflectors) alongside electrical projection lights. The tests took place in the Crefeld Gas-Works, in the presence of many military officials. A series of electrical projectors from the fortifications of Cologne were used; and the results showed that for certain search-light purposes the electrical illuminant was specially suitable, on account of the small dimensions of the luminous beam, while in lighting more extensive regions around fortresses, as well as for open sheds, &c., the "Lumière Boule" was specially suitable—its beam being about 15 times larger.

It has been found that a "Globe" projector of 6000-candle power, at a distance of 3 kilometres, and with a size of beam of 400 metres in breadth, was amply sufficient for the carrying out of earth works of all kinds. The men in the field of illumination cast long dense shadows, and a piece of paper held at a short distance from the face received a silhouette of the features, and at this distance of 3 kilometres large print could be easily read. I have worked out graphically—from some photometric tests with incandescent lights (with compressed air) using 30, 40, 50, 60, and 70 mm. pressure of gas and 0.3, 0.4, and 0.5 atmospheres pressure of air—that the efficiency of lamps with an air pressure of 0.3 atmosphere is scarcely better than with ordinary Welsbach burners; and the use of compressed air in this manner possesses the disadvantage (essential in connection with the "Lumière Boule") that the supplies of air during combustion cannot be correctly proportioned. But this correct proportioning is essential if the best result is to be obtained. Illumination by means of compressed air is also dependent on two variable factors—normal pressure of the gas, which is uncertain, and the pressure of the air, which is again open to uncertainty. The "Globe" light is affected by only one variable factor—the increased pressure of the gas; and as atmospheric pressure is in general constant, the relations between the combustible and the supporter of combustion can be most exactly regulated.

**Electricity for the Supply of Light and Power at the Paris Exhibition.**—The Secretary of the British Iron Trade Association has reported upon the display of iron and steel at the Paris Exhibition; and in the course thereof he has furnished some interesting figures in regard to the electrical exhibits under each of the different sections. They show that the electric lighting exhibits sent by the various countries number as follows: Austria, 3; Belgium, 1; France, 97; Germany, 15; Great Britain, 13; Hungary, 5; Italy, 3; Sweden, 2; Switzerland, 7; United States, 75. The numbers of exhibits furnishing electric power are as follows: Austria, 10; France, 82; Germany, 17; Great Britain, 19; Hungary, 9; Italy, 14; Sweden, 5; Switzerland, 13; United States, 102.

## METHODS FOR GIVING STOKERS AN INTEREST IN THEIR WORK.

By I. HEDDE, of Paris.

[A Paper read before the International Gas Congress in Paris.]

The object of the present paper is to analyze the question which figures in the programme proposed by the Organizing Committee of the Congress under the following title: "Description of the Systems Employed to interest Stokers in the Yield of Gas and Economy in Stoking."

Long ago, in 1877, the importance of this question was emphasized by the Société Technique du Gaz en France, when to its great honour it instituted prizes for foremen and workmen who had been the longest, and rendered the greatest services, in the same gas-works, and later, with the same idea, the Société obtained medals of honour from the Government to award to its most deserving and most faithful servants. With this object in view, I applied to my colleagues of the Société Technique, and a certain number of managers of companies and directors of works—members of the Association—kindly supplied particulars of the means employed for this purpose in their works.

The subject has been divided into three parts: 1. A description of the "technical means" for giving stokers an interest in their work, consisting of premiums on manufacture granted on the yield of gas and for economy of fuel. To avoid repetition and too great length, I shall merely give one of the replies received, taken from among those which detail the same methods. 2. General methods for making stokers take an interest in the style of their work and the prosperity of the undertaking. 3. Discussion of these methods and proposed solution. I shall, at once, add that this study does not pretend to give a solution applicable in all cases. Any such solution cannot exist, because it varies with the particular circumstances of each works. The object I have in view is merely to give an account of the means employed and the general principles of their application.

### I. TECHNICAL MEANS FOR GIVING STOKERS AN INTEREST IN THEIR WORK.

1. Wages of stokers. The work can be remunerated as follows: A. Fixed wages. B. A premium on manufacture, given for assiduity or good workmanship. C. The salary reserved for provident institution, for assistance in sickness, and for pensions.

#### A.—Fixed Wages.

The fixed wages are usually paid by the month in small works, by the day in average-sized works, and by the piece in large works. It would be better to pay fixed wages as frequently as possible—once a week, for example—because they are to meet the current needs of life. But this mode of payment has the inconvenience of augmenting the work of the wages account, and always settling with the workmen on the same day (Monday or Saturday), which may make them contract the habit of squandering their money on pay day. Payment every fortnight is most advisable and most common—on the 1st and 16th of the month. A month is too long, because the workman requires money on account or else buys on credit, and thus incurs debt.

It is generally admitted to be advantageous to defer payment of a part of the fixed wages or the premiums on manufacture for variable periods of time, according to the customs of the locality, so as to enable the workmen to meet payments at fixed dates—like rent, taxes, purchase of clothes, &c. The deferred amount is generally applied in payment of premiums on manufacture per quarter, half year, or year.

#### B.—Premiums on Manufacture.

The premium on manufacture is an increase of wages given to foremen, furnace superintendents, and stokers, either to stimulate their zeal to produce more gas, in conditions determined by the regulations, or compensate them for their extra labour and attention, or the regularity and assiduity of their attendance. Its contrary is the fine—penalty for bad work—the amount of which is kept back from the workman's wages, and is usually paid into the sick or pension fund, where there is such an institution.

Premiums on manufacture may be individual or general, according as they apply to each workman or to all the stokers among whom they are divided.

I give below the replies received from some colleagues regarding the various types of premiums paid—indicating the works by letters, as most of them were given in confidence.

**WORKS A.**—In order to make the stokers take an interest in their work, I award them a gratuity of 5 frs. per month; and when the work is defective I deduct 1 fr. or 2 frs., or more, according to the extent of the defects.

**WORKS B.**—The daily wages of the stokers are made up of: 1. A fixed sum of 4 frs. 2. A labour premium of 0.50 fr. 3. An attendance premium of 5 frs. per fortnight, which is only payable when the workman has been present during all that time. Finally, a daily premium of 0.50 fr. is also given to the head stoker of each gang. The labour premium was given before my arrival, when the output attained 200 cubic metres per retort per 24 hours. As this amount has for some years always been attained, I gave up this condition of manufacture. The premium







foundry district, where stokers can be found more readily who are accustomed to work at fires. The premiums were thus regulated: On the starting of each gang the engineman or foreman noted the index of the station meter, and the premium was fixed in the office for each gang and day without regard to the productions of the previous or following days. Moreover, the meter was only read two hours after the starting of the gang, so as to prevent any neglect of the furnace through jealousy or the practising of frauds which would affect the two first hours' work of the succeeding gang, and among which I may mention that commonly called "*rhabillage*" of the retort, which consists in covering a burnt-off charge with coal. It is to be observed that when stokers are given an interest in carbonization—the quantity of coal per retort being greater and better distributed—the yield of gas increases, the men attend better to the furnaces, and consequently the amount of fuel employed per 1000 cubic metres of gas is less. A direct premium might also be given for the most complete utilization of fuel on a minimum production of coke screened from the furnace cinders. The premium on gas manufacture is excellent, both for the works and for the workmen whose wages it augments, and not only indemnifies them for their extra strength, and the food they have rightly expended through doing more work, but also leaves them a bonus to increase their resources.

**WORKS L.**—The stokers (two men for four settings of seven retorts per 12 hours) receive a daily premium variable with the production of gas per retort. This premium (only given for an output of more than 190 cubic metres of gas per retort in 24 hours) is 1 c. for every additional cubic metre of gas manufactured. So that if the production is 200 cubic metres per retort per day, each of the four stokers receives a premium of 0.10 fr.; if the production is 220 cubic metres, the corresponding premium is 0.30 fr., &c. This system did not produce the results one had a right to expect; but this must be on account of the character of the workman (South of Italy), who is easily contented with his fixed wages, and cares little for premiums only to be obtained by extra labour.

**WORKS M.**—We do not give stokers any interest in production in the strict sense, but in the distillation of the coal in each retort as perfectly as possible; and we employ the following system of premiums and fines. A monthly premium of 0.50 fr. is distributed, at the end of each month, among those of the firemen and stokers who have had no retorts stopped during the month; and, on the other hand, there is a fine of 0.10 fr. per stopped retort. This amount is withheld from the stoker and fireman of the retort. We call a "stopped retort" that which, after six hours' work, has not its charge of coal carbonized sufficiently, through want of heat in the furnace or bad distribution of coal. In this case, the coal is not drawn from the retort, but remains subjected to carbonizing during a second period of six hours. We endeavoured to give the men some interest in economy of fuel (which is pit-coal), but had to abandon the idea, owing to the ease with which fraud could be practised. In fact, the workmen either added coke from the retorts to the furnace coal or else coal which should have been carbonized. Moreover, we consider that economy of fuel does not depend altogether upon the stoker. It is the engineer or manager who should fix the minimum amount of a given fuel to be employed to carbonize the charge in a given time. He gives this specified amount to the stoker who should obtain the required result, and should not be able to do it with less. The stoker has only the material management of the furnace—viz., stirring the fire, cleaning the grate-bars, &c.; and he should never touch the dampers, the opening of which is regulated by the engineer.

**WORKS N.**—Stokers have fixed wages of 3 frs. per day, and also receive premiums according to seniority, as follows: After six months, 0.20 fr. per day; a year, 0.40 fr.; 15 months, 0.50 fr.; 18 months, 0.75 fr. This daily premium is only due to be paid when they are stoking; when in the yard or town, they only receive ordinary wages. They are paid quarterly; but with the reserve that, in case of defective work, I can retain part of the premium in the way of a fine. They also receive the following premiums on manufacture: 5 frs. per month per stoker for an average yield of 29 to 29.50 cubic metres of gas per 100 kilos. of coal carbonized; 10 frs. for a yield of 29.50 to 30 cubic metres; and 15 frs. for 30 to 30.50 cubic metres. I must add that my results as regards yield of gas have not improved in any way—the stokers lose all interest in it. Is this due to the climate? I simply find that my stokers do as little work as possible.

**WORKS O.**—In addition to their fixed wages of 3.50 frs., a premium according to seniority of 0.25 fr. is paid at the end of a year's work, and after five years 0.50 fr. Each night and day gang is under the supervision of a head stoker, who has 0.25 fr. above the ordinary daily wages. Each charge of coal is weighed by the man attending the exhauster. The stokers receive a premium of 0.10 fr. per 100 kilos. of coal carbonized beyond the minimum charge of 100 kilos. The premium is not awarded if the yield falls below 29 cubic metres per 100 kilos. Excepting cases of accident for which the foreman considers the stokers are not to blame, he can inflict an additional fine of 0.10 fr. per charge not properly worked off. If the yield exceeds 30 cubic metres per 100 kilos. of coal, the premium is increased to 0.15 fr. The engine-man working the exhauster has a premium of 0.25 fr. when the yield is more than 29 cubic metres per 100 kilos., and 0.50 fr. when more than 30. He must pay a fine of 5 frs. if, through over-exhaustion, the illuminating power of the gas is not

in accordance with regulations. The two engine-men both note the figures of the meter when the gangs are changed, so as to have the work of the two gangs separate; this change from day to night service being every eight days. An extra premium of 0.10 fr. per man per day is awarded to the gang which has manufactured most gas in a fortnight. This system of premiums, which was applied when the works used only direct firing, was partially abandoned when regenerative furnaces were adopted; and owing to the complication of the wages bill, only the premium on coal was retained. The regenerative furnaces made it possible to obtain the same results of yield as with the premiums, which were replaced by an increase of fixed wages.

**WORKS P.**—The stokers and foremen here are interested in the yield of gas. In addition to their fixed daily wages, the former receive a premium of 0.25 fr. per day when their work is well done, and the yield of gas consequently good. Furnace superintendents receive a premium varying from 0.05 fr. to 0.10 fr. per 1000 cubic metres of gas manufactured if the yield does not vary beyond the limits of 29 to 30.2 cubic metres per kilo. of coal carbonized. A fine of 1 fr. to 5 frs. per 1000 cubic metres is inflicted if the yield is less or greater than the above.

**WORKS Q.**—Our stokers have an interest in the yield of gas owing to the monthly premium of 20 frs. when the average monthly yield has been 29 to 30 cubic metres per 100 kilos. of coal carbonized. If this yield is exceeded, or not attained, no premium is awarded. This very simple method—for which we have only to congratulate ourselves—has been applied for many years in the seven works belonging to the company. To attain this result, the stokers take care not to over-heat the retorts uselessly, and to keep them in good order.

**WORKS R.**—The application of a system of premiums on manufacture has been made in our works for ten years. The principle is to encourage the employees to improve the yield of gas and secure economy in firing. These premiums are awarded according to rules, the chief clauses being as follows: As the establishment of premiums must be based upon the effective results obtained during the term, the unit coefficients employed for reckoning the premiums cannot be definitely fixed until six months after the end of the term in question—viz., in the month of January of each year. At this date the Administrative Council of the Company make known the rate of these premium coefficients, which they have established—reckoning all the elements of cost price, and particularly: (1) Duration of retorts and furnaces; (2) amount of coke employed for firing; (3) illuminating power of the gas manufactured. As each of these elements has a preponderating influence on satisfactory working, any deficit in one of them would respectively involve suppression of one-sixth of the premium. To facilitate the application and distribution of the premiums, they are of two kinds: (1) A work-premium proportionate to the total quantity of coal carbonized; and (2) a yield-premium proportionate to the production of gas above the normal yield of 29 cubic metres per 100 kilos. of coal carbonized, taken as a basis and minimum production. Each of these two kinds of premiums is established monthly according to the figures in the carbonizing book, and on the following data: 1. The work-premium according to the indications of the weigh-bridge at the coal-store. (2) The yield-premium according to the index of the station-meters. During the first fortnight of each month, a notice is posted up to inform the employees as to the amount of coal carbonized and gas manufactured during the previous month; and a Committee composed of one representative from each of the classes interested is called upon to verify the accuracy of the accounts compiled under the care of the deputy-manager of each works. However, as these premiums must not be obtained to the detriment of the normal working of the establishment, they are subordinated to the three elements of cost price already mentioned. Any infractions of the regulations, as regards limits, cause a reduction in the total premiums of the year to the extent of one-sixth for each of these three elements. Distribution of the premiums is made to the stokers according to the number of days they work; and for the foremen and superintendents, 50 per cent. is added to their days of work in calculating the premium. All infractions of rules inside the works, all offences against discipline, and all faults or serious carelessness during work or service, cause the premium of the offender to be suppressed; and likewise in the case of workmen who have brought about disorder or excited their fellow-workmen to a neglect of discipline, in the case of those who leave the works without reasonable pretext or permission, and in the case of those who maliciously damage the Company's property. As regards premiums from the practical point of view, we consider that if, to some extent, we obtained an improvement in the yield of gas and regularity of charging the retorts, the labour of manufacture, on the contrary, through the various causes, has grown perceptibly and continuously more expensive during the last ten years; so that the economy in maintenance, &c., has been greatly affected. The total annual amount of the premiums attains an average of 20,000 frs.—equivalent to an increase of about 0.35 fr. in the stoker's daily wages. In a word, the application of the system has not given all the advantages one had a right to expect, though satisfactory to the stokers and others.

**WORKS S.**—When you have given a stoker the means of living (as regards food and lodging, provision for old age, &c.), you will find him willing to devote himself to his work. Then you can establish premiums—variable in different works, but always intended to be employed for rent, time of sickness, or an old



age pension fund. A stoker can, by assiduity, improve the yield of gas and economize fuel; but he should be encouraged by giving him a share in the results, by means of premiums. I think that the total amount of the premiums should be about 20 per cent. of the average wages and economy realized, in order to obtain the desired object.

WORKS T.—Stokers need a great deal of supervision; and it is the fear of losing their employment which influences them. This I regard as the most important factor for gaining the required results. When a workman lives at the works, he has a better opportunity of associating with his employer, and becoming well disposed if the employer evinces an interest in him. Thus he will be steadier and more zealous. If he has the means of living in his family, he will be an industrious, disciplined servant, regular in his service. In such a case, premiums will be useful, because they will benefit the family; whereas they are injurious when they lead the workman to the public-house. By thus improving his condition, more certain results can be obtained than by other systems of sharing profits—complicated and difficult to apply.

C.—Provident Institutions.

This inquiry demonstrates how different are the means and results obtained according to the peculiar circumstances of each works. However, it enables me to give some general principles, instructions, and figures, which will be useful in the various cases.

The two last-mentioned replies express the opinion that, for good work, a good workman is needed; and that if one wants a good workman he must be assisted by provident institutions to improve his physical and moral condition, and encouraged by certain advantages to be steady, economical, and laborious.

Premiums on manufacture certainly stimulate a workman, and we have seen from the result of the inquiries that payment is often deferred to some distant date so as to make him economize as far as possible.

This method is, however, necessarily imperfect, and the workman is led away by the temptation (so dangerous on account of his improvidence) of spending the money he receives, often in a way injurious to himself, especially when he is unfortunate, and wishes to drown care for a moment. He is thus left defenceless against the risks of life, sickness, and old age. In the second part of this work, I shall briefly discuss the means employed to provide against these risks by institutions.

(To be continued.)

TECHNICAL RECORD.

THE DEVELOPMENT OF ARTIFICIAL LIGHTING.

The last of the volumes of abstracts issued by the Institution of Civil Engineers contains the following summary of an interesting article on the above subject, by Herr C. Kjær, which appeared in "Ingeniøren," of Copenhagen:—

Starting from the oil-lamps of antiquity and the use of these lamps latterly with petroleum, this long historical and critical review notices Murdoch's invention of gas lighting in 1792, and traces the subsequent development of artificial lighting down to the Electric Exhibition in Paris in 1881, which was followed by the rapid spread of electric lighting in Europe.

The Welsbach mantle in 1886 provided an incandescent gas-lamp which not only reduced the consumption considerably, but also gave a better light than the electric glow lamp. It opens a wide future for water gas, which, though of no illuminating value when not carburetted, develops in this condition the high temperature necessary to make the mantle glow. In the Dellwik process, the object is to produce carbonic acid during the blowing, whereby more than three times as much heat would be developed as when carbonic oxide only is formed from the same quantity of carbon. Though this aim has not yet been successfully realized in practice, from 13 to 20 per cent. of carbonic acid has been reached, against only about 6 per cent. in the older processes; while the yield of gas is likewise greater, and the blowing is reduced to only about 1½ minutes for 7 to 8 minutes of gas making. In Copenhagen, the make of water gas is about 700,000 cubic feet per day. Dr. Leybold, of Hamburg, gives 0·46d. to 0·54d. per 1000 cubic feet as the total cost of production for carburetted water gas of 16-candle power, and 0·64d. to 0·76d. for 20-candle gas; including 0·15d. for wages in each case. It seems likely that lighting by water gas in combination with the Welsbach mantle will enter upon a new phase, and thereby secure a place by the side of electric lighting for a long time to come.

Acetylene gas is now produced at the rate of about 4·8 cubic feet per pound of calcium carbide; and the production of the carbide itself requires an average expenditure of about 2·2 E.H.P. hours per pound. Where ordinary gas or electricity is not available, acetylene certainly has its advantages.

Electric lighting of lamps in series has been accomplished to a certain extent by Herr von Hefner-Alteneck with differential arc lamps, and also with shunt arc lamps; but the latter to the number of two or three only. Lighting in parallel renders each lamp independent of all the rest, and is certain to be employed in future, either by itself or in combination with lighting

in series. Latterly the aim has been to reduce the consumption of electricity by constructing the lamps for higher tension and lower strength of current; 220 volts are now being employed instead of 110 volts, and double the number of lamps are supplied through the same conductors. In the American Jandus lamp, the arc and carbons are contained in a closed transparent cylinder, from which the air is excluded. Instead of the usual 10 to 16 hours, the carbons here last 100 to 200 hours; and their points are five to seven times farther apart. But the economy is less, because the light has to pass through the enclosing cylinder, and more is in consequence thrown up by the longer arc.

The fact that magnesia, lime, and other metallic oxides are insulators while cold, but when heated to a dazzling white heat become good conductors long before their melting-point is reached, was taken advantage of by Professor Nernst, of Göttingen, in his invention in 1898 of a glow lamp on a new principle. A little stick of calcined magnesia, 7 mm. (0·28 inch) long and 1½ mm. (0·06 inch) diameter, when heated in the open air by an alternating current of 118 volts and 0·23 ampère, or 27 watts, gave 31-candle power, or 1·14-candle power per watt. Such a magnesia stick hangs freely and vertically within a fixed cylindrical bell of insulating material, which is wound inside with a coil of platinum wire connected in parallel with the main circuit. Attached to the top of the bell, and concentric therewith, is an upright solenoid, in which the iron core is suspended by a helical spring from a fixed point overhead, so as to move up and down within the magnetizing coil. From the bottom of the core, the magnesia stick is suspended inside the bell by a wire connected in series with the magnetizing coil; and from the bottom of the magnesia stick another wire is led to the main circuit. On closing the circuit for lighting the lamp, the current at first passes only through the platinum coil inside the bell, because the parallel circuit through the solenoid and magnesia is blocked while the latter is still cold and non-conducting. But the heat from the platinum coil being concentrated upon the magnesia renders it in a few seconds hot enough to become conducting. The current then passes through it to the solenoid, the iron core is drawn down into the centre of the solenoid; and the glowing magnesia suspended from the core, being thus lowered clear below the bottom of the bell, gives out its light all round. By this movement the platinum coil is automatically cut out of circuit, and the whole current henceforth flows only through the magnesia and the solenoid. The magnesia suffers no diminution in brilliancy from length of burning in the open air, as the metallic oxide undergoes no change by heating in air. In all likelihood the Nernst lamp will not supersede either the arc or incandescent lamps of older construction, but will take a place of its own, intermediate between them.

A summary of his review is presented by the author in the following tabular form:—

Comparative Cost of 500 Candle-Power-Hours with Different Modes of Lighting.

Kind of Light.	Lamps and Burners most frequently Employed.		Cost in Denmark.		Heat Developed per Candle Power per Hour.	
	Candle Power.	Consumption per Hour.	Lighting Medium.	500 Candle-Power Hours.		
Electric—				Pence.	Cals.	Th.U.
Arc . . . . .	650	422 watts	7·31d. per kilowatt per hour.	2·37*	0·562	2·24
Incandescent . . . .	16	50 "		11·42†	2·700	10·75
" (Nernst) . . . .	50	75 "		5·48	1·296	5·15
Retort gas—						
Argand burner . . .	32	8·83 c. ft.	5s. per 1000 cubic feet	8·31	42·12	168·0
Flat-flame burner . .	16	5·64 c. ft.		10·64	54·00	215·0
Welsbach mantle . .	50	3·35 c. ft.		2·02‡	10·25	40·7
Non-carburetted water gas with Welsbach mantle	50	5·29 c. ft.	2s. 2d. per 1000 cubic feet	1·40‡	7·80	31·0
Acetylene gas . . .	50	1·14 c. ft. †	2·42d. per lb. of calcium carbide, equivalent to 4·8 c. ft. of acetylene gas.	5·76	9·02	35·8
Petroleum . . . .	30	0·18 lb. or 0·0225 gall.	9·68d. per gallon.	3·53	23·00	91·4

\* Add 0·205d. for renewal of carbons. † Add 0·236d. for renewal of the lamp itself. ‡ Add 0·133d. for renewal of mantles.

Under favourable circumstances, the ordinary incandescent lamps utilize as light only about 7 per cent. of the energy expended, and the Welsbach light only about 2 per cent.; the rest goes in heat. The ultimate aim of science is therefore the production of light alone, without heat; and, from the close analogy between electricity and light, it is conceived that this aim may in the future be realized by means of electricity.



## ELECTRIC CURRENTS AND GAS AND WATER MAINS.

Our contemporary the "Engineering Record" has lately been devoting some space to the above subject. It appears that a short time ago the Commissioner of Public Works of Providence retained Mr. A. A. Knudson, of New York, to make an investigation of the electrical condition of the water-mains in that city. Mr. Otis F. Clapp, the City Engineer, and Mr. J. A. McKenna, of his staff, assisted Mr. Knudson in his work; and Mr. Clapp states that observations will probably be made at short intervals in future, so that the authorities can keep in closer touch with what is going on underground. Mr. Knudson's report is an important document in many ways; and the following abstract, taken from our contemporary, will furnish some idea of the extent and results of his examination.

One of the laws governing electricity is that when more than one path is offered for a current to flow, such currents will distribute themselves among the different paths in proportion to the conductivity of each. In Providence, these paths are the railway tracks and feeders, the earth, the water and gas mains, and any other underground metallic structures. The rails of a newly constructed road with well-bonded joints and track feeders generally at first return the larger proportion of the current; but the rail bonds often break, or through corrosive action their electrical contact with the rails in time is impaired, and the proportion of current which follows the water and gas mains is increased. Where the current enters the metal, no harm is done; where it leaves the metal for earth or water, more or less damage occurs. The tendency of electrical currents is always to pass from points of higher to those of lower potential. In the report, where the tendency of the currents is to enter the water-mains, they are called "negative," and where it is to leave them they are called "positive." In addition to this, it should be noted that, owing to the character of cast-iron pipe-joints, there is always a tendency of a portion of the current to pass from each 12-foot length of pipe through the earth or water around the joint into the next length; and wherever this occurs some damage must result.

Something like 123 potential tests were made between the water-mains and the rails of the Union Railroad Company. A number of tests were also made at each of fifteen different locations, to determine the efficiency or condition of rail bonds at turn-outs, switches, &c. The outside surface of the water-mains was examined at eleven excavations, and both outside and inside at one, where the pipe had been removed from a street. In a section of the city where the water-mains are alternately positive and negative to the rails, it was noted, when the readings were taken, that the mains were generally positive during the absence of cars. When a car approached and passed, a reversal would take place—the current going from rails to mains to a much higher degree. A marked exception was the terminus of one line, where a difference of potential of 12.5 volts was noted.

In what may be termed the steady positive district, tests were made on the new fire service system of water-mains. It is noted that all of them are positive to the rails. The voltmeter readings are about the same as on the regular low-service mains at the same points; there being no material difference of potential between the two. While these readings are not high—ranging between one and two volts—it is not a healthy condition, and it is probable that electrolytic action is taking place at various points on the outside, or near the joints on the inside of the pipes. There was no evidence of such action on the outside of this pipe at the excavation. The pipe at this place was located in a peculiarly dry, sandy soil of high electrical resistance, and the most natural place for injury to occur would be on the inside of the pipe near the joints.

Special attention is called to the conditions on the Smith Street line, where a 24-inch main runs for more than two miles within  $3\frac{1}{2}$  feet of the tracks. Here the readings were from 4 to 6 volts; showing that the main was receiving and carrying a considerable amount of the return current of the line. This was confirmed by an inspection of the pipe at the excavation, where electrolytic pittings were discovered on the positive side of the joint. From the fact that this type of pittings was found at this joint, where the pipe was embedded in sandy soil scarcely damp, it is more than probable that this action is going on to a more marked degree in other places where the main may rest in soil of a character more conducive to electrolytic action, and on the inside near the joints anywhere along its length.

In looking for a possible cause of the high difference of potential along this line, a rail joint and bond was uncovered, of which a view is reproduced. Taking this rail joint to be a fair sample of others on this line, it will be noticed that the small two-bolt fishplate is not such as to ensure firmness of the rail ends; consequently, owing to their movement through car wheels passing over them, the copper bond is liable to become loosened from the rails or broken. The voltmeter readings indicate that such a condition prevails. This method of joint construction does not compare favourably with the cast-welded joint found at many places on the railway lines in Providence. If it is desirable to have cast-welded joints on other lines in the city, it is much more so over this large and important water-main. Besides the question of electrolysis, the jolting and jarring of cars over an uneven track is liable to cause at some point in the two miles

a settling of the earth, which may result in opening a joint of the water-main, and in a leak that may deprive a portion of the city of water for a time, and be costly to repair.

That such joints and bonds are of little electric value is evident from an examination of a loop line. The voltmeter readings were mostly negative; the highest being at two points. While taking a reading at one point, the needle suddenly jumped from 2.5 to 9 volts negative. A car was noticed at the time passing over a turn-out switch. Suspecting defective bonding, tests at the rail ends of this turn-out were made; and the very same reading was obtained between two rails as between the hydrant and rails about half a block distant—viz., 9 volts. At another place between the rails the reading was 6 volts. These two rail tests showed at once that the bonds had either become corroded where they connect with the rails, or actually broken and were useless for the purpose intended. At a second visit to this turn-out a few days later, a repair gang were found lining up rails and rebonding. A photograph was taken of one of the bonds, broken at one end and corroded at the other, which was removed from this turn-out where the high voltmeter reading was obtained; and a view of the two ends is furnished in the accompanying illustration as a sample of what a rail bond may become when left to itself.

The excessively high reading on another line (21 volts) led Mr. Knudson to look for a special cause, which was found at a point where, in putting in a sewer, a separation in the rails was made; causing the unusual flow of current on that section of the railway line to the water-main. After the rails had been connected a few days later, a second test was made at this terminal, and the reading was found to be 8 volts, or a reduction of 13 volts by connecting the rail ends. This is a good illustration of a road with defective rail bonds; the separated rails in this case being equivalent to poor bonding.

Passing over the portion of the report referring to a number of lines where the voltmeter readings—one as high as 8.5 volts—showed that the mains were receiving current from the rails, the peculiar electrical conditions at one portion of the line are the next interesting feature. The voltmeter readings over the entire line were excessive—indicating a heavy flow of current into the mains; and evidences of electrolytic pitting were noticed on the bell of a pipe which was uncovered. The railway line at the spot in question makes two turns or angles; and the interlacing water-pipes are located in the inside of these angles. The most direct course, therefore, for the current to return would not be by the rails, but by the short cut across the angles. In other words, instead of passing over the two sides of a triangle and following the rails, the current takes but one side—that being water-pipes, and to some extent the gas-pipes as well. After reaching the water-mains, there are two return paths—one east, through a 12-inch main, the other west, to a 30-inch main.

Several districts were found where the water-mains were generally positive, with readings indicating danger. One street line is also strongly positive through its entire length. The power station being located in this street, tests were made in its vicinity; but nothing of importance was shown—the readings being both ways to a comparatively small degree. At another place, however, the tests showed a higher range—the indications pointing to damage to the mains. An excavation was made here, and also one at another point. At both of these places the pipes were in unusually dry soil, and no signs of electrolysis were found on the outside of the pipe at either place; but the mere presence of current flowing on the pipes is a sure indication that it is passing out and injuring them somewhere on the inside or outside, or both, although not discovered at the precise points examined, where differences of potentials are found.

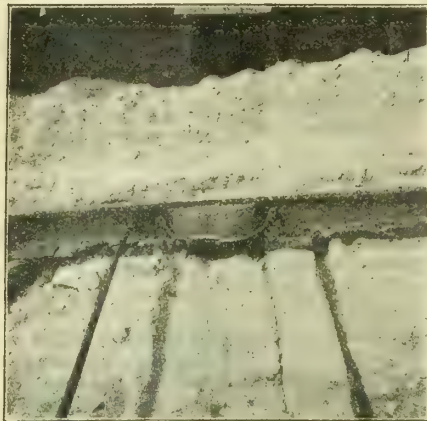
On the east side of the city no special features of importance, as in other cases, were developed in the tests; but they are useful in showing that a steady positive district was being approached towards the south. A few tests were made in one district between the water and gas mains; the result showing that railway current was passing from the former to the latter through the earth, from which in some other locality a portion was again doubtless passing from the gas-mains to earth and the short cut by the river. Five tests were made between water-mains and the river, all of which showed current flowing from them towards, and into, the river. In view of these tests, it becomes clear that railway currents collecting on the mains at distant points find their way to the water-piping in this section of the city—one portion going to earth and the river, while another portion, taking the other path, remains on and follows the mains; thus, in this sense, illustrating the law governing such currents, as mentioned at the beginning of the report.

Referring to bonds, the report states that a perfect rail-bond should continually equal the conductivity of the rail itself. Some bond makers claim a conductivity of 100 per cent. of continuous rail (the cast-weld is one of these); others somewhat less. The actual efficiency of bonds tested will be understood when it is stated that through a lineal foot on a rail of ordinary size it is seldom that 1 millivolt difference of potential can be obtained, or 0.001 volt; whereas, in many of these tests, in which the joint is included in the lineal foot, the difference of potential is more than 1 volt, and in two instances it rises to 6 and 9 volts. One-tenth of a volt is considered excessive, and indicates that the bond is losing its electrical contact with the rails. It is even more important that the contact between return-track feeders and rails should be perfect. Only one such point





ENDS OF BOND.



CAST-WELDED JOINT,



JOINT ON SMITH STREET LINE.

was examined, and it showed differences of potential between the feeders and rails as follows: First rail, 0.3 volt; second rail, 0.2 volt; third rail, 0.2 volt. Wherever these differences of potential occur, the tendency is to an increased diversion of current into the ground and water-mains.

At the eleven excavations, the water-mains were carefully examined for evidence of electrolysis, and millivolt tests for current through them were made at each place. Most of them were in soil which was sandy, and in some cases hardly damp, although there had been recent rain. This condition of soil is not such as to favour the flow of current from the mains, owing to its high electrical resistance, and thereby to cause electrolytic action at such points. In some cases, however, where the soil was more favourable, and the flow of current in the main excessive, electrolysis pittings were found, but not of an immediately serious nature, so far as could be seen, as in all except one case the action was on the bell end of the joint, where the metal is heavier than at other portions. The exception mentioned was where the effects of electrolysis were found at the spigot side of two joints—the current in the pipe flowing in the opposite direction to the other cases. This is a condition which should cause concern, and warrant early attention; for, though the damage is not serious, as found at this point, there may be many other joints in this main located where more favourable conditions prevail, and cause electrolysis to be more active and damaging.

In the list of pipes uncovered at the eleven excavations, there are five at which no signs of electrolysis were found. Of the remaining six, none had reached a stage that could be considered serious. But from the diagrams and their explanation in the report, it is apparent the investigation was not undertaken any too soon. That corrosive action on the Providence pipes has commenced, is plainly evident.

While it is not within his province to specify methods to be used by the Railway Company to better control their currents, Mr. Knudson recommends that attention be called to the necessity of early action, to correct the excessive escape discovered in the negative districts; also that the defective bonding specified in the turn-outs should be promptly attended to. Not only should the bonds be renewed, but the frogs and switches at all other turn-outs should be tested, and those found defective promptly renewed. It is the practice on some electric roads to periodically examine, by methods of testing, the entire bonding system of their lines, and promptly repair those found defective. Attention should first be given to reducing the escape of current to the water-mains in the negative districts. When this escape has been lowered in the negative localities, corresponding reduction may be looked for in the positive districts. There can be no assurance of complete immunity from electrolytic damage to water-mains caused by the straying railway currents so long as the single trolley system is used, in which the rails form one side of the circuit, and are in contact with the earth. Current which once enters the water-mains must leave them at various points, and more or less inside or outside near the joints, over the entire system; and wherever the smallest fraction of current passes out through earth or water, some injury to the mains must result. The destructive action may be slow, and go on for a long time unnoticed; but it inevitably and seriously shortens the life of the pipe.

It is suggested that when future extensions of lines are asked for by the Railway Company, such requests should be first referred to the City Engineer, to ascertain the size and location of the water-mains in the streets over which the new line is proposed to run. This is advised with a view to avoiding such a condition as that found in Smith Street, where, as already stated, the tracks of the road are placed directly over the important water-main, when apparently they could just as well have been located upon the opposite side of the street.

The following article from a recent issue of our American contemporary bears upon the subject of the electric conductivity of water-mains:—

During the last four years, while the pipe-laying of the mains

of the Massachusetts Metropolitan Water-Works has been in progress, a favourable opportunity has been furnished for the study of electrolysis. Some of the results of this study were recently communicated to the New England Water-Works Association by Mr. W. E. Foss. When the investigation was begun, towards the close of 1896, it was seen that a knowledge of the electrical resistances of pipe-lines of various diameters would be of value; and measurements to determine these resistances have been made on all convenient occasions. It was found that the conductivity of such pipes, in which no attempt was made to obtain a uniform electric contact at the joints, varied largely in lines of the same diameter, and even in different portions of the same line. All the measurements were made with the pipes laid in the ground; a measured current being allowed to flow through the pipe, and the drop in potential in a given length of main determined. The amount of current was from 10 to 140 ampères.

While laying pipe-lines, currents of from 20 to 100 ampères have been obtained by connecting the ends of sections with a No. 8 copper wire before the sections were united. At the point where the largest current was measured, a wire nail 0.1 inch in diameter was heated to a white heat when placed between the ends of the 48-inch pipes before the sleeve used in making the joint was put on. The following figures show the resistance of the mains:—

Diameter of Pipe, Inches.	Ohms per 1000 Feet.	Remarks.
12 ..	0.021 ..	New pipe; never filled.
16 ..	0.027 ..	" "
16 ..	0.060 ..	Filled; used six months.
20 ..	0.020 ..	" "
24 ..	0.028 ..	Empty; used 18 months.
36 ..	0.012 ..	New pipe; never filled.
36 ..	0.029 ..	" "
36 ..	0.035 ..	" "
48 ..	0.004 ..	" "
48 ..	0.016 ..	Filled; used over six months.
48 ..	0.018 ..	New pipe; never filled.

In a letter to the same Society, Mr. E. E. Bromwell stated that the electrical resistances of any pipe-line in streets with parallel conductors, such as gas and water mains with their service-pipes, can never be obtained with any marked degree of accuracy. Moreover, the resistances of gas-mains of like material and size are from 10 to 15 per cent. higher than those of water-mains.

The tests of which the following table is a summary were made at a considerable expenditure of time and money to secure conditions giving as accurate results as possible. The current was taken from accumulators; and Weston instruments just calibrated were employed in making the measurements. These pipes were completely isolated from any other conductors, and remote from any electrical influence of any kind, even to the grounding of a single telephone—the dry, gravel soil being the only variable factor. The pipes had been laid for periods ranging from five to ten years. The figures give in each case the average of ten independent readings; the greatest variation found being less than 4 per cent. in each series. Readings of the same class in a crowded street, with a good many adjacent pipe-lines, varied from 20 to 300 per cent.

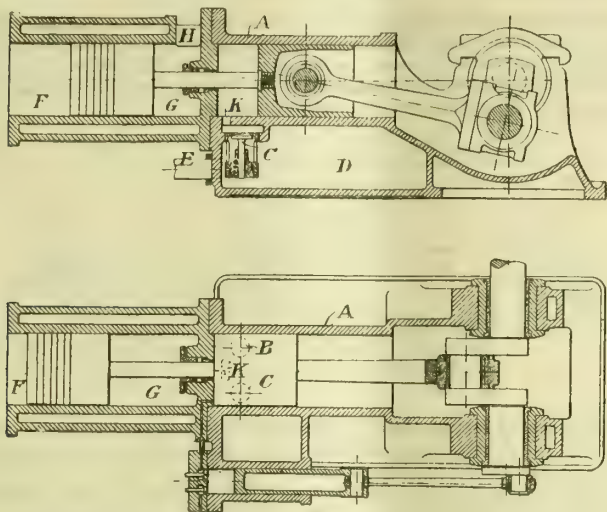
Diameter of Pipe, Inches.	Ohms per 1000 Feet.	Current, Ampères.	Drop, Volts.
4 ..	1.840 ..	8.0 ..	14.720
6 ..	0.792 ..	11.2 ..	8.890
8 ..	0.432 ..	12.4 ..	5.350
10 ..	0.275 ..	12.1 ..	3.320
12 ..	0.187 ..	13.2 ..	2.460
16 ..	0.104 ..	12.2 ..	1.260
18 ..	0.081 ..	12.2 ..	0.988
20 ..	0.065 ..	12.6 ..	0.819
24 ..	0.045 ..	11.8 ..	0.504
28 ..	0.033 ..	11.1 ..	0.369
30 ..	0.029 ..	11.0 ..	0.319
36 ..	0.015 ..	11.2 ..	0.168



## REGISTER OF PATENTS.

**Two-Stroke Gas-Engine.**—Abel, C. D.; a communication from H. Eckhardt, of Berlin. No. 11,263; May 30, 1899.

In two-stroke-cycle gas-motor engines—in which the combustion gases are cleared out of the working cylinder by means of a charge of compressed air produced without the use of a special pump—either the front end of the engine cylinder is utilized as an air-pump, or the crank-shaft is enclosed in an air-tight casing for the purpose. These arrangements, the patentee points out, have the disadvantage that, on the one hand, the dead space is very considerable, and, on the other hand, the compressed air supply comes in contact with the hot outer surface of the engine piston, so that an effectual cooling of the latter by means of cold air is not possible. The present invention relates to a construction of such two-stroke engines whereby these disadvantages are said to be obviated.



As shown, the guide A for the piston-rod and connecting-rod is constructed as a cylinder, to serve as a clearing air-pump, in such manner that the crosshead is formed as a piston. Air is drawn into A through a valve B, and is forced through a valve C into the air-chamber D, whence, at the required moment, the compressed air is led through a pipe E into the engine cylinder F. The front end G of the latter is in constant communication with the outer air, by means of the opening H; so that the piston will be effectually cooled.

With motors in which a supply of compressed air at higher pressure is required (such as for spraying liquid combustible, &c.), a portion of the air forced by the pump A into the chamber D can be led thence into a separate chamber, to be there retained at a higher pressure. This pump-chamber is in direct communication with the clearing-out pump; so that the pressure produced in the latter can be directly transferred to the separate chamber.

The combined action of the two pumps is as follows: The piston of the clearing-out pump A draws in pure outer air during its outstroke; and forces it, during the greater part of its instroke, through the channel K into the air-chamber D, in which the pressure may (for example) be increased to about half an atmosphere above atmospheric pressure. At a certain moment, the channel K is closed by a suitable device, so as to stop the supply to the chamber D. Or, instead of employing a special device for the purpose, the closing of the channel can be effected by the pump-piston itself, as shown. The air still contained in the pump-cylinder A, after the piston has passed the channel K, is forced into a small auxiliary compressing-pump; and here the air is still further compressed to the required degree by a plunger. The clearing-out pump A therefore supplies the air drawn in by it into two separate collecting chambers of different capacities, of which the larger one D serves to receive the clearing-out air supply of low pressure, while the smaller one serves to receive the air to be compressed at a higher degree.

The strokes of the two pump-pistons are, however, more or less shifted relatively to each other, according to the degree of higher pressure required; and the angle between the two cranks will have to be determined correspondingly.

In consequence of the direct connection of the small pump with the clearing-out pump, the suction-valve of the former takes the place of the discharge-valve of the latter as soon as the piston of A has passed beyond the passage K. And so the suction line of the high-pressure indicator diagram of the smaller pump will coincide with the discharge-line of the low-pressure diagram of the larger one.

**Internal Explosion Engines.**—Gardner, E., T. H., & L., of Manchester. No. 16,536; Aug. 15, 1899.

This invention relates chiefly to the type of internal explosion or combustion engine described in patent No. 18,210 of 1897, in which "the various functions or phases of the engine are controlled and effected by eccentrics on a stud parallel with the crank-axis, which do not permit of a separate cam for each valve, as in engines which have a lay-shaft." The object of the present invention is to provide for the more effective controlling and timing of the ignition, by a simple arrangement of devices operated by the eccentric which controls the inlet-valve. In this connection, the patentees claim the use (in ignition-timing devices for internal combustion engines) of: A valve casing; a valve and spindle within the casing, for controlling the communications between the compression and ignition chambers and the outside atmosphere; a rock or carrier lever, mounted upon a fulcrum adjacent to the spindle-end; and a trip-lever mounted upon a fulcrum carried by the carrier-lever, and adapted to press against the end of the spindle during the compression stroke of the engine, under the action of a spring, and to lose and regain its abutment with the spindle by the action of a sliding bar or rod.

**Purifying Water Gas.**—Boult, A. J.; a communication from J. E. Goldschmid, of Frankfort-on-Main. No. 19,270; Sept. 25, 1899.

The patentee proposes, for the purpose of purifying water gas at a distance from the gas-works (by choice in the ordinary supply-pipes, and as near to the consumer as possible), the insertion in the supply-pipe of an oxidizing agent—preferably permanganate salt, in the form of a dry cartridge, with or without the admixture of an inert material, so that the gas in passing comes in contact with it.

It is a well-known fact, the patentee remarks, that water gas is very often polluted with "volatile iron-carbon-oxide combinations." When such water gas is used for lighting purposes in connection with incandescent burners, small quantities of these combinations become decomposed, and produce on the mantle a brown deposit of, probably, oxide of iron, which very soon interferes with the illuminating power of the mantle. In order to overcome this drawback, it has been proposed to free the water gas from the iron-carbon-oxide, by passing it through red-hot tubes, or through suitable acids (see Strache's German patent No. 82,816). Lately Dr. Bunte has found that xylol very efficiently absorbs iron-carbon-oxide combinations; and he strongly recommends this carbon-hydrogen combination as a purifying medium. It has been found that the iron-carbon-oxide may be absolutely and easily destroyed by suitable means of oxidation, without interfering with the constitution of the gas.

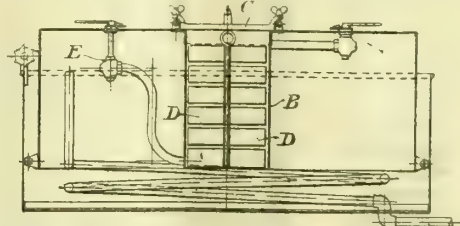
A great number of the known and usually employed means of oxidation will answer the purpose, whether they are employed in a liquid or solid form. Of the liquid means of oxidation, bromine water yields especially satisfactory results; but it is accompanied by the drawback that the purifying process has to be carried out at the central station itself, as it necessitates the construction of special scrubbers through which the water gas is made to pass before entering the pipes. Then it has been found that such an arrangement does not exclude the possibility of danger, as the gas purified at the central station is liable to again form iron-carbon-oxide as it passes along the pipes from the central station to the consumer—thus rendering nugatory the previous purifying success. A similar drawback is also attached to the method recommended by Strache (dealing with the destruction of the iron-carbon-oxide combinations by passing the gas through acids). Dr. Bunte's xylol process, too, is not absolutely free from such drawback.

These inconveniences are, however, absolutely avoided by using instead of the liquid for oxidation, a solid dry oxidizing agent, for the destruction of the iron-carbon-oxide combinations. Numerous experiments have "demonstrated the surprising result" that it is sufficient for the purpose of freeing water gas from iron-carbon-oxide combinations, to pass the gas through a layer of a suitable dry oxidizing agent preferably mixed with some porous or absorbent material; and especially does this refer to permanganate salts, which, "when applied in a dry state, will remove from water gas rapidly and radically any iron-carbon-oxide combinations."

One or more cartridges or charges of the oxidizing agent (preferably potassium permanganate, perchromate of potassium, or iron oxides or chlorides) are inserted in the piping—either directly before or after the meter—in such a manner that the gas must pass through it either on entering or leaving. It is of great advantage, the patentee remarks, in order to provide the oxidizing agent with a larger effective surface, to mix it with some porous material—such as powdered scoria or infusorial earth—or to saturate some porous material with a solution of the oxidizing agent, and then dry it. The filling of the cartridges with the oxidizing agent, and their insertion in the gas piping is carried out in the usual way. It is clear that, "owing to such an arrangement, there can be no danger of the renewed formation of the iron-carbon-oxide combinations in the conducting pipes, after having been purified at the central station. Incandescent burners fed by water gas purified in this manner preserve their natural power of incandescence as long as they last."

**Manufacturing Acetylene.**—Rogers, H. J., of Watford. No. 20,048; Oct. 6, 1899.

This acetylene manufacturing plant consists of a gasholder of the ordinary form, with or without guides according to its size. In the crown of the bell of the holder is placed a pocket B (with a sealed cover C) proportionate to the capacity of the holder; and in this is fixed a series of trays D for containing calcium carbide. At any convenient height in the pocket, there is a cock or valve E (actuated from the outside of the bell)



for the admission of water to the trays of carbide, and having its handle moving on a graduated dial, so that the supply of water can be regulated to any required extent. In the body of the holder is a coil of pipe in connection with the gas outlet-main. At the upper part of the pocket B is a cock or valve regulated from above the bell of the holder, and serving to shut off the supply of gas from the pocket.

The action of the apparatus is as follows: The trays D are lifted out of the pocket B, and filled with carbide and replaced; the cover C being afterwards sealed to prevent any escape of the gas. Both the cocks already referred to are then opened—one to admit water to the carbide, the other to permit the exit of the gas from the pocket B into the coil, and thence to the gas-main. Immediately the first cock is opened, water comes in contact with the carbide in the lower tray; gas is evolved; and the bell rises. When this gas is consumed, and the bell again sinks into the water, No. 2 tray comes into operation; and so on, until all the carbide in the trays is converted into gas.

**Lighting Incandescent Street-Lamp Burners.**—Tee, H., of Liverpool. No. 20,522; Oct. 13, 1899.

According to this invention, there is combined with the main burner (on which the mantle is used) an igniting device, by which the burner "is



readily ignited without liability of fracture or damage." The device consists of a pipe leading from the main gas supply-pipe, and above the main tap, and having on it a tap and a weighted lever or arm, disposed within the lamp, and adapted to be operated by a flap in the bottom.

Fig. 1.

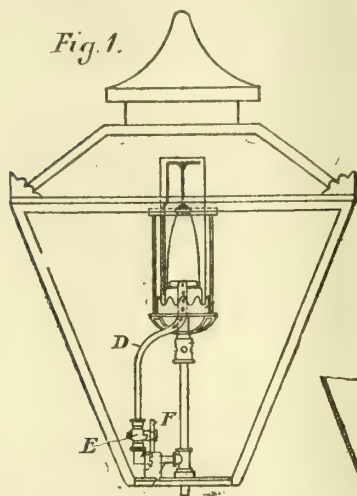
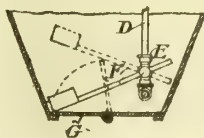


Fig. 2.



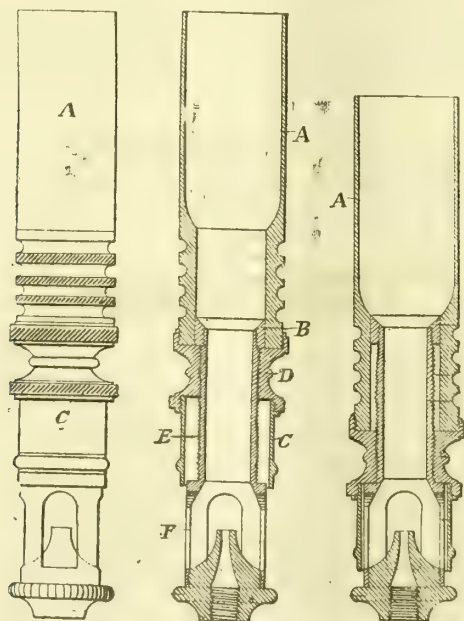
As shown, the upper end of the pilot-light pipe or tube D is passed up between the burner and the gallery, and holes are provided in it at a suitable point, so that, when the lighting torch is passed up through the opening normally covered by the flap G, the gas issuing out of the lower holes will be lit, and the flame will be propagated upwards into the burner by the ignition of the gas-jets issuing through the small holes in the tube. In the act of passing the torch into the lamp, the flap is lifted up, and the lever F (which normally rests on the outer edge—its hinge being disposed between the edges of the bottom) will be raised; and as it is further lifted upwards, the plug of the cock E is turned, and supplies gas to the igniting-tube. When the torch is drawn out, the flap G follows, and so allows the tap-lever F to fall; its return action being effected by the weight. When it reaches the position shown in fig. 2, the tap is closed completely.

**Seal-Padlocks for Gas-Meters.**—Tourtel, J., of Aldersgate Street, E.C. No. 20,782; Oct. 17, 1899.

This invention relates to improvements on patent No. 479 of 1895, whereby the padlocks referred to are rendered applicable for sealing purposes where wire and lead seals are already employed. For this purpose a hasp is provided, separate from the lock, instead of hinged to it as before. At one end of the hasp is a pin of such a size as is required to pass through the sealing hole of the object to be sealed. The pin also passes through holes in the seal-frame and case of the lock—thus assisting to secure the frame to the case; while the other end of the hasp is made in the form of a hook, so as to engage with the spring-catch of the lock. The remainder of the lock is constructed in a similar manner to that described in the earlier patent.

**Burner for Incandescence Lighting.**—Noel, P., of Paris. No. 21,086; Oct. 21, 1899.

In this gas-burner for heating and lighting by incandescence, the capacity of the mixing-chamber can be varied, and, at the same time, the opening of the air-supply orifices regulated, according to the pressure of the gas supplied.



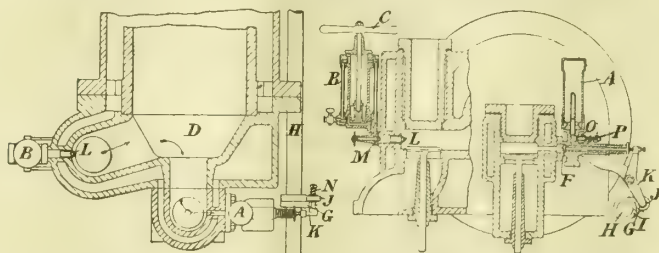
As will be seen by the engraving, the cylindrical piece A, which forms the mixing-chamber of the burner, is made internally of two different diameters—the larger part for the expansion of the gases, while the smaller receives a piston B, which serves to modify the capacity of the chamber. A sleeve C is firmly connected to the main chamber by means of a ring D, forming a nut, in which can be moved a screw-threaded

stem E. This is made with a quick thread, and has the piston B secured to its upper end, and the air-inlet F to its lower end. This enables the section of the air-inlet orifices in F to be diminished by the sleeve, the more the piston diminishes the capacity of the chamber A, and inversely. In this manner, there will always be the same relation between the chamber and the section of the air-inlet orifices.

The patentee claims that, with his burner, "a single injector is sufficient for both low pressure (from 15 to 50 mm.) or high pressure (50 mm. and above). At 50 mm., the injector delivers, for example, 260 litres, and at 15 mm. 150 litres; the capacity of the chamber A being diminished at the same time that the supply of air is diminished. There are thus always three things in constant relation to each other—the supply of gas, the supply of air, and the capacity of the chamber."

**Starting Gas-Engines.**—Bellamy, A. R., of Stockport. No. 12,045; July 4, 1900.

The object of this invention is to start a gas-engine by pumping into the cylinder (or space behind the piston) a charge of some explosive mixture, and providing means in conjunction with the ordinary igniter, so that the mixture may be exploded at any desired compression and when it is capable of giving the best starting impulse.



The essential feature of the invention consists in the provision of means for firing the charge when sufficient compression of the explosive mixture has been obtained. To effect this, the usual cam G, on the cam shaft H, is provided with a circular boss I, upon which is disposed, before starting the engine, the sliding bowl J of the lever K, which actuates the ignition timing valve F. In this position the rotation of the cam shaft would not affect the lever, and the ignition timing-valve is closed to the igniter A. The force pump B is then actuated by the handle C, forcing the explosive mixture through the nozzle L into the combustion chamber D, as shown by the arrows—the back-pressure valve M preventing the return of the gas to the pump. The requisite number of strokes of the pump-handle to obtain a sufficient compression of the explosive mixture in the combustion chamber is previously ascertained by experiment. When this compression is attained, the lever K is operated by hand to open the ignition-valve to the igniter, so that the charge is exploded and the engine started. At the same time, when the lower half of the lever is raised, the spring N thrusts the sliding bowl J upon the cam G, so that the lever is operated in the usual way by the cam.

To start the engine by hand, without the aid of the pump B, the bowl of the lever K is arranged upon the cam G in its proper working position so as to actuate the ignition timing-valve. The fly-wheel of the engine is then revolved by hand until the engine is started; a valve O being provided to allow the products of the previous explosion in the igniter to escape to the atmosphere. This valve can be closed when required by the screwed spindle P.

#### APPLICATIONS FOR LETTERS PATENT.

- 16,077.—POETTER, H., "Gas-generators." Sept. 10.
- 16,078.—METROPOLITAN GAS-METERS, LTD., and FORSTER, J. D., "Money-boxes, collecting boxes, and the like." Sept. 10.
- 16,092.—D'ALTON, J. J., "Acetylene lamps." Sept. 10.
- 16,118.—FORSYTH, J., "Pipes with special joints for all kinds of liquids and fluids." Sept. 11.
- 16,171.—SMITH, H., "Gas-engines." Sept. 11.
- 16,194.—WRIGHT, G. E., "Gas heating-stoves." Sept. 12.
- 16,230.—HAWKINS, H. & S. H., "Water-engine." Sept. 12.
- 16,256.—GIBBONS, W. P. & G. B. A., "Regenerative furnaces." Sept. 12.
- 16,294.—KERR, H. A., "Chimneys of incandescent gas-burners." Sept. 13.
- 16,367.—REES, W. P., and BOUNDY, G. R., "Generators for the production of acetylene gas." Sept. 14.
- 16,385.—HERING, A., "Water-motors." Sept. 14.
- 16,409.—SMYTH, J. F., "Manufacturing acetylene gas." Sept. 15.
- 16,427.—ROBERTSON, G., "Combined shade and controlling and regulating device for gas-lamps." Sept. 15.
- 16,469.—SMITH, G. B. & E. W., "Coin-freed gas-meters." Sept. 15.
- 16,473.—PIKHART, E., "Incandescent mantles." Sept. 15.
- 16,598.—CLARK, T. E., "Acetylene gas generators." Sept. 18.
- 16,621.—BORMANN, J. G. L., "Gas production." Sept. 18.
- 16,626.—WELCH, W. H. I., "Overhead regenerative gas-lamps." Sept. 18.
- 16,627.—ABEL, C. D., "Gas or oil motors." A communication from La Société Anonyme des Anciens Etablissements Panhard et Levassor. Sept. 18.
- 16,742.—CUSS, C. T., and HARRIS, H. W., "Gas generating governor." Sept. 20.
- 16,780.—HOWELL, H., "High-pressure accumulator for incandescent gas lighting." Sept. 20.
- 16,782.—WERNHAM, W. G., "Gas or water cocks." Sept. 20.
- 16,825.—BOTTOMLEY, J., and AINSWORTH, J. T., "Generator for acetylene." Sept. 21.
- 16,826.—ANDERSON, A., "Gas-stoves." Sept. 21.
- 16,829.—COX, T., "Washing and cleaning street gas-lamps." Sept. 21.
- 16,839.—QUELCH, G. H., and KENT, T. O., "Preparation of carbide of calcium." Sept. 21.
- 16,902.—CHAPMAN, E. F., and THORNTON, H., "Gas-engines." Sept. 22.



CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Mr. Forstall's Paper on "Technical Instruction" at the Paris Congress.

SIR,—Owing to the holidays, I have only just seen your report of my remarks in the discussion which followed the above paper, and your editorial comments thereupon.

When stating that the questions for the examinations of the City and Guilds of London were framed with the object of testing the practical knowledge of the candidates, I added (parenthetically) "in my time at any rate." These words do not appear in your report. I attach some importance to them, for the sole and obvious reason that I had no authority to speak for others. Moreover, I only knew clearly what my own aim had been; and I knew also that, in your opinion, as expressed at the time, I had not been unsuccessful in pursuing it.

The case of a successful student who had "never previously set foot inside a gas-works, a laboratory, or even a draughtsman's office," may only serve to indicate how much information is to be derived from the extensive literature on the subject, or from a practical lecturer aided by models and diagrams. Generally speaking, it is not difficult to recognize the mere book student from his answers, which may be rated accordingly. To encourage such candidature can scarcely be called useful work; because success in these examinations can never be of much practical value as the sole qualification of a candidate seeking employment in a gas-works.

CHAS. HUNT.

Birmingham, Sept. 27, 1900.

The Allowance to be Made for Fast and Slow Meters.

SIR,—“J. B. P.” has a rather curious way of proving his example; but his result is a very telling indictment of the tables referred to. If you will allow me a little more space than my previous letter occupied, I will endeavour concisely to explain the errors which have rightly drawn forth this correspondence.

The term *per cent.* as used in common arithmetic, and commercially, is a catch-word frequently leading into traps. The only safe mathematical remedy is the substitution of vulgar fractions. For instance, a business man will put 15 *per cent.* on a figure, and then perhaps require to remove it again. This percentage table will not help him, because 15 *per cent.* off 115 does not bring him back to 100. The right figure is 15 *per* 115, not *per cent.*, or in fractions  $\frac{15}{115}$ . The word *cent.* is the culprit. There are a number of such catchwords commonly misused in our language; but it is a serious matter when one of them leads to arithmetical and commercial errors.

Now in testing a gas-meter, one object of registering an error is in order that it may be corrected, presumably on an account rendered. Therefore the error if stated *per cent.* must be *per cent.* of the meter's wrong reading. Referring to “J. B. P.’s” example:—

Meter . . . 100 cubic feet  
Test-holder . . 50     ”     ”  
  
Error . . . 50 cubic feet fast

That is, 50 *per meter* reading  
= 50 *per* 100  
or in fractions  $\frac{50}{100}$

Taking another example:—

Meter . . . 5·00 cubic feet  
Test-holder . . 6·15     ”     ”  
  
Error . . . 1·15 cubic feet slow

That is, 1·15 *per meter* reading  
= 1·15 *per* 5  
or in fractions  $\frac{1·15}{5} = \frac{23}{100}$   
= 23 *per cent.*

I have before me Mr. F. W. Hartley's book on “Gas Measurement and Gas-Meter Testing,” at the end of which is given an abridgment of the tables compiled and printed by order of the Metropolitan Board of Works for the use of their meter inspectors. These are entirely wrong, because they calculate the percentage on the registration of the test-holder instead of the meter, as though the holder were in error and the meter correct. The result is just the same as that pointed out in the letter of your original correspondent “Gas-Meter,” although he was wrong as to the source of the error. Therefore his complaint is abundantly justified.

If these tables have been extensively used, then consumers who have had their meters tested and their accounts subsequently adjusted have been either credited too much or debited too little.

I will give two examples:—

(1) Meter . . . 100 cubic feet  
Test-holder . . 110     ”     ”  
  
Error . . . 10 cubic feet *slow*.

That is, 10 *per meter* reading  
=  $\frac{10}{100} = 10$  *per cent.*  
Table gives  $\frac{10}{110}$  or 9·09 *per cent.*  
(Debit too small)

(2) Meter . . . 20 cubic feet  
Test-holder . . 18     ”     ”  
  
Error . . . 2 cubic feet *fast*.

That is, 2 *per meter* reading  
=  $\frac{2}{20} = \frac{10}{100} = 10$  *per cent.*  
Tables give  $\frac{2}{18} = 11·11$  *per cent.*  
(Credit too much)

Really, tables are unnecessary, because the amount passed through a meter in testing is generally either a divisor or a multiple of 100; and the error or difference between the registration of meter and test-holder

has only to be multiplied or divided by the same dividend to at once give the percentage.

I do not know whether Mr. Hartley was in any way responsible for the tables referred to; but I had some years ago occasion to consult his book in writing a paper on “The Measurement of Gas,” and I then found on pp. 25, 26, and 27 (Third Edition), on rules for corrections for temperature, a hopeless muddle. This was partly owing to his taking his cent., or 100, to represent volumes of gas at a standard temperature, instead of the temperature to be corrected. By the use of vulgar fractions, these three pages may be replaced by a paragraph of about eight lines, which I inserted into the book that was lent me.

With your permission, I will send this and the short table of percentages given on p. 24, with an explanation, for insertion in next week's “JOURNAL,” as I think it may be of equal interest to the other matter.

B. R. P.

Sept. 28, 1900.

The Production of Water Gas by the Dellwik-Fleischer Process.

SIR,—The article on “Water Gas” in the “JOURNAL” for July 10, p. 85, is very interesting; but these and similar calculations might be much simplified by adopting the method proposed and explained in Hanssen's “Reform of Chemical and Physical Calculations.” By this method, the calculation of this new water gas process would stand thus:

One molecule of water gas CO + H<sub>2</sub> consists of—  
12 kg. C aerif. at  $\frac{1}{15}$  cbm. = 11·2 cbm. aerif. C at 0° N and at atm. density.  
16     ”     O     at  $\frac{1}{16}$      ”     = 11·2     ”     O } 18 kg. water.     ”     ”  
2     ”     H     at  $\frac{1}{8}$      ”     = 22·4     ”     H }     ”     ”  
  
30 kg. water gas     = 44·8 cbm. water gas of 0° N and     ”     ”  
Consequently 1 kg. =  $\frac{44·8}{30} = \frac{11·2}{7·5}$  cbm.     ”  
1 cbm.     =  $\frac{7·5}{11·2}$  kg.     ”

The decomposition of 1 kg. of water into O and H gas by heat only, requires 3853½ calories; but by the combined action of heat and the chemical affinity of one equivalent of carbon, only  $\frac{3853½}{2} = 1926½$

calories are required per 1 kg. of water.

To convert 18 kg. of water of ± 0° N, and 12 kg. of solid C into 30 kg. of water gas therefore requires—

Decomposing 18 kg. of water, by heat and chemical affinity, requires 18 × 1926½ calories . . . . . = 34,680 calories.

In the decomposing process 12 kg. of solid carbon are combined with the 16 kg. of O, set free, forming 28 kg. of CO; and as 1 kg. of solid C produces 2477½ calories sensible heat (while 3302½ calories become latent in the process of gasifying the solid carbon), it follows that the 12 kg. of solid C produces 12 kg. × 2477½ calories = 29,726 calories.

If the 30 kg. = 44·8 cbm. of water gas leave the generator at 600° N they will carry off 44·8 cbm. × 600° N ×  $\frac{3}{4}$  calories = 8,160 calories.

Available heat produced in the converting process = 21,566     ”  
13,114 calories.

Heat to be supplied by blowing up 1 kg. of solid C burnt to CO<sub>2</sub> produces . . . . . 11,560 calories.  
Gasifying 1 kg. of solid C absorbs two-sevenths of 11,560 calories . . . . . = 3,302½     ”

Sensible heat produced by 1 kg. solid C burnt to CO<sub>2</sub> . . . . . = 8,257½ calories.  
Products of combustion in air passing off  
at 600° N 3½ kg. CO<sub>2</sub> ×  $\frac{51}{220}$  cal. × 600° N . . . . . = 570 calories.  
8½ kg. N ×  $\frac{34}{40}$  cal. × 600° N . . . . . = 1,296     ”  
1,866     ”

Available heat per 1 kg. of solid C burnt to CO<sub>2</sub> = 6,391½ calories.  
To supply the deficiency of 13,114 calories, must be burnt:

13,114 calories = 2·052 kg. of solid carbon.  
6,391½ calories

To produce 30 kg. = 44·8 cbm. of water gas consequently are required 12 kg. + 2·052 kg. = 14·052 kg. of solid C. If 1 kg. coke contains 0·95 kg. of solid C and 0·05 kg. of ashes, then 14·052 kg. C are equivalent to 14·80 kg. of coke.

If we estimate leakages, imperfect combustion, radiation of heat = 14·80 kg. = 1·85, then 44·8 cbm. of water gas require 16·65 kg. of coke,  
8     ”

and 1 kg. of coke produces  $\frac{44·8 \text{ cbm.}}{16·65 \text{ kg.}} = 2·70$  cbm. of water gas, of 0° N  
(= 273° N abs.), or  $\frac{2·70 \text{ cbm.} \times 873° \text{ N abs.}}{273° \text{ N abs.}} = 8·63$  cbm. if measured at + 600° N = 873° N absolute temperature.

C. E.

Sept. 24, 1900.

Gas Exhibits at the Paris Exhibition.

SIR,—Referring to Mr. Brackenbury's able report on the Paris gas exhibits and to your article on the same, permit me to draw your readers' more particular attention to the very beautiful working model of the setting of inclined retorts, coke conveyor, and automatic coal-store exhibited by the Stettiner-Chamotte-Fabrik.

It may interest English readers to learn that the model is almost an exact reproduction of the new installation recently completed at the Frederiksberg works of the Danish Gas Company, which installation was unfortunately not finished at the time the Institution of Gas Engineers visited the works last year.

The model exhibits to perfection the writer's system of automatic coal



storing and store-emptying arrangements; and, as the mechanism is actuated by clockwork, the motion of the conveyor bands can be seen.

The model, as a whole, is well worth a journey to Paris to see; but the writer will endeavour to procure its exhibition in England at a later date. The original installation at Frederiksberg is always open for inspection.

Copenhagen, Sept. 28, 1900.

F. D. MARSHALL.

### Carbon Deposits in Retorts.

SIR,—It was with much interest that I read in your issue of Sept. 18 the report of the proceedings at the meeting of the Waverley Association of Gas Managers, and more particularly the discussion with reference to the deposit of carbon in retorts. One point in connection with this was, however, overlooked; that was the high price at present offered for a ton of gas carbon—viz., 45s.

I have given the formation and removal of carbon in retorts a good deal of attention, and agree with most of the speakers that full charges, a light seal in the hydraulic, and regular cleaning and scraping of the retorts, all tend to lessen the growth of carbon deposits.

For the past fifteen years I have carefully kept all the carbon removed from the retorts. I do not burn it off—thinking it is too valuable to burn; and when I have a set of old retorts in use that are to be renewed, I allow the carbon to accumulate and get it off when the retorts are broken up. Sometimes we get the ends of the retorts filled up to the extent of from 6 to 9 inches. This forms a nice heavy lump of carbon for sale. Of course, this is done when the exhaustor is off during the summer.

It may be interesting to know that on my works (making 30 million cubic feet of gas) the quantity of carbon produced in fifteen years has been about 8 tons, or a little above  $\frac{1}{2}$  ton a year. I do not think this is a large quantity, but would like if someone would compare his output with mine.

Most of the methods referred to for removing the deposit are good. The water spray I have used for 30 years. Some 26 years ago, in England, I sold gas carbon for 20s. per ton. It was used in a foundry where heavy castings were made, and was mixed with the coke.

At present, as gas managers must know, the demand for gas carbon is very great, and prices are high. Hardly a post arrives but there is an inquiry for gas carbon; and for this we have to thank our friend Electricity, who cannot it seems get along without us. Some day in the near future gas may possibly be only a residual, with gas carbon selling at £5 per ton. It might then pay us to produce it, instead of doing, as at present, all we know to prevent its formation.

I may add that the last lot of 4 tons of carbon—the “gatherings” of eight years—I sold for 12s. 6d. per ton; for the next lot I have to sell, I will get 45s. per ton.

The use gas carbon is also put to, I believe, is in connection with the manufacture of calcium carbide.

Montrose, Sept. 25, 1900.

THOS. D. HALL.

## LEGAL INTELLIGENCE.

### QUEENSTOWN (IRELAND) PETTY SESSIONS.

Monday, Sept. 24.

(Before Mr. A. E. HORNE, Chairman, and a Bench of Justices.)

#### Question as to Inspecting a Gas Company's Books.

To-day the Bench were occupied for nearly three hours in dealing with a summons taken out by Major Peter Curry against Mr. James Wilson, the Secretary and Book-keeper of the Queenstown Gas Company, for failing to allow the complainant, as a shareholder in the Company, to inspect the registers of shareholders and transfers and the minute-book and make extracts therefrom. The proceedings were taken under section 119 of the Companies Clauses Consolidation Act, 1845; and it was contended that, by his refusal, the defendant had rendered himself liable to a penalty not exceeding £5.

Mr. T. J. BABINGTON appeared for the complainant; Mr. W. RONAN represented the Company, on behalf of their servant.

Mr. BABINGTON said the Company were incorporated under the above-named Act, but they also had a Private Act. Certain books were directed to be kept, one of which was called the “Register of Shareholders.” The capital of the Company was £20,000, of which the complainant and his sister held £3000 in shares and debentures. Major Curry had for a long time been a Director of the Company, and he had reasons for thinking it was necessary that he should look through the books. He accordingly called at the offices, and demanded to see the register of shareholders, the register of transfers, and the minute-book. The last-named book was one in which all the transactions of the Company were entered. There was also the shareholders' list, which was required by Act of Parliament, and defendant refused to produce it. It was necessary for his client to inspect the transfer-books for the purpose of seeing that the purchases of shareholders were entered correctly. The minute-book was an account-book, in so far as it contained an account of every transaction entered into by the Company.

The CHAIRMAN remarked that he had a difficulty in seeing that this was an “account” book.

Mr. BABINGTON said the accounts could not be kept without the minute-book. Moreover, it was one of the books which the Act of Parliament ordered to be produced.

Major Curry, examined by Mr. BABINGTON, said he was the owner of shares in the Company. On Friday, the 21st of September, he went to the office and asked Mr. Wilson (the Secretary) for the registers of shareholders and transfers and also the minute-book. Defendant gave him several books to inspect, but refused the three indicated in the summons. He held 100 shares and £1200 of debentures of the Company.

Mr. RONAN remarked that Major Curry was suing Mr. Wilson in his capacity of Secretary and Book-keeper combined. He made his demand under the 117th section of the Act, and prosecuted under the 119th.

The former section gave a shareholder the right to see the books; while the latter imposed a penalty for refusing to produce them.

Witness (continuing) said the defendant gave him the ledger, but did not show him the accounts for the past half year.

Mr. RONAN then read the section of the Act which bore upon the case, and asked if a register of shareholders could be called an account-book, and if it came under the section. (To witness :) Did you ever hear of a minute-book being audited by an auditor?

Witness : I did not say so. There is no such thing.

I quite agree with you. Did you ever hear of a register of shareholders being audited by an auditor?—I refuse to answer. I call for protection against such nonsensical questions. I am here to answer any sensible questions that arise.

Did you ever hear of an auditor auditing a register of transfers?—No, I did not.

The ledger was here produced, and the complainant was asked whether he thought the auditor had audited it.

In further cross-examination by Mr. RONAN, defendant admitted that when he was a Director of the Company he never considered whether or not shareholders should be allowed to see the books.

Representatives of the parties having addressed the Court at some length, the Bench retired. On their return after a short consultation,

The CHAIRMAN said that, in their opinion, the refusal to permit the complainant to see the books did not constitute an offence under section 119 of the Act, which would enable them to impose a penalty not exceeding £5. The summons would be dismissed, because the books mentioned therein did not come within the meaning of the section, and were not books required for the purpose of account.

### Tampering with a Gas-Meter at Birkenhead.

On Friday, at the Birkenhead Police Court, Edward Orme was charged under section 38 of the Gas-Works Clauses Act, 1871, with fraudulently abstracting gas from a meter, the property of the Birkenhead Corporation. It appears that on the 22nd inst. one of the gas inspectors was passing defendant's house, when he noticed a strong smell of gas. On entering to ascertain the cause, he found that the meter had been disconnected from the service-pipe, and an india-rubber tube had been attached to the outlet from the main, thereby enabling defendant to abstract gas without the supply passing through, or being registered by, the meter. The meter was worked on the penny-in-the-slot system. Defendant told the inspector that they had tampered with the meter because they had not a penny. A Police Inspector stated that defendant had left the town; and his goods had been disposed of. A fine of 40s. and costs, or in default one month's hard labour, was imposed.

### Damaging and Pilfering from Prepayment Gas-Meters.

At a recent sitting of the Bench at the Burnley Borough Police Court, Wm. Henry Greenwood was charged with stealing 3s. 1d. from a meter belonging to the Corporation. Mr. Wheatley, the Assistant Town Clerk, was proceeding to prove the charge, when the Magistrates' Clerk said the Bench must first have evidence of the exact sum of money originally in the meter. Mr. Wheatley said it was impossible to prove it. Prisoner was then charged with doing damage to the meter to the extent of 1s. 6d. He denied the offence, and called a witness, who stated that he saw a number of children trying to get pennies out of the meter. There were four previous convictions against Greenwood; and he was sent to prison for one month, with hard labour.

At Warrington on Thursday, Alfred Austin was charged with stealing 4s. from a gas-meter at the house of Robert Dunn. He was further charged with frequenting the same locality on Wednesday night, with intent to commit a felony. Prisoner pleaded guilty to both charges. It appeared that Austin had been lodging at the prosecutor's house for some months, during which time he had taken the lock off the slot meter, and had abstracted the contents. The theft was not discovered until he was found in another house trying to take the money from the gas-meter. The lock had been removed from prosecutor's meter; and it was only fastened by a piece of wire. Prisoner was committed to gaol for three months, with hard labour, on each charge.

### A Stealer of Gas at Morecambe Properly Punished.

At the Lancaster County Police Court on the 8th ult., Eliza Clegg, of Morecambe, did not answer a summons for fraudulently obtaining gas in the town on Aug. 23. But Mr. J. E. Ogleshorpe, who prosecuted, said the defendant was charged with fraudulently introducing a pipe for the purpose of stealing gas from the Gas Company's mains. Mrs. Clegg was a consumer up to March 1, and then notice was given that, if she did not pay a bill of £4 16s. 7d., the gas would be cut off. This was done on March 23 by means of putting a cork in the meters. The meters then stood at 31,600 cubic feet for illuminating purposes and 54,000 cubic feet for cooking purposes. On June 25 there was suspicion that the gas was still being used, and an examination showed that, while there was no change in the illuminating meter, the cooking meter had advanced to 64,700 cubic feet, or 10,700 feet more than in March. The Company's Manager then ordered the meters to be taken out altogether, and the ends of the pipes were properly made up with caps and the taps turned off. On Aug. 23 suspicion was again aroused; and the Chief Inspector watched the house, and applied for admission to inspect it. Mrs. Clegg refused permission, but when the man was in the cellar adjoining, he heard somebody working at the pipe in Mrs. Clegg's cellar. He managed to get into the house, and in the cellar found a strong smell of gas and Mrs. Clegg trying to screw up the tap to the supply pipe. The gas-oven was perfectly hot and some chops were half-cooked. A warrant was granted after hearing evidence. This resulted in Mrs. Clegg putting in an appearance last Saturday week, when a fine of £10 and costs was imposed, or two months' hard labour.

At a special meeting of the Carmarthen Town Council last Tuesday, the tender of Mr. Edward Powell, of Pontypridd, for the construction of a new water reservoir was accepted. The figure was £20,330.



## MISCELLANEOUS NEWS.

## COMMERCIAL GAS COMPANY.

## The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending June 30, which, with the accounts for this period, will be presented at the meeting of the proprietors on Thursday:—

The Directors submit the accounts for the half year ended June 30, 1900. The revenue account shows a net profit for the half year of £49,424. This, added to the amount brought forward from the previous half year, makes £49,821 1s. 7d. Deducting therefrom £5592 8s. 2d., for interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £44,228 13s. 5d. available for dividend. The Directors recommend the payment of dividends at the rates of 12½ per cent. per annum upon the old stock of the Company, and of 9½ per cent. per annum upon the new stock, both less income-tax. The amount by which the profits of the Company are insufficient to pay the dividends will be taken out of the reserve fund. The Directors have

found it necessary to increase the price of gas from 2s. 6d. to 3s. per 1000 cubic feet, as from the taking of the Lady-day indices.

The accounts accompanying the report consist of the usual statements. They show that stock to the amount of £800,355 has been raised out of the total of £830,000 authorized; and that £253,287 has been borrowed out of £300,000 sanctioned. The receipts on capital account amount to £1,053,642 (issues of £13,930 of new stock and £15,000 of debenture stock having been made in the past half year); and there is £46,716 of premium capital—making together £1,100,358. The expenditure on capital account in the past six months (£13,213) comprised £6712 for new and additional buildings, plant, &c.; £1240 for mains and services; £2887 for meters and stoves; and £2293 for "coin" meters and fittings, less £1991 written off for depreciation. The total expenditure to June 30 last amounted to £1,067,544. The balance of £32,814 is carried to the balance-sheet. The reserve fund at the above-named date stood at £43,074, and the insurance fund at £28,652. The balance-sheet shows that the value of the stores in hand at the close of the half year was as follows: Coals, oil, &c., £22,446; coke and breeze, £337; tar, ammoniacal liquor, sulphate of ammonia, &c., £6758; sundries, £17,236—making a total of £46,777. The revenue and profit and loss accounts, together with the statements relating to the manufacturing operations of the Company in the half year, are given below.

## REVENUE ACCOUNT.

## To Manufacture of gas—

Coals and Oil, including dues, carriage, unloading and trimming	£104,279 13 5
Salaries of Engineer and Officers at works	2,412 10 0
Wages (carbonizing)	19,338 14 7
Purification, including £3191 8s. 10d. for labour	8,841 6 8
Repair and maintenance of works and plant, materials and labour (less £401 4s. 3d. received for old materials)	18,095 10 0

£152,467 14 8

## Distribution of gas—

Salaries and wages of Officers (including Rental Clerks)	£2,042 8 3
Repair, maintenance, and renewal of mains and service-pipes, including labour	9,465 8 3
Repair and renewal of meters	1,714 15 0
" " stoves	2,056 8 8
" " Automatic meters and fittings	1,991 5 7

11,270 5 9

Public lamps—lighting and repairing	2,949 4 8
Rents, rates, and taxes	7,763 2 8

## Management—

Directors' allowance	£1,250 0 0
Company's Auditors	75 0 0
Salaries of Secretary, Accountant, and Clerks	1,161 18 10
Collectors' salaries and commission	1,602 14 11
Coin meter collection	406 16 10
Stationery and printing	763 16 2
General charges	550 19 5

5,811 6 2

Bad debts	618 7 1
Discount and allowances	1,395 5 4
Law and Parliamentary charges	1,077 4 6
Superannuation and allowances	257 18 0
Official Officers	114 7 1

£183,614 15 11

Balance carried to net revenue account . . . . . 49,424 0 0

£233,038 15 11

## By Sale of gas—

Common gas, per meter, at 2s. 6d. and 3s. per 1000 cubic feet	£165,345 5 3
Public lighting and under contracts, common gas	10,220 19 2

£175,566 4 7

## Rental—

Meters	£2,555 13 7
Stoves	2,106 1 9
Automatic meters and fittings	2,836 1 2

7,497 16 6

## Residual products—

Coke, less £4036 1s. 4d. for labour	£30,723 8 0
Breeze, less £542 11s. 3d. for do.	1,866 9 9
Tar	8,870 3 9
Ammoniacal liquor and sulphate of ammonia	8,325 9 5

49,785 10 11

## Miscellaneous receipts—

Rents receivable	£165 18 11
Transfer fees	23 5 0

169 3 11

£238,038 15 11

## PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on debenture stock	£5,381 16 0	Balance on Dec. 31, 1899	£50,854 5 4
Balance of interest on temporary loans	210 12 2	Less dividend for half year ended Dec. 31, 1899, £49,475 12s. 6d.; and amount transferred to reserve fund, £981 11s. 3d.	50,457 3 9
Balance available for dividend carried to balance sheet	44,228 13 5		£397 1 7
		Balance from revenue account	49,424 0 0
			£49,821 1 7

## STATEMENT OF GAS MADE, SOLD, &amp;c.

Quantity Made. Meter Register (and estimated).	QUANTITY SOLD.		Total Quantity accounted for.	Number of Public Lamps.
	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands. 1,412,763	Thousands. 63,384	Thousands. 1,349,559	Thousands. 1,319,363	5,544

## STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1899.	Received during the Half Year.	Carbonized during the Half Year.	Used and Sold in Half Year.	In Store, June 30, 1900.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common coal	16,958	90,949½	87,888½	745½	19,317½
Cannel	6,977	Nil.	2,963½	521	3,493
	23,935	90,949½	90,801½	1,266½	22,810½

\* Oil used for oil-gas manufacture, 1,583,088 gallons.

## STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1899.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, June 30, 1900.
Coke—tons.	6,503	53,801½	16,030½	44,174	100
Breeze—tons.	1,481	12,658½	—	12,914½	1,220
Tar—gallons	471,979	1,170,057	—	1,161,556	480,500
Ammoniacal liquor—butts	11,490	27,204	82,828	1,325½	6,366
Sulphate of Ammonia—tons	403	1,057½	—	—	135

## ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

## The Half-Yearly Accounts.

The accounts which were presented to the shareholders of the above-named Company at their half-yearly general meeting yesterday, showed that in the six months ending the 30th of June no less a sum than £84,114 was expended on capital account. Of this, £16,670 was for manufacturing plant, machines, storage works, &c., £3575 for new mains and services, £2379 for additional meters (£1690 for prepayment meters), and £10,772 for automatic cookers, &c.; bringing up the total expenditure to £1,040,182. As the total amount of capital called up is only £999,906, the account has been overdrawn by £40,276. The Company, however, have £236,000 of unissued capital, and borrowing powers to the extent of £64,000 unexercised. The sale of gas in the half year produced £112,146; the rental of ordinary meters, £3212; do. of coin-meters, £4613; and the sale of residual products, £30,699—the total revenue being £151,109. The expenditure on the manufacture of gas came to £85,030 (coal costing £39,166, and cannel and oil £22,409); on distribution, to £10,449; and on management, to £5047—the total expenses being £111,949. The balance carried to the profit and loss account was therefore £39,160. The amount available for distribution

was £40,620; and out of this, dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares were recommended, the payment of which would leave £7342 to be carried forward. The statements relating to the manufacturing operations of the Company showed that 59,210 tons of coal, 9143 tons of cannel, and 459,844 gallons of oil were employed as raw material for the production of gas, of which 780,114,000 cubic feet were made, 673,249,000 cubic feet sold (44,522,000 cubic feet for public lighting), and 684,514,000 cubic feet accounted for; the estimated quantities of residual products being: Coke, 83,772 chaldrons; breeze, 8057 chaldrons; tar, 641,531 gallons; and ammoniacal liquor, 1,427,819 gallons.

## COLONIAL GAS UNDERTAKINGS.

In the "JOURNAL" for the 18th ult., we reported the proceedings at the last half-yearly meeting of the Australian Gaslight Company. The accounts of a few other Colonial gas undertakings of less importance have lately come to hand; and they may be conveniently noticed together. In the six months ending the 30th of June, the Brisbane Gas Company made a profit which, with the amount brought forward, gave



them a sum of £10,221—enabling them to pay a dividend of 5 per cent. and the tax thereon, and carry over £2876. The revenue from the sale of gas, &c., was £20,962; and the manufacturing expenses, depreciation, &c., came to £11,718. The Maryborough (Queensland) Gas Company had at the end of June a net sum of £1026 standing to the credit of the profit and loss account. The dividend, at the rate of 6 per cent. per annum for the six months, absorbed £771, and left £255 to be carried forward. The Rockhampton (Queensland) Gas Company had in the past half year a gross revenue from the sale of gas 22 per cent. higher than that for the corresponding period of 1899. The Company's electric light undertaking, however, showed a loss of £143. The amount available for distribution was £1687; and out of it dividends at the rates of 7 and 9 per cent. per annum were paid upon the ordinary and preference shares respectively, free of duty.

### BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, and also the Directors' report for the six months ending June last. It stated that the balance of profit was £22,370, after deducting the items mentioned hereafter, and adding £244 from the Trowbridge reserve fund—the parliamentary interest at that station not having been realized by this amount. The deductions were: Income-tax £1045, Hull excess profit £2755, Potteries excess profit £691, Hull debenture interest £1006, Norwich debenture interest £910, Potteries debenture interest £383, Trowbridge debenture interest £76—together £6868. In regard to the Hull station, the gas rental had increased by £3605, coke by £5958, tar and tar distilling by £2899, and ammoniacal liquor and sulphate by £283. Coal had cost 12s. 6d. per ton, against 10s. 11d.; while coke had realized 13s. 9d. per ton, as compared with 8s. 9d. The quantity of gas sent out was 501,435,298 cubic feet, against 453,594,611 cubic feet; or an increase of 47,840,687 cubic feet—equal to 10.54 per cent. Of this, 21,425,000 cubic feet was supplied in bulk to the Corporation. The profit realized was £2755 in excess of the parliamentary interest allowed. The sum named would be invested in Consols; making the reserve fund at this station £39,333. At Norwich, the gas rental had increased by £4251, coke by £1509, and tar by £59; but ammoniacal liquor had slightly decreased. Coal had cost 19s. 5d. per ton, against 15s. 3d.; while coke had realized 12s. 7d. per chaldron, as compared with 9s. 2d. The gas sent out was 185,516,000 cubic feet, against 154,727,000 cubic feet—an increase of 30,789,000 cubic feet, or equal to 19.88 per cent. The profit realized was £3755 less than the parliamentary interest. As to the Potteries station, the gas-rental had increased by £1989, and residuals by £1670. Coal had cost 11s. 7d. per ton, against 9s. 1d.; and coke realized 7s. 10d. per ton, compared with 5s. 6d. The gas sent out was 183,616,000 cubic feet, as against 165,109,000 cubic feet, or an increase of 18,507,000 feet, which was equal to 11.20 per cent. The profit realized was £691 in excess of the parliamentary interest. This would be invested in Consols, making the reserve fund at this station £20,226. Respecting the Trowbridge station, the gas-rental had increased by £444, and residuals by £147. Coal had cost 15s. 6d. per ton, as against 13s. 9d., while coke realized 14s. 11d. per ton, compared with 10s. The gas sent out was 27,928,000 cubic feet, against 24,982,274 cubic feet—an increase of 2,945,729 cubic feet—equal to 11.79 per cent. The profit realized was £244 less than the parliamentary interest. This sum would be taken from the reserve fund, which would leave a balance of £2569 to the credit of the account. Concerning the Holywell station, the gas-rental showed a slight decrease; and the residual products a small increase. The profit realized was £406. The total profit, added to the previous balance of profit and loss, amounted to £48,461. From this, the Directors recommended a dividend at the rate of 10 per cent. per annum, clear of income-tax. This would amount to £21,000, and leave a balance of £27,461.

The CHAIRMAN said it was his duty to move the adoption of the report and accounts; and, in doing so, he would make a few remarks on the proceedings of the half year. He thought the Directors might fairly congratulate the shareholders on the state of the accounts. It would be seen that the balance of profit was, as nearly as possible, £1000 more than in the corresponding half of 1899; and this had been arrived at, he might say, without having increased the price of gas at any one of the stations up to the 30th of June last. The Directors had, however, since that date, been obliged to advance the price in consequence of the much higher price they were now paying for coal. But though the additional profit had been obtained without increasing the price of gas, they had, to a certain extent, but not fully, felt the effect of the price of coal. At Norwich, it had hit them rather harder than at any other station, because they had very considerable contracts running under old prices at Hull, the Potteries, and Trowbridge; and, therefore, at those stations, they did not feel so much the effect of the great rise in the price of coal during the half year under review. It would be remembered that at the last meeting, he spoke about the Bill the Company had before Parliament in connection with the Potteries station; and he then told the shareholders that at the last moment, when the Directors thought there would be no opposition, the Corporation of Hanley decided to oppose. They carried on the opposition until the very last possible moment; and it was not until the evening before the Bill was going before Committee, and when the Company had incurred all the heavy expenses of feeling Counsel, witnesses, and preparing the whole of their case, that representatives of the Corporation came and told them that they were not going to oppose if the Directors would give them some slight advantages. So slight were the advantages, that the Board agreed that they would grant them, and so the matter ended. But an amount of nearly £1200 had been expended by the Company in consequence of the action of the Corporation. However, the Company obtained all they wanted in their Bill. They had secured a very valuable property at the Potteries (which was scheduled in the Act), adjoining the North Staffordshire Railway, from whence they would be able to make an excellent siding. Already they had begun to lay out the land for the extension of the present works, which was very much required. The shareholders would probably remember that he also spoke on the last occasion about the works

that were being carried out at Hull, in consequence of the Company having been asked by the Corporation of Kingston-upon-Hull to light the area which they purchased from the old Company serving that district. The Company commenced to send gas into the old town the last week of March; and from then they had been giving an ample supply to light the whole of Kingston-upon-Hull. To enable them to do this, they had been obliged to spend large sums of capital at the Hull station. Additional land had to be purchased; the mains had to be increased to a large extent; and a very fine holder had to be built. Nearly all this work had been satisfactorily completed during the spring and summer; and the new holder was almost finished, and would be in action by the first week in November. The new trunk main was completed; and carburetted water-gas plant and new purifiers nearly so. Thus their work there was well in hand; and everything had been done in the most perfect and satisfactory manner. The same remarks applied to the smaller station of Trowbridge, where, in consequence of the increase in the business, they had been obliged to remodel the small works which had been in operation a great number of years, and sadly wanted restoring. They had put up a new gasholder there; and new offices had been built. The holder had recently been tested, was found in perfect order, and had been passed by the Inspecting Engineer. Generally, the whole of the works were ready to meet the winter requirements. This brought him to the point of additional capital. Of course, the new works he had been mentioning at Hull, the Potteries, and Trowbridge had necessitated a very large outlay of capital. Roughly, the total amount which had been, and which would be, spent at these three stations would be something approaching £100,000. It would be remembered that the Board issued, or rather offered, to the shareholders 1500 shares at the price of £40. He believed it was thought at the time they were issued that the Directors were opening their mouths rather wide; but he thought that, in face of the balance-sheet which was before the shareholders that day, the Directors were fully justified in asking £40 for the shares, seeing the excellent business they had in hand, and how well the Company had always paid the shareholders in the past. However, the shareholders did not respond in the way in which the Directors would have liked them to have done, considering what an excellent 5 per cent. investment they put before them. Out of 1500 shares, only about 1100 were applied for by the shareholders; but he need hardly say that, when the balance was offered to the general public, it was most readily taken up. The reason why he mentioned this was that the 1500 shares at £40 only produced £60,000; and whereas, as he had already stated, the amount of capital which they would have to spend on new works, or had expended, was nearly £100,000, there was still some £40,000 to be provided. They now proposed to issue a further 500 shares. They were not, however, going to send out the usual circular, because they had nearly 1500 shareholders, and, for such a small issue as 500 shares, this was hardly worth while. But he should like it to go out to the shareholders in his speech that, if they chose to send in an application at once to the Secretary for any further number of shares, it would meet with due consideration from the Directors. The Directors had full power to issue these shares in any form they liked, either to the shareholders or general public, or both. There was one other subject which he must touch upon. In their report the Directors recorded the retirement from the Board of Mr. Frederic Lane Linging. They had found him for a great number of years—firstly, as Secretary, and afterwards as Director—a very valuable coadjutor; and it was with the greatest feelings of regret that he (the Chairman) noted his absence from the Board that day. Mr. Linging left them shortly after the last meeting, feeling his health was quite broken down, and that he could do no more work. He was most punctilious in his attendance at meetings, and in the way in which he performed his work. As his bodily infirmity would not allow him to continue such close application to business, he felt it was his duty to retire. He (the Chairman) need hardly say that he would be pleased to have a vote from the shareholders, expressing their regret at Mr. Linging's retirement, and hoping that he would live some time longer to enjoy his leisure. They had elected in his place a gentleman known to most of the shareholders, and well known in the gas world. He referred to Mr. R. S. Gardiner, who brought to the Board a great experience in gas affairs, and particularly in matters connected with collieries and coal.

Colonel J. WILKINSON seconded the motion.

Replying to Mr. J. B. Coulson, the CHAIRMAN mentioned that the 500 shares would be issued at the same price as last time—viz., £40.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Major-General W. T. CORRIE, a dividend at the rate of 20s. per share for the half year was declared, clear of income-tax.

The CHAIRMAN next moved, and Mr. F. WILKIN seconded, the re-election of Colonel Wilkinson and Major-General Corrie as Directors.

The motion having been unanimously carried, the retiring Auditor (Mr. E. Yardley) was re-appointed.

Moved by Mr. HARRIS, and seconded by Mr. COULSON, a resolution was passed heartily thanking the Chairman and Directors for their attention to the interests of the Company.

The CHAIRMAN, in responding, said the Directors were exceedingly glad there had been no feeling caused at any of their stations through the increase in the price of gas—nothing approaching the "remarks" made on the subject in London.

Mr. HARRIS proposed—"That the shareholders sincerely regret the loss of the services of Mr. Frederic Lane Linging, who, for the long period of over 40 years, has rendered valuable aid to the Company both in the capacity of Secretary and Director."

The CHAIRMAN seconded the proposition, which was unanimously passed.

The thanks of the shareholders were accorded to the Secretary and other officials; and an acknowledgment by the Secretary, on his own and his brother officers' behalf, concluded the proceedings.

New offices have been constructed for the Heywood and Middleton Water Board, at Heywood, at a cost of £3800. They were opened last Thursday by Mr. J. Aspell, the Chairman of the Board, who was presented with a gold key by Mr. James Diggle, the Borough Engineer of Heywood.



**SHREWSBURY GAS COMPANY.**

The Ordinary General Meeting of this Company was held at the Offices, Shrewsbury, last Wednesday—Mr. W. BEACALL, the Deputy-Chairman (in the absence of Mr. J. Spencer Phillips, the Chairman) presiding.

The SECRETARY and MANAGER (Mr. W. Belton) having read the notice convening the meeting, the report of the Directors and the statement of accounts for the year ending June 30 were taken as read. In their report, the Directors set forth that there had been an increase of 7 per cent. in the consumption of gas during the year, and that the growing demand had rendered necessary some temporary extensions of the works, which were nearly completed. In order to meet further requirements, application would have to be made to Parliament for additional financial powers. In the course of the year, 498 slot meters had been fixed, and 283 cooking and heating stoves let on hire. The accounts showed that the profit realized had been £5275. An interim dividend was paid in March; and the Directors recommended the declaration of the authorized dividend. After providing for this, and for interest on mortgages, there would be a balance of £301 to carry forward.

The CHAIRMAN, in moving the adoption of the report, alluded first to the absence of Mr. Phillips, which would, he knew, be deeply regretted by the shareholders, and then referred to a few salient features in the work of the year. He pointed out that the profit has been £5276, against £5136 for the preceding year—an advance of £140. But he said it must be borne in mind that it had not been quite plain sailing. The Company had had two very heavy charges on the revenue. Coals, for instance, had cost £1969 more, partly through the increase of 1s. 6d. per ton and partly from the additional quantity used. Repairs and renewals came to £1364 more; but this included £1200 paid off the suspense account, which was now closed. With regard to the receipts, the Company were in the gratifying position of having an increase of £1654 for gas and of £1555 for residuals; making a total of £3209 from these two sources. The rise in residuals resulted from the increased value of coke, which naturally followed on the enhanced price of coal. The augmentation in the consumption of gas for the twelve months had been more than 10 million cubic feet. This astonishing increase was no doubt due in some measure to the widening of the area of distribution, and to the extended use of gas-stoves and slot meters. There were on hire 1288 of these meters and 521 cooking and heating stoves; and probably there were gas-stoves in use to three times this number in the borough. It was pretty clear that the public were awakening to the fact that cooking by gas was a cleanly, handy, and economical process, and that slot meters were a very great convenience to the smaller consumers. With a growing business, they had to get increased sources of supply, and this meant additional expenditure of money. Some steps would have to be taken to provide fresh capital; and the proprietors would be invited to consider the advisability of raising it. So far as the works were concerned, they were in very admirable order; and, altogether, he thought the Directors might congratulate the shareholders on possessing a very sound, prosperous, and advancing undertaking.

Dr. E. CALVERT seconded the motion; and it was carried unanimously.

A dividend was then declared at the rate of  $7\frac{1}{2}$  per cent. per annum; the retiring Directors and Auditor were re-elected; and the usual complimentary votes were passed to the Chairman and Directors.

Dr. CALVERT proposed a vote of thanks to the Secretary and Manager and the officers of the Company. He said he could assure the proprietors that if it had not been for Mr. Belton they would have found themselves very often, and probably might now have been, in a "tight place." Anyone who was present during the inquiry as to the damage done by the Corporation in respect to the mains would admit that the lucidity and order with which everything was presented, and the way in which their Counsel were instructed, was beyond all praise.

Mr. WADE seconded the motion, and it was carried with acclamation.

Mr. BELTON, in reply, said he and the other officers took great interest—as they ought to do—in the affairs of the Company, and did their best to make it successful.

The proceedings then terminated.

**OTTOMAN GAS COMPANY, LIMITED.**

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice calling the meeting; and the report and accounts having been taken as read,

The CHAIRMAN moved their adoption. In the course of his remarks, he said that, when the Directors had the pleasure of meeting the shareholders on the last occasion, he adverted to the possibility of obtaining an extension of their concession from forty to seventy years; and some additional reference to this matter might be expected. He had, however, nothing further to report. Negotiations in such affairs as this made very slow progress; but their agent on the other side expressed great confidence in the course the negotiations had taken. It would be observed that, in the accounts, they still kept the forty years' concession (which, by the way, did not begin until 1902) as the basis for the calculation of the sinking fund; and if the Company were lucky enough to get a further extension to seventy years, then would be time enough to alter that basis. In the meantime, they must rest satisfied with what they had secured. There was a very important point in the report, and one upon which, he thought, they might all congratulate themselves, and that was the renewal for six-and-a-half years, from May last, of the public lighting contract in Smyrna. This question had given some anxiety to the Board; and it was a matter for congratulation that their efforts, and those of their Manager (Mr. John Gandon), had been rewarded with success. The renewal of the contract had been accompanied by a condition of the Municipality for a certain number (286) of new lamps. Of course, this meant new mains and additional expenditure; but, as a result, it left them in peace and free of trouble from people wanting concessions for electric lighting. In addition to this, it was pleasing to report an all-round improvement in the operations of the Company during the six months, although this had been accompanied by an increase of expendi-

ture; but it was an expenditure that those who understood the working of a business of this kind were quite prepared to face. It was also encouraging to see on the other side of the account what the consumption of gas had amounted to; the whole increase being derived from private consumers as distinguished from public lighting. The report mentioned the election of Mr. Strachan C. Clarke to a seat at the Board. When the services of his brother were required on the embodiment of his regiment (by the way, he was described in the report as "Mr." Stephenson R. Clarke, while the Army List claimed him as a Major), he at once tendered his resignation; but the Directors conceived it would be against the interests of the Company to accept it. Under the circumstances, as they required a certain number of working Directors, and seeing the large stake that Mr. Clarke and his family held in the Company, and their long connection with it, it was considered expedient to elect his brother to the vacancy on the Board which had existed since the loss of their late Chairman. He thought this was an arrangement which would commend itself to the shareholders. Turning to the balance-sheet, the Chairman pointed out the chief items. Among the most interesting, he said an item "Ottoman Government £549" was the accumulation of the Government's 5 per cent. on the profits of the Company. This, however, was not actually paid them, as they generally had an account due to the Company. Bills payable amounted to £2927, which was accounted for by the stocks on the other side of the account. The total balance of profit was £3366. Their investment on plant, &c., now stood at £93,913, which was an addition during the six months of £897. In anticipation of the public lighting contract, they had to commence laying mains; and this was purely on that account. Sundry debtors amounted to £8856, the principal details of which were: Consumers £4099, coke £715, and public lighting £1590. Then under the head of stocks (which amounted to £10,138), coal represented £5024, as against £1175 last year—the balance being made up of the usual gas-works requisites. The depreciation fund, which was invested in Consols, stood on June 30 at £1663; the amount added since and invested making a total of £2234. As to the revenue account, coal cost £4175, as compared with £3561. Having quoted the differences in the other items on the debtor side, he said the gas-rental amounted to £10,009, of which the private rental contributed £6523, as against £5335. The residual products realized £2652, as against £2053. The profit on fittings, &c., amounted to £578. The result was they had a balance on revenue account of £3273, against which debenture interest (£479) had to be charged, and the 5 per cent. for the Ottoman Government on the half-year's profits. This left them a balance of £2654 of net profit.

Mr. CHARLES GANDON seconded the motion.

The CHAIRMAN, replying to questions, said they had not on this occasion added anything to the reserve fund, which now amounted to £12,000, and was invested in coal and so forth. The addition to the number of Directors had not made any difference in their fees. With regard to the use of local coal, they had experimented with it, and with very satisfactory results; but so far as the cost was concerned, there was not much saving, compared with English coal, of which they had something like £5000 worth on the other side. Their Manager was quite alive to the necessity of economizing on every point.

The motion was unanimously carried.

On the proposition of Mr. R. L. ANDREWS, seconded by Mr. T. H. COOKE, the election of Mr. Strachan Clarke to the Board was duly confirmed.

It was next moved by the CHAIRMAN, seconded by Mr. H. W. ANDREWS, and carried, that a dividend at the rate of 7 per cent. per annum be paid on both classes of shares.

A vote of thanks was passed to the Secretary, the Manager, and the staff generally; and the untiring services of the Chairman and Directors were likewise acknowledged, on the motion of Mr. R. L. ANDREWS, seconded by Mr. F. E. LINGING.

**LEICESTER CORPORATION GAS AND ELECTRIC LIGHTING AND WATER DEPARTMENTS.****The Half-Yearly Financial Statements.**

At the Meeting of the Leicester Town Council last Tuesday, the half-yearly accounts of the gas, electricity, and water undertakings were presented.

The Gas Committee reported that the gas accounts showed a net profit of £25,054 for the half year ending the 30th of June last, after paying interest on the capital. Out of the net profit had been paid £5165, being the half-year's amount of sinking fund, and leaving a balance of £19,888. On the electric lighting undertaking, there was a net profit of £1430, after paying interest on the capital of the undertaking. Out of the net profit had been paid £1068, the half-year's sinking fund; leaving a balance of £362. The Committee reported that good progress was being made with the installation of the water-gas plant, as well as with the extension of the electric lighting central station.

Alderman LENNARD first moved the adoption of the portion of the report referring to the gas undertaking. He said that, after the statement he made in the Council a short time ago with regard to the increased cost of coal and the unsettled state of the markets generally, he thought the Council would be agreeably surprised to have received a balance-sheet showing the largest profit for any one half year that the department had ever yet given. The total expenditure for the six months had been £95,497, which was an increase of no less than £17,729. But fortunately the receipts had gone up still more; for they had amounted to £135,280, which was an increase of £22,864 on the corresponding period of last year. The receipts for gas figured at £98,343, against only £84,552 in the corresponding half year; being an increase of £13,791. In that account there was no advanced price yet charged; the increase was due entirely to the extra quantity made, delivered, and paid for during the half year. They had had an increased make and delivery in the past six months of more than 107 million cubic feet, or  $14\frac{1}{2}$  per cent., which was an extraordinary increase, considering that at the same time they were largely developing the use of the electric light. The coke receipts had been exceedingly good; the amount, less labour and cartage, being £22,124, against £14,881 in the corresponding half year, and £9000 odd in the June half two years ago. There were,







## ELECTRIC LIGHTING NOTES.

Last Thursday the General Purposes Committee of the Macclesfield Town Council sat for fully two hours, discussing whether the Council should themselves undertake the introduction of electric light and power or offer facilities to private companies to do so. By 24 votes to 5, it was determined to apply for a Provisional Order.

The Electric Lighting Committee of the Worthing Town Council have accepted offers for plant required in connection with the municipal electric lighting undertaking, amounting to £16,136. The erection of the generating station and the alterations to existing buildings on the site are to be carried out by the Corporation under the supervision of the Borough Surveyor.

The Walker District Council have received a cheque for £1937 from the Electric Supply Company, being the cost of the opposition of the Council to the Gas Company's application for electric lighting powers. There is something about this transaction and the opposition that does not look exactly like fairplay. However, the cheque apparently ends the matter; and the Finance Committee state that it has enabled the Council to reduce the general district rate by 4d. in the pound, and to carry out a certain number of necessary improvements without having to levy a rate for the purpose.

The "Coventry Herald," in one part of a recent issue, says that the figures of the Corporation Electric Lighting Department for the quarter ending June suggest "that the light is making a marked advance in popularity." In another column of the same impression, it is reported that "shortly after eight o'clock on Friday night last, the electric lights throughout the city suddenly failed. The streets were consequently rendered very dark, as there was a heavy mist at the time. . . . The cause of the light failing was the breaking of a governor spring on one of the engines at the generating station. In two minutes, another engine had been set working and the light turned on."

"Coming out of St. James's Church, Piccadilly, into Jermyn Street, after the evening service last night," said the "Daily Express" yesterday, "the congregation received a rude shock. Rumbles were heard as from the bowels of the earth; the electric lights flickered, and were nearly extinguished; and all wondered what was next to happen. In a few seconds there was a terrific explosion, which was followed by clouds of smoke issuing from a manhole. Cab horses bolted, and the people fled in panic. Crowds soon rushed down from the Circus and Regent Street, and were followed closely by half-a-dozen fire-engines and a large force of police from Vine Street. The report of the explosion was heard as far away as Leicester Square and Pall Mall. Workmen soon arrived from the Electric Light Company's depot in Mason Yard, close by; and in about an hour's time they were enabled to descend the subway." Our contemporary's representative was officially informed that the cause of the explosion was supposed to be the fusion of wires, and that the resulting sparks must have come into contact with either sewer or coal gas.

The Hampton District Council have had submitted to them a report on the electric lighting of the district by Messrs. H. W. Handcock and A. H. Dykes, Consulting Engineers, and Mr. J. Kemp, Surveyor to the

Council. It is evident from the report that, like numberless other places in the United Kingdom, the one great thing that is required for Hampton is electric lighting. It would, we read, be "advantageous to the growth and development of the district, owing to the greater purity of the light as compared with gas or oil, and the inducements thereby offered from a sanitary point of view alone for people to come and reside in the district." The wonder is how Hampton has managed to exist and thrive without the electric light so long. But there is no necessity for the town to go on without it now—indeed, it would be positively wicked for the District Council, in view of such sage counsel as has been tendered to them, to neglect the provision of an installation one day more than is absolutely essential. There need be no fear on the score of the success of the concern; for the reporters say that "ultimately" (whenever that may be) the "undertaking will be a great success financially and a valuable asset." As is pointed out, one thing in favour of the Council is that they can annex the whole of the public lighting, which now costs altogether about £912—a comfortable little beginning for the business. Then it is not thought unreasonable that, within a very short time, there would be a total of 1500 16-candle power, or 3000 8-candle power, lamps connected. A refuse destructor is also recommended. The estimated total cost of the scheme is: Electric light station and mains £15,450, and refuse destructor £3425; while the working expenses for the electric light are estimated at £1732 per annum, and for the destructor at £398. The total revenue, including the £912 from public lighting, is placed at £2632. It is also advised that, to gain small consumers, arrangements, should be made with one of the free-wiring companies.

A big expenditure is contemplated in connection with the Buxton District Council electricity works; and the proposal brings to notice that the light has not altogether so far enchanted the residents. At the same time, extensions are required at the works; and these, according to the Electrical Engineer (Mr. Calvert), will entail an expenditure of £25,041. For sanction to the borrowing of this amount, less the odd figures, the Electricity Committee recommended the District Council at their last meeting to apply to the Local Government Board. Then up rose Mr. Hall, who said he did not want to impede the progress of electricity in Buxton; but first of all he wished to see the present system perfect. They had already spent £23,000; and now were asked to spend £25,000 more. He for one would not lay out another farthing until they saw the system they had in hand perfected. He cast no slur on the Electrician; but he was not satisfied with Professor Kennedy. They had not had any income yet from the works; and instead of paying £300 a year for lighting the town, they were spending £500 a year, and even then it was not lighted up to the standard of the gas they had paid for before. Who ought to look after the lamps? Was it Professor Kennedy's duty, or the Electrician's, or his men? Let them have Professor Kennedy down, and talk to him. Things were not going right; and they wanted to call on Professor Kennedy to put them right at once. If they could not be put right, then he should suggest that the lamps be taken down, and others put in. Mr. Hulme said the lamps in the streets were a disgrace; and no more money should be spent until the present system was in order. Mr. Harrison also found fault with the arc lamps. Mr. Salt, the



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Chairman of the Committee, said there was no fault to find with the mains. He was sorry that some of the lamps had been out, but they could not help it. Professor Kennedy had written saying that Messrs. Crompton would, he was sure, make a point of getting matters put right with regard to the lamps. He (Mr. Salt) thought they were likely to make a profit of £800 on the present undertaking; and this in face of all their difficulties. An excited discussion followed; and Mr. Hall moved that Messrs. Crompton be given notice, either directly or through Professor Kennedy, that the complaint should be forthwith attended to. Mr. Hulme seconded; and the resolution was adopted.

#### NEW WATER-WORKS FOR ST. HELENS.

An interesting step in the development of the St. Helens water supply was made last Thursday, when the laying of the foundation stone of the new works at Melling was performed by the Mayor (Mr. J. Beecham).

For years it has been felt that the supply of the town would become dangerously short if a breakdown occurred at any of the stations; and this view was put forward when the Corporation, in 1893, decided to erect the works at Melling. An application was made to the Local Government Board to borrow £75,000 for the purpose; and at the ensuing inquiry, Mr. W. J. Jeeves, who was then Town Clerk, placed statistics before the Local Government Board Inspector. From these, it appeared that in 1871 the population of the town was 45,000; and the consumption of water 283 million gallons. In twenty years the population had increased to 71,000, and the consumption to 1000 million gallons. Instances were given by the Water Engineer of interference with the supply owing to breakdowns. They had sunk a trial bore which gave a supply of 250,000 gallons in twenty-four hours. The estimated expenditure on the pipe-line was: Melling to Kirkby, £5651; Kirkby to Knowsley, £9260; Knowsley to St. Helens, £26,550—leaving £43,539 for land, boreholes, machinery, and buildings. Professor Hull, the geologist, expressed the opinion that the minimum yield of the proposed wells would never be less than 1 million gallons per day, and would possibly go up to 1½ millions. Regarding the new station, Mr. J. J. Lackland, the Borough Water Engineer, is responsible for the design of the new building and the engines. Two boreholes of 560 feet deep have been made by Messrs. Timmins and Sons. The water will be pumped from the wells through an 18-inch main to the 21-inch main at Kirkby, two miles away, and thus on to St. Helens. The pumping-engine is to be of 200-horse power. The work will probably be completed in nine months.

The Mayor and members and officials of the Corporation drove to Melling on Thursday, lunching at the Knowsley pumping-station *en route*. At Melling the company inspected the works so far as they have been completed; and then Mr. Dixon-Nuttall (the Chairman of the Water Committee) called upon the Mayor to lay the stone. This ceremony was duly performed; the Mayor declaring the stone "well and truly laid," amid applause. A handsome chased silver trowel with ivory handle was presented to His Worship for use on this memorable occasion.

#### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

After the holiday season, the Edinburgh and Leith Gas Commissioners entered upon their winter duties on Monday. At their meeting that day, the most interesting and most pleasant item of business was the intimation by the Chairman (Provost Mackie, of Leith) that a letter had been received from Mr. Kinloch Anderson, in which he stated that he expected to be able to be present with them soon. Mr. Kinloch Anderson's restoration to health was hailed with gladness by all present, as it is felt that just now his services are invaluable to the Commission. The report by Mr. W. R. Herring, the Engineer, showed that during the month of August there was an increase of 6,680,000 cubic feet in the output of gas, as compared with the same month of last year; and that since May 16, the increase has been 15,179,000 cubic feet. The recommendation of the Works Committee, that the Commissioners should continue to supply gas of from 24 to 26 candle power, and that the price should be raised from 3s. to 3s. 4d. per 1000 cubic feet, was agreed to without remark. The increased price is to take effect only after the current accounts are rendered—the Commissioners thereby evading trouble with recalcitrant consumers, who object to increases in price being made retrospective. The estimates of income and expenditure for the current year, which were submitted by Mr. J. S. Gibb, the Treasurer, and upon which the increase in price is based, show an expected output of gas of the same quantity as last year, and that, with gas at the same price, and the return from residuals being £34,554, as against £35,928, there would be a deficit on the year's working of £22,100. He estimates the expenditure upon coal at £148,102, as against £103,321; and upon oil at £17,078, as against £9970. The total expenditure is put at £343,878. The increase of 4d. per 1000 cubic feet is only sufficient to make up a little more than half of the deficit. The remainder is to be taken from a working balance which has accumulated from previous years, and which it is expected will then be left with only about £5000 at its credit. The Commissioners are making inquiries for the purchase of about 30,000 tons more of coal. It was reported that the undertaking of the Commissioners had been valued for the year at £70,070, an increase upon the valuation of the past year of £11,430. Next year, according to the peculiar method of fixing valuations, if the expected deficit be realized, the undertaking should be entered, if that were possible, at less than *nil*. Mr. Douglas moved that—"In view of the greatly extended use of coal gas for cooking and heating purposes and for lighting with the incandescent burner, the necessity for continuing to supply gas of a high illuminating power appears to have vanished; and that, with a view of immediately proceeding to reduce the quality of the gas, and thereby lessening the cost of production and its consequent cost to the consumer, the whole matter be remitted to the Works Committee for consideration and report." In support of his motion, he said he thought it desirable that they should bring their gas, as regarded illuminating power, more into harmony with that supplied in other large cities. He had no doubt that gas less rich than they had could be better purified, and was thus much more healthy

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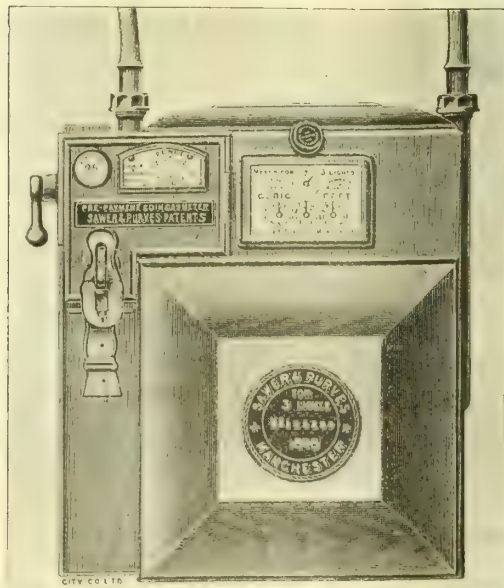
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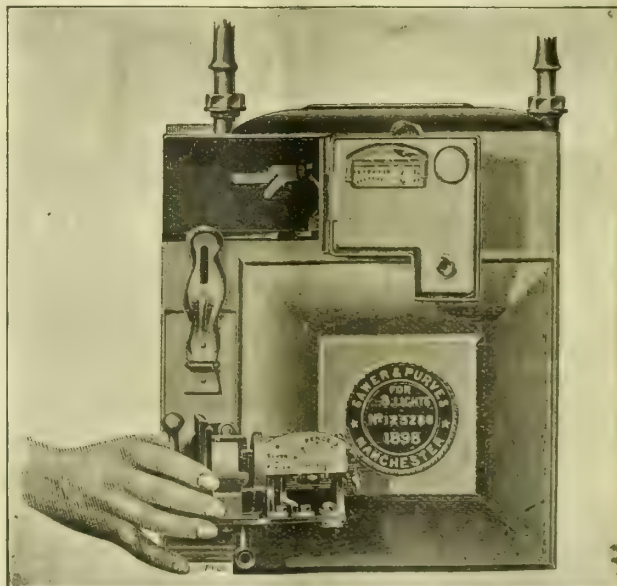
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to the inmates, and not so deteriorating to the fittings of houses. Bailie Manclark, of Leith, in seconding, said there was now a large consumption of gas in cookers and engines; and he thought it was absolutely necessary that they should reduce the illuminating power. Under their Act of Parliament, they could not reduce it below 20 candles.

The Chairman said there were complaints in Leith as to the bad quality of the gas; and it was desirable that they should do something; otherwise some might give up the use of gas altogether. The suggestion was made that the burners in use in Leith might be to blame for the poor light; but Bailie Manclark resented the remark, and said that the works in Leith were incapable of making the quality of gas in sufficient quantity, no matter what coal was used. Mr. Waterston objected to the phrase, "the necessity for continuing to supply gas of a high illuminating power appears to have vanished." He did not wish to commit himself to any such proposition. He was easily satisfied, and the remit was made; the Chairman remarking that the subject would require to be very carefully gone into by the Committee. I remember that the matter was considered by the Commissioners some years ago; and it was then concluded to be inadvisable to lower the illuminating power, because the mains and services had been laid for a high-quality gas, and if a poorer quality were supplied a great deal of expenditure would be necessary to adapt them for carrying the greater volume which would be required. But much has happened since then; and it is advisable, in the altered circumstances, to reopen the question.

I am obliged to revert to the subject of the legality, or the reverse, of making increases of the price of gas retrospective; for in Dundee this week a "kind" friend, in the shape of an evening newspaper—a good specimen of the mare's nest hunting species—has set the community agog over it, and has succeeded, without doubt, in placing the Gas Committee in a position which is not only awkward, but serious. There have been mutterings all through the summer at the action of the Gas Commissioners in raising the price from 3s. 4d. to 3s. 10d. per 1000 cubic feet; and the discontent gained greatly in volume when it was learned that the increased charge was being made to date back to the February-March survey, and that in the adjacent small town of Broughty Ferry, the Commissioners were able to reduce the price of gas. The storm-cloud which had been gathering burst on Monday, when the newspaper brought out an article intended to "expose" a "gas scandal." The complaint of the writer was that the Gas Department had not only raised the price of the gas, but that they were "granting concessions to some and leaving others to pay the full amount." The meaning of this is that, when it is demanded, some are being allowed a rebate which makes the price of gas 3s. 4d. till June 20, when the annual meeting was held at which the price was increased. One of the questions raised is by whose authority this is being done. Assuming, on the word of the newspaper, that it was being done, it is certain that the step was not taken upon instructions from the Gas Commissioners, for they had never had it before them. Indeed, the Gas Committee are only announced to have had the subject before them on Thursday. As the account of this meeting appears to have been communicated by some official, I give it as it appeared:

A joint meeting of the Finance and Gas Committees of the Dundee Town

Council was held yesterday, when consideration was given to the question of surcharging by the Corporation for gas. Treasurer Ritchie, who presided, explained that what had taken place was in accordance with previous practice since the Gas Act came into operation 32 years ago. It was quite true that some persons were charged the higher rate from a period at the end of February or March. This arose from the fact that the meters in the city could not be examined at the same time. It had been the practice to inspect the meters quarterly; and the consequence was that the quarters varied in the case of different consumers. It had been the practice during the last thirty years to charge the gas for the quarter at the price ruling when the reading took place; and taking one year with another, this practice was fair and just, because if the consumer was charged the high rate this year from (say) March, he would get the benefit of the lower rate next year from the same date, and so on every year. The Treasurer further explained that, in order to have the quarter-day the same in every case, the meters would require to be inspected on the same day; and this would entail the employment of 400 or 500 additional men. Therefore he could not believe, if the public understood the matter correctly, there would be the slightest objection to following the course which had been taken in this, as in previous years. The Treasurer further stated that, about 1886, when the rate was raised, some eight or nine people started the same complaint as had now been publicly ventilated. The consequence was that it was arranged to read their meters at the end of the financial year—namely, April 30. But these people soon got tired of this arrangement; and, in accordance with their request, the customary practice was followed. Nobody doubted, or had ever raised the question of, the Gas Commissioners' powers in regard to applying the new rate to the past financial year. It had never been alleged that it was exactly in terms of the Act; but for the reasons already stated, it was the most convenient course to follow, and from one year to another nobody was any the worse. The Clerk was asked to give his opinion on the legal question. He stated that the higher rate could not be charged for any period anterior to the beginning of the financial year; but that the higher rate ought to be charged, and could be enforced, from and after the beginning of the financial year—that was, from and after April 30 last. He explained that, in 1868, the financial year of the Gas Commissioners was made to end on April 30, and this had been followed yearly ever since. He added that, by section 90 of the Commissioners' Clauses Act, which, though incorporated by the original Gas Act of 1868, seemed to have been lost sight of by the critics of the Town Council, it was enacted that the Commissioners "shall cause their accounts to be balanced in each year at a period not less than one month before the annual general meeting at which they are to be produced." Now, this annual meeting was fixed by the original Gas Act on the second Tuesday of June (since altered by the Amending Act to the third Wednesday of June) in each year. Accordingly, the Legislature created the financial year of the Commissioners. The wording of section 69 of the original Act, which the Clerk showed had been published in the newspapers, must, he said, be read as following and carrying out the provisions of section 90 of the Commissioners' Clauses Act, which is incorporated in the original Act in one of its earlier sections. Section 69, therefore, when it mentioned the "year," referred to the financial year of section 90, and to nothing else. This was evidenced by the provision at the end of section 69 itself—viz., "Provided always that if in any year the revenue received exceeds the amount required for the purposes aforesaid, the Commissioners shall make such reductions in the sums to be charged by them in the following year for the like reasons, or one or more of them, or carry such surplus to the sinking

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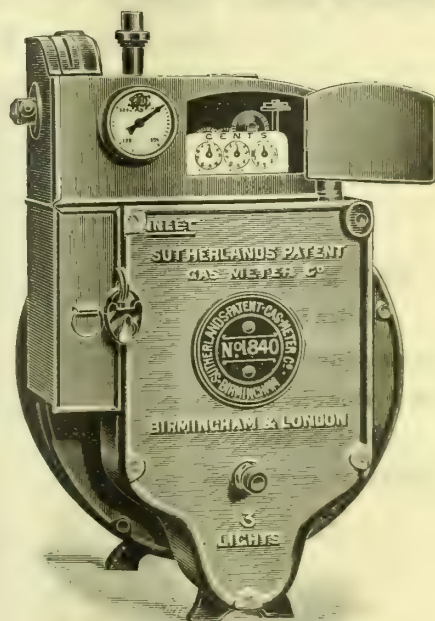
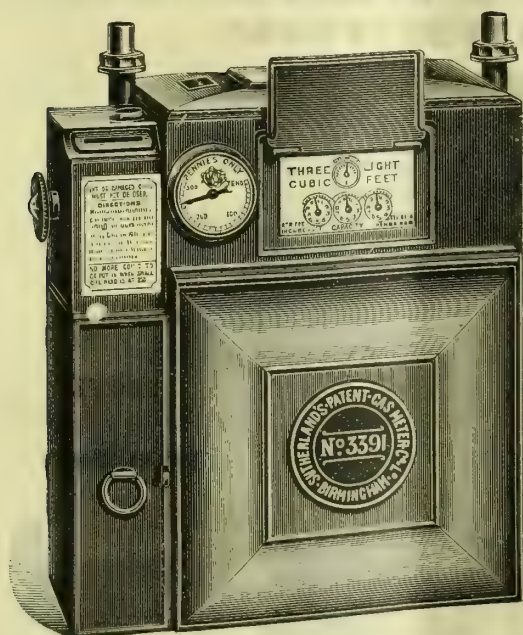
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fund hereinafter provided, as they shall think proper." The "year" here referred to could be no other than the financial year, because one balance could only be made in each year, and a balance could alone show any excess of revenue; and the balance must be made not less than one month before the annual general meeting. He added that the idea of dating the new rate, whether higher or lower, as from the annual general meeting, and not from the end of the financial year, April 30, was a delusion. He explained that there was nothing unusual in fixing rates retrospectively to the beginning of the financial year. The gas-rate was fixed this year from May 1, the day following the end of the financial year; and it had always been so. It was advertised on the 21st of June, the day after the annual general meeting, and was so fixed for the year. The public, the Clerk added, were duly notified; and nobody appealed or complained. Further, the police assessments ran from May 15; but they were never laid on until the September following. The water-rates also ran from May 15; but they are never laid on until the general meeting in July following. And so with all other assessments. The meeting, after consideration, were of opinion that use and wont should be followed, and that if parties claimed rebates to April 30 they should be allowed; but care should be taken that next year, or in any following year, when most likely the gas-rates would be reduced, the higher rates should be exacted from such parties claiming rebate down to April 30.

Now, I think that, notwithstanding the Clerk's (Sir Thomas Thornton) opinion, there can be no doubt as to the illegality of the practice of going back even to the date of the annual meeting, because in the portion of section 69 which Sir Thomas did not quote, the power to alter the price of gas is given for "the year then ensuing." But whether the action of the Commissioners was legal or not, they have been placed in a false position—first, by their resolving to give rebates to cover the period to April 30; and, secondly, by, in practice, giving rebate to June 20. My authority that they are doing the latter is the same newspaper; and I assume it to be the case. But whether it is so or not, it is amazing that the Commissioners should, at this meeting, have come to the conclusion that they would take the names of those claiming rebate, and would not give them the benefit of any reduction until the expiry of the financial year. This is not a worthy policy for a great corporation. These outlanders will give more trouble than the amount which may be obtained from them, as intended, can be worth. I know that it is easy to write thus, and that it is exceedingly difficult to find a remedy. Money must be secured for the carrying on of the gas undertaking; and the way to raise it is by charging for the gas which is consumed a price which can be adjusted to suit circumstances. The price has been adjusted in Dundee; and if it cannot be recovered, it will not be possible to meet other circumstances which are inexorable. It is a situation which cannot be looked upon without sorrow; for what is transpiring is only the outward manifestation of a distrust of public men which is felt. If this distrust be warranted, it will be hopeless to expect that public affairs in Dundee will be conducted on prosperous lines until able men are found willing to undertake the duties of municipal life. If it be not warranted, there can be small credit to anyone who endeavours to throw trouble in the way of those who attend to the communal interests. But whether warranted or not, the withholding of the increased rate is a poor remedy. If the action of the gas consumers should result in a deficit, the high

price will have to be continued another year, or a still higher price put on. The community will have to meet the charges; and an error in the method of imposing the rates to meet those charges is only a matter of detail. The only people who can be aggrieved by it are those who may leave the city before the reduction takes place. This must be a small number; and if such cases were to be considered, public business would come to a standstill. Though it may not be strictly legal, the practice of making increases in price retrospective is no more unjust than is that of taking a whole year's assessment for (say) police purposes, from a person who may live in the place for a month or two. Yet we never hear of an emigrant demanding back a proportion of his rates on the ground that he was leaving the country. The one would be as reasonable as the other. This being so, the action of the newspaper, and of those who have been moved by it, is not to be commended. The pity is that, the Commissioners having adopted a policy, they have not stuck to it.

The motion, of which notice was given by Bailie Fife in the Glasgow Town Council in August, relating to the purchase or lease, by the Corporation, of coal pits, was before the Council on Thursday. Bailie Fife said he did not advocate the proposal on socialistic principles, but purely as a commercial transaction. The amount of coal consumed by the Gas Department had risen from 516,315 tons in May, 1896, to 666,769 tons in the year ended May 31, and the price had advanced in the same period from 9s. 2-85d. to 11s. 5-44d. The estimate for the year that would finish in May next was about 700,000 tons; and the price was 16s. 2d. per ton. The average price for the five years was 9s. 11d. per ton. On the ground of the increased cost of coal, as well as of the profitable business that the Corporation could make of it, he advocated the motion. Bailie Shearer moved the previous question. Bailie Fife, he said, was putting before the Council a most pernicious principle, and one very dangerous to the best interests of the Corporation. He believed the Council or the country should take up any work that was a monopoly—such as tramways, gas, and water—but coal was no monopoly. The rise in the price of coal was merely temporary. Mr. R. M. Mitchell, the Convener of the Gas Committee, did not think it was fair to speak of the coal trade as a monopoly. It was no more a monopoly than any other trade. As regarded the resolution, he pointed out that it was not the purchasing or leasing of land with coal mines merely that would require consideration; and he thought it would be a mistake for the Council to embark hastily in a thing that might prove later on to be a very gigantic undertaking. The subject was, by 29 to 26 votes, sent to the Gas Committee to consider. By the time the Committee come to a decision upon it, the price of coal will be down, and the scheme, which is a somewhat Utopian one, will in all probability be dropped.

**The Water Scheme for Longtown.**—The new scheme which has been prepared by Mr. Little, of Carlisle, for the supply of Longtown, in Cumberland, with water, was approved at the meeting of the District Council last Tuesday. The cost is estimated at £17,000; and application is to be made to the Local Government Board for power to borrow this amount.

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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 29.

**Sulphate of Ammonia.**—Although there has been some improvement in the forward position, this has not reflected itself upon prompt delivery; values being barely maintained. The closing quotations are £10 10s. per ton f.o.b. Hull and Leith; and £10s. 13s. 9d. to £10 15s. per ton, delivered f.o.b. Liverpool. Sales, are, however, reported abroad at a substantial discount upon the equivalents of spot quotations—presumably forced sales of parcels held by speculators. There has been more buying going on, though buyers continue the delaying of their purchases as far as possible; but production is now increasing, and supplies are becoming more abundant. The circumstances prejudicially affecting the Scotch market are not yet removed; and Scotland remains the weakest point. £10 13s. 9d. per ton, Beckton terms, having been accepted in London for October-March delivery, the quotation was advanced to £11 per ton; but buyers have refused to follow. For delivery up to the end of the year, £10 15s. per ton is quoted. For delivery f.o.b. Leith, ordinary terms, makers ask variously £10 17s. 6d. to £11 per ton; but there are speculative sellers at £10 15s. per ton.

**Nitrate of Soda.** remains quiet; and, owing to arrivals, the quotations have been reduced to 8s. 3d. per cwt. for fine, and 8s. 1½d. for ordinary, quality.

LONDON, Sept. 29.

**Tar Products.**—This market is a little steadier; but the fluctuations that have taken place in it during the past three months have rather confused makers, who find it difficult to make up their minds as to the immediate future of the trade. Undoubtedly those who have paid a high price for tar are now smarting for their former sanguine views. A good business is being done in benzol; and large quantities are now being diverted from colour-making. Aniline makers are becoming a little alarmed at this, and are desirous of covering, with raw material, forward sales. Carbolio acid is in good request at a little better price. The value of crude has at last forced an improvement in the price quoted for crystals, which for some time have been out of parity. As much as 1s. per lb. is obtainable for a good make of crystals. Pitch is only moderately held. But most makers are committed for early shipments; and there is very little business of late noted. There is no improvement in oils; and anthracene is still a dead letter.

Values during the week may be taken as: Tar, 15s. to 23s. Pitch, east coast, 36s. to 37s. 6d.; west coast, 33s. Benzols, 90's, 10½d.; 50's, 1s. Toluol, 1s. 2½d. Solvent naphtha, 1s. 3d.; crude naphtha, 4d.; heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 3d. Carbolio acid, 60's, 3s. Naphthalene, 65s. to 75s.; salts, 40s. to 50s. Anthracene, nominal, "A," 4d.; "B," 2½d.

**Sulphate of Ammonia** is flat; and buyers are holding off to see if the market is likely to go lower. Makers are not lending themselves to the "bear" operations that are going on, as very little sulphate is being held. £10 10s. per ton, less 3½ per cent., however, may be taken as the average value at all ports.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—As intimated last week, there has been no further upward move in prices with the 1st of October; but generally the position, as regards all descriptions of round coal, continues exceedingly strong. As collieries are still able to get better prices on coal for shipment than on inland sales, they are quite indifferent about any present slackening off in home requirements, as all the surplus they have can be readily disposed of for delivery at Lancashire ports. In house-fire qualities the demand has moderated to something like its normal condition. Here and there collieries are enabled to put small quantities of the best qualities of round coal into stock, but in nothing like sufficient amount to meet any extra winter requirements. Common round coals are in fairly good inland request, for steam and forge purposes; but were it not for the pressure of shipping demands, these would probably be rather plentiful on the market. As it is, best coals are exceedingly strong at 16s. 6d. to 17s. 6d. per ton at the pit, seconds 15s. to 15s. 6d., common house coal 14s. to 14s. 6d., with steam and forge coals not quoted under 12s. 6d. to 13s. on inland sales. The shipping demand, as already stated, is exceedingly brisk; and from 17s. to 18s. is being readily obtained for ordinary steam coal delivered at the ports on the Mersey. Engine fuel continues to hang on the market, owing largely to the unsatisfactory situation of the cotton trade; and although Lancashire collieries do not reduce list rates, the tendency is in a weakening direction, as there are plentiful surplus lots offering on the market at much below local quotations, and merchants and large consumers are generally content to keep themselves supplied from hand-to-mouth, mainly with cheap special lots they are able to pick up. The quoted list prices at Lancashire collieries remain on the basis of about 10s. 6d. per ton for the best descriptions of slack, with lower qualities of fine screened slack obtainable in some cases at about 8s. 6d. to 9s., as these are really the classes of fuel just now most plentiful on the market.

**Northern Coal Trade.**—Business has been more irregular in the last few days; there being a lessened demand for some kinds of coals, and an increased inquiry for other qualities. For best Northumbrian steam coals, the demand now shows the falling off that is usual when the end of the Baltic shipping season is approaching, and whence the range of prices shows a little ease—about 18s. to 18s. 6d. per ton f.o.b. being now the current quotation. Second qualities are about 17s. 9d. per ton; and steam smalls may be had at about 11s. 3d. In the gas coal trade, it is believed that further contracts have been entered into for supplies during the coming winter for Metropolitan use, and that the prices are very near to 16s. per ton f.o.b. For occasional cargoes, as high as 18s. 6d. per ton f.o.b. is asked; but there is only a limited amount for sale, and beyond the contracts entered into gas coals may be said to be scarce. There is little change in other kinds of coal. In coke, the market is weaker; and there is a rather lower price for export qualities, though for blast-furnace coke the demand is very full. Prices are on the basis of 31s. to 33s. per ton f.o.b. for export, and about 27s. 6d. at the blast-furnaces. Gas coke is steady, at 24s. to about 25s. 6d. f.o.b.; these prices being quoted on

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Change, and recent business having been at medium rates, though gas coke is being delivered at lower prices on contract.

**Scotch Coal Trade.**—There is an easier tone in the market. The export trade shows a disposition to slacken, which may be only temporary; but if it should continue, rates will soon come down. The prices are: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 16s. 6d. to 17s. 6d., and splint 16s. 6d. to 17s. The shipments for the week amounted to 255,272 tons—a decrease of 10,306 tons upon the previous week, but an increase of 85,906 tons upon the corresponding week of last year. For the year to date, the total coal shipments have been 8,030,476 tons—which represents an increase of 1,472,909 tons upon the corresponding period of last year.

**The Transfer of the Spalding Water-Works to the District Council.**—The annual meeting of the Spalding Water Company took place last Friday—Alderman W. H. Mills, J.P., presiding. The report and accounts were adopted, and a dividend of 6 per cent. declared; a sum of £142 being carried forward. Reference was made to the transfer of the undertaking. In April last, the Directors entered into a provisional contract for the sale of the works to the Urban District Council; and an Act was passed last session authorizing its completion. This was the final meeting of the Company, as the works, &c., will be forthwith transferred to their new owners.

**Dorking Water-Works Purchase Question.**—With the view of simplifying the legal procedure necessary to acquire the Dorking Water Company's undertaking, a proposal has been made (but not yet finally adopted) that the District Council should solely promote a Bill in the forthcoming session of Parliament for the acquisition of the concern, under the powers conferred by section 26 of the Dorking Water Act, 1900; and that they should enter into an agreement with the Rural District Council (if required by the latter to do so within a stipulated period) to transfer the whole undertaking to a Joint Board consisting of members of both Councils as soon as the same could be constituted by the Local Government Board.

**Torquay Gas Company.**—Presiding at the half-yearly meeting of the Torquay Gas Company on Friday, Mr. J. Kitson said the receipts for the six months ending June 30 amounted to £15,170, and the disposable balance was £3842. Of this, £3396 was required for the dividend, which would leave £446 to be carried forward, as compared with £575 last year. Considering the state of the labour and coal markets, he thought the result of the half-year's working very satisfactory. The Directors' report and the accounts were adopted, and the usual dividends declared. The Engineer to the Company (Mr. R. Beynon) made a brief statement respecting the recent conference of Gas Engineers in Paris, and especially referred to the fact that the use of electricity for street lighting is being discontinued in Continental towns. He said that in Paris incandescent gas-burners were being substituted for electricity; but the lamps were placed much closer together than in Torquay, and the lighting was better than that of the electric arcs.

**Transfer of the Blaenavon Water-Works.**—It was announced at the meeting of the Blaenavon District Council last Wednesday that the water-works of the local Gas and Water Company would be handed over to the Council on the 29th (last Saturday). The amount of the purchase money and costs was £10,801 4s. 6d.

**The Water Finances of the Swansea Corporation.**—The Borough Accountant of Swansea (Mr. H. H. Hopton) has lately issued the abstract of accounts of the Corporation for the year ended March 31 last. With regard to the water-works, the income from all sources during the year was £21,035; and the gross expenditure, including £21,830 for interest and sinking fund, was £29,511. The loss upon the undertaking chargeable to the general district rate was therefore £8476, against £10,000 for the previous year. The Water Department has this year, for the first time, been credited with water used for flushing sewers, watering streets, &c., amounting to £1289.

**Exmouth Gas Company.**—The report presented at the half-yearly meeting of the Exmouth Gas Company last Thursday showed that the receipts amounted to £3574, and the expenditure to £2949; leaving a profit of £625. The make of gas had increased by 9·6 per cent., and the consumption had been well maintained; showing that the efforts to popularize gas through the use of cooking-stoves and fires and the automatic meter system had met with a large amount of success. The adoption of the report was moved by the Chairman (Mr. J. Palmer). Mr. H. A. Willey, speaking in support of the motion, said the extra cost of coal was equal to 10d. per 1000 cubic feet of gas; but the Company had only raised their price 6d. The difference would, they hoped, be made up by increased consumption of gas. The report was adopted, the usual dividends were declared, and the meeting endorsed a proposal that the salary of the Manager (Mr. J. T. Foster) should be increased by £30 per annum.

**The Norwich Corporation and the Gas Company's Accounts.**—It may be remembered that a few months ago an action was brought by the Norwich Corporation against the British Gaslight Company, Limited, on terms of a reference to Messrs. Cash, Stone, and Co., who had been selected by the Law and Parliamentary Committee to take an account of the amount employed by the Company as working capital at their Norwich station on the 31st of December last. At the meeting of the Corporation last Tuesday, the Committee reported that they had arranged a settlement of the action, the Company paying all costs as between solicitor and client and the Accountants' charges. Mr. Hackblock, in presenting the Committee's report, said the question was merely one of rectification of the accounts. In reply to a question, the Town Clerk (Mr. G. B. Kennett) said the Corporation thought the Company were charging interest on money upon which they ought not to have charged. But further investigation showed that the Corporation Auditor had known the fact for a long time, and the Corporation were bound by his knowledge; so that it was impossible to get any of the money back. Mr. G. Watson remarked that this question came up some time back, when he was on the Gas Committee; and it was felt that the gas accounts were not fairly and properly investigated. The report was adopted.

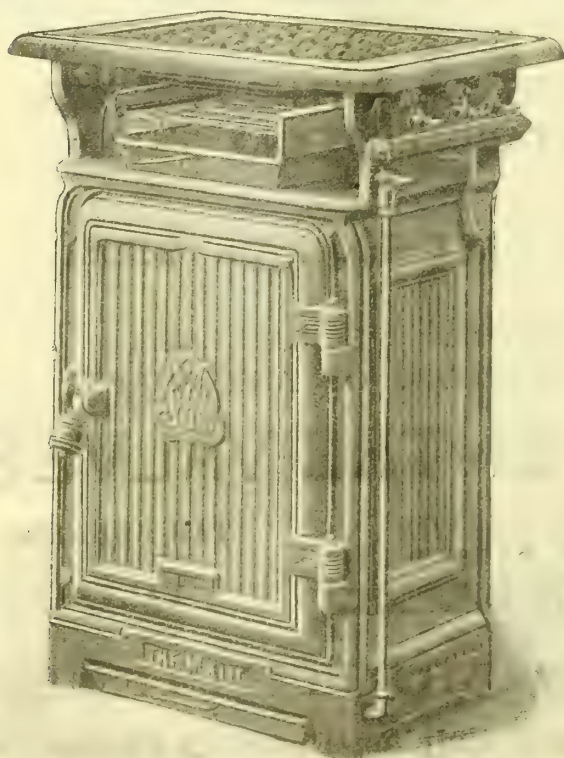
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## EDITORIAL NOTES.

## Need of Cheap Machinery.

A WRITER in a recent number of the "Spectator"—commenting on the triumphs of mechanical science which crowd the buildings at the Paris Exhibition—took occasion to call attention to the costliness of almost every machine, and the causes of that dearness, and to ask whether such high cost is really inevitable. The fact that the purchase of machinery involves the expenditure of large sums of money will certainly not be disputed by gas engineers; they are only too painfully aware of its truth. But before it is possible to say that anything is dear, it is necessary to prove that something that will do as much of the work required to be done, and do it as well, can be (or, were it made, could be) obtained for less money. That point is clearly seen by the writer of the article to which we have referred; and his contention is that our machinery need not cost so much as it does if only manufacturers would be content to make machines less perfect in finish—not the best which can be turned out, but equally good for their purpose. Add to this the hindrance to cheap manufacture afforded by the Trade Union rules restricting the number of hours during which a man may work a "tool"—that is, a machine-making machine—and that limit his output, and we find altogether "a considerable body of "opposition to one of the great and pressing needs of the "day." The fact that mechanics are paid high wages is urged at times as a reason why the machinery they produce is dear; but, as the "Spectator's" contributor points out, that argument will not hold water, as workmen get just as good pay in other industries, and yet produce cheap goods. The Oldham cotton spinners are among the most flourishing of workpeople (who has not heard of the Oldham Wakes?); but the article they manufacture is so cheap that it has been found to pay better to import Lancashire cotton goods into Central Africa, where cotton is indigenous and labour to be had for next to nothing, than to make the goods on the spot.

There is, indeed, no necessity to go outside the machine-making industry in order to prove that high wages do not of necessity mean dear goods; for we need only look to the United States to find mechanics' earnings higher and machines cheaper than they are in this country. The writer in the "Spectator" appears, in fact, to have left the Americans out of his reckoning, as he makes no mention of their products in the machine-making field, where he might, in truth, have found ample evidence to prove that most kinds of machinery (agricultural labour-saving appliances especially) can be turned out at much less cost than that for which they are produced over here, if only the men work their tools loyally, and the masters and purchasers are content with a serviceable, but less highly finished, article. Our readers may remember a remark made by an American, which we have before quoted, that English locomotives are fit to hang on a lady's watch-chain, but for their size. The American engine, on the other hand, is less elegant, but equally useful, and cheaper. There lies the moral our manufacturers have to learn; and it will be sharply brought home to them ere long by the advent of keener competition.

Our cousins across the water were, in fact, the first to produce that pattern of a serviceable and accurate but cheap machine which is a standing refutation of the theory that such a machine cannot be produced. We refer to the Waterbury watch. "All the arguments by which manufacturers say you cannot, will not, and shall not have a "cheap self-binding reaper, or a cheap steam-digger, or a "fifty-guinea autocar, or engines for a launch, that shall "not cost more than if they were cast in silver, were used "against the men who said they could make cheap watches. "They knew better, organized their work, had cheap tools "to make their watch machinery, and very soon turned "out by the hundred thousand a most delicate machine, "adjusted to fractions of a second, cheap, fairly durable, "and good enough." What the English manufacturers do apparently (and their men undoubtedly) fail to see is that a material reduction in the cost of machinery would lead to its far wider use. If only the Trade Union would allow tools to be worked to their maximum output, there would be employment for more hands than ever, as the demand would be stimulated by the decreased cost. If agricultural machines only cost one-third or one-half of their present

## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.



price, they would be used throughout England; and the area of country under corn would increase rapidly—to the benefit of farmers in particular and the nation in general. If stoking machinery could only be installed in gas-works for 50 per cent. of the present outlay, how many works would be without it five years hence, how much cheaper could gas be produced, and how much more gas would be consumed!

There is, in truth, a rich harvest waiting for the men who will provide us with cheap machinery; and we are not without hope that the stimulus that will soon be given to the enterprise and ingenuity of the manufacturers in this country by the influx of the surplus production of American workshops, will eventually lead to the great revival of our national prosperity that must ensue from the cheapening of the means of production. At no time in recent years has the need of cheaper methods of manufacture been more keenly felt than at the present.

#### The Affairs of the Commercial Gas Company.

THE general meeting of the Commercial Gas Company on Thursday did not offer any promise of interest; and therefore it proved to be very well worth attending, for several reasons. It is always a particularly businesslike gathering, for one thing; for although the Chairman, Mr. John Blacket Gill, makes no pretence of being an expert in gas, he is very straight, and speaks to the point. Thus, on this occasion, in a few simple words he explained so clearly the necessity under which the Commercial Directors lay to increase the price of gas, that there was no more to be said either about this or the consequential reduction of the dividend. Even at the advanced price, the Company have not cleared their coal bill, nor earned the dividend declared. Not a word of protest was raised from the other side of the table against the diminished dividend; though, by a rare coincidence, it has followed upon the new departure of the Company in respect of selling new stock issues in the open market. This reticence is really a high compliment to the Commercial Board, especially when it is remembered that many of the proprietors who regularly attend the meetings follow the operations of the Company with keen interest. The Directors have received a deputation of consumers with reference to the advanced price of gas; but naturally nothing came of it. There is no denying the facts of the matter; and Mr. Gill is not the man to irritate his public by any defect of manner or want of tact in dealing with a delicate situation. Of course, it is hard that the Commercial Company, like most other gas companies, should have been compelled to raise the price of gas—just as the poor of their district are beginning to enjoy the benefits of gas and the Local Authorities are “progressing” into electric lighting; but it cannot be helped. Doubtless, if the Board could have paid heed to the case of the richer and older proprietary alone, they would have been inclined to cut the dividend down to the earnings. Having sold stock recently, however, they owed some consideration to the purchasers, and were also constrained to think of the future. Accordingly they dipped into the reserve fund.

Mr. Gill remarked that he feared the London County Council might be so ill-advised as to re-introduce next session their Portable Photometer Bill. This was the first warning of such a design that had reached us; and we lose no time in declaring that if the County Council are bent upon doing anything of the kind, it must be attributed to the sway of influences of the most mischievous order. It is all very well to cry up the public spirit of modern local authorities; but when this enterprise takes the form of squandering public money upon unnecessary, or even pernicious, adventures, it is time to put a check upon it. In his suggestive little speech in reply to a vote of thanks to the engineering staff, Mr. H. E. Jones mentioned the very heavy burden of rating that oppresses the East-end parishes. The authorities responsible for the administration of these districts seem, according to Mr. Jones, to spend the ratepayers' money more extravagantly than the Vestries of the rich West-end of the town. Although it seems paradoxical to say it, there will always be a greater tendency to extravagant expenditure out of the rates in a poor than there can be in a well-to-do local government area. This is a question for the London Municipal Boroughs of the future. The equalization of rates as between the differently circumstanced parishes of the Metropolitan area is a just measure, in a proper degree;

but it should not be permitted to cover illicit or extravagant payments by the lower-class Vestries.

Lastly, for those who had eyes to see it, there was provided in the room where the Commercial meeting was held (one of the public apartments of the Cannon Street Hotel) an excellent object-lesson for the encouragement of gas shareholders. The room had originally been lit by means of an 8-branch gas-pendant, of a familiar type. In course of time, eight branches for incandescent electric lamps had been placed in the intervals of the gas-burners, and had shone in their stead. Now, and lastly, four of the old flat-flame gas burners and globes are replaced with Kern incandescent gas-burners, which thus do the work of the electric lamps, retired. The same substitution has been made throughout the Hotel. The traces of the alteration of the old fittings are quite a subject for study in what may be styled the archæology of domestic artificial lighting.

#### Official Photometry under the Gas Referees.

THE publication of the Notification of the Metropolitan Gas Referees for the winter is a fitting opportunity for calling attention in these columns to the present state of the practice of statutory gas testing, as regulated and ordered by this authority. In the first place, it is imperatively necessary that everybody who is required by law, or is otherwise moved, to follow the proceedings of the Gas Referees, should be provided with official copies of these Notifications as they appear; for there is no finality in the Referees' ordinances. For this reason, it is impossible to be certain, with regard to such independent statements relating to legal English photometry as that made by Dr. Violle at the recent International Electrical Congress in Paris, that the description applies to the absolutely latest pattern and method of using the Referees' apparatus. The previous Notification of the Referees, for the past summer, contained enough fresh matter to fill about a column of the “JOURNAL.” The present prescription also contains new features. Once more Mr. Vernon Harcourt's Ten-Candle Pentane Lamp, the standard of light adopted by the Gas Referees, has been altered—or improved, if the word be preferred. The description and illustration of this standard, in Appendix A are corrected to embrace the addition to the apparatus of “a metal cone, acting as a damper,” suspended over the air-inlet. This device is arranged to be actuated by a string carried over pulleys to an adjusting screw fixed on the table, handy to the examiner's seat. Its object is the laudable one of enabling the operator to regulate the lamp without having to leave his chair. He is further considerably told that “it is best so to turn “the stopcock as to allow the flame to be definitely too “high, but not to turn it full on, before letting down the “regulating cone to its working position.” Simple enough, doubtless; but still forming one more thing for the officer to look to. Dr. Violle reports that already the pentane standard required “more attention” than the Hefner-Alteneck standard lamp; while M. Liebenenthal has reported that it takes half an hour after lighting up to attain its maximum brilliancy. The Notification only requires, as before, that the lamp is to be burnt at near its proper height for at least ten minutes before any testing is made.

The previous Notification contained a prescription relating to the provision and care of service-pipes to testing-places. This ordinance is repeated. It is probably the outcome of a polemic, or negotiation with the Gas Companies; and the nature of the directions given is one more bar to the acceptance of any system of peripatetic penalty testing. The whole tenour of these Notifications, of course, absolutely negatives the idea of the trustworthiness of any gas testings otherwise conducted. If a Portable Photometer Bill should again be promoted in Parliament, it should be sufficient answer to the preamble to call the Referees as witnesses, one after another, put a copy of the Notification to them, and then ask to have the superfluous directions pointed out. If any follower of the gas industry wishes to know what are the peculiar cares and responsibilities of the managers of London gas-works, the same source of information will serve for his enlightenment. The managers have to prepare to meet all this microscopic gas examination daily and hourly, and keep the sulphur down to the prescribed limit. Nowhere else in the world is anything approaching this rigorous examination practised. For this reason, the management of London gas-works is an art not to be acquired out of the Metropolis. What with the care of his purifiers on the one hand, and the



thought of his daily testing returns on the other, the London gas manager has so much to worry him that the wonder is how he can think of economies and improvements in working. Whatever he may ponder in the way of cheap gas making, the trial of fresh materials of manufacture, or what else, he has ever present to his mind the consciousness of the Referees sitting serenely aloft, in official detachment from all sympathy with, or necessary knowledge of, the gas maker's business—not to keep watch on the life of this "poor Jack," but to screw him up in a cast-iron regimen. And behind the Referees stands the functionaryism of the London County Council, ever ready to justify itself at all costs to private trade and enterprise. So the position is to-day. How rapidly and thoroughly would it be changed if the gas supply were municipalized!

#### North of England Association and Federation.

THE North of England Gas Association, at their meeting in Durham on Saturday, had before them a meagre programme of business; but before they rose, Mr. T. Bower, of West Hartlepool, filled up the blank by moving them to action upon the subject of labour troubles, which to many, both inside and outside the Association, is an all-important one at the present time. This is not the first occasion on which Mr. Bower has not only called attention to, but has been instrumental in getting something done upon, a master question. Just two years ago he intervened with a proposal for combined action in the matter of insurance of owners of gas-works against liability for accidents to workmen. The good which was effected by his step was great indeed—the Insurance Companies having come down to conditions which make it no longer necessary to combine in order to get suitable terms. The question Mr. Bower has now raised will not, it is to be feared, be so easy of solution; for the class to be dealt with is a much more unscrupulous one than are the trained financiers of the insurance world. At the present time, a general demand, supported by organizations which always figure in like movements, is being made for conditions of labour that are not in all cases equitable. In Mr. Bower's own instance, the money claim alone would result in adding £3000 a year to the expenditure of his Company. The proposal is to take common action in dealing with all such applications. It is not intended to go farther at present than to collect information with a view to the formulating of a scheme. That may or may not be a safe movement; but, whether or not, any further step will require to be well considered before it is taken. Hitherto the aim of the Workmen's Unions has been to force the hand of the owners of gas undertakings in the largest centres of population. In all these places they have been so far baffled that they have not yet obtained a footing inside the gates. As this is what the leaders (as distinct from the men) most desire, the present descent upon the smaller undertakings is not devoid of the suspicion that they may have arrived at the conclusion that it would be easier to compel recognition at the hands of the scattered representatives of the industry in the Provinces than at the hands of the powerful bodies in the larger cities. This is a point not to be lost sight of; because it would not be to the profit of the whole industry were the weaker places to be captured by the Workmen's Unions. Even the information collected, if it be not well guarded, may be used to defeat the purposes of the employers; and with this possibility in view, the Committee of the North of England Association will do well to ponder carefully the scope of their inquiry before they enter upon it. Our sympathies are always with those upon whom inequitable or tyrannical claims are being made; and we are in complete accord with Mr. Bower's motive in striving towards some common understanding upon a subject of common interest. But we should prefer to see much caution displayed, and deep counsel taken, before it should be resolved to form the employers of labour into a militant organization which could be cited, questioned, ridiculed, or placed in dock or pillory; because the creation of such a body might mean masters and men standing hopelessly at bay, and a demand for someone in authority to step in and compose the differences. Could there be a more complete triumph for the leaders of the workmen? A friendly conference with workmen is always an open course, and commits no one to more than may be agreed upon. To admit workmen to a formal Court of Conciliation, with their representatives present, would be a risky step. We fear that Mr. Bower's generous feelings towards the workmen, which do him inexpressible credit,

although in the one case it might be appreciated, would, in the other, be altogether thrown away.

#### Borneo Gas Oil in the Thames—and in the Newspapers.

THE great Crummles could never understand how all the interesting little bits of information about his theatrical company got into the papers. It was an unfailing source of wonderment to his simple mind how the newspapers were able to tell their readers so many things about him and his little arrangements for entertaining the public. The case of Crummles must often recur to the minds of readers of the newspapers of the day, when they discover such frequent mention in print of certain persons and transactions. For some unknown reason, much journalistic notice is being taken of the development of the Borneo petroleum trade, which seems to be largely, if not exclusively, in the hands of a concern called the Shell Line Company. Last week, the news went the round of the London newspapers, and is doubtless still spreading, of the arrival in the Thames of a cargo of Borneo oil for the London market. This consignment was declared to be for the Gaslight and Coke and the Brighton Gas Companies; the quantity being 6000 tons, and the price 25 per cent. under the rates current for Russian gas oil. This is a big cargo; and the interest of its safe arrival was increased by the accompanying explanation that it had been carried the whole of the 10,000 miles of sea between Borneo and Millwall by oil-fuel steaming.

As is generally the case, the real points of importance in respect of this performance were carefully omitted from the newspaper reports; nor is the special account published in the "Petroleum Review" much more explicit. We want to know what are the true prospects of the importation of Borneo gas oil into this country. There is no miracle in the mere getting of a single cargo of oil, or coal for that matter, across seas; but if, as we remarked on the arrival of the American coal, one swallow does not make a summer, most assuredly one shipment does not constitute a trade. As time goes on, it becomes more and more evident that the petroleum supply of the world is both large in amount and widely scattered—in this respect resembling coal and peat deposits. Very many questions have to be considered before it can be settled which source of fuel supply is commercially and industrially most available. The problem of bringing Borneo oil to the British market, at a price to compare favourably with the American and Russian articles, is primarily a simple question of freights—assuming, that is, that all three supplies are of about equal industrial value. The American supply is in the hands of the Anglo-American Oil Company, whose business organization is unsurpassed. The industrial organization in the United States, which stands behind this distributing concern, is, and has long been, perfected. Hence no further developments of the American oil trade are to be looked for. At the same time, the combined interests vested in this enormous trade are so vast and well controlled, that every effort will, as a matter of course, be made to retain the markets of the world by selling at the lowest margin of profit. The case of Russian oil is not the same, inasmuch as the source of the supply is not yet in pipe-line connection with any ocean port. It is rumoured that the organization which is to be the counterpart in the Russian trade of the Anglo-American Oil Company is already constituted; though this seems putting the cart before the horse. But presumably the members of the new company know their own business. The complete commercial fruition of the Russian export oil trade must, however, await the completion of the inland transport arrangements; and meanwhile it appears premature to say how the product will stand in the market.

Wherefore, advertisement apart, it seems the prudent thing to hold this Borneo importation as an experimental success only. As at present advised, it would be rashness to admit the supply as a reliable one in the sense of being profitable to all parties. It is a far cry to Borneo. Nor does the expedient of steaming with oil fuel strike one as a proved success, to the degree of rendering that possible by this means which is not commercially practicable with coal fuel. One would like to see a complete balance-sheet of the steaming performance, covering a round trip with each kind of fuel. Nothing short of this proof is worth an instant's consideration. We all know the generalities as to one pound of oil being as good for fuel as two pounds



of coal, and the saving of stokers' labour with the former. The question of what the difference between the fuels amounts to in the long run, all in, has never been conclusively answered. In the example in point, we observe that the cost of the steam for atomizing the oil remains a bugbear of the system. A method of burning oil which is free from this drawback is evidently demanded. Not until this improvement is effected, will liquid fuel be strictly comparable, on the merits, with steam coal.

#### How Not to Read Gas-Meter Indices.

LAST week, *à propos* of the smoke-prevention movement, we had occasion to remark on the slowness with which accurate knowledge of some things penetrates the educated orders of the community. Another example in point has come under our notice, in a well-meant endeavour of a writer in Saturday's "Daily News" to teach the public how to read a gas-meter index. One might have been pardoned for thinking that quite enough had been done in this branch of technical instruction; but evidently such a conclusion would be too sanguine. It is the positive fact that this latest of would-be teachers of an accomplishment seemingly rarer than ability to decipher Egyptian hieroglyphics, fails in half-a-column of type to disclose the key to the mystery of meter-dials, and actually misrepresents these common objects of the gas consumer's cellar! He gives a drawing, not over clear, of the meter-dials, which he boldly declares to be "the same as those which appear on the face of every gas-meter—either in laundry, factory, or private house," and proceeds to reflect on the astonishing circumstance that so few people can reckon their own gas bills. The joke of the affair is that his drawing is all wrong. He makes all the dials read in the same direction; having failed to observe that the middle dial reads in the opposite way to the first and third. Therefore he cannot be expected to have the sense of the business of index-taking aright, and consequently to be able to lay down the only rule which is to be followed—that of registering always the lower of the two figures between which the pointer stands, on every dial. This is very funny, in a voluntary teacher. No wonder, if such are the instructors, that the ordinary householder is at a loss to read his gas-meter. But this is not all; the same respectable authority states that "these little hands enable the renter to tell to a sixpence what the bill should be." They do this, of course; but only if the registration at the previous indexing is known. A further explanation of this point is introduced by the cryptic statement: "As a rule, a gas company never sends out a meter with the hands at zero, just to confuse customers; but that makes no trouble in computing the bill." It is very sad; but in these days of bicycle cyclometers, one might reasonably have credited gas consumers with knowing a little of the trick of continuous mechanical counters. It is hardly necessary to state that most gas companies do the index-taking of consumers' meters in some way that puts the consumer in complete possession of the same data as that used in making out his gas account. This is useful in enabling the inspector to check his entry on the spot, and satisfies the consumer who may happen to be curious in the matter. As a rule, the consumer thinks little about it until he receives his bill; and then he only cares to mark whether or not the amount is increased. We pity the consumer who valiantly tackles his meter-index under the guidance of the "Daily News" expert. He might succeed in taking the registration correctly the first time, although this is doubtful. When he went to look at it again, a week or so later, there would be "confusion worse confounded" between the aspect of the dials and their newspaper presentment. If some Metropolitan householders give their district gas inspectors trouble a fortnight hence, the latter will know whom to thank.

#### The Artistic (?) Electrolrier.

REFERRING to our last week's "Note" in these columns on the eccentricities of design exhibited by the lamp-posts of London town, it has since been brought to our notice that several firms of electric light fittings manufacturers have brought out pattern-books of "electrolriers" for the coming lighting season. Some of these works of art are well spoken of in contemporary journals; and we have examined them with no small degree of curiosity. Result—disappointment. Yet it can hardly be called disappointment, either; because nothing better was to have been

expected of tradesmen who continue to offer for sale the vile imitation electric "candle," which figures in all furnishing electricians' catalogues. An electrical contemporary has distinguished, by reproducing, one of these "artistic" electric light fixtures. It is a statuette of a very fat small boy, insufficiently clothed, but in violent action—bounding forward—with a sham candle stuck upon his chubby outstretched finger. What an idea! How much light might one of these imitation candles be expected to give? Certainly, not enough to go very far towards the lighting of a room of any size. And then, imagine the effect of a repetition of fat boys holding candles at an impossible angle, in every corner of the room. How reposeful! This element of suitability for repetition to any desired extent is, of course, one of the points of good lamp-standard designing; and it greatly increases the difficulty. The very handsomeness of articles that might be very acceptable as specimens—in standard oil-lamps, for example—debars them from being multiplied. Public opinion wants to be educated in this matter of lamp design; but the trouble is to find capable masters of the subject. It is not a trouble of the lamp trade only. Since all metal work has fallen into the hands of "firms"—some of them limited companies—the individual designer has disappeared; and unfortunately, he has taken his art with him.

### WATER AND SANITARY AFFAIRS.

THE shareholders of the East London Water Company had a much pleasanter story to listen to from the Chairman (Colonel Lockwood), at the half-yearly meeting last Thursday, than that which he had to tell them this time last year. Fate and the elements had combined against the Company; and while those who were responsible for the management of the undertaking had been unjustifiably attacked for not having works equal to the demands upon them, Parliament refused to grant the powers necessary for bringing them into this condition. Fortunately, thanks to the intercommunication scheme, the Company were able to maintain a full supply during the dry summer of 1899, much to the chagrin of their enemies, who were anxiously looking for a breakdown. Such a mishap did not happen; and it may be confidently hoped that one may now never occur. Altogether, the prospects of the Company are brighter. Parliament showed them greater consideration last session by passing the Bill which had been previously rejected—thereby conferring power to construct additional storage works and obtain more water; the new reservoirs in course of construction are proceeding satisfactorily; and up to the present time no extraneous assistance has been needed to keep up the supply of water, of which there is a good stock on hand. The position of the undertaking must therefore be most gratifying to the Directors and the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.), upon whom rests the responsibility of furnishing one of the prime necessities of life to a population numbering already 1,375,000 persons, and increasing at the rate of 40,000 per annum. The Company's supplies reach a total of 207,655, or more than those of the Grand Junction, West Middlesex, and Chelsea Companies combined. With this extensive business, it is an indication of good collection to find the loss from bad debts only £528 on a charge of close upon £200,000. The increase in the water-rates last half year amounted to £9612; and the average rate per house on the new supplies was £1 4s. 3½d.—a reduction of 1d. on those put on during the summer of 1899. Colonel Lockwood complained of the imposition of the sinking fund forced upon the Company in 1886, and showed how it had detrimentally affected the dividends. But the fund is now a fixture, and will have to be borne. The profits of the half year allowed of the payment of a dividend at the rate of 7 per cent. per annum.

In the course of his remarks at the meeting above referred to, Colonel Lockwood expressed the hope that the obstruction and opposition to which the Company have been subjected for so many years may now cease, and the stability and value of the undertaking be allowed to further develop. In view of the events of the past decade, the wish may well be extended to all the other Metropolitan Water Companies. They have passed through a time of trial; but fortunately the progress of their business has not been checked. Testimony to this fact is borne by the Companies' half-yearly accounts; but it is shown even more clearly by the annual "Analysis" originated twenty years ago by Mr. Alfred



Lass, and continued by the firm of Messrs. Lass, Wood, and Drew. The latest of these most useful compilations (dealing with the financial year ending December 31, 1899, and March 31, 1900, has just been published); and it furnishes some instructive figures. We find that the total amount of capital authorized in respect of the supply of water in London is £20,742,252, of which £18,449,391 is employed—£18,345,186 having been expended on works which sent out 77,156,679,166 gallons of water; being at the rate of £239.12 per million gallons, compared with £241.23 per million in the previous year. The average daily supply for domestic purposes only was 162,118,514 gallons; for all other purposes, 48,133,170 gallons—the figures for 1898-9 being 157,452,692 and 46,580,715 gallons respectively. The average number of houses supplied during the year was 884,169, against 862,876; the population served being estimated at 5,953,529, against 5,875,003. The average daily supply for purely domestic purposes was 183 gallons per house and 27.24 gallons per head of the population—practically the same as for the year 1898-9. For all purposes, however, the figures are 238 and 35.32 gallons respectively. The number of houses on constant service at the close of last year was 29,836 more than at the corresponding period of 1898; 9628 being added by the Lambeth, and 7126 by the East London Company. The total income of the Companies was £2,363,246, against £2,275,951, or at the rate of £30.63 per million gallons, and £2.67 per house supplied. Maintenance and management cost £1,031,023, or £13.36 per million gallons and £1.16 per house; and the net profit was £1,056,569, or at the rate of 10.27 per cent. on the stock and share capital, as compared with 10.06 per cent. for 1898-9. The analyses of the Metropolitan Water Companies' accounts are followed, as last year, by those of the accounts of the Edinburgh, Glasgow, and Manchester Corporations. They show that in Edinburgh the supply of water produced a surplus of £5620; whereas in Glasgow and Manchester it resulted in deficiencies of £19,796 and £3199 respectively.

In a leading article which appeared a short time ago, "The Times" reviewed the results of the working of the Parish Councils Act, and offered some sharp criticism of the action of the members of some of these Councils for their dilatoriness in remedying the sanitary defects of the areas under their control. That the remarks of the leading journal were justified in many cases, there is too much reason for believing; but instances occasionally come to light where they are equally applicable to much more important bodies than those against which they were directed. If a small Parish Council are to be censured for slackness in the discharge of their duties, what shall be said to a Corporation—and especially that of a Royal Borough—who are equally remiss? By the merest accident, a worthy Burgess of Windsor—a member of the Berkshire County Council—became possessed of an idea that a report by the Medical Officer of Health in regard to the insanitary condition of some cottages had been deliberately suppressed by the Town Clerk; and he accordingly, early in July last year, communicated with the Local Government Board on the matter, and requested them to hold a public inquiry. This was by no means the first time that the Board's attention had been specially called to the state of the borough; a deputation having waited upon Mr. Ritchie, as long ago as 1886, with the view of having an official investigation into certain allegations made in the previous year by a Special Commissioner sent down by the "Lancet." As the result of the interview, Dr. Hubert Airy and Mr. Arnold Taylor held an inquiry, and made some specific recommendations. They subsequently revisited the borough, and reported in detail as to what had been done. In response to the recent application, the Board sent down Dr. H. Timbrell Bulstrode to inquire into and report upon the representations which had been made, with "special reference to the extent to which insanitary conditions of the kind pointed out in "1887 and 1889 by Dr. Airy and Mr. Arnold Taylor are "still existing."

Dr. Bulstrode made searching inquiry into the several allegations and a thorough inspection of the town, especially of the poorer quarters; and a copy of his report was received towards the close of last month. It is a very voluminous document—occupying eight columns of a local paper. Of course, it is impossible to give here even a summary of its contents. Suffice it to say that, while there is no serious complaint in regard to the water supply, the Corporation are charged with failing to adopt simple sanitary

precautions, neglecting the drainage, permitting the accumulation of refuse, disregarding matters repeatedly brought to their notice by the Sanitary Inspector, and framing bye-laws but not enforcing them. There has, in short, been a slackness—or, as Dr. Bulstrode puts it, a "want of backbone"—in the proceedings of the Sanitary Authority. He says there has been too much action of an apologetic sort, too much non-effectual and more or less informal letter-writing—in a word, there has been "indecision in dealing with the matters under consideration." This severe criticism will doubtless have permanent good effect. That it should have been called for in a borough whose residents are for some few months in the year actually in touch with Royalty, does not show a very keen appreciation of their duties and responsibilities by those who are entrusted with the administration of its affairs. On the contrary, it shows, as Dr. Bulstrode says, a want of "the initiating and guiding force necessary for vigorous administration." Though the gentleman whose action brought out this rebuke was mistaken in the matter of the alleged deliberate suppression, he deserves the thanks of his fellow-townsmen; for, in a post-script to his report, the Inspector expresses his pleasure in appending a memorandum by the Corporation, as the result of a meeting held after his visit, showing that many of his criticisms have been already acted upon. The report was discussed by the Town Council last Wednesday with closed doors; a motion that their deliberations on this important matter should be open to the public having been rejected.

**The "Kugel," or Globe High-Pressure Gas-Light.**—Herr Salzenberg, the Manager of the Crefeld Gas-Works, who has invented the system of high-pressure incandescent gas lighting, known in Germany as the "Kugellicht," and in France as the "Lumière Boule," asks us to correct an erroneous impression which certain references to his system at the International Gas Congress at Paris may have created. He claims to use gas under a compression of "one atmosphere and upwards," and not, as some references to his system imply, of one atmosphere only. This is apparent from the translation of the paper that he read before the Congress, which appeared in our columns last week (p. 837), in the course of which it is stated (p. 838): "The gas can be compressed quite well to 10 atmospheres in a metal reservoir, although for practical purposes the increased motive power required limits the compression to about 3.5 atmospheres. The actual pressure of combustion must not fall below 1.1 atmospheres." The patents protecting the system in all countries claim the use of pressures of 1 atmosphere and upwards.

**Lighting Industries Exhibition in Vienna.**—An exhibition will be held from the 1st to the 30th of next month, in the rooms of the Austrian Horticultural Society in Vienna, of appliances and inventions relating to artificial lighting. The exhibits will be classified in fourteen groups, as follows: (1) Historical Objects of Methods of Artificial Lighting; (2) Light for Devotional Purposes, and Church Lighting; (3) Public Lighting; (4) House Lighting; (5) Lighting of Schools, Hospitals, &c., and Light in Hygiene and Medicine; (6) Factory Lighting; (7) Lighting of Vehicles, Railway Carriages, Ships, and Lighthouses; (8) Military and Naval Lighting; (9) Light in Photographic Processes; (10) Lighting Arrangements for Night Operations, and Fire-Risks; (11) Lighting of Mines; (12) Decorative Illuminations; (13) Sundry Objects; and (14) Literature of Artificial Lighting. The arrangements for the exhibition are in the hands of Professor F. Kleinpeter, Herr E. Sehnaal, Imperial Surveyor, and Herr L. Weiss, publisher. The exhibition is announced as the first universal one for all methods of artificial lighting.

**Calcium Carbide Works in Great Britain.**—With reference to our comments on the list of carbide works in Great Britain given by Professor Vivian B. Lewes in his work on "Acetylene" (*ante*, p. 464), and to the paragraph on the subject in the "JOURNAL" for the 18th ult. (p. 690), we have now to add that we have made further inquiry respecting the works reported to be in operation, or under construction, at Blackburn and in North Wales. At Blackburn, Messrs. Ashton, Frost, and Co., Limited, of the Bank Top Foundry, were reported to have 200-horse power engaged in the manufacture of carbide. A private inquiry directed to this firm, asking for confirmation of this report, has however elicited no reply. It would seem scarcely probable, nevertheless, that this Blackburn works is identical with the small works at Chatburn, near Clitheroe, referred to by Mr. Fowler in our issue of the 25th ult. (p. 786). Our information as to a works of 4500-horse power under construction in North Wales was derived from the German technical Press. A firm of Engineers (Messrs. Fried. Krupp Grusonwerk, of Magdeburg-Buckau) who were reported to have supplied machinery for these works, inform us, however, that the Foyers factory is the only one in Great Britain which they have supplied, and that they are not aware of the existence of works in North Wales. Consequently, the only calcium carbide works of the existence of which in Great Britain at the present time there is no question are the works of the Acetylene Illuminating Company, at Foyers, N.B., and those of Messrs. Tinker and Holliday, Limited, at Haslehead, Sheffield.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 912.)

THE Stock Markets have at last got a foretaste, as they hope, of the good time for which they have more or less impatiently been waiting so long. Last week saw quite a revival of cheerfulness; and though business might well have been a bit more plentiful, yet it was distinctly a change for the better. There was an almost uniform advance in prices throughout all departments, with only a fall here and there to chequer the list. There can be no doubt that the result of the elections has had much to do with this; for only with a strong majority can either party aspire to give John Bull's house the setting to rights it requires. In the Money Market the supply was very abundant, and short loans were obtainable on very easy terms. But looking further ahead, discount rates had quite the reverse tendency. The Gas Market marched in line with the rest, and took its share of the general brightness and revival of activity; and now that the holiday season is pretty well over, we may perhaps look for this state of things being maintained. Prices in general keep steadily pushing up; and some moderate advances were scored in the week. In Gaslight issues, the ordinary was pretty active right through to the close. Opening at a fraction below par, it touched 100 more than once; and the quotation closed at an advance of a point. The secured issues were very much neglected, and gave no sign. Dealings in South Metropolitan were rather quieter; but the tendency was buoyant, and the selling price was advanced two points. Nothing at all was done in Commercial; and present prices are not good enough to tempt holders to part with their stock. The Suburban and Provincial Companies were inconspicuous, and made no sign. The Continental group were in undiminished strength; and some issues added further gains to their recent advances—Union being especially buoyant. The remoter undertakings were unmoved, with the exception of a reduction in Oriental part paid. The Water Companies were generally firm; and several moderate improvements on quotations were made. New River, however, was a little lower.

The daily operations were: Gas opened very firm on Monday; but business was only moderate. Prices all round were good; but only Continental Union advanced 1. Transactions on Tuesday were on much the same level, with marked strength. Union rose 2; and Gaslight ordinary and Imperial Continental 1 each. Lambeth Water gained 5. Wednesday was noticeable only for a further improvement of 3 in Continental Union. Thursday was moderately active; and South Metropolitan moved up 1. In Water, East London rose 2, Southwark 1, and ditto "D" 3; but New River fell 2. Friday was dull; and quotations did not move. Saturday was quite quiet. Oriental £4 10s. paid fell ½.

### ELECTRIC LIGHTING MEMORANDA.

**The Liability of Electric Cables to Deteriorate.—The Importance of Depreciation.—The Gains of Electric Science: Dr. Bose's British Association Paper.**

In the current number of the "Electrician" there appears a statement relating to the liability of electric cables to deteriorate, which is singled out by our contemporary for somewhat apprehensive comment. It originated in a communication by M. Georges Rheins to the "Comptes Rendus," to the effect that, when an insulated electric cable is used for the transmission of current always in the same direction, it passes through four stages of deterioration, marked by the complete loss of some electric property and a change of the properties remaining. The first property to go is inductance, followed in order by capacity, insulation, and conductivity. This process of deterioration is due to the slow penetration of the metal of the core into the insulation surrounding it; and the phenomenon appears to be independent of the kind of dielectric used, since it has been observed both in the case of paper and also of gutta-percha. In one instance of the latter kind of insulation, in use for twenty years, the copper of the core was found to have soaked through to the surface of the insulator. In another case, of a papered cable used only four years, the copper was found to have penetrated into the first layer of paper, but not into the second. Here is a nice "secret" for the electric lighting interest, especially where public money has been spent lavishly on electric mains, without provision for depreciation. The "Electrician" very properly draws attention to the statement, and suggests that some experiments on the "life" of electric mains should be instituted. The suggestion is a little late. Plenty of experiment of the kind is actually going on, and will have to go on to the inevitable end, whatever this may be.

If M. Rheins is to be trusted, there will be a sad awakening for some confiding ratepayers. Of course, the statement may not possess any industrial importance. It is not said under what conditions the discovery of the "Rheins effect," as it will presumably be called, was made. We are not told where the cables in question were laid, what they were used for, or, indeed, anything about them. Hence our contemporary properly remarks that, before any definite conclusions can be accepted one way or the other, it must be made clear that the discovery was not of the "mare's nest" order. When the conditions are established, the effect must be reproduced and accelerated, if possible, on selected

test lengths of cable, in order to get to the bottom of it. Meanwhile, it ought not to be difficult to find samples of electric light and power cables that have been at work for at least ten to twelve years, and ascertain whether they have suffered any real electrical or physical deterioration. Still, whatever may come for the moment of M. Rheins's announcement, those who are responsible for the money spent on electric cables should be advised against relying on the assumption that these things are everlasting. We do not know what goes on inside an electrical conductor; but we can at least surmise that a good deal of strain is put upon it somehow, and that this will be borne for any length of time without alteration in the nature of the substance is incredible.

The electricians have been meeting in congress in Paris, like all the rest of the scientific and technical world, and so paying homage to the great nation that has always tried to honour Science and Art above every other. The transactions of the congress were not particularly inspiring. The papers appear to have been of "fair to middling" quality; but their subject-matter was not of the highest importance. English electrical science was not so completely "out of it" as English gas engineering was at the gas technicians' congress; but American electrical work seems to have had no representation at all. This is to be regretted; because when all is said and done, England and America are the first workshops of the world, and have more uses for electricity than any other countries. There are many unsolved problems of electrical technics that might well have been discussed at an international congress. It should be recorded here that by far the most striking contribution to electric science for the year was the paper by Dr. Chunder Bose, of Calcutta, read at the British Association meeting. This remarkable paper goes to the heart of physical things in a way that makes the reader gasp and hold on to something lest he should fall into the Infinite. When it is stated that Dr. Bose actually treats of his successful experiments with an artificial retina, which responds to invisible as well as to visible lights, and "exhibits an automatic recovery," it is unnecessary to say more for the astounding character of his researches. One of our electrical contemporaries goes so far as to remark of Dr. Bose's results that they seem to bring us to the brink of a stupendous generalization in the physical sciences; and the observation is no exaggeration. Take this simply-worded statement: "I have been able to construct several curious receivers which are sensitive to radiation, and also exhibit an automatic recovery. One of these responds, not only to visible, but also to invisible lights. It is very strongly affected by electric radiation; the same receiver responds, not only to heat radiations, but also to different coloured lights. The action of this receiver is probably somewhat complex." Again, Dr. Bose has been led to regard some phenomena as containing the possibility of bridging over the gulf which separates physiological from psychological processes! He ventures upon an explanation, based on a physical analogy, of memory itself. He says, of certain phenomena, "it is difficult to draw a line and say 'here the physical process ends and physiological process begins,' or 'that is a phenomenon of inorganic matter and this is a vital phenomenon peculiar to living organisms,' or 'these are the lines of demarcation that separate the physical, the physiological, and the beginning of psychical process.' Such arbitrary lines can hardly be drawn." We must wait patiently for the development of these inferences, for they are scarcely more at present.

### GAS ACTS OF 1900.

THE following Acts relating to gas supply were added to the Statute Book last session:—

The Bedford Gas Act authorizes the raising of £40,000 of additional 7 per cent. ordinary or 4 per cent. preference capital. One-third borrowing powers are granted. Clauses are added requiring mains to be laid under the superintendence, and to the reasonable satisfaction, of the Borough Surveyor, and ordering a map of the mains to be deposited with the Town Clerk.

The British Gaslight Company, Limited (Staffordshire Potteries), Act authorizes the application of an additional capital sum of £75,000 to the station named. Of this amount, £50,000 is to be 5 per cent. capital stock of the Company; and the balance must be 4 per cent. loan capital—to be borrowed on the best terms obtainable at the time. The works are to be extended on lands to be acquired for the purpose.

The Cleethorpes Gas Act consolidates and converts the capital of the Company into a uniform 5 per cent. stock. This operation is not to increase or affect the borrowing powers of the Company. New stock to the amount of £60,000 is authorized, with one-third loan. The initial price is 3s. 9d. per 1000 cubic feet. [It was 6s. by an Order of 1879, now altered.] Additional gas lands may be acquired for the extension of the works, subject to a clause protecting the gathering-ground of the Great Grimsby Water-Works Company. Power is given to use pipes for ancillary purposes. The Company may deal in (not manufacture) gas-fittings. Prepayment for short-period gas supplies may be demanded, without the obligation to allow interest.

The Grantham Gas Act extends the limits of supply to include the parishes of Great Gonerby and Barrowby. The classes of shares in the Company are to be consolidated into an equivalent amount of 5 per cent. stock, with the addition of £45,000 of new capital. The borrowing powers are enlarged to one-third of the nominal amount of the consolidated stock created and issued.



The Company may deal in, but not manufacture, gas-fittings. The maximum price is reduced from 6s. to 5s. per 1000 cubic feet, for 15-candle gas. Clause 41 empowers the Company to specify the size and material of service pipes. This clause is in substitution for the proposal of the Bill to inspect consumers' internal fittings. The power has been restricted to the service pipe, the meter, and covered pipes on the consumers' premises. Appeal is to a Court of Petty Sessions.

The Hartlepool Gas and Water Act consolidates and converts the share capital of the Company into a 5 per cent. maximum ordinary stock, with the addition of £150,000 of new gas capital. The loan capital is in the proportion of one-fourth. The Bill proposed to raise £200,000 of additional capital.

The Kingston-upon-Thames Gas Act gives the Company the power to acquire additional gas lands, and extends the district of supply. The old capital is consolidated into 5 per cent. stock, with £107,500 additional. The Company can only borrow £33,333 in respect of the consolidated existing capital stock, inclusive of a present mortgage of £25,000; but on the new issue the loan may be one-third of the amount paid up. The old maximum price of gas (dating from 1854) is given up, and the sliding-scale enacted, with 3s. 6d. per 1000 cubic feet as the initial price, as asked in the Bill. Gas for the public lamps is chargeable at the lowest prevailing price. Pipes for ancillary purposes may be laid with the consent of the Local Authority. Gas of 15-candle power is to be supplied, tested on the works. Candles are to be used as the standard of light until Parliament or the Board of Trade shall order the adoption of another standard for testing London gas. One test only is to be applied, after the gas has been burnt for at least 15 minutes. No forfeiture shall be incurred for defect of illuminating power or purity assignable to unavoidable cause or accident; and in the case of an excess of sulphur, unless the accident shall amount to 2 grains upon the average of six consecutive days, or 10 grains upon any one day. In the event of the Gas Examiner finding any defect, he is forthwith to notify the fact to the Company. The Company may deal in, but not manufacture, gas-fittings. They may contract for the supply of gas in bulk beyond their district, but not to the injury of the district. Application may be made for an Electric Lighting Order, but not for Kingston or Surbiton without consent of the Local Authority. Clauses are inserted for the protection of the London and South Western Railway, and the Surrey County Council (in respect of main roads and bridges).

The Maidenhead Gas Act converts and consolidates the old capital into a uniform 5 per cent. stock, with the addition of £60,000. Only £10,000 may be borrowed in respect of the original consolidated stock of £56,800; and one-fourth of the amount of the new issue. The gas-fittings clause, as in the preceding Acts, is inserted. The sliding scale is enacted, with 4s. and 4s. 3d. per 1000 cubic feet as the initial prices of gas supplied respectively within and beyond a distance of a mile and a half from the Maidenhead Town Hall. Gas of 15-candle power is to be supplied, with no penalty for default ascribable to accident or unavoidable cause.

The Newport (Mon.) Gas Act extends the Company's district of supply, and consolidates the existing stocks and shares into a uniform 5 per cent. stock, with power to add £150,000. The borrowing powers are £48,530 on the old stock of £194,120, and one-fourth of the amount of the new issue. The Company are authorized to acquire the undertaking of the Caerleon Gas Company by agreement.

The Redhill Gas Act gives the Company compulsory powers to purchase lands for gas storage—subject to a clause protecting the Corporation of Reigate. Additional 5 per cent. capital is authorized, to the amount of £75,000, whereof not more than £30,000 may be raised as preference capital. Borrowing powers are one-third of the amount of the issue. The standard price for gas is 3s. 6d. per 1000 cubic feet within the borough, and 4s. beyond, with a margin of 4d. for reduction without corresponding increase of dividend.

The Rugeley Gas Act incorporates a Gas Company originally formed in 1847. The capital of the Company is £30,000, composed of: £20,000, representing the share capital of the limited Company; capital stock of £4000, representing the amount expended by the limited Company out of revenue upon extensions and improvements; and £6000, additional capital. The whole of this stock is to bear a 5 per cent. dividend. Clause 32 of the Act empowers the Directors, at their discretion, to annually appropriate out of the Company's revenue, and as part of the expenditure on revenue account, any sum not exceeding 1½ per cent. on the paid-up capital (but not exceeding £120 in any one year) to be called the "Renewal Fund," and to be chargeable with the renewal and repair of works and plant. The fund must be invested, and may be accumulated at compound interest until it amounts to 5 per cent. on the paid-up capital, after which the interest is to be carried to the amount available for dividend. The borrowing powers are one-fourth of the "original" capital of £24,000; and the same on the additional capital. [The converted stock is thus to be the datum for the loan capital.] The initial price is 4s. 3d. per 1000 cubic feet for 15-candle gas, tested on the works or within 200 yards from any part thereof. The Company are empowered to deal in, but not to manufacture, gas-fittings. The provision asked for in the Bill, for all consumers' connections to be made under the supervision of the Company, has been struck out. Discounts up to 20 per

cent. are sanctioned. The Company are authorized to apply for an Electric Lighting Order. The gas-mains are to be extended into any street within the district of the Urban Council, upon a sealed requisition by the Council guaranteeing for five years a profit return of 10 per cent. on the outlay. The Council may promote a Transfer Bill in any of the next five sessions of Parliament, without opposition except on clauses. In ascertaining the transfer price, the arbitrators are to proceed under the Lands Clauses Act, as for compulsory purchase. They are also to have regard to the value of surplus works. The Company are to receive the costs of the present Act; and the Council will pay all winding-up expenses, and the value of the stock-in-trade.

The South Metropolitan Gas Act varies the standard price of gas with the illuminating power. As from July 1 next, 15-candle gas is to be supplied at the standard price of 3s. 2d. per 1000 cubic feet. After July 1, 1905, the illuminating power is to be dropped to 14 candles, at a standard price of 3s. 1d. It is provided, however, that the reduction may be accelerated on giving notice. In testing the gas, it is to be burnt at such a rate as shall give a light equal to 16 candles, with a suitable chimney when the quality shall be reduced to 14 candles. On demand, the Company are to provide free of charge burners suitable for the grade of gas supplied. The Act authorizes the construction of a branch railway into the East Greenwich Gas-Works (subject to certain condition) within five years. It is enacted that the form of accounts published by the Company shall show the actual and nominal (converted) amounts of the ordinary capital and debenture stock upon which the Company pay dividend and interest.

The Wandsworth and Putney Gas Act authorizes the acquisition by the Company of additional gas lands, subject to particular conditions. Certain thoroughfares are to be stopped up. The existing capital of the Company is consolidated and converted into a uniform 5 per cent. stock; and the debenture stocks into a new 3 per cent. debenture stock. Additional capital to the amount of £300,000 is authorized, with one-third loan. The standard price of gas is unaffected by the Act. The Local Authority are to be notified of the laying of mains in undedicated roads. The sulphur impurity of the gas is not to exceed 20 grains in 100 cubic feet, subject to the Kingston provisions as to penalty. The Wandsworth District Board of Works may provide and maintain two testing-places for Wandsworth and Putney respectively. The Company convey to the District Board a piece of riverside land.

The Wolverhampton Gas Act authorizes the construction of new gas-works on a scheduled site—subject to the proviso that no chlorine or sulphuric acid shall be manufactured thereon, and that not more than 30 per cent. of the output shall be water gas. Any workmen's dwellings to be erected by the Company are to come under the local building ordinances. Additional capital to the amount of £140,000 is authorized—to carry a 6 per cent. ordinary or a 5 per cent. preference dividend, and one-fourth borrowing powers. A fittings inspection clause (as in the Rugeley Act) is inserted. No penalty for defective supply is to be levied in case of accidental or slight and unimportant shortcomings not materially affecting the value of the supply. The Corporation of Wolverhampton may during the next and succeeding sessions of Parliament promote a Bill to purchase the undertaking by arbitration.

The Metropolis Gas (Prepayment Meter) Act forms a class by itself. It enacts that gas supplied by the London Gas Companies through prepayment meters is not to be charged at a higher price than that otherwise supplied. A maximum surcharge of 10d. per 1000 cubic feet of gas is sanctioned for prepayment-meter supplies, which is to cover the providing of the meter and fittings and every other cost of the service. This rate is subject to revision by the Board of Trade, upon stated conditions, after seven years. Accounts to be rendered to prepayment-meter users must show clearly the charge for gas and the rate for the meter and fittings. The maximum charge for the hire of a prepayment meter without fittings is 10 per cent. on the cost of the meter to the Companies; and all the Acts applicable to ordinary meters apply so far as may be to prepayment meters.

**A Steam-Meter.**—In the abstracts from "Ingenioren," of Copenhagen, which have been published by the Institution of Civil Engineers, a description is given of a steam-meter of interesting construction designed by Herr A. Friedeberg, of Berlin. Its action is to condense and measure continuously a portion of the steam flowing through the main steam-pipe. Inside a horizontal length of the main a flap-plate suspended from a horizontal axis actuates, by means of an internal sector and rack, a conical plug-valve controlling an opening in the top of the main. When no steam is being used, the plate hangs vertically, and keeps the valve closed. When steam is flowing through the main, it turns the plate more or less towards a horizontal position—thereby opening the valve correspondingly; and the steam escaping through the valve is condensed in a worm. The water from the worm is either collected in a measuring tank provided with a gauge-glass, or is delivered on a bucket-wheel, the revolutions of which are indicated upon a counter arranged to show the corresponding quantity of steam flowing along the main.



## A SKETCH OF THE HISTORY OF THE GAS SUPPLY OF NEW YORK.

[SECOND ARTICLE.]

In June, 1863, a venture called the Anthracite Gas Lighting and Heating Company obtained from the Board of Aldermen of the City of New York a grant of powers to lay pipes in every street and public place under their jurisdiction, for a period of fifty years. This Company did nothing for eight years, and sold their franchise in 1871 to the Union Gaslight Company. Influential speculators and city politicians had discovered that there was money in gas franchises. Accordingly, in 1866 another Company—called the Mutual Gaslight Company—was brought out, and obtained a franchise for thirty years. Meanwhile, the Manhattan and all the other Gas Companies actually doing business in the city formally terminated their street-lighting contracts with the Corporation, which included the condition, originating with the formation of the Manhattan Company thirty years before, to supply the public lamps for \$15 a year apiece. They served the authorities with notices that, as from the beginning of 1865, their price for street-lamps would be \$53. Without showing cause for the opinion, Mr. Myers describes this joint action of the established Companies as part and parcel of the corruption that ruled the city affairs under the *régime* of the notorious "Tweed Ring." Yet he admits that the city authorities of the day objected to the increased charge, and only paid it after the Harlem Company had obtained judgment against them in the Superior Court and Court of Appeal. This does not look much like corruption, on either side. What it does indicate to us is that the Gas Companies declined to continue bound to light the public lamps at a loss, if the Board of Aldermen were bent upon inflicting competing concerns upon them. We also suppose that the Courts would not have supported the action of the Companies if it had not appeared right and reasonable in the circumstances. The price of \$53 per lamp continued in force until 1872.

In 1876, the Knickerbocker Gaslight Company came upon the busy scene; buying the franchise of the Union Gaslight Company, which was then in the hands of a receiver. The same year saw the birth of yet another Gas Company—the Municipal. These new undertakings meant business; the Knickerbocker setting the pace by paying their President a salary of \$500,000 a year, and dropping the price of gas to \$2 per 1000 cubic feet. This happened in 1878, and was the signal for an outbreak of cut-throat competition, during which some consumers got their gas for 75 cents per 1000 cubic feet. In a couple of years, the Knickerbocker Company were absorbed by the old Manhattan, and a pooling agreement was entered into by all the New York Companies. This arrangement, dated 1880, fixed the price of gas to private consumers throughout the city at \$2.25. A capital charge of \$1.25 per 1000 cubic feet of gas sold was set aside for dividend, and apportioned every three months among the Companies in proportion to their actual sales of gas. Competition for business was barred.

A new Company—the Equitable—was brought out in 1882, to get a share of the huge profits the Associated Companies were believed to be making. At that epoch, any Company could lay pipes in New York by consent of the Mayor, the Comptroller, and the Commissioner of Public Works. The Companies accordingly exerted their influence, and obtained the repeal of this ordinance by a vote of the Board of Aldermen. The Mayor, however, vetoed the repeal; and the Equitable Company obtained their franchise on the score of their offering to compete with the old undertakings. These adventurers engaged to pay into the city treasury 20 cents for every lineal foot of trench opened for their mains; to supply the public lamps at \$12 per annum; and to charge \$1.50 per 1000 cubic feet for gas supplied to the city buildings, and \$1.75 per 1000 cubic feet to private consumers. The Mayor—Grace—plumed himself on his share in this business. The Equitable Company built works and sold gas at the agreed price in 1884; but in the same year the Associated Companies united more closely, and formed the Consolidated Gas Company, with a nominal share capital of \$45,000,000. In the following year, a Committee of the State Senate investigated the affairs of this organization. The result was to show that the nominal capital was more than double the actual sum invested. It was also given in evidence that the cost of manufacturing gas in New York was only about 45 cents per 1000 cubic feet, and that nearly one-half of the gas-*rental* was clear profit. In consequence of this report, a Bill was brought into the State Legislature reducing the price of gas in New York to \$1.50 per 1000 cubic feet. The Bill was lost; but the following year another one was carried, cutting down the price of gas to \$1.25 per 1000 cubic feet. "This relief measure quieted public agitation for ten years." But it did not check the inroad of new Gas Companies, all anxious to pick up what profit they could at the legal price of gas. Among these were the Standard and the East River Companies; the latter with works at Ravenswood, and a tunnel for trunk mains under the East River itself. For this franchise, the Company engaged to pay into the city treasury a subvention of 3 per cent, on the gross receipts of the undertaking. The tunnel was destined to play a very important part in the final settlement of the New York Gas Question. In the meantime, though there was no actual cut-throat competition

as from the advent of the new Companies, the streets were grid-ironed with rival mains; and while ostensibly keeping to the legal price of gas, the Companies engaged in lavish canvassing, and beat one another down in various ways. Once more the Companies, or the majority of them, combined in 1896 and made a restricting agreement. They ceased canvassing, and paid off thousands of agents who had been employed in this way. Free gas-stoves and connections, and other baits for custom, became things of the past.

When the fresh combination became known, the State Legislature was again moved to inquire into the matter of gas prices, and eventually an Act was passed reducing the price to \$1 within five years, by yearly reductions of 5 cents per 1000 cubic feet. This is the law at the present time. In 1896, however, another bid for a franchise was made by a venture calling itself the Consumers' Fuel, Gas, Heat, and Power Company. The Board of Aldermen first granted, then withdrew, this ordinance. In January, 1898, the Equitable and the East River Companies amalgamated under the name of the New Amsterdam Gas Company. By this manœuvre for mutual protection, the only two Companies that were under obligations to pay anything into the city treasury for their franchises contrived to throw a veil over the extent of their liabilities in this regard. The one that had to pay on the mains will lay no more pipes; and the one that paid a percentage on gross receipts will never do any more business on its own account. Then came the last "rate-war" of 1899, which put an end to the division of interests in the gas and electric lighting of New York. Mr. Myers does not mention the Act of the State Legislature requiring the consent of frontagers to the grant of any new gas franchises; but until this law is repealed, the public will not be troubled with any more "grid-ironing" of the streets. He does mention a certain abortive "Astoria grant," which finishes his story. It is a tale of a Bill brought into the State Legislature, apparently on the orthodox English lines, to authorize the making of a tunnel under the East River, in order to connect proposed gas-works with pipes in New York. Mr. Myers complains of this scheme chiefly that it proposed to reclaim 16 acres of land actually under water, and not to make any compensation to the city. "At Governor Roosevelt's request, a special clause providing for a 3 per cent. payment was inserted. Even in this form, the Bill was bitterly attacked, as giving away a franchise worth millions of dollars." The Bill did not pass. Now the land in question is sold; but whether the purchasers are the Consolidated Gas Company or not, does not appear.

It seems a pity that Mr. Myers, who writes on this subject so intelligently and instructively, does not say outright whether he holds that gas franchises should be paid for, and in what manner. We in England hold that the statutory permission to trade is of no intrinsic value. There is no price for Acts of Parliament. If the business conducted under statutory permission prospers, the public get a return upon the value of the franchise, first, in the cheapness and goodness of the service rendered; secondly, in the rates and taxes paid by the undertakers. Is not this better than all the subventions on mains laid, or artificial charges on the gross receipts? To talk of a franchise for a competing gas supply to New York as "worth millions," is without meaning. What is the intrinsic value of a United States patent?

It further appears that the State Legislatures of America, with their power of fixing the maximum price of gas anywhere, have all that is necessary for the protection of the public against the effects of over-capitalization. It cannot matter to the public a jot whether the Consolidated Gas Company elect to pay dividends calculated on twice the amount of money actually subscribed, or on the real investment. The State authorities will get their taxes on the true value of the property; and the Legislature can order the Company to make the best they can out of gas sold at whatever figure they judge to be reasonable. There has already been talk of a Bill fixing the price of New York gas at 75 cents per 1000 cubic feet. At present, the law fixes it at \$1 as from the beginning of next year. There are probably a dozen men at Albany, the State capital, who could tell off-hand the lowest price at which the Consolidated Gas Company could afford to sell gas and pay an honest dividend. When such a figure is put into a Bill, that Bill passes. The Company may protest; but they will submit. Not so if the Legislature were to order a ridiculous reduction of price, at which the makers could not pay their way; but then, civilized Legislatures do not consciously pass unjust and oppressive laws.

These articles on the gas affairs of New York cannot be concluded without reference to the contemporary outbreak of a "war of rates" between the Gas Companies serving Chicago. There have been two leading Chicago Gas Companies—the People's Gaslight and Coke Company, and the Ogden Gas Company. Both undertakings possess franchises, and did a concurrent, if not exactly a competing, trade. The People's Company was the larger concern, and tried to buy up the Ogden property. For some unexplained reason, the bargain fell through; and then the People's Company schemed to bring out a third concern, called the Municipal Company, to compete at drawn daggers with the Ogden Company. The new comer was to take gas from the People's works, and distribute it at any price to be had, in the Ogden district. Not to be cornered, the Ogden people promptly dropped their price to 50 cents, which was one-half of the usual figure for Chicago. As the People's Company own that gas costs 62½ cents per 1000 cubic feet to make, both sides



must be losing money fast. Hundreds of men on each side are running mains everywhere, putting in connections, and pulling out the opposition meters. Naturally, the public are interested; and gas consumers are thinking of "free gas, or even better." The attention of the Illinois State Legislature might profitably be directed to this shocking waste of money. So long as competition in gas supply is permitted (even encouraged) by law, these financiers' attempts to put an end to it by the ordeal of battle may be expected. This is sufficient answer to those who imagine that competition in gas supply is not only expedient, but feasible. Capital, acting in this connection like a thing of sentient life, knows better. Capital, as we have already remarked, will submit to control, even up to the very limit of natural law in respect of profitable gas manufacture. It will take 50 per cent. dividends, if they are to be had; but it will accept 5 per cent. rather than nothing at all. It is intolerant of economically indefensible competition; and two gas companies, offering the same commodity in the same district, is a spectacle abhorrent to its sense of fitness. There is no excuse for it. Other means for protecting the public against the abuse of a natural monopoly must be found. Mr. Myers does not know of any that can be safely relied on, where the monopolists are recalcitrant, fraudulent, or simply stupid. "No doubt the reduction of the price of gas by the Legislature has been beneficial; but it is a method of control far from ideal." He is bold enough to declare that the plan of requiring a reduction of price after profits have reached a given figure is no better. It is a pessimistic conclusion; but we cannot find fault with it. A legislative assize seems the only practical check upon monopolistic greed or inefficiency.

#### RECENT NOTEWORTHY JUDGMENTS.

At the close of the judicial year, our contemporary the "Law Times" publishes a summary of the chief decisions which have marked the course of that year; and from the articles contained in our contemporary's issues for the 15th and 22nd ult., we take the following notes of those cases which are of interest to our readers. The majority of these decisions of the Courts have been already noticed or reported in our columns from time to time; but their collation may usefully recall the points involved, and also be of service for purposes of future reference.

**Workmen's Compensation Act.**—Appeals under this Act were, for the first time, dealt with by the House of Lords during the period under review. It was held by the final court of appeal that, where a workman who had sustained an injury had sent to his employers within six months thereof a notice of the accident, and also a notice that he claimed compensation, the requirements of the Act as to the claim for compensation had been met, notwithstanding that the initiation of proceedings in the County Court had been postponed until after the expiration of the six months (a). It has further been held (b) that the expiry of this period is not an absolute bar to proceedings, if the parties have agreed as to liability, but have held over the consideration of the amount. Such an incident would estop an employer from setting up as a defence that the request for arbitration was out of time.

A series of decisions (c) goes to show the meaning of the word "accident" within its signification in the Act of 1897. The essence of the whole matter is that there must be something fortuitous and unexpected in the occurrence of the injury. It is not an accident if injury be suffered by a man owing to his being in impaired physical condition. But, on the other hand, a misfortune which has happened to him, not caused primarily by his impaired condition, but, it might be, aggravated by it, would come within the conception of an "accident" in this particular Act.

One of the most important judgments decided, on the authority of the Court of Appeal (d), that a man must have been at least two weeks in the employment in which he is injured in order to be entitled to compensation. This point, and that raised by the decision (the reference to which is not given) that a man's dependants are not entitled to compensation in the event of his death by accidental injury unless he has been two weeks in the service of his employers, will probably ultimately reach the House of Lords; and we venture to think the judgments will be there reversed.

**Relief from the Rates for Men on Strike.**—The decision of the Court of Appeal (e) upon this question was one that attracted considerable notice, and may be said to be the only noteworthy judgment, apart from those already mentioned, bearing upon the relations between master and servant. Here the Guardians had been backing up the miners on strike by making allowances to able-bodied men who could, but would not, work; and an application was made to the Court to restrain such action. Lord Justice Romer, who first heard the case, held that Guardians need only satisfy themselves of the fact of destitution before affording relief. The Court of Appeal, differing, have held that relief may be given to the families of men on strike, or to workmen prevented from earning their living by a strike not of their making. Strikers, however, who can have work and will not do it are not entitled to be supported in idleness out of the pockets of the ratepayers. We commented at the time upon the difficulty of administering the poor law in accordance with this judgment. Our contemporary remarks that the decision "illustrates neatly

how great are the limitations to strict logic when administering the law of a highly civilized community."

**The Law of Cutting Off.**—It has been held by Mr. Justice Wright, in *Re Flack; ex parte Berry* (f), that where a person is adjudicated a bankrupt, and the trustee takes possession of his premises the water-rate upon which is in arrear, the company cannot cut off the water upon the trustee's refusal to satisfy the arrears; for the trustee is an incoming tenant, and not liable for them.

**Patent Law.**—The decision of Mr. Justice Buckley, in the case of *Welsbach, &c., Company v. New Incandescent, &c., Company* (g), which has figured largely in our columns, is briefly referred to by the "Law Times" as bearing upon the quantum and nature of utility necessary for the support of a patent. It is now held, says our contemporary, that a very small amount is required; and a patent only implies that an invention is better in some respects than what was existing, and not necessarily in every respect. Thus, if an article, good in itself, though it may not be so good as one previously known, can be produced more cheaply, there would be presented the element of utility; or, again, an article is patentable which gives purchasers a useful choice.

**Posting Allotment Letters.**—Mr. Justice Cozens-Hardy decided a point which is of some value as serving to emphasize the importance of care in the despatching of all letters, and especially of any the posting of which it may at some future time be absolutely necessary to technically prove. Those only who have had close acquaintance with the preparation of evidence in cases where it is essential to be able to prove the delivery of instructions or documents, know the enormous amount of trouble that is caused by the lax manner in which many companies allow the despatch of their letters to be effected. In the case referred to, A applied for shares in a company, but, changing his mind, wrote a letter withdrawing his application, which letter was duly posted, and was received by the secretary of the company. In the meantime, however, the allotment letters had been prepared; and, about an hour-and-a-half before the withdrawal was received at the company's office, they were handed to a postman outside St. Martin's-le-Grand, who, for a small fee, offered to take the letters inside. Owing to delay in the despatch of these letters, and consequently in their receipt by the applicants, A claimed the return of his deposit and the cancellation of the allotment made to him. The Judge held that A was entitled to claim for the removal of his name from the register, and for the return of his deposit (with interest at 4 per cent.), on the ground that the postman was not the agent of the Post Office for the purpose of taking charge of letters to post them, and that the letter did not necessarily become within the custody of the department directly it entered its doors. Consequently, the company failed to prove that the acceptance had been posted before 8.30 a.m., the hour at which the withdrawal had, it was proved, reached the secretary's hands.

In concluding its summary of the noteworthy decisions of the judicial year, from which the above notes are compiled, our contemporary remarks that "in wideness of scope the record for the past year will bear comparison with its predecessors. Imperfections exist in case-law, as in everything else depending on human endeavour; but the clean-cut language of a considered judgment—terse, clear, and decisive—compares very favourably with . . . some of the statutes of the present year of Grace. A perusal of the cases to which we have drawn our readers' attention renders it impossible to withhold a humble tribute of admiration for the intellectual forces there displayed—forces which must necessarily appeal with special power to lawyers who know the complexities of the subjects through which a plain path has been driven. However great this mental grasp, the public would not respect decisions were it not for the moral influence they possess. Both litigants and their advisers are conscious that our case-law, unlike our legislation, is unaffected either by fear or favour." That is an eulogium in which we can all join; the unfortunate fact is, however, for the litigant, that good law is often, if one may use the expression, bad justice.

- a. "Powell v. Main Colliery Company." (83 *Law Times Reports*, 83; [1900] A.C. 85.)
- b. "Wright v. John Bagnall and Sons." (82 L.T.R., 346; [1900] 2 Q.B., 240.)
- c. "Hensley v. White," "Lloyd v. Sugg and Co.," and "Walker v. Lilleshall Coal Company." (81 L.T.R., 767, 8 and 9; [1900] 2 Q.B., 142.)
- d. "Lysons v. Andrew Knowles and Sons, Limited." (82 L.T.R., 189; [1900] 1 Q.B., 780.)
- e. "Attorney-General v. Merthyr Tydfil Union." (82 L.T.R., 662; [1900] 1 Ch. 516.)
- f. 82 L.T.R., 503; [1900] 2 Q.B., 32.
- g. 82 L.T.R., 293; [1900] 1 Ch., 843.

#### THE PROFITS OF COAL OWNERS.

SOME time back we noted the profits that are being earned by certain colliery proprietors during their harvest time. What the sum total of all these profits has actually been we shall never know, as the majority of the mines are in the hands of individuals, or of private companies who do not publish their accounts. But the reports of those concerns in which the public are interested, serve as a very good indication of how coal-owners generally are faring. A recent issue of the "Economist"



contained an article giving some account of the profits earned by several of the principal colliery companies; and from this article we take the following particulars to supplement those previously given.

The great North-country firm of Pease and Partners was only turned into a public Company two years ago, with a share capital of £1,000,000, and debenture stock to the amount of £400,000. Those who subscribed the capital have reason to think themselves fortunate indeed, seeing that the profits for the year ended June 30 last (after writing off £15,600 for depreciation of leaseholds) amounted to no less than £350,919. That is to say that, after deducting £16,000 for interest on debentures, there remained a profit divisible among the shareholders equal to 33½ per cent. on their capital. With a prudent thought for the future—these halcyon days they well know cannot last for ever—the Directors have only paid a dividend of 20 per cent., putting £100,000 to reserve and £20,000 to other purposes, and carrying forward a balance to the next account. Another report—that of the Rhymney Iron Company, which is now, however, mainly a coal-owning concern—shows a profit of £111,498, “by far the largest ever earned by the Company.” The percentage of profit to share capital in this case is, however, only about 11½ per cent., over 5 per cent. of which has been carried to the reserve, depreciation, and debenture redemption funds. The Main Colliery, like Pease and Partners, have done much better than the Rhymney Company—earning 41½ per cent. on their share capital. They also have put by a nice little nest-egg for sustenance in the days to come, when “coal famines” shall be but a cherished memory. Over 20 per cent. on capital has been taken from the aforesaid profits and added to various reserve funds. The Fife Coal Company do not publish accounts, but give sufficient evidence of prosperity by paying a half-year's dividend at the rate of 50 per cent. per annum, which is a rate equal to the aggregate of that paid during the three preceding years. In other words, shareholders—if the present half year should yield a dividend equal to that for the past six months—will have received back the whole of their capital in four years, while still holding shares of a present market value four times as great as that at which they were originally issued.

We have heard a great deal of late about the “lean” times when coal mines have to be worked at a loss (that being a less evil than ceasing to work them altogether), and there have doubtless been such periods in the history of the coal trade. But, with the figures quoted at hand for reference, we shall feel little disposed to extend much sympathy to coal-owners when those times come again, as come they will, and that all the sooner because the advantage which the sellers have had over the buyers of coal this past year has been pressed to its extremity. To the investor, we should say, “Buy gas shares now, and coal shares two years hence; if you then hold on to both, you will always be sure of a good return from one or the other.”

#### GAS AND WATER INTERESTS IN THE NEW PARLIAMENT.

As the main object of the General Election, in the throes of which the United Kingdom now finds itself, is to elicit a definite expression of opinion by the country on the South African policy of the Government, internal and purely domestic subjects have not figured very prominently in the addresses circulated or the speeches delivered either by the members of the late Parliament or by those seeking a place in the new one. Although overshadowed by the larger questions at issue, those bearing upon the administration of home affairs have nevertheless been in evidence; and among them has figured that of the municipalization of gas and water undertakings. It may therefore be of interest to note how the welfare of these concerns is likely to be affected by the results of the elections, so far as they have been published.

It may be supposed that the question of the gas supply of the Metropolis will possess special attractions to the returned members of the Powers of Charge Committee of last year; but of the fifteen gentlemen who constituted that Committee, five—viz., Messrs. Brynmor Jones, Gilliat, Lowles, Pickersgill, and Steadman—have lost their seats. Of the others—viz., Messrs. Abraham, Baldwin, Banbury, Cohen, Lough, and Pirie, Sir J. Rankin (Chairman), and Sir F. Dixon-Hartland—have been returned, and Mr. Lough has already expressed his intention of not letting the gas question drop. The only really gas engineering member of the late Parliament, as far as we are aware—Mr. D. Ford Goddard—has not forfeited the confidence of the electors of Ipswich, with which town and its gas-works he has been associated all his life, and whose Chief Magistrate both he and his father have been. It is perhaps going too far to say that in the new Parliament he will have a professional colleague in Colonel Sadler, who has been successful in securing a majority of the suffrages of the electors of Middlesbrough. Seeing, however, that he is an associate member of the North of England Gas Managers' Association, and was President of that body in 1894, he may be said to be in close touch with the gas industry. He has deprived the borough of the services of Mr. J. Havelock Wilson, who will have more leisure to devote to his compeers of the sea; but when it is borne in mind that the new member is a large manufacturing chemist and coalowner, and has for nearly thirty years filled the positions of Councillor, Alderman, and

Mayor, is a Magistrate for Middlesbrough, the County of Durham, and the North Riding of Yorkshire, and also a member of the River Tees Commission, we think it will be acknowledged that he is eminently fitted to watch the interests of his borough and of the nation at St. Stephen's. Moreover, he is an ardent Volunteer, and possesses a highly genial temperament. Another new member connected with the gas industry is Mr. W. R. Plummer, who last week had such brilliant success at Newcastle-on-Tyne; getting in at the top of the poll. He is a Director of the Newcastle Gas Company, a member of the Corporation, and a very active man in the borough. As a large employer of labour in connection with both gas and water undertakings, we are gratified to find that Mr. John Aird will continue to represent North Paddington in the new Parliament. Mr. J. E. Spencer, of Wednesbury, retains his seat for West Bromwich. Sir James Joicey, Bart., the great North Country coal owner, has not been deprived of his seat for the Chester-le-Street Division of Durham by the Conservative candidate (Captain Nicholson), who polled only 5391 votes, against 5830 secured by Sir James.

With regard to water supply, Mr. E. Boulnois, the Chairman of the West Middlesex Water Company, and of the Staines Reservoirs Joint Committee, retains his seat for East Marylebone; and Lieut.-Col. Lockwood, who occupies a similar position in the East London Company, has been elected for West Essex. As Chairman of the Thames Conservancy Board, the unopposed return of Sir F. Dixon-Hartland for Uxbridge retains at Westminster a gentleman who is especially interested in the future of the London Water Supply. The London County Council have sought to increase their strength in the new Parliament; but have been unsuccessful. Mr. W. H. Dickinson, who has been Chairman of the Council and of the Water Committee, was unable, though he tried very hard, to shake the confidence of the electors of North St. Pancras in Mr. E. R. P. Moon, who is very popular, and who polled a majority of 711 votes; nor was Mr. T. McKinnon Wood, a prominent and active member of the Council, more fortunate in the St. Rollox district of Glasgow, although his opponent only counted 183 more votes. In addition to failing to secure these two seats, the Council have lost two in the Metropolis. Mr. Stuart has been superseded in Hoxton by the Hon. C. G. Hay; and Mr. Steadman at Stepney, by Major W. E. Gordon. Mr. Stuart's defeat is a distinct misfortune to the Council, as he was their spokesman at Westminster and took charge of their Bills; and, on the whole, it must be acknowledged that he was well qualified for the duty. Mr. Burns has come off better at Battersea; so that the Progressives on the Council will not lack a representative. As bearing upon the London Water Question, we note that the Hon. W. F. D. Smith (Strand), the first member elected to serve in the new Parliament, agrees with the conclusion of the report of the Royal Commission, and thinks the water undertakings should be transferred to a public authority.

Other names with which readers of the “JOURNAL” are familiar have been more or less prominent in connection with the election. Mr. Will Thorne, the General Secretary of the Gas Workers' Union, put up for West Ham, in opposition to Major Banes; but the electors would not have him. Mr. Keir Hardie, the Secretary of the Miners' Union, and a prominent Labour member, failed at Preston, but managed to get in for Merthyr Tydfil. Mr. A. D. Provand, who has lately taken up the coal question, with the view of having a Royal Commission appointed, will no longer represent the Blackfriars division of Glasgow; and Mr. Geoffrey Drage, the Secretary of the Labour Commission, has lost his seat for Derby. On the other hand, Mr. W. R. Bousfield, Q.C., whose name has lately been much before our readers in connection with the incandescent gaslight litigation, has been again returned for North Hackney, with a majority of 2568 over his Radical opponent.

#### PERSONAL.

Mr. J. B. TERRACE, of Brechin, has resigned the post of Manager of the Gas Company there, which he has held for many years.

Mr. J. A. KELMAN has resigned the secretaryship of the Gas, Water, and General Investment Trust, Limited, and accepted a seat upon the Board.

In our account last week of the visit of the Society of Engineers to Beckton, an incidental reference was made to the long association with the Society of Mr. PERRY F. NURSEY. That connection has extended to a longer period than we then imagined, although we were aware, from our own knowledge, that many years must have passed since it commenced. We learn that last Friday Mr. Nursey reached his seventieth year, and his forty-second year in the service of the Society, in one capacity or another. It has been, as he himself says, “an intermittent service of pleasure.”

Mr. SIDNEY EVANCE STEVENSON has been selected to fill the position of Engineer and Manager of the Devonport Gas Company, in succession to Mr. Richard Clark, whose death was announced in the “JOURNAL” for the 25th ult. We understand that there were 71 candidates for the appointment, in response to the invitation which appeared in our columns. Mr. Stevenson had arranged to take up his duties yesterday. He will bring to the discharge of them wide and varied experience acquired in this and other lands during the past twenty-five years, as



well as the prestige which the name he bears carries with it. Shortly after his admission to the British Association of Gas Managers, in 1877, Mr. Stevenson was engaged at the Exeter Gas-Works, where he remained for about four years. He then moved to Lincoln, and subsequently, in 1884, to Colchester, where he filled the position of Engineer and Manager of the Gas Company. In March, 1889, he left England for Canada, to take charge of the Montreal Gas-Works; but he returned at the expiration of five years to proceed to South Africa as Manager of the Cape Town and District Gas Company. This appointment he relinquished early in the present year, and left the Cape for England on the 31st of May; his successor being Mr. E. P. Reilly, of Guildford. We offer our cordial congratulations to Mr. Stevenson on being once more in a position to exercise his abilities as a Gas Engineer, and to the Directors of the undertaking who have secured his co-operation in carrying out the technical details of its management.

#### OBITUARY.

The death is announced of Mr. J. F. WILEMAN, the Chairman of the Staffordshire Potteries Water Company. Deceased was an Alderman of the Staffordshire County Council, and had been on the Commission of Peace for Staffordshire since April, 1876.

We record, with sincere regret, the death, on the 3rd inst., at the advanced age of 82, of MATILDA, the wife of Dr. W. Pole, F.R.S., for many years one of the Metropolitan Gas Referees. The deceased lady was the daughter of the late Rev. Henry Gauntlett, Vicar of Olney, Bucks.

One of the veterans of the gas profession passed away last Thursday in the person of Mr. BARTHOLOMEW GAY VENNER, who had been Engineer and Manager of the Eton Gas-Works for a period of 45 years. Deceased was one of the earliest members of the British Association of Gas Managers, having joined it in 1869; and his connection therewith was severed only two years ago. Deceased was in his eightieth year.

Mr. JOHN BAIRD, the venerable Chairman of the Brompton, Chatham, &c., Water-Works Company, died last Wednesday morning at his residence, Deskford Cottage, Gillingham, at the age of ninety years. Mr. Baird was one of the founders and original Directors of the Company, which was formerly known as the Brompton and Gillingham Consumers' Water-Works Company, and was established in 1856 to provide water for Old Brompton and the neighbourhood. In 1860 the Company was incorporated by Act of Parliament, and the area extended so as to include Chatham and Rochester. Mr. Baird had been Chairman of the Company continuously since 1866, and had always taken a keen interest in its progress—being almost a constant visitor at the offices and works. Mr. Baird was High Constable of Gillingham on two occasions, and for about 25 years Chairman of the Medway Board of Guardians.

News of the death, last Tuesday, at the age of 52, of Mr. CHARLES H. BINGHAM, a prominent citizen of Sheffield, came with a shock of painful surprise to the whole city when published the next morning. The sad event calls for notice in our columns from the fact that some years ago Mr. Bingham's name figured rather prominently therein in connection with his dispute with the Sheffield Water Company on the question of the supply of water to baths. In the test case which arose out of the dispute, the Company claimed a declaration that they were not bound to supply water for private baths except on the terms of the consumer providing, at his own expense, a meter or other automatic self-registering instrument for the accurate measurement of the water used. The Court decided in their favour; but Mr. Bingham's action resulted in the Company's scale for baths being reduced by about 50 per cent. Deceased, who was one of the heads of the firm of Messrs. Walker and Hall, was elected Master Cutler in 1894.

**Injecting Cement with Compressed Air.**—Injections of cement have long been employed for stopping cracks in masonry; but the operation has been performed from the surface to the inside. The "Annales des Ponts et Chaussées" mentions the following method devised by M. Caméré, who works the reverse way. He makes vertical channels in the new masonry, 12 centimetres in diameter, into which cement is injected by the aid of air under a pressure of 1 kilogramme per cubic centimetre. The system can, it is stated, be applied for the consolidation of masonry in bad condition.

**The Welsbach Company's New Price List.**—We have received from the Welsbach Incandescent Gas-Light Company, Limited, their catalogue for the forthcoming season. It furnishes evidence of the ability of the Company to offer to the public a large variety of burners, mantles, globes and shades, pendants, and other accessories of incandescent gas lighting. In addition to the illustrated particulars relating to the above articles, comparisons are made between the cost of incandescent, ordinary, and electric lighting, by which the economy of the first-named system is abundantly proved. The catalogue is specially valuable to gas managers, as it not only supplies them with examples of the latest types of appliances used in connection with the incandescent system, but also with figures by which they may easily demonstrate to their consumers the advantages resulting from its adoption.

## COMMUNICATED ARTICLE.

### PRACTICAL NOTES ON GAS MANUFACTURE.

By S. CARPENTER, of East Ham.

(Continued from p. 836.)

#### TESTING AND TEST-PAPERS.

It is necessary that the gas should be tested for sulphuretted hydrogen and carbonic acid at the inlet and outlet of the scrubbers. The instrument employed is the eudiometer; and the process is as follows: Take a portion of the gas into the eudiometer, add a solution of acetate of lead, and well shake it up with the gas. Put the eudiometer in water, and let it remain there for three minutes; then take it out, and read off the amount of absorption, which will give the percentage of sulphuretted hydrogen. Add a few drops of a strong solution of caustic potash to the gas, and shake well; then stand the eudiometer in water for three minutes, and read off the absorption, which will give the percentage of carbonic acid. The test at the outlet of the scrubbers will show the percentage of impurities taken out of the gas by the water in these vessels. At the same time the gas should be tested at this point with red litmus paper, to see if there is any ammonia in it. If there should be, the paper will turn blue. Then examine the scrubbers, and see if they are working properly. Before passing into the lime purifiers, the crude gas should be tested for bisulphide of carbon. Prior to this operation, it should be sent through a small purifier charged with oxide of iron, to remove the sulphuretted hydrogen. It should likewise be tested for carbonic acid and bisulphide of carbon at the inlet and outlet of the first lime purifier; and the difference between the two testings will give the percentage of the latter impurity which has been taken out by the lime. There should be a lime-water test for carbonic acid in the middle and at the outlet of the purifier. If the water becomes milky, carbonic acid is present. The gas at the outlet of the second lime purifier should be tested for bisulphide of carbon in the same manner as the first. This will give the percentage of bisulphide in the gas at the outlet of the second lime purifier.

When the bisulphide of carbon is as high at the outlet as it is at the inlet of the first purifier, or if carbonic acid should make its appearance at the outlet, the vessel should be thrown out of action. If the crude gas is allowed to act upon the foul lime, a newly-formed impurity, called sulpho-carbonic acid, will appear, and the quantity of sulphur will be very great. It will not only give high sulphur results at the outlet of the first purifier, but will interfere with the lime in the second. The writer's experience is that when the sulphur at the former point is as high as it is at the inlet, that purifier should be thrown out of action, and the second vessel made the first—a clean lime purifier being put on for the second. The gas should be tested for sulphur at the outlet of the second purifier.

From the outlet of the lime purifiers, the gas should be passed through a series of vessels charged with oxide of iron, for the purpose of taking out the remaining sulphuretted hydrogen. About  $1\frac{1}{2}$  to 2 per cent. of atmospheric air should be passed into the first oxide purifier with the gas. This will keep in an active state the oxide of iron, which will purify much more gas. The gas at the outlets of the oxide purifiers should be tested twice a day for sulphuretted hydrogen, and once at the outlet of the last oxide purifier for bisulphide of carbon. It is an excellent plan to have a test for the former impurity on the outlet of each oxide purifier. This can be easily done by taking a piece of glass tube, an inch in diameter, inserting a strip of paper saturated with a solution of acetate of lead, and passing about a cubic foot of gas per hour through it.

To prepare the lime water for testing gas, take a gallon of water, and drop into it about 4 oz. of quicklime. After it is dissolved, decant the clear fluid, then filter it, and put it into a glass bottle. It will then be ready for use when required. To prepare the test-papers for sulphuretted hydrogen, add one part of sugar of lead to eight parts of water, and when the lead is dissolved, moisten some sheets of bibulous paper with the solution. Let them dry, then cut them into small strips, and put them into a glass bottle, ready for use. Blue litmus papers are made by taking a solution of blue litmus, and a few drops of very dilute sulphuric acid, and saturating some paper with the solution to such an extent as to leave it slightly red when dry. Cut it into small strips, and put them into a dark glass bottle, when they will be ready for use.

To test gas for carbonic acid, take a small quantity of the lime water in a beaker. If there should be any carbonic acid present, the lime water will become milky. When testing for ammonia, the red paper will become blue if there should be any of this impurity. When testing for sulphuretted hydrogen, its presence will be shown by the white paper turning a dark brown. On testing for bisulphide of carbon, the Gas Referees' sulphur test should be used.

#### THE MANIPULATION OF LIME IN PURIFICATION.

It appears that at present hydrate of lime used dry is the most effectual, economical, and least hurtful agent to which impure gas can be subjected. No practical man will venture to deny (in fact, those who are best acquainted with purification



will be the first to declare unanimously) that lime is the only substance which will effectually remove the chief impurities of coal gas without causing so serious a lowering of its illuminating power as to require the introduction of a new element in the calculation of the cost—that is to say, the employment of cannel coal, by way of compensating for the loss caused by other purifying agents than lime. In the preparation of this valuable purifying material, take a bushel of quicklime (commonly called "unslaked" lime), properly burnt from good chalk, and weigh it. Its weight should be from 56 lbs. to 60 lbs.; if it is more than from 58 lbs. to 62 lbs.—say, from 66 lbs. to 68 lbs.—the chalk has not been properly burnt, or it may have been of inferior quality. Spread out the lime, and water it. It will take from 4 to about 5 gallons of water to slake a bushel. After it is well slaked and mixed, a bushel should weigh from 32 lbs. to 34 lbs. Take a handful and squeeze it; and if it adheres, it will be the required consistency, and fit for the purifier. Then slake a yard of the same lime, which will take from 85 to 90 gallons of water. In slaking, spread the lime on the floor in a layer about 6 inches thick and about 10 feet square; then water it, and put on another layer, treating it in the same way. Continue doing this until the lime is about 4 feet high, and let it remain until it is thoroughly slaked. Then turn it over, and well mix it. Good lime is soft to the hand; if when slaked it has a sandy feeling, is not good for purification purposes.

(To be continued.)

## NOTES.

### The Softening of Feed-Water.

Mr. J. A. F. Aspinall has given a paper to the International Railway Congress descriptive of the various means adopted by a number of Railway Companies for softening the feed-water supplied to their locomotives. How important this matter is to steam-users on a large scale, need not be emphasized. In the Argentine, a water supply of 25° of hardness, chiefly temporary, is reduced to 9·8° of hardness by the use of the Tyacke apparatus. This process consists in the rated addition of quicklime and caustic soda to the water. The Southern of Austria railway uses the Beranger and Stingl apparatus; the reagents being milk of lime and soda, with subsequent filtration. A hardness of 44·64° is thus reduced to 11·7 per cent. Very much the same appliance is used by the French State railways. On the Eastern of France, if the hardness does not exceed 35°, soda alone is used. If over this, milk of lime is added to separate the bicarbonate of lime. The London and North-Western Railway use the modified Clark process, reducing the total scale-forming matter from 19·5 to 3·1, and the total hardness to 3·6°. The Midland Railway employ the Archbutt-Deeley process, which is a rapid and economical one, reducing the total scale-forming matter from 13·16 to 2·68. Some Austrian and Russian lines use petroleum, for the sake of its mechanical action, which prevents the adhesion of the precipitated matter by coating every particle with a skin of oil.

### Coke Fired Motor-Vans Successful.

It has been stated, and the statement has been widely circulated, that the experience of the Chiswick Sanitary Authority is unfavourable to the use of motor-vans for dust collection. Mr. E. Shrapnell Smith has given the Association of Cleansing Superintendents of Great Britain, meeting at Salford, a different view of the matter. He criticizes the Chiswick returns, and sets against these some encouraging figures supplied by Mr. Arthur Ventris, the Engineer and Surveyor to the Strand Board of Works, whose smart-looking motor dust and watering vans are well-known objects of the streets lying between Covent Garden and the River Thames. A saving per annum of £173 per motor is claimed for these machines, for which perhaps the excellent organization of the work is partly responsible. It is agreed, moreover, that steam is the only mechanical power within the range of practical politics, and that solid fuel—coke for choice—is more economical than oil fuel. The machines are high priced; but their working capacity is declared to be in proportion. It should not be overlooked, however, that the Strand vehicles scarcely ever go off wood pavement. The rules for the economical employment of motor dust and water vans are: The concentration of sufficient men upon it to allow of its large capacity being fully utilized; the prompt execution of repairs, and periodical tightening of the wheels by a hydraulic tire-setting implement; the working of the motor two shifts a day. After all, these rules only mean that a motor-van, like any other labour-saving device, requires to be driven to its fullest capacity to pay.

### A Cheery View of the National Coal Resources.

In his Inaugural Address as President of the National Association of Colliery Managers, Mr. Rhodes touched upon the lugubrious statements that have been made from time to time with regard to the approaching exhaustion of the British coal-fields. Mr. Rhodes did not take this pessimistic view of the question. He particularly objected to the proposed restriction or total stoppage of the export of British coal, declaring that such a suggestion will never be entertained, except possibly with regard to the Welsh smokeless steam coal. This, being limited in quantity and invaluable for naval purposes, should be bought up by

the nation. But to put a stop to or any limit on the exportation of coal generally would mean reducing the means of livelihood of 600,000 coal miners and their families, which would entail the immediate interference with the means of support of 3,000,000 of the industrial population. Quite apart from the consideration that it is possible to think too much of posterity, Mr. Rhodes holds the opinion that the coal resources of the country are very, very much greater than is generally supposed. While it is true that a calculation which it is easy to make will show that, at the present rate of production, the best seams will be exhausted in from 200 to 300 years, yet there are a large number of seams of coal in reserve which can be worked under very much more favourable conditions than the seams actually being got in Belgium and France. These seams will undoubtedly come into use when the better ones are exhausted. In normal times, they cannot be worked in competition with the better-class seams, because a difference of a shilling a ton in working cost would be prohibitory. But it is an undoubted fact that there are seams which will be available, and will be worked for many hundreds of years after such seams as those of the Barnsley bed are exhausted. This declaration of opinion was very warmly applauded by the meeting.

### A New Liquid Fuel Burner.

Mr. G. Denis has reported in the "Petroleum Review" on the working of the Peterson-Swenson patent liquid fuel apparatus. This is an appliance for burning liquid fuel, for steam raising, in a way that substantially differs from the ordinary, by pulverizing the fluid by pressure only. Most atomizers, as is well known, work by steam or air injection, to both of which there are grave objections. The appliance now in question comprises a strong copper cylinder, through which the controlling needle passes centrally, finished off at the head with a steel cap having a central hole for the oil spray, and provided with a side pipe connection for admitting the oil from the pump. That is nearly the whole of the arrangement, besides the usual accessories of boiler-furnace attachments, and so forth, which are not peculiar to it. One speciality, however, is an adjustable grooved screen fixed in front of the outlet for the oil-jet, and inclined upward at an angle of 45°. This is relied upon to form the spray for ignition in the furnace. The oil is pumped into the apparatus by a small Worthington steam-pump with 3-inch steam and 1½-inch oil cylinders. It is delivered at a pressure of 200 lbs.; and the spray is stated to account for 25 gallons of oil per hour. Two or more sprays can be fitted into a Cornish boiler furnace lined with fire-bricks at the point of ignition, and for a distance of about 8 feet inwards. This lining soon gets white hot, materially assisting the rapid and complete combustion of the oil. There should be a fire-brick bridge at the end of the chamber; and the oil should be preheated by the exhaust. In a test cited in detail, the equivalent evaporative duty of the oil was about 12½ lbs. per pound of fuel. The expense of the apparatus is represented by the quantity of steam used in working the oil-pumps, which is returned as averaging 0·31 per cent. of the total generated, or 0·039 lb. per pound of fuel treated. Natural chimney draught was used, at from 8 to 10 millimetres vacuum. There is no noise; and the air regulation showed a theoretical excess of 36 per cent., which is about right for the best working with liquid fuel.

### Xylozited Timber.

A process of preserving timber has been brought under our notice by the Xylosite Company, who have works at Pitlake, Croydon. It is claimed for the process that it increases the life of all timbers, especially soft woods, without any of the consequential disadvantages of the most successful older preserving processes, such as creosoting. The treatment does not discolour the wood, leaves it odourless, and reduces its inflammability to a minimum. It is due to the study and perseverance of Mr. Fritz Hasselmann, a German engineer and architect, and consists essentially in boiling the timber in a saline solution under moderate pressure. The impregnating materials are the sulphates of copper and iron, crystallized together in the proportions of 20 per cent. of copper and 80 per cent. of iron, with alumina and "kainit"—a commodity hitherto only known to commerce as a manure. The proportions of the salts in the preserving bath, its temperature, the time of boiling, and so on, are adjusted to the requirements of the sample of wood to be treated. It is an understood fact that the salts of iron and copper will preserve timber, provided they can be thoroughly and evenly distributed throughout it, and kept there. Both these necessary conditions are stated to be fulfilled by the process. The sap is dissolved and carried off in the liquid bath—the copper destroying all putrefactive germs; and the iron remaining in chemical combination with the cellulose, or nature of the timber, which is insoluble in water. The metallic salts are not mechanically deposited by the evaporation of the liquid that previously held them in solution; nor do they recrystallize in the cells and sap-ducts of the wood. A microscopical examination of the treated wood shows the cells and sap-ducts to be perfectly free of crystals; while the presence of iron throughout the timber can be demonstrated by the usual simple chemical tests. The efficacy of the Hasselmann process is certified by Dr. Roesler, of the Imperial and Royal Testing Establishment, Klosterneuburg; and it has been largely adopted for the South German Railways. Xylozited wood is claimed to be a complete answer to the request contained in a "Note" published in the "JOURNAL" for Aug. 28.



## THE INTERNATIONAL GAS CONGRESS.

### METHODS FOR GIVING STOKERS AN INTEREST IN THEIR WORK.

By I. HEDDE, of Paris.

[A Paper read before the International Gas Congress in Paris.]

(Concluded from p. 842.)

#### II.—PROVIDENT INSTITUTIONS.

No man who has had the management of workpeople for any length of time will dispute the fact that the tramp who lives from hand to mouth, and only stops on his way to find his daily bread as best he can, does not do such good work as the workman who has been made steady and economical, thanks to the provident assistance of the employer. The tramp only looks for the immediate wages which enable him to meet the needs of the day. He cares nothing for good workmanship and the prosperity of the works. He is generally miserable; and, as poverty is a bad councillor, he is, as a rule, hostile to the master, with whom he has never had any relations beyond receiving wages in exchange for labour. Payment, he considers, cancels all obligations; though, in most cases, the workman stigmatizes the master as a fraud. The permanent economical workman, on the contrary, who is, of course, temperate, preserves his physical strength better, studies his master who takes an interest in him, and endeavours to do his work as well as possible so as to give satisfaction. He sees his lot improved by economy; and, encouraged by the certainty of his next day's bread, he will perform his task with so much greater spirit. It is not then from a purely sentimental and philanthropic point of view that provident institutions should be considered, but also as the most reliable means of forming a really devoted and capable staff at the works.

Among these provident institutions, I shall merely mention those for gratuitous or cheap lodgings, savings banks, sickness, and old-age pensions—insurance against accidents having been dealt with by the law of April 9, 1898. However, even if people generally agree as regards the advantages of provident institutions, opinions are various on the question as to the possibility of all works adopting them, and the best means to employ.

I shall begin—thus completing the above inquiry—by recalling the schemes which have been established by two companies whose names I can mention, as the documents supplied to me have been published—viz., the Paris Gas Company and the Mans Gas Company.

#### Paris Gas Company—Stokers' Wages and Premiums.

1. The retort-house hands (stokers, luters, &c.) are paid by the piece, at the rate of 3'30 frs. per metric ton of coal carbonized (the charge is more or less great according to the degree of heat of the furnaces). The three stokers also receive a premium of 0'50 fr. for the scoop-handle holder and 0'25 fr. each for the two others. The men who wheel the coals and coke do not form part of the furnace staff, and receive fixed wages.

2. All the workmen are given a premium, in kind, in addition to their wages—viz., 4 hectolitres of coke per month in winter, and 2 hectolitres per month in summer.

3. At the end of each term they also receive a share in the profits of the Company, representing more than 0'30 fr. per day of work.

4. The furnace men pay 0'07 fr. into the provident funds per day; and when sick they receive a daily allowance of 3'50 frs., and also medical and other necessary attendance.

5. Workmen who are recommended by the position of their family, and the time and nature of their services, receive from the Company a supplemental allowance equal to that from the provident funds.

6. Workmen have the privilege of depositing their savings to the extent of 500 frs. in the savings bank, for which interest at the rate of 5 per cent. is paid.

7. Without making any deductions, the Company accord pensions of 600, 700, and 800 frs. after 25, 30, and 35 years' service—the age of the workmen being at least 55, except in the case of a workman incapacitated by infirmity.

The widows and young children of pensioners receive one-third of the pension paid to the workman, provided that the widow married at least ten years before retirement of her husband, and that the orphans have no mother, or if she is unfit to receive the pension.

The report for the year 1899 gives the following details regarding the working of these banks.

*Provident Bank.*—It is supported by a deduction of 1 per cent. from the attendance tickets of the Directors, from the salaries and wages paid, and by an equal subsidy from the Company.

The expenses for the year 1899 were 555,994 frs. The excess of expenses over receipts has been debited to the works' accounts.

*Savings Bank.*—The object is to facilitate, without expense or loss of time, the investing of savings from wages, and pay an interest of 5 per cent. On Dec. 31, 1899, the deposits of the employees and workmen amounted to 290,486'21 frs.

*Pensions Fund.*—In 1899, the following sums were paid by the works: 1. For old-age pensions granted since Jan. 1, 1893 (the

starting point of the working of the funds), 112,170'96 frs. 2. For the annual renewable relief money granted before Jan. 1, 1893, 31,371'51 frs.—a total of 143,542'47 frs. To provide the capital necessary to pay the pensions after Dec. 31, 1905 (the date of the end of the concession), the sum of 121,721'44 frs. has been charged to the works' accounts.

#### Mans and Vendôme Gas Company.

*Wages.*—Stokers receive fixed wages, in addition to which those at the Mans works who attend to the regenerative furnaces receive a premium of 0'75 fr. In order to remunerate the extra labour due to the increase in the number of charges, each stoker is awarded a daily premium varying from 0'25 to 0'75 fr. The total of the premiums may amount to 273'75 frs. for each stoker. During the periods of military instruction, the chief workmen receive full pay; the others, half pay if bachelors or widowers without children, and full pay if married or widowers with children.

*Stoking.*—The following monthly allowances are made to each workman: 3 hectolitres of coke during the six winter months, and 2 hectolitres during the rest of the year.

*Participation in Profits.*—The staff employed (foremen and workmen) receive 5 per cent. of the net profits after deduction of the prescribed sums for the formation of the reserve funds, and the amount required for paying the shareholders a first dividend of 5 per cent. The money is divided among the men proportionally with the year's salaries and wages; and the amount due to each is paid into the savings bank and entered into a special book.

*Sick Funds.*—A sick workman is attended to at the expense of the Company. He receives half his wages all the time he is ill; and, if he dies, he is buried at the Company's expense.

*Assistance for Children.*—In 1878, the Company gave each of the workmen's children an old-age pensions fund-book with an entry of 20 frs. Since then the workmen pay annually to the credit of each child a minimum sum of 10 frs. until the child is old enough to earn its living. The Company pay an equal amount for the benefit of each child. The payments are made out of the reserved capital.

*Pensions.*—Since 1899, the Company have replaced the gratuity pass-book by a system of pensions without any deduction from the wages. The amount paid at Dec. 31, 1899, for pensions to 73 old workmen was 104'26 frs. each, and also 4604'66 frs. was credited to 34 old workmen who have retained their gratuity pass-books. At the end of each year, the Company pay to the National Old-Age Pension Fund, on the individual pass-book of each participant, 8 per cent. of his wages, if he has been at least one year in the works, and 10 per cent. for ten years' service. The age at which the old-age pension is payable was fixed at 57 years. In the event of the Company abandoning the works, they would also stop payment. These institutions represent an expenditure by the Company of about 30 per cent. of the total wages. Some workmen have secured a patrimony for their children, and there has never been any stoppage of work or a strike—the understanding being perfect between the Administration who give such tokens of solicitude for the employees and the workmen who in return do not spare their zeal.

#### III.—DISCUSSION OF THE MEANS INDICATED AND PROPOSED SOLUTION.

##### Premiums on Work.

The inquiry which forms the first part of this essay demonstrates that premiums on manufacture are paid with success in a number of works, while in others, on the contrary, they gave no results. Application of the system, in fact, depends upon complicated factors, the chief of which are:

*Size of Works.*—In large establishments, where the system of work is by the piece, the individual premium on the coal carbonized has no reason for existence; and the total premium on the gas is so much the less efficacious as the number of settings, the production of which is registered by one station-meter, is greater. Only the foremen or furnace superintendents can have any interest in the yield of gas. It is in average-sized works that premiums on manufacture are most common. The results will be so much the better according as the service of the settings is better organized with a view to premiums and as the manager makes the stokers clearly understand the advantages; and finally according as he verifies that the premiums have been accurately calculated and that the stokers have been rightly informed. In small works, where supervision and inspection do not exist, nor even, very often, the weighing of the charges of coal, only simple premiums can be applied which do not require calculation or settled agreement; and yet even these are efficacious when judiciously applied like that mentioned in reply A.\*

*Type of Furnaces.*—With regenerative furnaces, the temperature, which is the most important factor in gas-yields, does not depend upon the stoker, because the dampers are regulated by the retort-house foreman, who alone inspects and moves them. Consequently, premiums depending on the yield of gas seem more suitable for ordinary furnaces, in which the management of the fires requires less attention from the stoker than with regenerative furnaces.

*Character of the Workmen.*—In some places, the intelligent,

\* See ante, p. 839.



industrious workmen will be stimulated by a premium; in others, stupid and indolent, they will not be influenced. Thus premiums generally give good results in the North and East. Replies L and N seem to indicate that it is not so elsewhere; and replies K and L clearly demonstrate this difference of local temperament. I would make the following observations regarding the various systems of premiums.

*The Premium for Assiduity* is universal, and everywhere gives good results. It is just, because the stoker becomes more valuable the longer he remains in the works; and if later his value remains stationary or commences to decrease, it is an encouragement to permanent work and a recompense for services rendered.

*Premium on Coal Carbonized*, which really is only paying by the piece, justly remunerates the workman for his extra labour. It has the advantage of being individual, and easy to apply; but it has the inconvenience of inducing the stoker to put the greatest amount of coal possible into the retorts. It must therefore be supported by strict supervision by the foreman, so as to reduce the charges according to the temperature of the furnace, and inflict fines for retorts not properly worked off.

*Premium on Gas Manufactured* is given either for the total production or the amount in excess of a fixed quantity, according to the type of furnace, kind of coal, &c. This premium, which has the drawback of not being individual, and depending on the kind of coal, is simple in application, and has the advantage of bearing directly upon the final result to be secured—viz., production of gas—and thus interesting the stoker in maintaining the temperature of the setting, and the good condition of the furnace and retorts, proper distribution of the charge, &c. Replies K and L give the application of the premium to the production of gas per retort above a fixed quantity, which has the advantage of encouraging the stoker to increase the charge, and consequently employ a minimum number of retorts. Reply K gives the fullest details regarding this premium, and demonstrates its advantage with wonderful precision.

*Premium on the Yield of Gas* is simple in application, and generally gives good results. Replies P and Q, it may be noticed, provide for the excess of yield detrimental to the illuminating power, also for the preservation of the furnace, and for consumption of fuel.

*Premium on Economy of Fuel* is not practised, at least directly. Consumption of fuel, in fact, depends upon several factors—draught, over which the stoker has no control; quality of fuel, often variable; and fireplaces, which when corroded consume more fuel than when new. Some of the preceding premiums indirectly include it—like the premium for amount of gas per retort, and that on the yield of gas within certain limits. Reply K deals with a direct premium based on the minimum proportion of coke called "*marron*" remaining in the ashes. But it is to be noted that this coke from screened ashes is utilized, and that the real loss is due to what is uselessly burnt by excess of air or to the dampers being opened too much, or currents of air through the joints in the settings. It is also to be observed that some works have realized economy of fuel by giving the stokers an interest in the work or employing poor, cheap fuel.

#### *Provident Institutions.*

As M. Fougereousse remarks in his work "*Masters and Men of Paris*," "the essential basis of provident institutions is, first, pecuniary sacrifice by the master, who takes, for the profit of his men, from the general expenses or profits of his enterprise an additional sum to what he legally owes them; secondly, the saving by the master for the benefit of the men. The resultant of these two forces is the possession of capital, constituting a patrimony for the workman." It is this principle which, with most praiseworthy generosity, the two above-mentioned Companies have adopted—viz., the Paris Gas Company and that of Mans. As regards provident institutions, I shall only discuss those regarding lodging, savings, sickness, and old age.

*Lodging.*—The lodging has a great moral influence on the workman. Generally, he has the most miserable lodgings—reducing his rent as much as possible—bad sanitary arrangements, overcrowding, and inconveniences of all kinds, which drive him from his home and family to the public-house. An excellent result, both from the physical and moral point of view (as also of good workmanship), is obtained by lodgings at the works or cheap workmen's dwellings, the rent of which includes purchase, by which an economical workman can become owner of the house he occupies after some years. Numbers of gas-works lodge their employees and head workmen, and some their best stokers. Thus the workman, has a home where he enjoys all the healthy recreation of life, and becomes settled. He oftener meets his master, who thus has greater facility for testifying his solicitude by visiting him when sick, &c., when a token of goodwill or assistance often creates everlasting gratitude.

*Savings.*—Long experience with labour in gas-works demonstrates that economy engenders order, temperance, and assiduity, and that an economical workman is always diligent and regular. The great difficulty for a workman in saving, is to put his first sou aside—not that he is ignorant of the benefits and necessity of saving; but before beginning, he is afraid of the privations he may have to endure, he becomes discouraged, procrastinates, and eventually abandons the idea. He needs some provident administration to protect him against his own weakness, encourage him by liberal advantages to save some little to begin,

no matter how trifling, and if necessary compel him (later he will be the first to return thanks) by the rules of the works to put aside some of his wages to provide for sickness and old age. This first saving will lead to others which will be less and less difficult; and he will progress in this path, under the influence of habit and satisfaction, towards the object, which is the possession of capital or an income to assure the existence of himself and family at the time of slack work.

*Savings Bank.*—The system of deposit with liberty to withdraw, as practised by the savings bank, is evidently that which most respects the liberty and dignity of the man. But it presents a danger—viz., that, as soon as his capital has attained a certain figure, the workman may be led to leave the works, and risk his money in some transactions or trade of which he is ignorant; whereas, by reserving his savings in the provident fund or old-age pension, he provides against sickness during work and assures, according to his own expression, "*bread on the board*" for his old age.

*Provident Fund.*—As we have seen, the Mans Company meet the expenses for the sick fund without taking anything from the wages. Several companies supply their provident fund from the workmen's wages, and a generally equal subsidy from the company; but most, solely from the wages and fines. Here the author of this communication begs leave to mention a personal reminiscence: At the Angoulême Gas-Works, which he managed for 23 years, he established a mutual sick fund supported by retaining 1 fr. per month from the wages of each member, and the fines. At the beginning, membership was optional; and there were few members and little money. Seeing that the institution could not thus exist, he decided to make it obligatory, by the rules, for all the permanent employees—including the manager—to belong to the Society. This was accomplished without difficulty; and many of the workmen later expressed their thanks. This Provident Society has constantly supplied medical aid, with daily allowances varying from 1 fr. to 1.50 frs., according to the money in hand. The accounts were read to the workmen at an annual meeting presided over by the manager, who merely practised the precept given by the eminent M. Cheysson: "*Laisser faire et guider*." Moreover, the workmen behaved with wisdom; changing their rules with great prudence, and preventing irregularities by mutual control. In fact, it was a question of their money and the existence of an institution the benefits of which they had appreciated. For many years there was no serious difficulty; and on his departure, the manager was greeted at the farewell meeting with unforgettable expressions of affection and gratitude.

*Pension Fund.*—This question was dealt with in a masterly manner at the Congresses of 1880 and 1881, by M. Leclerc; and at that of 1890, by M. du Pasquier. The discussions raised by these communications, and the unanimous approbation expressed by the President, M. Ellisen, demonstrated the keen interest taken in the question. Without returning to the calculations given—which would now require modification, owing to the fall in the rate of interest from 4 to 3½ per cent.—I shall merely mention the solutions proposed. M. Leclerc recommended the foundation of a single pension fund for gas-works which participated, with or without their employees. According to his estimates, 6 per cent. of the annual wages sufficed to give from the fund to each workman of 60 years of age, after 30 years' service, a pension equal to half his wages. To have the reversion at death for the widow and orphans, it was requisite during the first years to deduct more than 6 per cent. M. du Pasquier, recalling his difficulties in establishing this single fund (the chief of which was the liability of the fund to the persons insured in case of dismissal), proposed a system of individual insurance contracted by the works separately for each workman, with Assurance Companies, making the former participate in the old-age pension, with a loss of all rights in case of leaving or dismissal, at least during the first ten years. An exception was made for certain cases. For example, where a workman with more than ten or fifteen years' service was obliged to abandon stoking against his will, and without blame, in which case he retained his contract. Thus the gas-works would have to pay the assurance premium as long as the workman remained in their employ. This has the inconvenience of making the Assurance Company profit by all or part of the money paid. Gas companies hesitated to thus bind themselves, both on account of the amount they would have to pay and the uncertainty of future resources, as also the possibility of legal disputes with the companies or workmen. Must we then abandon the great advantages of the old-age pensions so well described by M. Leclerc? They certainly have the advantage of retaining the workman until the age for pensions; for they constitute a real premium for perseverance, and facilitate the finding and retaining of employees, assuring a better selection. They also attract and specialize reliable and devoted workmen—thus benefiting not only the employees, but also improving the working.

In the discussion which followed M. Pasquier's communication, M. Delahaye rightly remarked that there were strikes at Lyons in spite of the premiums—a proof that deferred pay does not prevent strikes. Messrs. du Pasquier, Ancet, and the President, M. Le Trenst, agreed that the pension system was the best means to attract the stoker. I believe one can obtain this permanency of engagement, so desirable for workman and master, and would call to mind the glowing words of Jules Simon:

Poor and soured by their poverty, ignorant and ashamed of their igno-



rance, the workmen always fear being deceived or exploited. Words cannot dispel their error; one must persuade them by the long and sure system of institutions.—"L'Ouvrière."

We must then persevere in the study and improvement of these institutions, endeavouring to dispel as much as possible that mistrust natural to the workman, and develop to the fullest extent his individual initiative by aid of that marvellous instrument *interest by saving*. M. Cheysson writes as follows in the "*Institutions Patronales*:" "We value but little what costs no trouble, and accustom ourselves to regard favours as rights. Readily we admit that those who do good, do so only for their own interests. There is something yet worse when a kind of providence supplies all the workman's wants without requiring any labour on his part. Then he ceases to rely on himself, and loses all initiative and sense of dignity. To revive his initiative, and accustom him to rely on self more than his master, is preferable to that kind of guardianship which tends, through simple benevolence, to maintain the workman." Thus, in the case mentioned, of the sick fund of the Angoulême Gas-Works (to which the Company gave no subsidy), I am convinced that difficulties or abuses would have been greater if the Company had incurred all expenses.

Conformably with these principles, I would like to propose the following solution, based on the co-operation of wages and a voluntary pecuniary sacrifice of the company to constitute an old-age pension fund. In this scheme the workman alone would accumulate, by his savings in the National Old-Age Pension Fund, the capital requisite for an annuity. His pass-book is his private property, and follows him wherever he goes. The company only intervenes to require or compel him to take this book, according as the regulations make it optional or obligatory—granting him a free allowance called "gratuity for improvement of pension." Every month the workman should pay so much per cent. to his account, and the company annually place to his credit in the account called "improvement of pensions" a voluntary gratuity fixed by the directors at the end of each year, having regard to the amount paid by the workmen and the resources of the company. This allowance would be divided among the workmen, reckoning their shares according to the number of their children and dependants. The amount would be entered in the account for "improvement of the pension" of each workman, and could not be paid out except as pension. In the case of a man voluntarily leaving the works or being dismissed, he would take away his pass-book as constituted by his wages, but forfeit the added allowances, which would then be put to the other accounts, except in special cases decided by the directors. This system presents the following advantages: 1. The workman's payments and those of the company are separate. 2. The company make no future engagement—everything being settled yearly—and there can be no litigation, as the regulations regarding dismissal, &c., are perfectly clear and just. 3. It applies to all works, large and small. It is very simple, and can be commenced gradually with the greatest ease. Every month, the total amount is sent with the pass-books and an account to the National Old-Age Pensions Bank, which enters it and returns the books.

Let me add that the pension pass-book system has been extensively adopted, particularly in the Orleans Railway Companies and it is that of the law of June 29, 1894, relating to sick fund; and pensions for mining workmen. An objection can be made—viz., that the workman has no perfect certainty of attaining a given age and pension; but the above remarks demonstrate that this is preferable for good work. A workman whose pension is assured may be grateful and zealous; but he will not feel the necessity of effort like one who accumulates it daily by optional or obligatory savings, and who is encouraged by the advantage accorded by the company to work harder to improve it. On the other hand, he will devote the more attention to the pension because it consists in part of his savings, value it more, and be more anxious to make new sacrifices to increase it.

In order to clearly explain the matter, let me suppose that the minimum percentage of wages to enter in the pass-book is 5 per cent. on an annual salary of 1500 frs. The following table gives, according to the rates of the National Old-Age Pensions Bank, the results of the various annuities at different ages, either with alienated or reserved capital:—

Age at First Payment.	AGES OF RECIPIENTS OF LIFE ANNUITIES.					
	Alienated Capital.			Reserved Capital.		
	50 yrs.	55 yrs.	60 yrs.	50 yrs.	55 yrs.	60 yrs.
25 yrs.	255 frs.	405 frs.	662 frs.	160 frs.	250 frs.	400 frs.
30 "	182 "	300 "	498 "	110 "	175 "	286 "
35 "	123 "	213 "	366 "	71 "	120 "	199 "
40 "	75 "	142 "	258 "	41 "	75 "	132 "

If one supposes that the allowance of the company is equal to the wages-reserve, the above results will be double; and they demonstrate that a stoker who begins working at 25 years will at 60 have a pension of 800 frs. reserved capital. At the present time, stokers with 35 years' service are few; but I think this number would augment with the permanency of engagement resulting from the adoption of the system explained, and that his savings will greatly exceed the quantum of 5 per cent. To

this sum of the pensions will be added the bonuses provided by Article 11 of the law of July 22, 1886, for pensions of less than 360 frs. The company's allowance, instead of being equal to the sum kept back from the wages or some arbitrary amount, might be fixed, as at Works R, by technical results of working during the year.

The system of individual pass-books has been adopted because it is simple and easily understood by the workman, eminently practical, and the pension is guaranteed by the State. I must, however, observe that I consider M. Leclerc's idea of a single pension fund realizable only by means of a mutual-aid society, the common funds of which would be deposited at the "*Caisse de Dépôts et Consignations*," as decreed by the law of Mutual-Aid Societies, dated April 1, 1898. The amount of the pension would be calculated according to Article 9 of the law of July 20, 1886, of the National Old-Age Pensions Bank. Thus the company would not have to guarantee a fixed sum at a given time, conformably with the advice of M. Jules Michel, an authority on provident institutions (particularly for railways), who says: "Give pensions, but promise nothing." The common funds would be formed from wages; the annual allowance by the company being separate, as in the system of individual pass-books. In case of dismissal, the workman has always his right of membership, though he would not be likely to retain it by paying his premiums. Moreover, he could not disturb a society formed mainly by a great number of works with their offices in Paris. The advantage of the system, compared with the individual pass-book, would be an interest on deposits of  $4\frac{1}{2}$  per cent. instead of  $3\frac{1}{2}$  per cent.; consequently higher pensions in the same proportion. The Society would also have State subsidies, according to the provisions of the law relating to Mutual-Aid Societies—Article 26 of the law of April 1, 1898. The Society would thus merely be responsible for the calculation of the pensions and paying in of the funds to the bank. If the rôle of a Technical Institution prohibits intervention directly in founding such a Society, it is certainly our duty to ascertain its possibility, and (the case arising) to promote such a Society outside, but in proximity to, itself.

In brief, the work of stokers might be thus remunerated: 1. Fixed wages, paid by the fortnight, 1 per cent. being retained for the Provident Bank and 5 per cent. for old-age pensions. 2. Premiums on manufacture, payable at fixed dates, 5 per cent. being retained for the provident fund and 20 per cent. for pensions. 3. Annual allowances by the company—all entered to the account of pensions improvement.

In concluding this work, I beg my colleagues to excuse me if I have allowed myself—owing to the interest of the question—to be led away into long explanations. I am convinced that the stoker is interested in his work not by mere wages only, but also by the assurance of provision being made for him in days of sickness and old age. In order to attain this, I would remark in conclusion (adapting an ever-true maxim which puts tersely all I have written): "Help thyself, the Master will help thee."

## DRY METERS: THEIR ADVANTAGES AND DISADVANTAGES.

By W. ASSELBERGS, of Bergen-op-Zoom.

[A Paper read before the International Gas Congress at Paris.]

Among modern improvements in plant for gas manufacture under the most economical conditions, it often happens that little attention is bestowed on the distributing system, and especially on meters, although the latter occupy a most important place. The meter may be defined as an instrument which measures the quantity of the product sold; but its action, no less than its construction, is very superficially understood by us. Still it is the *bête noire* of the consumers. They have a lurking suspicion that meters are not always accurate in their registration of the gas consumed—that some record too much, others not enough; and that gas companies fit up (so they conclude) only those meters which register to their own advantage.

Hence it will be understood that, when the public were, some twenty years ago, informed by the vendors of gas apparatus that a new meter could be supplied to them which did not require water (so that the monthly adjustment of the water-level would be dispensed with), and, further, that these dry meters registered to the advantage of the consumers, many of the latter adopted dry meters, particularly as they observed that the managers of gas-works viewed them with no special favour, if not with absolute mistrust.

Now, is the dry meter actually an instrument deserving of this want of confidence? No meter, wet or dry, measures gas with unvarying accuracy. Our laws in Holland allow a difference of 5 per cent. on either side of the correct reading; but in the course of my experience in checking meters I have found differences of 20 to 30 per cent. with both wet and dry meters.

The question of the accuracy of the measure by which gas is supplied, is one of moment to every works. We do not want a consumer to pay too little, nor too much. We wish him to pay merely for what he has really had. As the many discussions at Association meetings show, this question of meters has engaged the attention of the gas profession from the commencement of the industry; and much time has been devoted to pointing out



to manufacturers the defects in the instruments, and in studying the methods of eliminating them.

The wet meter is so well known that, for the purposes of comparison, we need only study the dry meter. It may be pointed out first of all that the dry meter is not by any means a recent invention. The first meter constructed by Clegg for measuring gas was a dry instrument. It was a very primitive arrangement, consisting simply of two bellows. As it gave unsatisfactory results, Clegg abandoned it, and invented his wet meter. Some time afterwards, an American workman constructed a dry meter with moveable discs; but, in spite of many improvements and great expense, no practical instrument was forthcoming. It was not until Croll and Richard brought out their patent that the dry meter was used for measuring gas; and at the present time the Croll meter (as subsequently improved by Glover) is the most extensively used of all dry meters.

Before making comparisons between wet and dry meters, I may state that some eminent authorities in the gas profession strongly condemn the dry meter, and use it only in exceptional cases; while others equally eminent make very considerable use of the dry meter—in some cases to the total exclusion of wet meters. Among manufacturers, one will pronounce the dry meter the best instrument, and another will consider it impossible and inadmissible for correct registration. Engineers and others who control the out-door departments, after having first accepted dry meters only provisionally and on trial, and after having taken the necessary steps to ascertain their errors in practical work, are now relinquishing their distrust of the dry meter, and are permitting the use of well-made instruments of this class.

Before advancing an opinion as to the value of the dry meter, it will be well to discuss the results of the investigations to be found in the proceedings of the various Gas Associations, to which I can add information acquired in course of correspondence with the makers of various types, as well as with a large number of my Dutch colleagues, who have had dry meters in use for some years past.

The most important communication on dry meters with regard to their advantages and disadvantages is that by Mr. Travers before the Gas Institute in 1884 and the discussion which followed. In a paper by Dr. Lowenherz, of the Registration Department, Berlin, read before the Association of German Gas Managers, there is also much information. Then there is much useful matter in the correspondence in the pages of the Dutch journal "Het Gas," and in the report of the proceedings of the Commission of Inquiry on the Registration of Gas-Meters in Holland, and in the brochures by which this report was followed—viz., those by Dr. Ryke and Dr. van Doesburgh. There is also Mr. Glover's work, entitled "Correct Measurement." A careful analysis of these various sources enables me to enumerate the alleged advantages and disadvantages of dry meters. First, the dry meter is recommended on the score of an exact and uniformly accurate measure. All those who have made trials on this point, as well as others who have communicated the results obtained in their practice, state that errors attending the use of dry meters are greater, both in number and magnitude, than those observed in connection with wet meters.

At the meeting of the Gas Institute in London in 1884, most of the English gas managers (in fact, almost all of them) affirmed that the dry meter registered too little—i.e., to the disadvantage of the gas company; only one manager, on the other hand, recorded a registration in favour of the gas company. The German managers found that, as a general rule, the dry meter registered too much—i.e., favoured the companies. The meters first used were almost all on the English Croll-Glover system, or of English manufacture. This disparity in the records of experience arises chiefly from the make and capacity of the meters. There were, of course, good, bad, and indifferent.

At that time there were in England many one-light dry meters, and some even smaller—known as Nos. 0 and 00. The consumers, almost all of whom purchased their meters from a dealer in gas-fittings, naturally obtained the cheapest; and it is, therefore, not astonishing that many of them were supplied with meters which were too small and of inferior construction. It is not surprising, too, that many of these small meters should have made incorrect records and have given rise to complaints—a frequent cause of difficulties and trouble to the companies' employees, who naturally discountenanced these meters and preferred their own wet three-light meters.

According to Dr. Lowenherz, in his address to the 1885 meeting in Germany, a special Commission was formed at his suggestion, and was entrusted with the consideration of the meter question. The conclusions of this Commission, though not decisive, contain much valuable matter on the subject. A report of the results obtained by the six gas-works which had participated in the official investigations, states that, with the assistance of the Registration Department, more than 4000 dry meters were examined between 1892 and 1895, in which were included very various specimens as regards size and construction. Some of the meters had been in use for a year only; others for 28 years. Of all the meters tested, it was found that two-thirds registered well—i.e., within the limits of an error of 4 per cent. on either side of correctness; while of those which were inexact, three-fifths registered too much, one-fifth too little, and one-fifth were leaky.

It was found that the liability of the meters to register too much showed especially during the first three years. This period

was followed by another, in which the meter registered normally. Afterwards a tendency developed to register too little. Lastly, leaks and breakages in the surface of the bellows commenced to appear. The Stockholm Gas-Works, which have fitted up a very large number of dry meters, checked for seven years one-sixth or one-seventh of the meters connected, and found that out of the number thus tested (which was 31,524, of which 27,612 were of English and 3902 of Dutch manufacture) 25,482 registered within the limits of 5 per cent. fast or slow, 872 registered more than 5 per cent. slow, and 1253 registered more than 5 per cent. fast.

In a large German town, where 220 dry meters were similarly tested, 157 (75 per cent.) were found correct within 4 per cent.; 47 registered more than 4 per cent. fast (among them were some which registered up to 10 per cent. fast), and 16 meters registered a little more than 4 per cent. slow (two of which showed an excess of 19 and 20 per cent.—due, no doubt, to leakage). In some cases, the causes of inaccurate measurement were found to be dry leathers, split leathers, badly fitting valves, and deposits on the leathers and jointed rods.

In order to ascertain to what extent the wet meter is liable to error in actual practice, it is necessary to make the test, under working conditions, by means of a second check meter, which is accurately adjusted every day. The experiments made on these lines have not furnished any results worthy of publication; for their difficulties and cost make it impossible to maintain a sufficiently large number of meters over a given period. The works' tests of wet meters are not applicable to conditions prevailing on the consumers' own premises. In the works laboratory, the meter is placed in an exactly horizontal position, and is adjusted before trial; while in the other case the condition of horizontality is not assured, and a change in the water-level may take place the day after adjustment, through evaporation. A wet meter, as ordinarily used, may therefore give rise to far greater errors than those observed in laboratory tests. It may even happen that a meter which allows a consumer's gas to pass entirely unregistered (say, through the water-level being too low, and the valve not being closed) may be found in perfect order on a laboratory test. Hence it is far from easy to ascertain whether the errors of wet meters are greater or less than those of dry meters. All that can be said is that the errors of wet meters are to the disadvantage of the gas companies.

The conditions of accurate measurement by the wet meter are: (1) Water-level at the normal height. (2) Base of meter parallel to the surface of the water. (3) A horizontal position of the meter. (4) Fairly constant gas pressure.

A second advantage claimed for dry meters is that there is no danger of fluctuation of the flame or momentary stoppage of the stream of gas—factors in causing irregular illumination, and even total cessation of the gas supply. These annoying effects are frequently observed, it is said, in connection with wet meters.

A third advantage is the absence of any need for levelling; there being no screw to be disconnected by the employee, no danger of leakage through improper re-screwing, no unpleasant odour, no mess, no danger of explosion. The greater cleanliness of the dry meter permits of its installation in situations in which the wet meter would be vetoed, and consigned to cellars and dark corners difficult of access.

A fourth advantage (of no slight importance) is the fact that it is more difficult to tamper with a dry meter than with a wet one. It cannot be "faked" by inclining it to one side or forward. I have placed a dry meter at an angle of 30°, and under test conditions could observe no appreciable vitiation of its registration. The mechanism of the dry meter cannot be tampered with without showing some sign on the exterior of the meter. There is no regulator level which can be broken by undoing the screw to the fullest extent. There is no wheel liable to be perforated by the delivery-tube; and no lower valve-box wall in which an aperture can be made.

The dry meter resembles the wet meter in permitting falsification by damage to the walls of the outer case, or to the clock-work; but such attempts are at once detected. One may, therefore, reasonably conclude that there are less opportunities for fraud than with the wet meter.

During cold weather, the functions of the dry meter are never upset by the frost. There is no damage to the mechanism by ice, or risk of explosion when the latter is thawed. The advantage of excluding water from the distributing system of houses is a very important one in times of frost.

The dry meter takes up less time when an examination is being made for test purposes. There is no need to water or level—a double advantage, since less labour is required and the consumer is spared the frequent visits of the inspector, whose object he is very liable to suspect as that of increasing the readings of the meter. There is less corrosion by water. The meters can be placed in the driest spots, since there is no need to select the lowest part of the house (as is necessary with wet meters so that the condensed water may return).

It is sometimes said that the wet meter is of more solid construction, and exacts less for wear and tear than does the dry meter. This was formerly true; but for some years past more careful manufacture and critical selection of materials have been the rule. Lead plate has been abandoned for the outside cases, in preference for sheet iron of special quality. The leather used for the diaphragms is of the first quality—carefully prepared and



selected, and treated with a solution to render it impermeable by, and resistant towards, the gas. Another reason for the immunity of the interior mechanism from deterioration by the gas is the purer quality of gas now made. The ammonia (of which gas formerly contained more) acted most prejudicially on the metallic portions of the meter, as well as on the oil with which the diaphragms were treated—rendering the latter less flexible. From some considerable number of quarters, I learn that the expenses of repairing dry meters are rather less, instead of greater, than those of wet meters.

Some statistics obtained by the Dordrecht Gas Company may be cited on this point. The number of meters purchased in 1887, 1888, 1889, and 1890 was 199 altogether; and the cost was 5370.32 florins (= 11,277 frs.). The total cost of repairs in the four years, and up to the day of my visit (in 1897), amounted to 536 florins (= 1125 frs.)—say, for ten years, about 10 per cent. (2.50 florins or 5 frs.) of the value of the meter—i.e., approximately 25 c. to 35 c. per meter per year.

After having witnessed the manufacture of the meters and estimated the cost of repairs, shown in the books, I asked the maker if, by increasing the price of the meters 10 per cent., he would guarantee the maintenance of the dry meters in working order for ten years at his own expense. His reply was that he would accept such an offer. It is therefore seen that little risk is involved in taking a number of dry meters on trial on these terms. There is little likelihood of the repairs being greater than stated above.

The dry meter has thus many advantages over the wet form of instrument; and if the supply of a solidly made and carefully adjusted meter could always be relied upon, a few years would see the disappearance of the wet meter. Theoretically, the latter is a more exact measuring device. The volume of a measuring vessel and the volume displaced on each revolution of the wheel can be calculated very exactly; but not so with the dry meter. The volume displaced by each movement of the bellows is nominally the product of the area of the moving disc into the distance traversed. But the volume of gas actually displaced does not invariably tally with that obtained by calculation; for it cannot be predicted how the diaphragms of the instrument will be acting.

Not long ago it might have been said that every gas manager of experience rejected the dry meter for measuring purposes. Nevertheless, it is a fact that more and more dry meters are being purchased, even by works in which they were previously condemned. In 1884, Mr. Livesey stated that he had not placed a single dry meter in his district; but I now learn that the South Metropolitan Gas Company have been fixing a constantly increasing number of dry meters during the past ten years, and that all the prepayment meters, of which the Company had 60,000 in 1892, are dry meters. The same tendency is encountered in most works.

My Dutch colleagues (the larger proportion of whom purchase more dry than wet meters) say that the dry meter is more convenient, cleaner, and more in public favour, and that it is often specially asked for by consumers—among others by those using gas-motors, who in this, as in other matters, follow the advice of the makers of motors.

Most gas managers are now accustomed to purchase dry meters, even though they contend that the wet meter is a more exact measure. ("Is" in this last sentence should be read "may be.") To the gas company there is no loss nor great profit; for though some meters may register too little, others register too much, and in the words of Mr. Livesey at one of the meetings of the Gas Institute, it is a case of robbing Peter to pay Paul.

It is not right to make one consumer pay for what another escapes payment for. But unfortunately the public frequently suspect the good advice given them; and when a gas official says that the dry meter is not as good as the wet one, the consumer most frequently assumes that the dry meter will be to his advantage, and forthwith obtains one. There is, therefore, no reason why the wishes of the public should not be acceded to—all the more as the dry meter possesses certain undeniable conveniences. All that the company may do is to test the meters from time to time, in regard to their accuracy of measurement.

Speaking of the dry meter, I have had in mind the Croll-Glover instrument, which is the most in vogue. In America, a triple-bellows meter (the Defries) is in use. In Germany, the meter of Emile Haas, of Mayence, known as the "Va," is coming into use. For some time past a factory for the making of these "Va" meters has been worked by Messrs. Elster, of Berlin, whose dry meters (especially prepayment meters) have met with much favour.

One advantage claimed for the Haas meter is its accuracy even after long usage. Owing to the special construction of its moveable partition, the meter can give a surplus in the diaphragm without affecting the measurement, since the capacities of the measuring chambers are limited by fixed walls, against which the diaphragm presses. No vitiation of the reading follows from the closure or enlargement of the diaphragm. The surfaces of the moveable partitions being larger in area than those of other types of dry meter (the pressure of the gas thus acting on a larger surface), the mechanism of the meter is actuated with greater ease and regularity. The slide-valves, being heavier and longer, move more readily on the guides, and there is less danger of escape of gas.

Heer Salomons, the Engineer of the Feyenoord Gas-Works, Rotterdam, has tested some of these meters for a year or more. He placed in serial order, a five-light meter, a three-light meter, and lastly a second five-light meter. After the passing of more than 1000 cubic metres of gas, Heer Salomons found that the differences between the three meters did not exceed 2 per cent. When 720 litres passed the three meters per hour, the diminution of pressure was only 5 mm.; and this rose to 20 mm. with 1500 litres per hour. With 1600 litres per hour through a single five-light meter, the loss was only 7 mm., and only 2 mm. with 960 litres per hour. It is thus seen that these meters have a greater capacity than is nominally assigned to them.

## TECHNICAL RECORD.

### NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

#### Half-Yearly Meeting at Durham.

The Forty-Seventh Half-Yearly Meeting of this Association was held on Saturday at Durham, the residence of the President for the year, Mr. E. H. MILLARD, the Engineer and Manager to the City of Durham Gas Company. There was little business on the agenda; and this, together with the fact that the General Election was still requiring the services of some of the members, accounted for the absence of several who are usually present at the gatherings of the Association. Still a goodly company mustered at the Gas Office in Claypath at noon. Light refreshments were served, after which the meeting was constituted in the Board-room of the Company.

The PRESIDENT introduced the Chairman of the Gas Company, Mr. John Coward, J.P.

Mr. COWARD said he was present to accord to the Association, on behalf of the Company, a hearty welcome to the city of Durham. It was a very inopportune time for them to be there; but, of course, when they appointed the meeting to be held on that date, they had no idea that they were going to have a General Election. He and the Vice-Chairman (Colonel Rawlinson) were much engaged; but they had made arrangements to try to entertain the members in the best way they could. He hoped their meeting would be a good one, and that they would have many pleasant reminiscences of their visit.

#### NEW MEMBERS.

The PRESIDENT said he was desirous of introducing an innovation in their practice. There were so many new members joining, that they were in danger of not knowing them all; and he would like the proposers of new members or associates to formally introduce them to the meeting after their election. The following were admitted to the Association:—

*Members.*—Stout, W. H., Walker and Wallsend Union Gas Company; Buckley, A. E., Corbridge.

*Associates.*—Burn, J. H., coalowner, Newcastle; Haswell, W. Spence, Manager, Tangyes Limited (Newcastle); Constable, P., Messrs. James Milne and Son, Limited (Leeds); Miller, J. C. (Rugby), representative of the Eagle Range and Gas-Stove Company, of Birmingham; Batt, W. (Manchester), representative of Messrs. T. Glover and Co., Limited.

In accordance with the desire of the President, these gentlemen were presented to the meeting and shook hands with the Committee.

#### ABSENT MEMBERS.

The PRESIDENT intimated that apologies had been received from several gentlemen who were unable to attend the meeting.

The President then delivered the following

#### INAUGURAL ADDRESS.

Gentlemen,—I regret the position we are in to-day, in not having another paper to follow on the very sparse matter I have now to lay before you; but at the very last moment I was disappointed in a gentleman who I thought would have come forward. He has, however, been so long on his holiday that he has found he had not time to prepare a paper for discussion to-day.

I think I also ought to refer to an incident which occurred last week, in the election of a gentleman whom we are all delighted to know was successful at the polls. I refer to one of our associate members, and a Past-President—Colonel Sadler. There is another gentleman of whose success we are pleased to hear—Mr. W. R. Plummer, of Newcastle, who presided at our dinner last year.

I beg to tender you my thanks for the honour you have done me in electing me President of our Association. I cannot say it was unexpected, as it naturally follows the Vice-Presidency. But I can truthfully say the promotion to the latter office was entirely unexpected; and I am afraid I accepted, and so took the plunge, without fully realizing to what I was committed. However, with your kind forbearance, I will do my best, and by the aid of the Officers and Committee, trust to pull through my year of office in such a manner that my successor may take the chair with the hitherto undimmed lustre which clings to it from its association with the long line of eminent men who have so ably filled it in the past.



I think that we must congratulate ourselves on our numerical strength, and also upon our average attendance from so wide a district, which shows a healthy interest in our Association and its work. I may say that the total members and associates in October, 1895, was 106; in October, 1900, the number is 142—an increase of 36, or not less than 33½ per cent. I trust that the younger members will take care that it is not allowed to degenerate into a technical France, but that it shall produce a healthy progeny of papers and communications. Their efforts will receive the kindest reception, as in no body of men have I noted a keener interest and goodwill expressed for the progress of the younger members than in this Association—more especially by the veterans, and often with an entire abnegation of their own claims. We younger members, however, must be careful not to allow them to carry this obliteration of self too far, but see that our Committee shall always be ballasted with a good proportion of them. If we allow them a well-deserved rest from the preparation of papers, they will not shirk their duty in this direction.

We are living in troublous times for all connected with gas-works management; and every effort will have to be strained to maintain our position as head of the artificial lighting industries. These periods of tense struggles come round in cycles; and ten years ago we were confronted with this same question of advancing the price of gas. As this was successfully negotiated, so no doubt the present corner of high price will also be turned; and we shall have the satisfaction of seeing the price of gas again return to what we may term its normal condition.

We must not forget, however, that the price of coal is not affecting our electric lighting competitors to the same extent as ourselves; and they will doubtless take full advantage of their opportunity. But, on the other hand, the cost of their plant has advanced in greater proportion than ours, so that all extensions carried out now are laying a charge for the future. The advanced price of coal during the last two years represents an addition of 0.34d. per unit to the cost of electricity, or (say) equal to 2½d. per 1000 cubic feet on gas; but to gas-works it means not less than 4d. per 1000 feet, even after allowing for the advance in the price of residuals. However, we need not become despondent; for the truth of the old proverb that "Every cloud has a silver lining" is being abundantly justified, since the high price of household and manufacturing fuel has given a boom to the use of gas for cooking, heating, and motive power. The position we have attained will not be lost, except by our own negligence.

The vaunted growth of the electric lighting industry has been trumpeted forth with a far louder blast than the occasion really warrants. I have recently taken the trouble to ascertain the units of output of electricity in several towns; and, after converting these into an equivalent number of cubic feet of gas, I find that the average result would only represent an addition of 10 per cent. to the gas-works in those towns—and this, too, in places where electricity is supposed to have made enormous progress. Good will also have been done by promoting experimental work with a view to the production of a cheaper gas, as is already evidenced by two processes at least being on their trial as to suitability to the conditions prevailing in this country—viz., Professor Lewes's methane gas at Sligo, and benzolized water gas under the Dellwik-Fleischer process at West Bromwich—the working results of which will be awaited with interest.

I am afraid those who expected to find in carburetted water gas a panacea for their troubles in this direction will have been disappointed, as with the advance in the price of coke and oil the cost of its production has increased in a greater ratio than that of coal gas, except in isolated positions. These remarks may appear strange from an adherent to this method of gas making. But it was for its other advantages that I advocated its adoption here; and there is little doubt the price obtainable for gas coke to-day is largely due to the amount taken off the market by this process. It has also, where adopted, eased the labour question; and there are many companies who would to-day rather pay a little more in the cost of this gas, than have to bear the tyranny of the labour organizations, who have succeeded in exacting for the labourer at this class of work a remuneration beyond that of a skilled mechanic, and are still not content—agitation being on foot over this north-east district.

While on the subject of carburetted water gas, there is one point to which I do not remember attention being called—viz., that where it is purified along with coal gas there is a danger of the greater proportion of carbonic acid which it contains interfering with the action of the sulphide purifiers. Of course, this was to be expected; but in the tension of meeting the heavy demand of three or four exceptionally dark days by increasing the proportion of carburetted water gas, it is just one of the points apt to be lost sight of.

The successive alternations of times of good and bad trade should surely serve as pointers to gas companies and corporations to carry out their extensions, even beyond their absolute requirements, while materials and wages are low—confident in the future of our industry—instead of waiting to be forced by necessity to undertake the requisite increase of plant during times of boom in trade, at an increased cost of 40 or 50 per cent. Even in America, the land *par excellence* of the electric and other competitive lights, such confidence is felt in effete coal gas that I am informed, on the authority of one of our members who recently visited the United States, that the Manhattan Gas Company have purchased 200 acres of land for the erection of coal-gas works.

While on this subject, I cannot help noting the tendency to carry increasingly heavier pressures, until the high-pressure service mains used by some of the larger works demand more pressure than the gasholders are able to give, when mechanical means have to be introduced in the form of exhausters or fans. Taking into consideration the marvellous results produced by the blowpipe action of the various compressed gas systems on the incandescent mantle, and the general approbation extended to a lower standard of illuminating power of gas which would be equally efficient with such burners, does it not appear reasonable to expect that the day is not far distant when it will not be necessary for individual consumers to erect installations to compress the gas for themselves, but they will have it delivered to them at the necessary pressure? I believe this increased pressure will be corollary with reduction of illuminating power. For various trade purposes, this increased pressure would be invaluable; and the idea is by no means a visionary one, as has been shown us by Mr. Shelton (see his paper read before the International Gas Congress at Paris) in America, where a high-pressure system has been completed to work at, not merely 10 inches, but up to 20 lbs. per square inch on a main nearly 5 miles in length. Difficulties would no doubt occur, especially in districts subject to settlement; but the extra pressure would all the sooner reveal any leakages which might occur.

At this juncture, I am led to remark on the difficulty of testing long lengths of leading mains for leakage at the present time, with continual demand at all hours of the day, which renders the old method of cutting into sections a most inconvenient one for the consumers; and it suggests itself to me that an inexpensive portable gas-compressor would satisfy the want by delivering high-pressure gas along a small auxiliary, light, wrought-iron pipe, laid on the surface of the roadway, to supply the consumption beyond the section under test. If some such apparatus were introduced, it need not remain idle except when used for this purpose, as it might also be employed to supply compressed air to a pneumatic caulker for setting up the lead joints when laying mains, in lieu of the usual manner by hand. This should result in considerable economy of labour, and, what is of more importance still in the main thoroughfares of large towns, in saving of time. It might also come in handy for the pneumatic spray painting of gasholders.

I have for some time been of opinion that there is an opening for the display of originality in the introduction of machinery in mainlaying operations; the motive power for same being compressed air conducted by flexible hose in the usual manner from a high-pressure air receiver mounted on wheels, on the top of which could be fixed a gas-engine to drive the necessary compressor. The application to the filling in and ramming of the trenches, in particular, does not seem to present any insuperable difficulties.

I have often been struck with the wasteful use of steam in an ordinary gas-works. In the majority of instances, the fuel, no doubt, is cheap; but surely it is worth while employing the exhaust steam to heat the feed water, or, as in my own case, using it under the fire-bars of regenerative furnaces.

Another point I notice is the lack of means for the extinguishing of an outbreak of fire. Most works will have a pump, from which it would be possible to connect mains with hydrants placed at suitable parts of the works. These, with a length of hose, would enable any outbreak to be promptly met; and it is the minutes at the commencement of a fire which really determine its fate.

I feel that this address would be incomplete did I not refer to the work carried out by the Committee and Secretary on the Workmen's Compensation Act, upon the initiative of Mr. Bower. The various Insurance Companies having taken what is considered a reasonable view of the case, your Committee have declared their labours finished in this direction. I may say that our useful Secretary, Mr. Penney, will be very pleased to give any further information with reference to this matter, to the members of our own Association or to any others connected with the gas industry who may wish for it.

I cannot help thinking the Association might be made much more useful to the companies with which the members are connected by the issue of a weekly or monthly trade circular, giving information as to the course of the various markets in coal, coke, tar, pipes, and all materials used or sold at gas-works. Of course, this would mean our Secretary being provided with paid assistance; and the information would be compiled from particulars to be supplied by the members generally as to prices paid and obtained. A small subscription from each Company would soon be repaid them by the better terms they might secure. I have found this interchange of information so useful in a small circle, that it could not but prove beneficial in an enlarged sphere.

The abnormally high price obtainable for coke at the present time has led me to turn my attention to the burning of tar for heating the furnaces, as it is evident that with coke at 24s. or 25s. per ton f.o.b. north-east ports, it is better to do so than sell tar at any lower price than 29s. per ton.

Mr. M. DUNN (Goole) said it was with pleasure that he rose to propose a hearty vote of thanks to Mr. Millard for his excellent address. He certainly had given them some data to be going on with—information which would bear reading again, and which, no doubt, would be productive of much good.



The PRESIDENT thanked the members cordially for the manner in which they had received the proposition. He could say truly that anything he could do for the Association was no trouble to him. His only regret was that a series of experiments of which he had hoped to inform them in his address had been blocked at the last moment through failure on the part of the makers to let him have the apparatus in time. However, it was a matter which could be given again. He was very pleased, indeed, to see so large a turn-out of members, and trusted that the lack of any great amount of technical information, which they looked for at these meetings, would not interfere with the pleasure of their visit to Durham.

#### PROPOSED FEDERATION OF GAS-WORKS EMPLOYERS.

Mr. T. BOWER (West Hartlepool) obtained permission to mention a matter which, he said, had been on his mind, and which he had no doubt had been on the minds of many of the members. It was with regard to the labour question he wished to speak. They had, in the President's Address, an acknowledgment of the services which the Committee of the Association had rendered in another direction—in connection with insurances under the Workmen's Compensation Act. He thought the Committee might very well go further, and take up this other matter, seeing they had so well fulfilled the duties they undertook before. They might have a Committee of the North of England Association formed to deal with the labour question. He was not one of those who thought they should exact from their stokers and other employees the very uttermost they could. He should like to be as liberal as possible to his workers, as he hoped his Directors would be to himself; but when he had said this, he wished to point out that there could be no doubt whatever that there were many cases—and his hearers would bear him out in what he was going to say—where a favour, or some perquisite, it might be in various directions, was exacted from one company or corporation in favour of their workmen, and which was used, he might say, as a whip in extracting from other companies or corporations, who were working under totally different conditions, a similar favour—it might be money or some other form of perquisite. It seemed to him that if they had some sort of Conciliation Board, or Reference Committee—let them call it what they liked—a Committee that could deal with labour questions pertaining to all gas-works connected with the Association, it would serve some good purpose. He believed something had already been done in this direction, and that at the present moment some of the Gas Companies on the north-east coast were meeting together, or were in conference with each other, as to the basis to be laid down for wages. It would very likely be known to every member present that a general application had been made in all the gas-works (his own included) for a very large advance in the wages and conditions of labour of stokers and other employees; and it was for this reason that he thought it would be to the interest of the members of the Association, and of those whom they served, that they should do something. The least they could do was to refer the matter to the Committee of the Association, and let them look into it, and see if they could formulate a scheme, or do anything which they thought would be conducive to the best interests of the Association and of the workmen. He did not mean that there should be anything done which would be of a one-sided character. Whatever they did, it should be opened up so that the workmen should have an equal voice with them, and that they might hear their voice. He would not mind the men having their representatives present. He considered that a workman was entitled to get the best possible value he could for his labour; but what he did say was that he had no right to insist upon conditions which were not at all suitable for the works where he was stationed, and which, in some cases, as he knew, had been tyrannical. At the same time, the workman was entitled to fair consideration, and to have a fair say. Those were matters which the Committee might look into, get some information upon, and submit to a future meeting of the Association some sort of draft or suggestion as to the basis on which an Association could be formed. If it were their pleasure, he would move that some such step be taken. Perhaps before it was put to the meeting, some of their friends who were in the throes of labour difficulties might express their views on the matter.

The PRESIDENT was very pleased indeed that Mr. Bower had brought the matter before them. It was a point on which his Chairman was talking to him a few days ago. If it had not been for his being so busy with the elections, the Chairman would have liked to have said something about the labour question that day. He (the President) quite agreed with the idea Mr. Bower had expressed; and he knew that others were also moving in the direction in which Mr. Bower wished to move. He was pleased that Mr. Bower looked to the Association for some pronouncement on the matter, as it was following on the lines on which he should like to see the Association made use of.

The HON. SECRETARY (Mr. J. H. Penney, of South Shields) said the question was a very burning one; and he was glad Mr. Bower had been good enough to bring it before the Association. At the present time, in the North of England three gas companies had been what they might call attacked by the labour populace making a very large demand upon them; and he was very pleased to say that they had federated, to try to come to some definite arrangement whereby they might be placed on a level in regard to wages. Hitherto the tactics of the Union had

been to attack first one on what might be called a weak point—where the wages might be a little less—and, if they won, to go on to the next; and so on. This time they had rather altered their plans, and had taken a group of companies. The matter was now under the consideration of the gentlemen interested; and there would probably soon be some pronouncement upon it. He hoped it would point the way to a better future arrangement. He could not say what the result would be; but he trusted it would be favourable.

Mr. T. M. WALLER (Durham) said he had much pleasure in seconding Mr. Bower's proposal. He certainly thought it was high time that something was done in the direction indicated.

The motion was adopted.

The PRESIDENT said he was very glad it had been carried; but at the same time he felt that the Committee should be strengthened, in order to adequately deal with such a strong position as had been taken up by the Unions.

Mr. BOWER suggested that the Committee be asked to bring up at the next meeting of the Association a report as to what they thought was the most desirable thing to do, in order to introduce some form of conciliation between employers and employed in gas-works; and if the Committee thought to act on the President's suggestion, and invite outside members to assist them, they would have an opportunity of embracing the idea.

#### VOTES OF THANKS, &c.

Mr. W. DOIG GIBB (Newcastle) moved that the thanks of the Association be given to the City of Durham Gas Company for granting them the use of their Board-room for the meeting.

The vote was acknowledged by Mr. J. WILLAN, J.P., one of the Directors of the Company.

The business then closed.

#### VISITS AND DINNER.

The members afterwards visited the Cathedral and the Castle, both exceedingly interesting structures, and both, though of hoary age, still ministering to the needs of humanity—the one in the ecclesiastical, the other in the educational sphere.

On the invitation of the Gas Company, a party of about fifty sat down to dinner at a later hour, in the County Hotel. Mr. WILLAN presided. Among the toasts given were those of "The North of England Gas Managers' Association," proposed by Mr. COWARD, and responded to by the PRESIDENT; "The Chairman and Directors of the City of Durham Gas Company," proposed by Mr. GIBB, and responded to by the CHAIRMAN; and "Kindred Associations," proposed by Mr. T. HARDIE, of Gateshead.

#### MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Second Annual Meeting of this Association was held on Saturday, the 29th ult., at the Technical School, Manchester—Mr. R. H. Garlick, the retiring President, in the chair. There were about thirty members present. The Council submitted their report on the work of the past year, which they stated had been very successful. The roll of membership had been well maintained; and the accounts showed a balance in hand. The members had enjoyed and benefited by the various visits arranged during the year; and the Council acknowledged the courteous manner in which the Association had always been received. Valuable papers had been read—by Mr. Frank West, on "Revivification;" by Mr. Lewis, on "Cyanogen;" and by Mr. Halliwell, on "Examinations in Gas Manufacture." There had also been several "Question-Box" evenings. As the result of Mr. Halliwell's paper, the Association had been in communication with Sir Philip Magnus; and he had laid their views before the City and Guilds of London Institute, who had promised to give them careful attention. The question of reporting and publishing the proceedings of the Association had been under the consideration of the Council, who, as the result of correspondence, were able to assure the members of better reports being furnished in the future. In looking forward to the current year, the Council expressed the hope that the members would individually help to make it a successful one by contributing papers at the meetings. The report was adopted. General satisfaction was expressed at the good progress already made by the Association, and confident hope was entertained for its continuance. The following officers were then elected:—

*President.*—Mr. C. Berry, Hyde.

*Vice-President.*—Mr. R. H. Garlick, Salford.

*Treasurer.*—Mr. R. B. Braddock, Radcliffe.

*Council.*—Mr. A. E. Mottram, Hyde; Mr. S. E. Halliwell, Littleborough; Mr. H. Smith, Bury; Mr. W. Baxendale, Chorley; Mr. W. Hill, Stalybridge.

*Hon. Secs.*—Mr. E. J. Wellens, Middleton; Mr. B. S. Haynes, Stretford.

*Auditors.*—Messrs. F. Oldfield and F. Irwin, Denton.

A few slight alterations were made in the rules; and the meeting was brought to a close by the usual vote of thanks.

The Instructions of the Metropolitan Gas Referees for the autumn and winter seasons, issued last week, contain, in addition to the alterations mentioned in our editorial columns, the usual intimation that 22 grains will be the maximum amount of sulphur allowed in every 100 cubic feet of gas until further notice.



## REGISTER OF PATENTS.

**Starting Gas-Engines.**—Bell, J. R., of Ratho, N.B. No. 21,360; Oct. 26, 1899.

This starter comprises a hand lever or wheel, the boss of which is formed with a screwed or equivalent part to engage in a corresponding part formed on the end of the engine crank-shaft, or on a boss-piece fixed on the end of the shaft; the boss of the lever or hand-wheel being arranged to go out of gear on the engine starting and turning the shaft. The lever or hand-wheel is, however, prevented from being entirely thrown off by one or more pins in its boss engaging in a groove in the crank-shaft extension. Similar levers or hand-wheels may be applied to both ends of the crank-shaft; the screw threads being disposed to suit the direction in which the shaft turns.

**Generating Acetylene.**—Morin, R., of Quebec, Canada. No. 7539; April 24, 1900.

The object of this invention is to provide apparatus for generating acetylene that will "meet with all the requirements of the Underwriters' Association, as regards safety." It includes a safety-tank (which is a safety-valve) operated, not by pressure of the gas, but by the quantity of the gas generated. This "safety-tank" is operated by the rising of the main gas-storage tank; but, when once started, the rising and falling of the bell of the main tank stops or starts a flow of water to the carbide, and as this is automatic—the gas being generated instantaneously when the water falls on the carbide—the flow of water is regulated and cut off instantaneously. Self-feeding generators also are provided, independent of each other; so that one may be charged without interfering with the working of the whole apparatus. The invention further consists of sundry details fully described only by the aid of a series of nine sheets of drawings.

**Gas Pressure-Regulating Apparatus.**—Bullock, A. R., of Cleveland, Ohio, U.S.A. No. 7754; April 26, 1900.

This invention relates to contrivances for controlling the pressures between gas-generators and the points of consumption; and the object aimed at is to provide an apparatus whereby a predetermined pressure may be maintained at the terminals of consumption, regardless of fluctuations in the supply of gas to the regulator, and an irregular consumption of gas from it.

Within the vessel shown in the engraving there is provided a diaphragm having a tube depending from it. From the top of this vessel extends a flue, having a comparatively contracted outlet, and a full inlet. An opening below the diaphragm is provided for connection with a generator to supply gas to the apparatus. By means of the diaphragm, the vessel virtually becomes divided into an upper and a lower compartment, which are partially filled with liquid (water), and in each of which is placed a float or buoy. The float C in the upper compartment carries the cup D, and securely attached to the float E is the pipe F of S form. One terminal of the pipe is in open relation with the gas-containing part of the compartment fitted with the float E; while another depends into the cup D. When vent is given through the outlet at the top, the flue and cup D become filled with liquid; also vent is then had from the lower compartment, so that the liquid rises until enough is supplied to fill the compartments to about half their capacity, in order to obtain the largest range of variation for the floats in a given height for the compartments. Furthermore, the higher the compartments, the greater can be the difference in pressures which may be established (and relatively reduced) by the apparatus. The regulation of pressure (or maintenance of a certain predetermined pressure) is afforded by means of the floats, and depends upon the extent to which the pipe F is returned into the cup D. The column of liquid above the immersed end of the pipe affords a liquid check against the emission of gas from the pipe. The deeper the pipe F extends into the cylinder, the greater the reduction in pressure will be between the incoming and outflowing gases. The distance between the lower edge of the tube and the bottom of the vessel limits the range of variation for the floats; and the connections of the float with the cup and pipe admit of vertical adjustment to suit particular conditions under which the apparatus is to be used.

**Photometry of Large Sources of Light.**—Carter, F. W., of Birmingham. No. 8704; May 11, 1900.

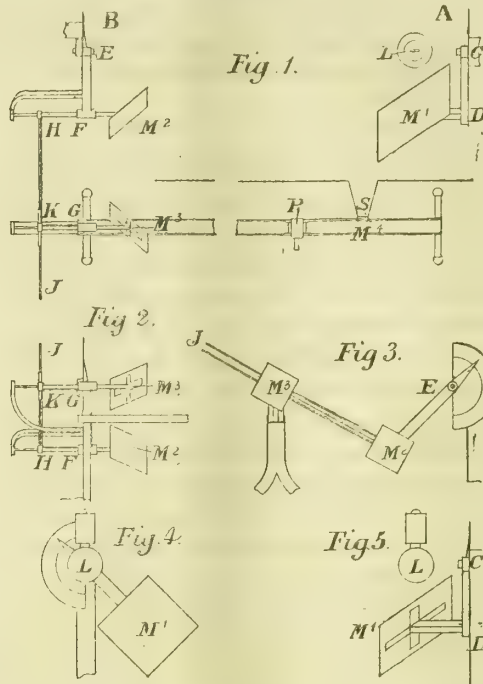
This invention is intended particularly to facilitate the photometry of high-power lights (of which it is necessary to examine the intensity or power in various directions).

Fig. 1 is a plan of the apparatus—showing it arranged for the photometry of a light emitted at an angle of  $45^\circ$  below the horizontal. Fig. 2 is a side elevation of the mechanism marked B in fig. 1. Fig. 3 is a front elevation of the mechanism B. Fig. 4 is a front elevation of the mechanism A in fig. 1. Fig. 5 is a side elevation of the mechanism A.

The mechanism A consists of an arm of metal C D  $M_1$  (substantially as shown in figs. 1, 4, and 5), turning at C about an axis lying parallel to the photometer-bench  $M_3 M_4$ , and capable of being clamped in any position. This arm carries at  $M_1$  a mirror, fixed relatively to it, and making an angle of  $45^\circ$  with C D and D  $M_1$ . Fixed to the arm is a pointer or other indicator of its angular position.

The mechanism B consists of an arm of metal E F, equal to C D

(arranged as shown in figs. 1, 2, and 3), turning at E about an axis lying parallel to the photometer-bench, and in the same straight line as the axis at C. This arm is capable of being clamped in any position, and carries a pointer or other indicator of its angular position. It also carries at F a bearing in which a tube or rod  $M_2$  H can turn and slide, and which is parallel to the photometer-bench. At G, which is on the same horizontal level as the photometer-head P, is a fixed bearing, in which



the tube or rod M K can turn and slide, and which is parallel to the photometer-bench. The tube carries at H a tube or rod H J (which may be in duplicate, as shown), fixed to it at right angles; and at  $M_2$ , a mirror set at  $45^\circ$  with  $M_2$  H and H J. The tube  $M_3$  K carries at K a cross-tube (which may be in duplicate, as shown), fixed to it at right angles, in which the tube or rod H J slides, so as to direct it towards H. At  $M_3$  is fixed a mirror, set at  $45^\circ$  with  $M_3$  K and H J. To the bearing F is attached an inextensible cord or chain F H K G, which passes through a ring or other guide at H, through another such guide at K, and is itself attached to the bearing G.

The light emitted in any direction from the source L will generally be compared with that emitted in a particular direction by means of the arrangement shown at S in fig. 1. This consists of a funnel of wood or other opaque material (painted white inside when necessary), with its wider end directed towards the source L, and its narrower end covered with a vertical translucent plate, whose effective area can be varied by means of stops. This plate is parallel to the photometer-bench, and on the same level as the photometer-head. Opposite this plate is set a vertical mirror  $M_4$ , at an angle of  $45^\circ$  with the bench, in such a position that the image of the translucent plate formed by it lies in the path of the photometer-head. The funnel is shown in fig. 1, attached to a screen for intercepting the direct light from the lamp.

The invention is used as follows: The source of light L is set on the line C E, at a distance from C equal to D  $M_1$ . The arm C D is set so that the mirror  $M_1$  receives light in any required direction from L. The arm E F is set parallel to C D, while the tubes or rods  $M_2$  H,  $M_3$  K are slid together through their bearings until the cord F H K G is just taut. The position of balance of the photometer is now found; the effective size of the standard S being varied, if necessary, by its stops, in order that balance may be found at a point on the bench. Thus the relation between the powers of the light in different directions is determined.

The action of the apparatus is as follows: The arms having been set as described, the light from L, striking the mirror  $M_1$ , is reflected along  $M_1 M_2$ . Now the rod H J turns the mirrors  $M_2$  and  $M_3$  in such a manner that the normals to their planes at their centres lie in the plane of H  $M_2$  and K  $M_3$ . Since the ray  $M_1 M_2$  is in this plane, it is reflected in this plane, and so traverses the path  $M_2 M_3$ ; and at  $M_3$  it is again reflected in this plane, and traverses the path  $M_3 P$ . Now the portion  $M_3 M_4$  of the path of the ray of light varies in length with the position of the arm E F. This variation is allowed for by the sliding of the tubes or rods in their bearings; for, since the cord is kept taut, and H K is equal to  $M_2 M_3$ , it is clear that, when  $M_2 M_3$  is increased by any amount, the mirrors  $M_2$  and  $M_3$  are each pushed forward by a half of the amount. Thus the total distance L  $M_1 M_2 M_3 M_4$  remains constant.

**Acetylene Generators.**—Haddan, R.; a communication from the Adams and Westlake Company, of Chicago, U.S.A. Nos. 10,993 and 10,994; June 16, 1900.

These inventions relate to acetylene generators of the class intended to supply a distributing system provided with a plurality of burners—particularly for the lighting of railway cars, &c.

The objects of the first invention are stated to be: To provide for the generation of the gas without unduly heating the carbide from which it is made; to regulate a constant supply of water; to provide for the proper delivery of the water to the carbide; and to provide for the cooling of the gas and the condensation of the vapour carried out of the generator.

In the case of the second invention, the objects aimed at are stated to be: To provide a generator of the type in which water is conveyed in small quantities to a mass of carbide—the flow of water being controlled by the gas pressure developed; and a special object being "to provide means for combining in a single battery a number of comparatively small

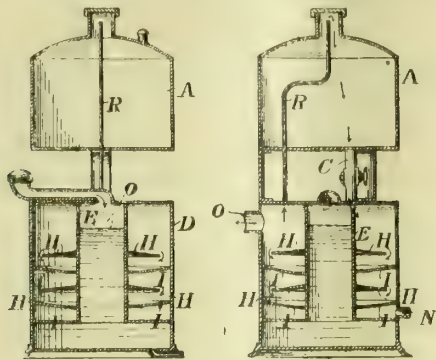


generators or cells which may be used in unison or in succession, as may be desired—means being provided for automatically bringing into action one or more generators after others have been exhausted of their charges, and for conveniently replacing an exhausted cell by one newly charged."

Neither invention is further described apart from a mass of detailed drawings, and lengthy lettered specifications.

**Carburetted Air with Gasoline.**—Wünsche, R., of Herrnhut, Germany. No. 10,574; June 9, 1900.

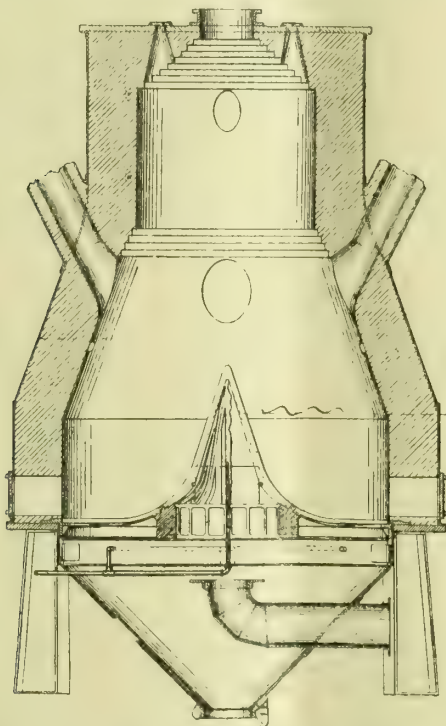
This invention relates to apparatus for carburetted air with gasoline, to be employed for purposes of illumination, heating of calendering machines in the process of finishing cloths, in combination with a soldering tool, and for similar objects. The apparatus (as shown) comprises, in combination, a reservoir A for the reception of liquid hydrocarbon; and



a generator D connected with the hydrocarbon reservoir by means of a pipe C, and containing centrally a cylinder E adapted to be heated by steam or water. A number of dropping-rings H are alternately secured to the outer wall of the heating cylinder E, and to the inner wall of the generator D. A gas-pipe R leads from the generator to the space above the level of the liquid hydrocarbon in the reservoir A; while there is an air-admission pipe N at the lower end of the generator, and a gas-outlet pipe O at the upper end.

**Manufacture of Water Gas.**—Slocum, F. L., of Pittsburgh, Penn., U.S.A. No. 12,336; July 7, 1900.

This invention of apparatus for the manufacture of water gas, has for its object "to provide for the manufacture of such water gas by the quick blasting-up of the fuel (coal or coke), and the production of carbonic acid in large proportions in such blasting operation, so as to raise the fuel to a higher heat by shorter blasting periods, and provide for longer runs of gas-making."



The invention comprises, generally stated, a water-gas generator (as shown in longitudinal central section), having a wide lower combustion chamber gradually converging upwards, and having several waste-product openings at its upper end. Above these, there is a coal-chamber narrower than the combustion chamber, and having a feeding opening and a gas-outlet passage at its upper end. An extended grate-surface below the combustion chamber is preferably furnished with a conoidal central portion rising above the main body of the grate; and so providing for a rapid supply of large bodies of air to the mass of ignited fuel, and (through the central conoidal portion of the grate combined with the converging side walls of the combustion chamber) for the travel of the air and products of combustion but a short distance through the mass. This, it is claimed, leads to extremely rapid heating of the mass; the formation of a large proportion of carbonic acid; and the withdrawal of the products of combustion before they can absorb much carbon from the mass.

The generator consists in certain other improvements set forth in the claims, as follows.

1. A water-gas generator having a wide lower combustion chamber;

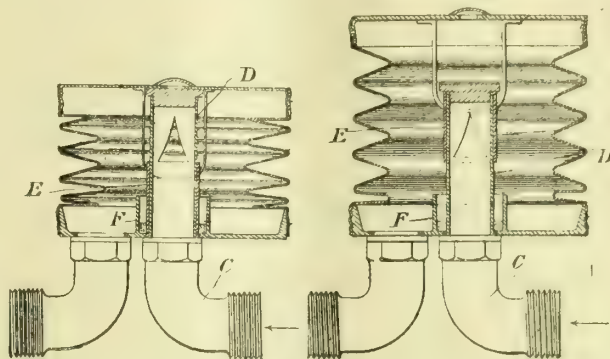
an extended grate surface as wide as the combustion chamber, the walls of the chamber gradually converging upwards, and having waste-product openings arranged therein around its upper end; and a coal-chamber narrower than the combustion chamber, and superimposed above it, and having its lower walls merging into the upper walls of the combustion chamber above the waste-product outlet—the coal-chamber having a feeding opening and a gas-outlet passage at its upper end.

2. A water-gas generator having a combustion chamber with an extended grate, provided with a conoidal central portion rising above the main body of the grate.

3. A water-gas generator having a combustion chamber provided with cross-beams extending below, supporting a central ring; a central conoidal grate portion supported on the ring; grate-bars extending from the ring to the side-walls of the chamber; a steam-supply pipe, provided with a perforated ring portion under the horizontal portion of the grate; and a central steam-pipe rising within the conoidal portion of the grate, and having an outlet at its upper end.

**Gas-Governors.**—Child, J. F., of Honor Oak, and White, R. J., of Camberwell, S.E. No. 13,408; July 25, 1900.

This invention in gas-governors has for its object "to provide a governor of simple construction, by means of which a regular pressure of gas may be maintained in the outlet-mains notwithstanding the variation of draught, or variation of pressure in the inlet-mains."



The governor comprises an expansible chamber, which (as shown) consists of two saucer-shaped plates, having their recessed surfaces opposed to each other, and connected by flexible bellows. The lower plate is stationary, and has secured to it the inlet and outlet mains. The inlet-main C is preferably arranged at the centre of the plate, and communicates with a valve-body D, cylindrical in form, and rigidly secured to the plate within the expansible chamber. The upper end of the valve is closed in any convenient way; and the gas from the inlet-main makes its exit from the valve-body by triangular-shaped orifices formed in the wall of the valve. Surrounding the valve D is a sleeve E, free to slide upon the valve, and secured to the upper plate in the expansible chamber by supports. When the expansible chamber is contracted, the sleeve falls below the orifices in the valve D, so that gas from the inlet-main is allowed to pass freely into the expansible chamber—making its exit thence by means of the outlet-main, which communicates freely with the chamber. Should, however, the pressure in the inlet-main be greater than the pressure it is required to maintain in the outlet-main, the pressure in the expansible chamber will cause the upper plate to rise, and so extend the flexible walls, and raise the sleeve E upon the cylindrical valve-body D. As the sleeve rises, it will cover more or less of the orifices—thus throttling off a certain amount of gas. Should, however, the draught of gas be suddenly increased upon the outlet-main, the plate will immediately fall, lowering the sleeve E, and again allowing an increased flow of gas from the inlet-main C.

Surrounding the lower end of the valve-body D is a fixed sleeve F, by means of which an annular recess is formed around it. This recess may be filled with a lubricant, so that, as the sleeve E descends into and rises out of it, the surface of the valve will be lubricated, and the sleeve E made to slide freely upon it.

#### APPLICATIONS FOR LETTERS PATENT.

16,952.—MACLAURIN, R., "Utilizing the heat from illuminating flames for heating apartments." Sept. 24.

16,954.—KEITH, J., "Automatic lighting device for high-pressure incandescent burners." Sept. 24.

16,955.—KEITH, J., "High-pressure burners for incandescent lamps." Sept. 24.

16,960.—THORNE, L., "Acetylene generators." Sept. 24.

16,964.—WALTER, L. H., "Gas-burners." Sept. 24.

16,979.—FAZAN, J., "Generator for acetylene gas." Sept. 24.

17,019.—MILNE, J., and O'CONNOR, H., "Dry meters." Sept. 25.

17,025.—PREDMERSZKY, J. & G., "Acetylene gas generator." Sept. 25.

17,052.—DESQ, P., and FRANCOUAL, S., "Manufacture of calcium carbide." Sept. 25.

17,067.—THOMPSON, W. P., "Igniters for gas-engines." A communication from the Victor Motor Company, Ltd. Sept. 25.

17,098.—LLEWELLYN, J., "Incandescent gas-burners." Sept. 26.

17,101.—LANGHANS, A., "Manufacturing incandescent media for lighting purposes." Sept. 26.

17,127.—HEAD, J. H. R., "Valves for gas or other fluids under pressure." Sept. 26.

17,173.—DANIELS, J. S. & F. L., "Cooling and condensing apparatus for the treatment of gases." Sept. 27.

17,210.—SHARP, J., "Fluid meters." Sept. 28.

17,217.—COPELAND, H. L., "Water-motors." Sept. 28.

17,296.—HOOKER, W., "Burners for gas lighting by incandescence." Sept. 29.

17,298.—POTTER, W. G., "Acetylene generators and lamps." Sept. 29.

17,324.—LAKE, H. H., "Pressure-reducing apparatus." A communication from A. E. Simonds. Sept. 29.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Allowance to be Made for Fast and Slow Meters.

SIR,—As promised in my letter of last week (p. 847), I give below the table of temperatures taken from Mr. F. W. Hartley's book on "Gas Measurement and Meter Testing," to be used for correcting volumes of gas passed through a test holder. I have, however, added 100 to the percentage column in all cases.

The following table by the Astronomer-Royal, published in Parliamentary Paper No. 339 (session 1861) shows the dilatation of gas in contact with water, and saturated with aqueous vapour for given temperatures.

Note.—The table shows the percentage of increase of the volume of gas above its volume at the temperature of 31°4' Fahr.

Temperature in Fahrenheit's Scale.	(Percentage of) Dilatation.	Temperature in Fahrenheit's Scale.	(Percentage of) Dilatation.	Temperature in Fahrenheit's Scale.	(Percentage of) Dilatation.
31°40	100	54°33	105½	74°30	111
33°54	100½	56°24	106	75°94	111½
35°70	101	58°12	106½	77°23	112
37°84	101½	60°02	107	78°81	112½
39°91	102	62°00	107½	80°40	113
42°05	102½	63°77	108	81°94	113½
44°17	103	65°63	108½	83°44	114
46°22	103½	67°43	109	84°88	114½
48°25	104	69°18	109½	86°39	115
50°32	104½	70°90	110	87°83	115½
52°36	105	72°60	110½	89°20	116

I will give two examples showing how to use the table:—

(a) Meter reading, 100; temperature, 72°60'  
Testholder,, 95; ,, 54°33°

We can either correct the temperature of the meter by multiplying 100 cubic feet by  $\frac{105\frac{1}{2}}{110\frac{1}{2}}$ , or we can correct the holder by multiplying

95 cubic feet by  $\frac{110\frac{1}{2}}{105\frac{1}{2}}$ . The final result will be the same. But as it is convenient to retain the meter reading 100 (or some divisor or multiple of .100), we correct the gasholder—

$$95 \times \frac{100\frac{1}{2}}{105\frac{1}{2}} = 99.50 \text{ cubic feet.}$$

This shows that the meter is 0.50 cubic foot fast in 100 = 0.50 per cent.

(b) Meter reading, 100; temperature, 52°36'  
Testholder,, 107; ,, 70°90°

Correct the holder, as before, by multiplying—

$$107 \times \frac{105}{110} = 102.14 \text{ cubic feet.}$$

This shows that the meter is 2.14 cubic feet slow in 100 = 2.14 per cent.

I have taken the examples as in the book. The confusion therein arises (1) from reckoning the increase of volume from temperature 54°33' to 72°6' as 5 per cent. instead of 5 per 105½; (2) calculating on the meter reading, but rectifying the gasholder, which is done to try to counteract the first error; and (3) calculating the final percentage of error by taking the corrected difference in reading *per the gasholder* instead of *per the meter*, which error was fully dealt with last week. Then the remainder of the chapter is devoted to a very roundabout way of getting the calculations correct for cases where it is admitted to be necessary, but not improving error (3), which is the most serious.

Oct. 4, 1900.

B. R. P.

"T. H. C." asks us to invite some correspondents to give their views as to the most profitable modes of utilizing the tar and ammoniacal liquor of a gas-works situated about 30 miles from the nearest port; the make of gas per annum being about 20 millions.

**Additional Gas Plant for the Cowes District Council.**—At the last meeting of the Cowes District Council, a recommendation of the Special Gas Committee to apply to the Local Government Board for a loan of £1500 for new mains, services, and meters was adopted; and the Council authorized the Committee to take up £1000 of the £2000 already sanctioned by the Board for working capital.

**Fatal Gas Explosion in Liverpool.**—At Liverpool on Tuesday, Mr. Gibson, Deputy-Coroner, inquired into the circumstances attending the death of William H. Burnham, Manager of a public-house in Park Street, who died in the Royal Infirmary on the previous Sunday from injuries received through an explosion of gas. The widow stated that on the 23rd ult. her husband went to the bar for the purpose of preparing to open the house. A few minutes afterwards she heard a rumbling noise; and on going downstairs saw that the windows of the bar and bar parlour were blown out. Her husband was lying in the parlour suffering from severe burns about the head, arms, legs, and body. He told her that he opened the bar parlour door; and as soon as he did so, he was blown back again. A barman employed by deceased deposed that for the past week or two customers had complained of an escape of gas; but they were unable to detect where it was. A police-constable, who assisted deceased after the explosion, said that Burnham could not account for the explosion, as the gas had been turned off the previous evening. A plumber stated that he had examined the chandelier in the bar parlour, and found a fracture in the ball-joint close to the ceiling. From this there had been a considerable escape of gas; but he did not think it could have been detected by a casual examination. The Jury returned a verdict of "Accidental death."

## MISCELLANEOUS NEWS.

## COMMERCIAL GAS COMPANY.

The Ordinary Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. J. BLACKET GILL presiding.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the report and accounts, from which extracts were given in last week's issue, were taken as read.

The CHAIRMAN said he need not occupy the time of the proprietors at any length on this occasion; but they could well imagine that the past six months had been a time of considerable anxiety for everyone connected with the management of gas-works. The cost of coal had been so excessive; and such a rapid rise had very much impeded their efforts. From 1877 to 1890, they only paid for coal, free on board, 5s. 10½d. per ton, and in 1896 6s. 2d.; whereas this year they had had to pay 16s. Imagine, he said, the very great difference of working under such figures. In these circumstances, it was absolutely imperative that the Directors should increase the price of gas to the consumers; and this, the proprietors were aware, they did last Lady-day, by raising the charge from 2s. 6d. to 3s. per 1000 cubic feet. The consumers, of course, were not particularly well pleased, though really they had enjoyed cheaper gas than certain other parts of London for some time. A deputation, headed by three members of Parliament, waited upon the Board at the Stepney offices, and suggested the desirability of not increasing the price. But the Directors were obliged to point out the fact that the cost of coal had so seriously advanced, that it was absolutely essential they should do so. The increase in the price of gas, it would be noticed, would not clear the coal bill; and while the proprietors were sacrificing ¾ per cent. dividend, something would also have to be taken from the reserve fund. Under these circumstances, the Directors told the deputation they should, as early as possible, be only too pleased to revert to the lower figure for gas; but until the people in the North would let the Company have coal a little cheaper, it was absolutely impossible they could do so. Another cause of considerable trouble to the Board during the half year had been the proceedings in the House of Commons Committee Rooms. As the proprietors no doubt knew, the London County Council introduced a most troublesome Bill for the legalization of the portable photometer; and this engaged the close attention of the Company's General Manager (Mr. H. E. Jones), who had to be assisted by many gentlemen of the long robe for a considerable period. Consequently, he (the Chairman) was told, they had now a bill from their Parliamentary Agents amounting to something like £1200; and this they had to pay for successfully combating such a mischievous measure. He was sorry to hear, on good authority, that the County Council intended to make another attempt; and this merely meant that the Company would have to fight them again. These people did not seem to understand that the cost of doing so must necessarily fall on the consumers of gas, though they themselves employed the rates, part of which the Company had to pay, to fight against them. It was an utter waste of money, and it was a matter that was absolutely unnecessary to pass into law. He might say that through the industry and ability of their excellent General Manager, they had also successfully combated some of the efforts made to raise their rates in the parishes in which they carried on their business; and though the rates were somewhat more—in fact, nearly every time the proprietors met they saw an increase in the rates—still they had come out better than was anticipated; and this, as he had said, was greatly owing to the ability with which Mr. Jones had fought their battles. Another Bill which had been before Parliament was one that Mr. Livesey introduced; and, as the proprietors probably saw, Mr. Livesey had achieved a certain success. In a humble way he (the Chairman) had alluded very often to the ridiculous waste of money involved in providing gas of such high illuminating quality as they had to supply; and he had hoped the time would come when they would be permitted to reduce the candle power. Mr. Livesey had obtained an Act in which he had got the illuminating power of the South Metropolitan Company's gas reduced by 2 candles; but, of course, he had to pay a *quid pro quo* for it, though he (the Chairman) believed Mr. Livesey was quite satisfied with what had taken place. Of course, what the South Metropolitan Gas Company had secured did not apply in any way to the Commercial Company at the present time; and they certainly had no wish to appear in the portals of Parliament until they were obliged to. But what had taken place might possibly have an effect upon the gas legislation of the future; and, if they could only produce 14-candle gas instead of 16-candle gas, he thought it would be a good thing for the Commercial Gas Company. As to the half-year's business, they showed an increase of 6½ per cent., which was very satisfactory, inasmuch as the Gaslight and Coke Company only had an increase of 3 per cent., though the South Metropolitan Company had the extraordinary advance of 12 per cent. He would not weary the proprietors with a number of figures; but he would simply give the principal ones. The gross income for gas at 2s. 6d. and 3s. had increased, comparing it with the first half of last year, by £20,610; meter-rents by £87; stove-rents by £710; and coin meters and fittings by £149. So that the total gross income for gas and rents showed an increase of about £21,000. So far the figures were very satisfactory. But, on the other side, coal and oil had cost £27,651 more than in the corresponding period of last year. Residuals, however, yielded more by £12,540; so that the net cost of coals presented an increase of £15,111. In short, gas and rents showed a gain of £21,485, and residuals of £12,540, or a total of £34,025. Against this they had to put the loss on coal £27,651, the increase on wages and salaries £2439, on purification £1709, wear and tear £4527, and rates, management, &c., £1800—leaving a net loss of £4125 for the half year. The proprietors knew the dividend must be reduced; and the amount they would require to pay the 12½ per cent. and 9½ per cent. dividend, which was ¾ per cent. short of the statutory dividend (for many years past they had kept ¾ per cent. in hand), was £46,610; and they had available £44,229. It followed that they were £2381 short; and this would have to come out of the reserve fund of £43,074, which would reduce it to £40,693, which was a very satisfactory figure. The works were all in good order; and everything was going on satisfactorily. They were putting up another oil-gas plant at Stepney. It was not yet in full working order, but would be shortly.



Then they had had to pay a much higher price lately for lime for purification purposes. The spent lime had been difficult to get rid of; and so they were putting up a lime-burning plant. They believed they would be able to revivify and use the lime over again; and he was in hopes that they would save a considerable sum in this way in future. Coke was selling well; and everything was going on satisfactorily—everything excepting coal. Many people had hazarded prophecies on the question as to whether coal was going to be cheaper next year; but he thought the gentry in the North had tasted so much of the sweets of these high figures that it would be some time before consumers would again see the price of coal down at a reasonable limit. He hoped, however, that by next spring they would get something like easier figures. The present state of affairs had produced this advantage: The price of their stock had not been so high as it used to be, and that was a great advantage, as they could now go into the market and buy again. And a better investment than the stock of the Commercial Gas Company, they could not buy.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw) seconded the motion, which was unanimously carried.

Dividends having been declared at the rates of 12½ per cent. per annum on the old stock, and 9½ per cent. on the new stock, less income-tax,

Mr. A. E. BAKER proposed a hearty vote of thanks to the Chairman and Directors. He remarked that the proprietors deeply sympathized with them in the anxious duties which had fallen to their lot during the last few months; and they felt the justice of the remarks the Chairman had made upon the Bill of the London County Council. As he had stated, the Company and the ratepayers generally had to pay the rates; and a portion of these rates were taken for the purpose of fighting private companies. Besides having to pay the rates, they had to pay out of their profits the funds required to oppose these deplorable machinations of the County Council. He was glad the Gas Companies had defeated the Council in their present endeavour; but unfortunately they kept repeating their evil practices—not only with Gas Companies, but with many other commercial undertakings of the City of London. He was certain the Directors would continue the good work they had done, and would not leave a loophole through which their antagonists could attack them.

Mr. C. J. THORNTON seconded the proposition, which was cordially agreed to.

The CHAIRMAN thanked the proprietors for their kind reception of the vote, more especially as the Board had to come before them with a reduced dividend. He sincerely hoped they would soon be in a position to revert to the old rate. He then spoke of the excellent services of Mr. Jones, who had been connected with the Company so many years, as had his father before him. Mr. Jones took such a keen interest in the concern, that they had the fullest confidence in him. A similar tribute was paid to Mr. Ellis; and the exertions on behalf of the Company of Mr. W. Favatt, the Accountant (who, the Chairman said, was their oldest officer), were likewise acknowledged. Concluding his remarks, the Chairman moved a vote of thanks to the officials and staff.

The DEPUTY-CHAIRMAN seconded the motion, which was heartily passed.

Mr. JONES, in thanking the Chairman and the proprietors for their kindness, said that at the present time the management of a gas-works was not exactly a bed of roses. With such a revolution as an increase in the price of coal, as shipped in the North, of 100 per cent. (they now paid 16s. where they used to pay 8s.), the proprietors could imagine that a gas manager's heart was rather appalled; and it did not make it more comfortable when he knew that, at both ends of his district of supply, the local authorities were starting electric light undertakings. It had been perhaps the greatest mortification he had suffered for years to find that, just as two municipal electric lighting establishments were being inaugurated, the Company had to raise the price of gas, and so handicap themselves. But, having looked into the accounts of electric lighting companies, he was glad to assure the proprietors that they too, like the gas companies, had to devote at least one-third of their whole expenditure to the cost of fuel; and therefore, in the coming year, when he saw the electric lighting companies' accounts, he would have the gratification of seeing that they too had had expenses considerably increased. How, in the face of this, they were going to supply, as they pretended they would be able to do in one part of the Company's district, electricity at 1d. per unit, when he had satisfied himself that it cost at Manchester, Glasgow, and several other places where the undertakings were on an enormous scale, and where they were in the middle of coal-fields, more than double this figure (the raw costs were more than double the figure)—how they were going to supply at 1d., he did not know, unless the ratepayers were to forbear, and "fork out" the additional penny. He had the gratification of receiving the other day a letter from one of their gas consumers, who had noticed that, on the heads of the gas bills, he (Mr. Jones) had called the attention of the consumers, or rather he had given them warning not to be led away by any calculations put before them as to the economy to be derived from giving up gas and going over to the electric light. The consumer to whom he referred wrote that he had noticed the caution on the top of the gas account; and he said he could quite endorse the statement. He had extensive shops in the Commercial and the adjoining Gas Company's district (West Ham). He said he had tried both gas and electricity at his two shops, and his electricity bill was two-and-a-quarter times as much as his gas had been before. This gentleman had given him (Mr. Jones) permission to use his name; and if it was asked for, he would furnish it with pleasure. The statement, he should like to say, was made quite voluntarily. He (Mr. Jones) had never seen the writer; at any rate, he was quite certain he had never had a word of conversation with him. But he had sent him this tribute to gas; and he (Mr. Jones) thought it right he should refer to it. Alluding next to the busy times he had had, Mr. Jones said that he had appealed against the rates in nearly the whole of the parishes in the Company's district. They were all determined to put on extra rating; but he was glad to say that in every case (only one of sixteen was unsettled) they had brought them back. If the parishes had succeeded in keeping the rates at the amounts at which they had put them, the Company would have had to spend something like £1300 or £1400 more under that head. Such was the economy, or want of economy, in these districts, that the rates were as much as 8s. 10d. and 8s. 7d. in the pound; while in some parishes in the west of London, they were as low as 5s. 6d. It was to be hoped that, at the municipal elections, gentlemen would get into power who would have regard to the expenditure of the rates, and see

whether part of the outlay which was now going on could not be saved. From his own observation, it seemed to him that some of the large paving—unwise paving he might call it—was simply done for the purpose of finding employment for men to get votes, or to benefit the contractors. It was absolutely unnecessary, wasteful, and improvident. It was not done for the best; to do the best, every parish should save expenditure. Concluding his remarks, he said that, having been for 31 years in the Company's service, he had been thinking of a time of rest. But what with the County Council, rates, electricians, and coal, he felt that he must put his shoulder to the wheel harder than ever, and stick to it a little longer, or until the proprietors found that he was worn out, and ought to be put on one side.

Mr. ELLIS said he should like to emphasize every word his colleague had said, except the last ones. He was sure the proprietors would not think for one moment that Mr. Jones was worn out, or even getting near that condition. There were many years of good work in him yet, and he was sure Mr. Jones would give them to the Company. On behalf of himself and staff, he thanked the proprietors for their vote.

This concluded the proceedings.

#### ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Offices, D'Olier Street, Dublin—Mr. CHARLES LAWLER, J.P., in the chair.

The report and accounts for the half year ending June 30, noticed in the "JOURNAL" last week, having been presented,

The CHAIRMAN moved their adoption. In doing so, he remarked that in the six months covered by them there had been sold 25,028,000 cubic feet more gas, for which £2117 0s. 4d. had been received. But the proprietors must bear in mind that by the reduction of 1d. per 1000 cubic feet, which came into operation at the beginning of the year, the Company had lost nearly £3000. The residual products, however, had increased in value. Coke had brought in £2243 more than in the corresponding period of 1899; breeze, £211 more; and tar, £1066 more. But sulphate of ammonia had fallen off to the extent of £117, owing to a smaller quantity having been made. Shareholders and consumers alike were fully aware of the great advance which had taken place in the price of coal. The increased cost the Company would have to pay for the year's supply would be about £60,000. However, they had no alternative to paying it; for they were, like every other gas company, completely at the mercy of the coalowners. They had also to pay a much higher figure for all materials used in the manufacture of gas. To partly meet these increased charges, they were obliged to raise the price of gas 6d. per 1000 cubic feet. This would not nearly represent the additional expenditure for coals, freight, &c.; but the Directors considered it better to await the results of the current half-year's working. They hoped to receive an additional income from residuals, which, when added to the balance they were carrying forward, might tide them over the difficulty. But it was more than probable that it would become necessary to draw a moderate sum from the reserve fund. Prepayment meters continued to be in active demand. There had been an increase of 1327 for the six months; and the total number now in use was 3400. So many applications had been made for them that the staff were unable to complete the orders they had taken, owing to the scarcity of qualified fitters to execute the work; but they hoped after some time to overcome this difficulty. In conclusion, he said the Directors recommended the payment of the usual dividends at the rates of 10½ and 7½ per cent. on the respective shares.

The DEPUTY-CHAIRMAN (Mr. John R. Wigham, J.P.) seconded the motion; and it was unanimously adopted.

The dividends recommended were next declared; and the proceedings closed with a vote of thanks to the Chairman.

#### THE SOUTH METROPOLITAN GAS COMPANY'S COAL CONTRACTS.

##### Inaccurate Statements Corrected.

Under the heading of "Gas Coal Contracts and Prices: The South Metropolitan Patronizes Durham Again," the "Financial Times" last Tuesday published an article containing some inaccuracies which it is well should be set right. It will be observed that the information on which our contemporary bases its statements emanates from an "excellent authority" in the North. This and the whole tenor of the article make palpable the intention of the communication. We reproduce the article referred to, and give the true and simple facts at the end.

Our contemporary writes: "When the South Metropolitan Gas Company came on the market last spring for its year's supply of gas coals, prices were so high that the Company decided to purchase only half of its year's requirements. Instead of arranging for something like 1,500,000 tons, the Company bought half that quantity, trusting that, by the end of six months, prices would come down, and enable the Directors to secure the balance on more favourable terms. But the six months have passed; and, as everybody knows, prices have not come down. They have rather risen; and so awkward was the outlook for the South Metropolitan Company during the summer, that Mr. Livesey was tempted to buy some experimental cargoes of American gas coal. This American coal duly arrived; but whether Mr. Livesey and his co-Directors are satisfied with the results obtained from this American coal, we do not know. We do know, however, on excellent authority from the North, that the Company has just been arranging for its required half-year's supply with the colliery owners of Durham. Indeed, by now the contracts have been closed. They cover, we understand, some 750,000 tons, to be shipped to London from October to March; and the prices average about 16s. a ton f.o.b. Tyne. The price is what most other large buyers of gas coal have lately had to pay for forward contracts—indeed, the figure has been paid on several occasions for delivery over the whole of next year—and it is practically the same figure which the South Metropolitan Company paid in the spring for its half-year's requirements. Two deductions seem to be clear from the settlement of these contracts on this basis. One is that



the South Metropolitan Company has been obliged to return to its old source of supply—the county of Durham—and the other is that it has gained nothing by waiting; the contract price now being as high as it was in the spring, when six instead of the full twelve months' supply was purchased. Wherefore it may be assumed (we speak under correction of Mr. Livesey) that the imported American coal has not been a success, and that the Company deems it wiser to stick to the Durham coal. If that be so, we are sorry; for while no one wants to see our gas-works fed with American coal when we have a plentiful supply at home, everybody recognizes that the present 'boom' in prices has been carried to a most mischievous level. Of course, the fact that so large a buyer as the South Metropolitan Company has been compelled to pay the high price of 16s. a ton for its coal, exclusive of the cost of transporting it from the Tyne to the Thames, is convincing proof that prices are going to be high next year; but that much is already understood by coal consumers. It is impossible that a great 'boom' in the coal trade like the present should subside suddenly, unless, indeed, the country were swamped with cheap American coal, of which, considering the rates of freight and the existing labour difficulties in the American coalfield, there is, we fear, not much prospect. But now that the Transvaal war is about over, and that China is ceasing to trouble, less coal will be required by our own and other Governments; and, with a more normal demand, there will in time be more normal prices. Certainly the top has been touched; and though, as shown by the South Metropolitan contracts, prices are still high, and likely to be high for months to come, it is very improbable that they will rise higher."

Now, in addition to some of the statements being incorrect, the sub-heading which the "Financial Times" gave to the article is, as will be seen, misleading. The facts are simply these: Last spring, the Company made only six months' contracts from April—rather more than half with Durham at 16s. a ton f.o.b.; the rest with Yorkshire, at a slightly lower price. These contracts totalled to some 600,000 tons; leaving rather more than 400,000 tons to make up the twelve months' supply, of which the Company have bought about 386,000 tons of the same contractors at the same prices as in the spring—16s. being the maximum for Durham. Practically all the Durham and Yorkshire contracts have been renewed at the old prices. Two or three contracts, we learn, expire in December. Thus the Company have gained nothing by their struggle; but they have lost nothing. When we say that the Company have gained nothing, we mean in money; for they might have bought for twelve months at exactly the same prices (neither more nor less) as they have now paid. The Company have, however, saved their self-respect; and the Directors have the satisfaction (we can go even further, and say that they do feel it is a satisfaction) of knowing that they did not weakly give the coalowners all they asked for, but have done their best, at it is true, some considerable risk, to protect themselves from the coalowners' greed. Moreover, by their action, the Directors have found out those of the Durham coalowners—only, we learn with regret, two or three out of a dozen or more—who were disposed to act in a fair spirit; the bulk of them having shown that they cared more for the last 3d. per ton they could exact than for the Company's long, and considerable, connection with them. No doubt the Company will not forget this when their time comes, as come it will; and then dealings will probably take place only on the strictest business principles.

### MANCHESTER CORPORATION GAS SUPPLY.

#### The Testing of Gas Meters.—Gas Profits and the Relief of the Rates.

At the Meeting of the Manchester City Council last Wednesday—the Lord Mayor (Mr. T. Briggs) in the chair—the minutes of the Gas Committee contained a recommendation to allow gas-fitters an increase of 3s. per stove in the payment made to them for fixing hired gas-stoves for the Committee. Reference was also made to the fact that the Chairman (Alderman Gibson) had submitted to the Committee certain proposals of Mr. N. Bradley, on behalf of the City Justices, on the subject of the testing of meters, and stated that as the present system of testing complied fully with the requirements of the Acts of Parliament, and inasmuch as inaccuracies of registration were of very rare occurrence, and the institution of a more elaborate system of testing would cost the Committee £500 a year, he was of opinion that it was not necessary to carry out the suggestions of the Justices in this matter. The Committee concurred in the opinion of the Chairman, and resolved to leave the matter entirely in his hands to deal with accordingly. The minutes also included a notice given by Mr. Phythian of his intention to move a resolution that a Special Sub-Committee be appointed to consider and report as to the desirability of purchasing a coal mine or colliery for the supply of coal to the Corporation for gas-making and other purposes.

On the presentation of the minutes, Mr. SHUTTLEWORTH drew attention to the paragraph respecting the testing of gas-meters. He said he had previously brought the question before the Council, and thought it was a matter on which they and consumers generally should have some further information. The Chairman of the Committee had stated on a recent occasion that only 425 meters out of 125,000 were proved wrong. This was scarcely an accurate statement, as he found that, on an average, 616 meters were annually found to be wrong; and he knew that recently 30 meters had been tested, and shown to be registering from 25 to 70 per cent. against the consumer. One meter which had been stamped as quite correct was afterwards placed under the Liverpool double test, when it turned out to be 63 per cent. against the consumer. He should be very pleased if the Chairman would take the matter back, and give it further consideration, in the interests of consumers and all concerned.

Mr. BOYLE, referring to the increase of 3s. in the payment for fixing stoves, said he did not know what the figure had previously been, but he would like to ask whether the same price was charged for small as for large stoves. It might act as a deterrent, especially to cottagers who might want to use gas-stoves, if the charge was not reduced somewhat for small as compared with large stoves.

Alderman GIBSON, in reply, said he could assure Mr. Shuttleworth and other members of the Council that the Gas Committee were as much interested in the question of the accuracy of the meters as anybody else could possibly be. He was quite aware that there was a stricter test in

Liverpool than the one adopted in Manchester; and he also knew of the particular case mentioned by Mr. Shuttleworth. In that instance, the cause of the defect was a wrong wheel which had been put into the index; and all the legislation in the world could not prevent mistakes of that kind happening. Liverpool and Manchester were very differently situated in this matter. In Liverpool, the Gas Company had all their meters from one firm, who paid all the expense connected with the testing of them. In Manchester, the Committee obtained their meters from a great number of makers, and had also spent a good deal of money in having them tested. As to the number that were found incorrect, Mr. Shuttleworth only mentioned particular cases which operated against the consumer; but he (Alderman Gibson) could tell them of others which told against the Committee quite in the same proportion. Inasmuch as so few meters comparatively were found to be incorrect, the Committee did not feel justified in spending an extra £500 a year by adopting the Liverpool test. It was not used by any other Corporation than that of Liverpool, and was adopted there because Liverpool did not pay the expense of it. If, however, Mr. Shuttleworth or anyone else could induce gas meter manufacturers to relieve them from this responsibility and payment, the Committee would be glad to have the highest test that could possibly be applied. Under existing circumstances, however, the Committee did not think they would be justified in spending the money. As to Mr. Boyle's question, the Committee some time ago found that it militated against the interests of the gas undertaking to have the gas-fitters charging various prices for fixing gas-stoves, as when they sold a stove to a customer they never seemed to know exactly what it was going to cost for fixing. The Committee consequently made an arrangement with a certain number of plumbers that they would fix these stoves, irrespective of size, &c., at a given figure. This answered the purpose of both parties very well. But, in process of time, the plumbers came and said that this price did not pay them; and it was decided to allow them 8s. more.

The minutes were adopted.

Alderman GIBSON, who, as mentioned in the "JOURNAL" last week, had given notice of a motion to the effect that the system of subsidizing the rates out of the profits of the gas undertaking was wrong in principle, unjust in practice, and inimical to the interests of the ratepayers, and should be discontinued, remarked that this matter was an important one, not for himself, but for the ratepayers.

At this stage of the proceedings, however, the meeting was adjourned until the close of the month; when Alderman Gibson's proposal will be duly brought forward for consideration.

### THE ALDERSHOT DISTRICT COUNCIL AND THE GAS AND WATER WORKS.

About two months ago, the Clerk to the Aldershot District Council (Mr. W. G. Foster) forwarded to the Directors of the Gas and Water Company copies of resolutions passed by the Council on the subject of the proposed purchase of the Company's undertaking. In reply, the Secretary (Mr. R. W. Edwards) said that the Directors could not sell the concern without the consent of the shareholders; that they had never thought of advising them to sell; and that they could only be induced to consider the subject further on the Council making a very liberal offer on behalf of the town. He added that the Board assumed that the Council had seriously considered the very large sum which, on arbitration, would be awarded to the Company—probably in excess of £500,000. The Gas Purchase Committee of the Council had consulted Messrs. Stevenson and Burstal and Messrs. Blyth, Dutton, and Co. on the question, and, on the strength of their reports, brought up a resolution at the meeting of the Council last Wednesday, expressing the opinion that the statements contained therein justified the Council in "laying the case before the ratepayers, with the view of ascertaining their opinions on the subject." The Chairman of the Committee (Mr. Calvert) moved this resolution; but it was ruled out of order on a question of procedure. As explained by the Clerk, the proper course would have been for the Chairman to give notice of a motion proposing to acquire the Company's undertaking, and, on this being carried, to call a public meeting to sanction the purchase. Mr. Calvert presented a petition, signed by a large number of townspeople, for a public meeting; and this will be called by the Chairman of the Council (Mr. J. May), subject to the ruling of the Clerk on a point of order. In the meantime, the reports of the Engineers and the Parliamentary Agents have been published in the local papers, in order that every ratepayer may be in a position to come to a decision on the question to be submitted to him. The former point out that in any purchase effected by the Council they will have to include the gas-works as well as the water-works, and give the Company "the fair value of their undertakings—such value being ascertained by arbitration, in the event of an agreement not being arrived at." They say the Company would not be the losers by the transfer, and the town could not lose by paying a fair value for the undertakings. Messrs. Blyth consider that if the transfer were sanctioned by Parliament, the price would be fixed at something between 23 and 28 (probably 25) years' purchase of the net earnings; but they remark that there are various matters which would be taken into account by way of increasing or diminishing the price—such, for example, as the relations with the Government and the special arrangements existing between the Company and them. How this would bear upon the price, they say it is not easy to decide; but, of course, if there were any reasonable probability of losing so large a special customer, it would be a point that would be unfavourable to the value. They go on to explain that the costs of obtaining an Act and acquiring the works are defrayed by a loan which is made repayable in 10 years, but that the money requisite to acquire the water-works would be repayable in 60 years, and the money needed for the gas undertaking in 40 years.

Incandescent gas lighting finds favour with the Rochdale Corporation Gas Committee. They have decided to fit up the lamps in about eight streets with Welsbach burners.

At their next meeting, the Birkdale District Council will consider a motion that the Southport Corporation be asked upon what terms and conditions they would be willing to cease the supply of gas to Birkdale after due notice to expire—say, five or seven years hence.



## THE GAS FINANCES OF THE BOLTON CORPORATION.

Mr. G. Swainson, the Borough Treasurer of Bolton, has just issued his "Blue Book" for 1900; and a considerable amount of its space is devoted to the finances of the gas undertaking. The quantity of gas consumed during the past financial year increased from 889 million to 941 million cubic feet; but, owing to a reduction of 3d. per 1000 cubic feet made in the price of the illuminant, the receipts were less—viz., £109,007, against £113,580. The decision of the Committee to abolish meter-rents in the extended borough brought the receipts from this source down to £75, as compared with £662 in the preceding year. On the other hand, the residual products realized £39,354, against £26,648; the principal augmentation coming from coke. The fittings trade yielded £150 more than in the previous year. The coal and cannell carbonized during the twelve months cost £54,136, against £43,757; the total expenditure for the manufacture of gas being £77,288, as compared with £64,845. The increase here shown was mainly due to the higher price of coal and cannell. Management expenses showed a rise of £230; while the cost of distributing gas was £200 less, owing to the smaller sum required for repairs and renewal of meters. In dealing with the point as to interest on loans, which last year showed a reduction by £800, Mr. Swainson says this is due to the reduction in the rate of interest; but he adds that, in view of recent announcements and advertisements, it would appear that next year will witness a serious addition under this head. In fact, from one end of England to the other investors are now obtaining considerably higher returns for their money. The sum placed to the sinking and reserve funds differed very little from the previous year; but the profit transferred in aid of the rates went down from £25,000 to £20,000. Owing to the increased price of fuel, the charge for gas has been raised 2d. per 1000 cubic feet, by which means it is hoped that it will be possible to apply in relief of the rates at the end of the year's working the sum of £20,000. The Borough Treasurer gives a table showing what the Gas Department has accomplished within the last thirty years. From this, it appears that the total gross yearly transfers amount to £1,219,088; there has been added to the sinking fund £45,789; carried to the reserve, for renewals, &c., £255,525; the profit voted in aid of the rates is £356,928; and the depreciation debt paid off is £92,745.

## DEVELOPMENT OF THE WELSBACH COMPANY'S BUSINESS.

## Effect of the Reduction in Price.

In the "JOURNAL" for the 5th of June last, we commented in favourable terms upon the important step taken by the Welsbach Incandescent Gas-Light Company, Limited, in making a very substantial reduction in the prices of their specialties, and remarked that the effect of this concession was to bring the incandescent light within reach of the British prepayment meter consumer, as it had long been to his compeer on the Continent. It was an opening, as we then pointed out, of which no man living could see the end. Four months have elapsed since those words were written; and we are now in a position to judge of the extent to which the public have profited by the opportunity afforded of improving the lighting of their homes by the adoption of the latest system of using gas for illuminating purposes. From a circular just issued by the Welsbach Company, we learn that from the 1st of June (the date of the inauguration of the reduced prices) to the 30th of September the increase in the number of burners and mantles sold, as compared with the corresponding period of last year, amounted to 57 and 55 per cent. respectively. The expansion per month is shown by the following statement: For the month of June, the increase in burners was 17 per cent.; in mantles, 29 per cent. For the two months June and July, the mean increase in burners was 43 per cent.; in mantles, 50 per cent. For the three months June to August, it was 54 per cent. for both burners and mantles; and the figures for the four months are given above. This increased demand exceeds the capacity of the Company's factories at Westminster; and additional premises have been temporarily secured. But to meet the still larger output which, from the foregoing figures, may reasonably be anticipated, as the advantages of the Company's system (at the reduced prices) become further appreciated, it will be necessary to provide entirely new and improved factory accommodation. The Directors are informed by the Managing-Director that many economies in the process of manufacture, which cannot now be effected from want of space, would be possible in buildings erected expressly for the purpose. Having regard to the Company's extensive and growing output, these economies would result in considerable savings on the present cost of manufacture. The expanded trade necessitates increased stock, and the consequent employment of further working capital in the purchase of materials; but as the Articles of Association are at present drawn, the Board have no power to borrow money, on security, from their bankers or others, for the purposes of the business of the Company. Such a restriction makes the conduct of a progressive industrial enterprise quite unworkable; and, in view of the new departure approved by the stock and share holders, the Directors have determined to call them together to sanction the necessary modifications in the Articles giving the Board the usual facilities for borrowing. The new Article has been settled by Counsel, and has been submitted to the proprietors for their approval. The Directors point out, however, that, although authority is sought up to an amount not exceeding £250,000, they do not contemplate that the requirements of the business in the immediate future will reach any such sum. In the arrangements made with the Sunlight Company, power was reserved to the Welsbach Company to redeem the unsecured debenture stock, amounting to £110,000, to be issued in payment for the former undertaking, and the Directors have thought it wise to seek authority for such an amount as would enable them to exercise the option of such redemption, if and when considered expedient, in addition to providing for the requirements of the business. The meeting has been called for the 17th inst., and, in view of the importance of the proposal to be considered, the Directors hope to be strongly supported on the occasion.

A silver medal has been awarded to Messrs. E. Derval and Graham, Morton, and Co., for their exhibit in Class 87 at the Paris Exhibition, which includes the system of inclined retorts shown by the latter firm.

## THE LIGHTING AND WATER SUPPLY OF MUNICH.

In the course of a report recently presented to the Foreign Office by Mr. F. D. Harford, Second Secretary to Her Majesty's Legation in Munich, he gives some particulars in regard to the lighting and water supply of the city. As Munich is, he says, probably one of the best-lighted towns in Europe, it is interesting to note that the expense of street lighting in 1898 was £42,500, or about 1s. 10½d. per head; and 25 miles of streets were lighted by electricity, at a cost of £25,947, inclusive of sinking fund expenses, depreciation, &c. Improved incandescent gas-lamps are fitted in all other streets; and whereas the old-fashioned burners used 4.45 to 4.9 cubic feet of gas per hour, yielding only about 12 units of light, the incandescent burners only consume 3.5 cubic feet and give 70 units of light. The gas, electric light, and water supply systems are managed by the Municipality. The Gas Company, who charged more than 7s. per 1000 cubic feet, and paid dividends of 20 per cent., were bought out on Nov. 1 last year; and Mr. Harford says it is a matter for surprise that the Municipality show no sign of reducing this very high charge.

The Municipality have recently compiled a record of the remarkable progress of the city, from a hygienic and sanitary point of view, in the last thirty or forty years, with which the distinguished name of Dr. von Pettenkofer will ever be associated. In 1881, a new system of main drainage came into use; and in 1883 a new water supply was completed at a cost of £300,000. The mortality, which was 40.4 per 1000 in 1871-5, fell to 30.4 in 1881-5, and to 24.1 in 1896-8; so that Munich must now be considered a very healthy town. The water, brought from the mountains, was calculated to supply 300,000 persons with 33 gallons per head per day—that is, at the rate of 114 gallons per second to the reservoir, and at the rate of 200 gallons per second to the town mains. The population has now increased to 450,000; but the supply has been increased to 308 gallons per second of the purest water. The charge is 3d. for 220 gallons, and a minimum rate of £1 16s. a year per house.

At Höllriegelsgeret, on the Isar, a few miles above Munich, are electric supply works, with four turbines, developing 2000-horse power; while provision is being made for a further 4000-horse power. The creation of these works has called into being an entirely new industrial district, which is supplied with light and power by their agency. First of all Sending is served; and now 21 other localities near Munich benefit by these works, which afford a most interesting object-lesson in showing the means, where the necessary water power exists, of removing factories, workshops, and labourers' dwellings to cheaper and healthier localities outside great cities. Factory chimneys, with their noxious fumes and smoke and unsightly aspect, can then be reduced in number. The experiment of the Isar works has proved a great success, as there are now 90 undertakings of all kinds, including 25 farms, supplied with light and power by them. The owners of many of these works previously sold their valuable buildings and sites in the centre of the town, and bought far cheaper plots, with siding connections with the railway, and built workmen's dwellings adjoining, at great profit and economy in working expenses. In all, there are 151 electro-motors with 1062-horse power, and 21 motors with 267-horse power in course of erection, besides which 13,500 incandescent lamps and 329 arc lamps are supplied with electric current. A steam-engine of 1000-horse power is held in reserve. The electric cables measure 56 miles, with 30 miles of secondary distributing cables. The Isar works are operated largely by turbines, with reserve steam-engines, with an elaborate system of regulators according as the river is high or low. During some recent floods, the accumulators were under water for some days, but continued to give out current.

## MR. W. ARNOTT ON "COAL AND ITS PRODUCTS."

A copy of the "Cape Daily Telegraph" recently to hand contains a report of an interesting lecture on the above subject delivered by Mr. W. Arnott, Manager of the South African Lighting Association, Limited, before the Literary Section of the Port Elizabeth Institute. He began by describing the composition of coal, and then went on to refer to the quantity of the mineral annually produced in Great Britain. He quoted figures to show how this had increased from 170 million tons in 1889 to 188 millions in 1894 and 220 millions last year; while in the same years America raised 48, 152, and 205 million tons, and Germany's output went up from 35 to 130 million tons. Though the British output has not quite doubled since 1870, the exports have more than trebled. The citation of these facts led Mr. Arnott to touch upon the question of putting a prohibitive *ad valorem* duty—say, 50 per cent.—on coal sent out of the country, except when its destination is one of the British Colonies; and he seemed to favour the idea. He next indicated the classes into which coal is divided—viz., (1) anthracite, (2) bituminous steam coal, (3) lignite or brown coal, and (4) gas-producing coal or cannell—and dealt with each at length; samples being held up for inspection. By means of diagrams, he showed that though England may fairly claim to possess some of the principal known coalfields in Europe, coal exists in all parts of the world; the greatest deposits of the mineral being those of North America. There are also extensive coalfields in China, Australia, and New Zealand.

Coming to the part of the world which is for the present his home, Mr. Arnott went on to show that South Africa, in its rich and wonderful mineral wealth, is not behind other countries in the matter of coal; the coalfields covering a fairly symmetrical area, embracing many parts of Cape Colony, the Orange River Colony, the Transvaal, Natal, and the whole of Basutoland. The greatest length and breadth of the coalfield contained within the boundary line are 5000 and 2000 miles respectively; and its area is about 56,000 square miles. Workable seams of coal have been found, and are being worked along the extreme edges of this vast basin, in Stormberg, near Molteno, at Indwe, in Natal, and in the Transvaal. With the exception of these few places, this extensive coal area or basin is practically unexplored, and unknown as regards its mineral resources. Up to the present, its fringe has just been touched in a few isolated and far distant points; and it appears to be certain that further systematic researches will be rewarded by the discovery of great stores of mineral fuel, capable of supplying the wants of South Africa for many generations. The coal measures in this area are all 1000 feet thick.



Doubtless this thickness will be found to vary considerably from point to point; the coal changing in quality—in some places anthracite and in others semi-bituminous. Mr. E. J. Dunn, the well-known geologist, addressed a very important report to the Cape Government this year on the subject of the coal formation in the Karoo. After examining certain mines at Vereeniging, he says: "I can now state absolutely that the magnificent coal seam worked at Vereeniging, ranging from 6 to 15 feet thick, and averaging 9 feet of coal—superior to any hitherto worked in South Africa—rests upon the Dwyka conglomerate. This means that from Middelburg in the Transvaal to Beaufort West there is practically an unbroken line of coal near by. The whole of the Free State is underlain by this coal system, part of Natal, a great deal of the Transvaal, and a large portion of Cape Colony. From these lower measures, workable coal is likely to be found within reasonable distance of East London, Port Elizabeth, and Cape Town; and the quality, if that exposed in faulted localities is any criterion, is probably not inferior to the best Welsh steam coal." Mr. Arnott remarked that the opening up of this source of fuel would convert Table Bay into a first-class port and naval station of the premier order. Mr. Dunn suggests that the Government should offer a bonus of £10,000 for the first seam of coal cut within the boundaries of Cape Colony and below the Karoo. The lecturer dealt at length with the formation of South African coals; pointing out that the majority are of subaqueous origin. Natal possesses some fine coal-fields, which, however, are not worked to the extent they might be. The best coal sent out from Natal is from the Dundee mine, but up to the present the supply has not been equal to the demand.

On the subject of the future of the coal supply, Mr. Arnott expressed the opinion that, when our present resources fail, we shall have to look to Japan, India, and China, in which there are large deposits of coal, for help, though doubtless some better means of generating power, and of more economically using it, will then have been discovered. He thinks the Celestials will be the coal kings of the future. They are already awakening to the fact that they hold in their grasp untold wealth in the shape of coal, and are making preparations to take greater advantage of the treasure which Nature has bestowed upon their country.

The concluding portion of the lecture was devoted to the products resulting from the distillation of coal for the manufacture of gas. Mr. Arnott emphasized the fact that, much as we know of these products, a good deal more may be learnt; and he said if there was one mineral more than another that could afford interest and pleasure to the student, it was coal. Diamonds, gold, and precious stones must all give way to it.

A hearty vote of thanks was accorded to the lecturer.

### ELECTRIC LIGHTING NOTES.

The Wigan Corporation have resolved to apply to the Local Government Board for power to borrow a further sum of £16,500 for electric lighting purposes.

The number of lamps connected to the Canterbury Corporation electric lighting system on May 31, 1899, was 3475; at the end of the following August, it was 5151; and by Aug. 31 this year, it had risen to 9216. In view of this substantial growth, the Resident Engineer has advised an extension of the plant; and Mr. R. Hammond has been requested to report on the matter.

The Electric Lighting Committee of the Hereford Town Council have settled accounts with the contractors for the electric lighting installation. The cost of land, erection of buildings, laying of cables, &c., amounted to £20,470. The original estimate was £20,000; and the increase is accounted for by cable extensions. The present installation represents the equivalent of 6822 8-candle power lamps, together with the equivalent of 684 lamps for the motor and lights at the works. So far, applications for 500 lights have been received.

The annual accounts of the borough of St. Helens (Lancs.), just issued by the Borough Treasurer, show that the total income on the revenue account of the Electricity Department was £5196, including £3420 from the sale of electricity, and £1409 for traction power to the St. Helens Tramway Company. The expenditure (including £1719 for generation of electricity, £318 for distribution, and £626 for management) amounted in the aggregate to £5185; leaving a "balance profit" of £10—£10 12s. 7d. to be more exact, which (according to one of the local papers) "is considered eminently satisfactory, and an augury of the large profits which may be expected from the sale of electricity in the future."

We suppose the York City Council ought to be congratulated upon the results of the working of their Electric Lighting Department during the past six months; but the figures in a paragraph that has reached us appear to be either deficient or they require a little further explanation. The paragraph states that, at the meeting of the Council on Monday last week, Alderman Dodsworth said the members would be pleased to know that the Electric Lighting Committee had during the past six months made a trading profit of upwards of £200. After the interest and sinking fund was paid, it would leave about £100. It was very satisfactory; and in the next six months, he said, they would show a very good profit. Are we to understand from this that at York £100 is sufficient for interest and sinking fund for six months?

The chief item on the agenda at the meeting of the Oldham Town Council last Wednesday had reference to a proposal of the Electric Light Committee to apply to the Local Government Board for sanction to borrow £157,000 for the purpose of erecting, at Greenhill, a station for the supply of electric energy both for lighting and power and tramway purposes. It was stated by Alderman Harrop, the Chairman of the Committee, that the old station was started in a state of fear for the purpose of keeping companies out of the town, and not for the love of the work. The present site was very cramped, inconvenient, and expensive. Seeing the success of the work, the Committee thought it best to start in an adequate way; and they would provide for the next 20 years by the system now proposed. The price for the current was one of the lowest in the country; being 3-41d. for lighting, and 3-89d. for other purposes. The total of the various estimates for the electric extension amounted to £156,510. The necessary resolution was passed.

Fuse-boxes in the pavements of Hull are causing annoyance to some of the tradesmen; and a few days ago a deputation waited upon the Electric Light Committee of the Corporation on the subject, which has on several occasions been under their consideration. One speaker said the complaint

against the boxes was that they were a nuisance, because of the number of people who lounged about them. He understood that the boxes could be placed underground, and he thought this should be done—at all events in the busy commercial thoroughfares. They had no wish to hamper the work of the Committee, but they contended that the convenience of the traders should be considered. Another speaker said his establishment had a frontage of only 16 feet to the main street, and out of this a space of 4 ft. 6 in. was obstructed by a fuse-box and a pillar letter-box. Another member of the deputation said the fuse-box which was opposite his windows had to be cleansed every morning from the impurities received in the night, and during the day it was the venue of loafers, who made offensive remarks about the passers by. Other speakers followed with arguments condemnatory of the present position of the boxes. The Chairman (Mr. Skinner) said the Committee would make personal inspection of the localities named, and consider what could be best done to remove the cause of complaint.

The Dudley Corporation are desirous of adopting "free-wiring" in connection with their electric lighting undertaking; and for this purpose they have applied to the Local Government Board for sanction to borrow £10,000. Consequently Mr. H. Percy Boulnois visited Dudley last Friday to hear evidence on the matter. The Consulting Engineer is Mr. R. P. Wilson, and, in the course of his evidence, he stated that the Corporation were going to charge 6d. per unit for two hours per day, and 1½d. per unit for the remaining twenty-two. Dudley would be the first place in England where so low a price as 1½d. per unit had been charged. At present they were only supplying current for the tramways; the charge being 2d. per unit for the first 150,000 units, and one-tenth of a penny less for every additional 50,000 up to 400,000 units. The tramway to Stourbridge had been at work a year, during which the consumption had been 196,000 units; and they anticipated a consumption of 270,000 units with the electric lighting. He quoted Hanley, among other places, with the view of showing the consumption had largely increased after the adoption of the free-wiring system, which absorbed the whole of £10,000. To cite Hanley was an unhappy choice, as only two or three weeks since Mr. Boulnois heard some other particulars about the working of the Corporation concern there which did not altogether speak well for its past financial management.

Paradise Street, Liverpool, is not exactly the kind of place that its name implies. It contains, among other places of business, an electricity generating station, which is a positive terror to the tradesmen and other residents in the locality, through its "emission of calcined soot or unburnt slack." The tradesmen, it is asserted, can only keep their doors open at the expense of having their goods covered with the black deposit. The street and pavements are constantly strewn with it, and it is blown into the premises, causing much damage to provisions and other eatables. Gutters and rain spouts are continually being choked up; and several of them have already been broken down—one gutter falling through a roof, fortunately at night time. Alderman Walker is one of the sufferers; and he states that he recently spent £20 to £30 in cleaning his roof and spouts, and in less than a week about 1 cwt. of the deposit had collected. Besides this, an almost constant stream of water is discharged across the pavement; and as there is no channel, it spreads to a great extent. No wonder that the ratepayers and property owners in and round about Paradise Street are desirous of having this nuisance abated. On Monday last week, a deputation waited upon the Ward representatives; and they promised to bring the matter before the City Council. Such a serious nuisance as this would not have been allowed to continue if the generating station had been owned by a private individual.

Sir William Preece, the expert appointed by the Maidstone Town Council and approved by the Local Government Board, has reported on the electric lighting scheme for that town. He urges the Council to retain the Fair Meadow as the site for the generating station, and to select another unobjectionable site for the dust destructor. He estimates the income from electric supply at £5000, and says the cost of the working should not exceed £2500. He is quite sure the undertaking will be self-supporting and successful. He, however, takes one important exception to the scheme. The streets, he says, are now so well lighted, and at such a cheap rate, by the Welsbach incandescent mantles, that he questions very much the advisability at first start of adopting glow lamps to replace the gas-lamps. It is proposed to fix 32 arc lamps and 119 glow lamps. There is no question of the advantage of arcs; but it is different with the glows. They are not so brilliant as the incandescent gas, and cost much more. It has been found necessary to fix two 32-candle power lamps to compete with the Welsbachs. Maidstone pays £2 18s. 6d. per lamp per annum for gas. But it will cost £6 per annum to light equally with glows; and the satisfaction given will not be commensurate with the extra cost. Sir William recommends the Council to leave out the glow lamps for the present, and to extend the arcs. He says they could, on their estimate, supply 16 more arcs, and give much greater satisfaction.

The Leeds City Council last Wednesday adopted a proposition of Alderman Wigram, the Chairman of the Lighting Committee, that application be made for permission to borrow £510,500 for electric lighting and power purposes, including therein £177,573 already sanctioned by the Council. Speaking upon his motion, the Alderman pointed out that, since the acquisition of the electricity undertaking by the Corporation, the Committee had been bound to incur increased expenditure to develop electric lighting in the city. Those who had lately followed the proceedings of the British Association would realize of what urgent importance the production of electricity for lighting purposes had now become. The Committee had to look to the provision of electricity throughout the whole of the city. The proposed expenditure would, of course, have to be spread over a considerable number of years. Speaking roughly, it included £100,000 for general extensions; £80,000 of this being for the extension of the main line which passed through Wortley, New Wortley, Armley, Bramley, and on to Stanningley. It also covered the cost of crossing the river, and extending up to Hunslet in a westerly direction. It was intended to spend £140,000 for the extension and provision of new buildings, and the supply of extra machinery at Britannia Mills. Alderman Wigram added that the sum the Committee asked for was very large; but there was satisfaction in the belief that the business would be profitable.

Last Wednesday, the West Bromwich Town Council had before them the report of the Electric Lighting Committee, in which they recommended that the charge for electricity for lighting purposes should be at the rate of 6d. per unit until an equivalent of 100 hours of maximum



demand had been reached each quarter, and thereafter during the same term at the rate of 2d. per unit; that the charge for electricity for power purposes should be at the rate of 3d. per unit until an equivalent of 78 hours' use of the maximum demand had been reached in each quarter, and thereafter during the same term at the rate of 1d. per unit; that the "free-wiring" system be adopted; and that application be made to the Local Government Board for sanction to borrow £10,000 for providing materials and labour for wiring houses, and also for the purchase and fixing of motors. The report gave rise to a discussion, in the course of which the Mayor (Alderman S. Pitt) said the Committee had considered the question of electricity from a commercial standpoint, and they had come to the conclusion that the charges were such as would make the undertaking a profitable one. It was their intention to supply current as cheaply as possible, and also to see that proper precautions were taken in the wiring of houses, so that nothing injurious might result. According to their scale, the more electricity used, the cheaper it would be. Mr. Bushel wished to know what the actual expense to the consumer would be, and also asked for a comparison of the cost of electricity with that of gas. He urged that the average charge made by corporations throughout the kingdom was 2½d. per unit; and he failed to see how West Bromwich could commence with a minimum charge of 2d. The Mayor said if electricity were taken for power purposes, customers would have four hours at a cost of 1½d. per unit, which would be equal to gas at 10½d. per 1000 cubic feet. If they took two hours for light at 4d. per unit, it would be equal to gas at 2s. 4d. The Committee calculated that, with an increasing demand and a supply of no less than 300,000 units per annum for the trams, they would be able to adhere to the charges they had made. The report was approved.

### EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Meeting was held at the Company's Offices, St. Helen's Place, E.C., on Thursday last—Colonel A. R. M. Lockwood, M.P., presiding.

The SECRETARY (Mr. I. A. Crookenden) having read the notice calling the meeting,

The CHAIRMAN said he thought that the report which he had to place before the meeting would be received with interest, both by the proprietors and the public at large. Dealing with the accounts, he referred with satisfaction to the substantial increase in the water-rates, amounting to £9612, as compared with the corresponding period of last year. Having regard to the large expenditure of capital which was now taking place, they all naturally looked forward to an increase in the water-rates. A very considerable proportion of this expenditure was for the construction of reservoirs, to meet an increasing demand; and it also constituted an insurance against droughts. But in other respects, mains, engines, and similar works were necessary to meet the wants of the rapidly increasing population supplied by the Company in their parliamentary area. Of course, the outlay on these works became immediately income-bearing. It was curious to notice in this connection—and it was a fact which the proprietors must carefully bear in mind, having regard to possible events in the near future—that the percentage of profit on the existing capital did not equal that for the year 1886, when the sinking fund was forced upon the Company by a Committee of the House of Commons—a proceeding which had been unequivocally condemned by every unbiased authority since. In Midsummer, 1886, for instance, the percentage of profit on the total capital raised available for ordinary dividend, was 2·70, while that for Midsummer, 1900, was 1·93 only; thus proving the contention which the Company made before the Committee in 1886—that the new capital spent in storage reservoirs, and in the necessary mains and works to supply scattered and straggling districts, could not possibly pay the proprietors at the same ratio as the capital expended up to 1886 in the central parts of the area of supply. And if this were so, the whole case on which the imposition of the sinking fund was based fell to the ground. There was no great variation in the other items of the revenue account, except, perhaps, that of "pumping and engine charges, including the cost of coals, wages, &c.," which stood out with unpleasant prominence. As they were all aware, coals during the period under review had greatly increased in price; and he did not think that it would be possible for the Directors, or for the great Railway Companies, to predict exactly the course which the Coal Market would take in the ensuing two years. With regard to the item "Salaries of Engineer and clerks, &c.," the decrease shown of £2400 was only apparent. It was a matter of account; part of the charges under this item having been very properly transferred to the capital account. In the management section, the proprietors would observe that, upon the whole, the expenditure was rather less than in the corresponding period of last year. Turning to the credit side of the account, the substantial increase of water-rates to which he had alluded would be seen; and the other item of a satisfactory nature was the sum written off for losses and bad debts. The loss from bad debts only amounted to £528, out of a charge of upwards of £192,000. Of the £4000 set aside to meet sums written off from all causes, there was a balance of £340 to carry over. So far, therefore, he thought that the accounts and balance-sheet would be considered fairly satisfactory; the unappropriated balance carried forward being nearly £4000. With respect to the future, the Directors had visited the works; and the assurance contained in the report, that everything was in good condition, and that the works were proceeding satisfactorily, was the outcome of their survey, and was fully confirmed by the Company's Chief Engineer, Mr. W. B. Bryan. Regarding increased business, the new services laid on during the half year were not quite so many as in the corresponding period of last year; but the Company now had a total of 207,655 supplies, which was greater than the Grand Junction, the West Middlesex, and the Chelsea Companies combined. The proprietors could therefore imagine that the Directors, in conducting the affairs of the Company, had their hands pretty full. It might be interesting to note that the average water-rate per house on the new supplies was £1 4s. 3½d., or exactly 1d. less than the average for the new houses laid on up to Midsummer, 1899. It must be a source of gratification to them all that, in the Committee of the House of Lords on the East London Company's Bill, wiser counsels obtained this year than last, and that the measure was favourably reported

to the House, and the Royal Assent given to it on the 6th of August. It was greatly to be wished that the obstruction and opposition to which the Company had been subjected for so many years might, under the *egis* of this last Act of Parliament, cease, and that the Company might be allowed to pursue the great work of providing water to a population already numbering 1,375,000 souls, and increasing at the rate of 40,000 per annum. If justice and fairness were thus meted to the Company, the Directors would look with confidence to its future development, stability, and value. He might state, although the subject did not come properly within the period ended at Midsummer, that the Bill introduced by the Lea Conservancy, the principal features of which he explained at the last meeting of the Company, was passed unaltered by a Committee of the House of Lords. Both the New River Company and themselves protested most strongly against such a violation of agreed terms, but without effect; and the measure would come into operation in January next. Having expressed great regret at the retirement from the Board, through the state of his health, of Mr. Herbert Dalton, after 34 years' services to the Company, the Chairman concluded by proposing a resolution for the adoption of the report and accounts, and the declaration of a dividend at the rate of 7 per cent. per annum, less income-tax, on the ordinary stock, for the half year ended Midsummer last.

Sir HERBERT BARNARD seconded the motion, which was carried unanimously.

An Extraordinary General Meeting was subsequently held.

The CHAIRMAN proposed a resolution for raising the sum of £24,000, by the creation and issue of sufficient debenture stock for the purpose, under the provisions of the Metropolis Water Act, 1899, and of the consent of the Local Government Board given on May 17 last; and for authorizing the Directors "to issue such stock on such terms and conditions, at such times, and in such manner, consistent with such provisions and consent, as they may deem expedient."

Sir HERBERT BARNARD seconded the motion, which was carried unanimously.

The CHAIRMAN afterwards stated that the new reservoirs were proceeding very favourably, and that the Engineer was satisfied with the progress made with the works. Up to the present, the Company had not had to buy any water; and they had a satisfactory stock on hand.

The proceedings terminated in the usual manner.

### MANCHESTER AND THE THIRLMERE WATER SUPPLY.

#### The Second Pipe-Line.

On Thursday last, about seventy members of the Manchester City Council went to Thirlmere to witness and take part in the ceremony of laying the first length of the second pipe-line to convey the water of Thirlmere to Manchester. In 1894, when the Thirlmere works were opened for the supply of the first instalment of 10 million gallons a day, the total average quantity of water delivered to the entire district was about 25 million gallons. From that date, owing to the improved system of distribution since the water from Thirlmere was introduced into the city and the growing demand for trade and domestic purposes, the consumption has largely increased; being, on the average of the present year, about 32½ million gallons per day—an increase at the rate of 30 per cent. on the consumption in 1894. The scheme which was commenced on Thursday consists of tunnels and "cut-and-cover" work of about 50 miles in length, and pipes for a further distance of 45 miles, covering the distance of 95 miles between Thirlmere and Manchester.

The ceremony of laying the first of the second line of pipes was undertaken by the Lord Mayor (Mr. Thomas Briggs) on the invitation of the Water Committee; and for the purpose, his Lordship was presented with a silver mallet and level. The Lord Mayor, in accepting the gifts, said he considered there was no city in the United Kingdom which had a better water supply than Manchester. The first contract for the commencement of the Thirlmere works, which included the tunnels through Dunmail Raise, Nab Scar, and Moor How, was let in December, 1885. The works for the supply of the first instalment of 10 million gallons a day were completed and opened on Oct. 12, 1894, having occupied in construction nearly nine years. At that date, the consumption of water was about 25 million gallons a day; but, owing to the improved system of distribution when the Thirlmere water was brought to Manchester—which resulted in a much greater pressure in certain districts—the consumption commenced at once to increase greatly; and in 1895 it had reached 28,750,000 gallons a day. Since that date, there had been almost a continual growing annual increase; the average quantity now supplied being about 32½ million gallons, or 50 per cent. increase since 1894, when the works were opened. The population supplied was above 1,100,000. The area of supply was about 30 square miles, and included, in addition to the city, 24 adjoining townships supplied in detail, as well as the supplies in bulk. It was satisfactory to be able to state that, notwithstanding the large expenditure incurred in carrying out these works, amounting to about £2,750,000, no addition had been made to the rates or the charges for water. On the other hand, the Water Committee had, within the last two years, been able to afford relief in the reduction of rates and charges for water to the extent of about £35,000 a year. It had now become necessary to prosecute with vigour the laying of the second pipe-line in connection with the aqueduct. The estimated cost of this work would be from £400,000 to £500,000. The greater portion would consist of pipes, 44 inches in diameter, and between Middle Hulton and Prestwich (about thirteen miles), they would be 40 inches in diameter. The water would be delivered into the existing reservoirs at Prestwich. The complete scheme when the five pipes were laid, was estimated to yield 50 million gallons a day.

The Lord Mayor then lowered the first pipe by means of blocks and chains, and, with the aid of the mallet and level, declared it to be "well and truly laid."

Luncheon was subsequently served at Rigg's Hotel, Windermere. Sir John Harwood presiding. In the course of the after speeches, Mr. G. H. Hill, the Chief Engineer, mentioned that it would be some four or five years before the works in connection with the new pipe were completed. If the city continued to prosper at the same rate as at present, they would want the third pipe in about ten years' time.







stokers, in addition to the present advance asked; that assistant potmen receive the shilling that was taken off their wages recently; that the minimum wage for shed and yard men be 23s. per week of 51 hours, time-and-a-half for overtime, and every day to stand by itself; that purifier men be paid at the rate of 6d. per hour; that season men be paid double time for all holidays they work; that when retorts are drawn or charged by machinery, 40 retorts be the limit per hour for each machine man; that double time be paid for Sunday labour, and all unnecessary Sunday labour be abolished; that when barrowmen are barrowing, they have no coke to drown or trim in the yard; that should these conditions be granted, no extra work shall be put upon the men; and that boilermen be put on the same level as the barrowmen, in addition to the advance asked. The deputation, after stating their views, thanked the Committee for receiving them. The Committee said they would consider the petition; and the deputation then withdrew. There is certainly no lack of audacity in these claims; and I fear the worst of the matter is that Aberdeen is not by any means singular in respect of the attempt to stir up the men in the gas-works to agitate for impossible conditions of labour.

In Hamilton, also, the stokers have made a demand for an advance of wages. At a meeting of the Town Council this week, the Manager (Mr. W. Ewing) reported that he had made inquiries as to the wages and conditions of labour of stokers in other towns, and had received replies, from which it appeared that the stokers in the gas-works at Hamilton were in a better position than those in other places; and the Gas Committee recommended that the men be requested to put their applications in writing, and to state their reasons for making them. Mr. Meehan, who seems to be a pro-labour man, disputed the statement that the stokers were in such a good position; and he pointed out that in Motherwell, for instance, the hours and the wages were the same as in Hamilton, but that the retorts in the Hamilton works required 4 cwt. of coal, whereas in Motherwell they only required 2½ cwt. Mr. MacHale, the Convener of the Gas Committee, pointed out that this was not so, but that, while Motherwell was the only town that could be compared with Hamilton in the matter of stokers' wages, the retort charging in both towns was the same, and there were other essential differences which were in favour of Hamilton. Mr. Meehan complained of Sunday labour in the works. Mr. MacHale undertook to do all he could to dispense with Sunday labour. Mr. Meehan then withdrew his opposition; and the recommendation of the Committee was adopted.

After considering the subject for seven years, the Corporation of Hamilton have this week agreed to proceed with the erection of sulphate plant in the gas-works. The order has been placed with Messrs. Ernest Scott and Co. The business was not agreed to with unanimity, as in the Hamilton Corporation there is a standing opposition to the Gas Committee. Mr. Tainsh, who headed it on this occasion, specified other two firms, one of whom would do the work for £720, and the other for £400; and he asked if they were to expend five times more than the thing was worth because someone had an idea in his head. Mr. MacHale explained that the Committee had recommended the firm they did because they believed that with their process there would be an absence of nauseous smells. The opposition then gave way.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 6.

**Sulphate of Ammonia.**—The market has been somewhat irregular; but, on the whole, a shade easier—the closing quotations being £10 10s. per ton f.o.b. Hull and Leith, and £10 12s. 6d. to £10 13s. 9d. f.o.b. Liverpool. There has been a considerable amount of reselling, at below makers' quotations, in the home market, and abroad at a still further discount. Prompt orders have, in fact, been largely covered in this way; and at the close available supplies in makers' hands are more abundant than they have been for some time. For delivery ahead, makers maintain a firm attitude; and the forward market has consequently been mainly in the hands of speculators. For delivery up to the end of the year, there are sellers f.o.b. at spot prices; and sales are reported abroad at below the equivalents. For spring months, however, there is more caution; and a substantial premium would have to be paid.

**Nitrate of Soda** is quiet at 8s. 1½d. to 8s. 3d. per cwt., according to quality, on spot.

LONDON, Oct. 6.

**Tar Products.**—Business has been a little irregular during the past week; benzol inquiries not being so much in evidence. Most makers, however, are very fully committed until the end of the year at old rates; and very few are participating in the improvement that has occurred during the past two or three months. Carbolic acid is steady; and the same may be said of crystals. There is a little better inquiry for tar oils; but these are still offering at low and unremunerative rates. Pitch shipments are now in active progress. Anthracene is dull; but naphthalene in its various forms is moving off freely at old rates.

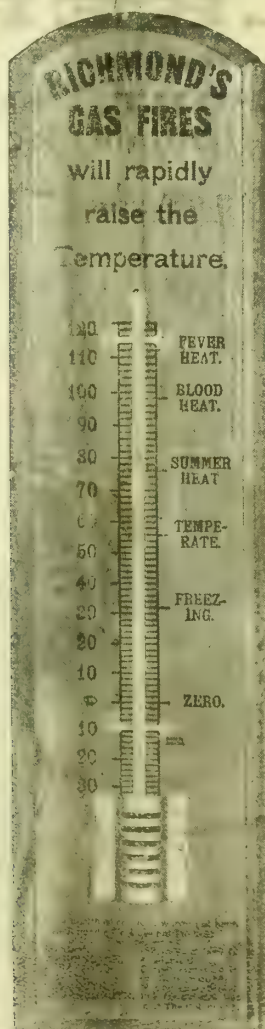
The week's quotations average out as follows: Tar, 15s. to 22s. Pitch, east coast, 37s.; west coast, 33s. Benzol, 90's, 10½d.; 50's, 1s. 1d. Toluol, 1s. 3d. Solvent naphtha, 1s. 3d. Crude naphtha, 4½d. Heavy naphtha, 1s. Creosote, 1½d. to 2d. Heavy oils, 3d. Carbolic acid, 60's, 3s. Naphthalene, 70s. Salts, 45s. Anthracene, nominal, "A" 4d.; "B" 2½d.

**Sulphate of Ammonia** is neglected. No new business is offering; but makers, generally speaking, are well sold. Sulphate is now getting out of parity with nitrate; the latter article being strong for forward delivery. The average value in all positions may be taken at £10 10s. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—With a continued sufficiently good demand for all descriptions of round coal to prevent any material accumulation of stocks, prices are being well maintained at late rates. House fire descriptions, although not in pressing request, are moving away fairly well, considering the large amount of buying which went on two or three months back; and coalowners are unable to put down anything like the quantities they are anxious to secure so as to provide for winter



SUPPLIED  
FREE FOR  
GAS COMPANIES'  
SHOW-ROOMS.  
BOARD-ROOMS.  
OR  
OFFICES.  
WRITE  
132,  
QUEEN  
VICTORIA  
STREET.



requirements. At the pit mouth, best Wigan Arley is firm at 16s. 6d. to 17s. 6d. per ton, Pemberton four-feet and seconds Arley 15s. to 15s. 6d., and common house coal 14s. to 14s. 6d. The lower qualities of round coal, although perhaps not in more than moderate demand for inland requirements for steam, forge, and general manufacturing purposes, are still in brisk request for shipment, with the result that all descriptions of round coal are moving away freely at full prices—12s. 6d. to 13s. per ton at the pit being about the minimum figures for inland slack, with 16s. 6d. to 17s. being obtained for steam coals, delivered at the ports on the Mersey. The chief difficulty of colliery proprietors is still with regard to engine fuel, plentiful supplies of which are hanging on the market; and prices are perhaps not being quite so well maintained as in round coal. Some improvement (which is looked for as probable) in the cotton trade, would no doubt tend to relieve the situation; but, on the other hand, there is a probability of quietude in the coke-making industry which would throw a good deal of slack on the market. Taking the position all through, the outlook for slack tends rather towards weakening prices. For the present, Lancashire collieries still quote 11s. to 11s. 6d. per ton at the pit for the best qualities of slack, with common or fine screened slacks obtainable at 9s. to 9s. 6d.; but there are surplus lots from outside districts offering at low figures, which consumers are picking up to keep them going from hand to mouth, rather than contract for supplies at present rates. In hard cokes for furnace purposes, prices continue to tend steadily downwards.

**Northern Coal Trade.**—The coal trade shows already the diminution in the demand for the Baltic and the northern ports generally, and its effect more especially on the trade of Northumberland. Steam coals are decidedly weaker, and may now be quoted at from 18s. to 18s. 6d. per ton f.o.b. for best Northumbrian qualities, 17s. 6d. for second kinds, and from 10s. 6d. to 11s. for steam smalls; while for forward deliveries, there is a lower range of prices quoted. In the gas coal trade, there is considerable activity. Shipments on the long contracts are now very heavy, and so take up a considerable part of the large output that the Durham gas coal collieries are making. For occasional cargoes, the price quoted for best gas coals varies from 17s. 9d. to 18s. 6d. per ton f.o.b.; and the contracts usually are at about 16s. Coke is a little weaker, as far as export qualities are concerned. Best Durham coke is 30s. per ton f.o.b.; while blast-furnace coke is about 27s. at the Teesside furnaces. Gas coke is steady in price, though there is an enlarging output. The f.o.b. quotation is from 24s. to 25s. per ton; but there are quantities delivered on contract at lower prices.

**Scotch Coal Trade.**—There is little change to record, except a continued decline in the exports. The home demand is strong, which is chiefly due to the fact that coal stores are everywhere low. It is the cheaper varieties which are most in request. The prices quoted are: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. 9d. to 17s. The shipments for the week amounted to 244,332 tons—a decrease of 10,940 tons upon the previous week, but an increase of 56,991 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,241,018 tons—an increase of 1,596,112 tons over the same period of last year.

**Developing the Lincoln Water Supply.**—Mr. E. A. S. Fawcett held a Local Government inquiry last Tuesday at Lincoln, regarding an application by the City Council for sanction to borrow £16,000 for purposes of water supply. The Deputy Town Clerk (Mr. W. T. Page, jun.) explained that the Corporation were empowered to supply Lincoln, Bracebridge, Boultham, Greetwell, Canwick, and the County Asylum with water. The average daily requirement was from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  million gallons; the maximum being about 2 million gallons. It was, he said, as much as the Corporation could do to meet present requirements from existing sources in the dry season. To obtain a further supply, it had been decided to bore for water; and they now asked for the sanction of the Local Government Board to an expenditure of £16,000 for the work. Their borrowing powers for water-works purposes were £85,000; and a Provisional Order obtained in 1871 gave them power to borrow an additional £50,000—£135,000 in all. Of this they had actually raised £105,000; but a good deal of the money had been repaid. He hoped that the Board would agree to the money being borrowed for a period of 50 years. The Water Manager (Mr. Teague) stated that the present pumping capacity was about 2 million gallons per day, and there was a steadily increasing demand. Replying to the Inspector, Mr. Page said they would be glad to cut off the other sources if they obtained a sufficient supply from the more reliable ones. Mr. Percy Griffith, the Engineer in charge of the boring operations, said the proposed boring was the largest that was practicable; but, in his opinion, nearly  $1\frac{1}{2}$  million gallons daily would be obtained from it. After further evidence, the inquiry closed.

**Kingsbridge Water Supply.**—A new scheme for obtaining an additional supply of water for Kingsbridge is under the consideration of the District Council. Two schemes which had reached the Provisional Order stage have been balked by the requirements of the Local Government Board. In the first case it was proposed to obtain water from springs on a local estate known as Borough; but this had to be withdrawn because the Board insisted upon the Corporation acquiring, in addition to the 8 acres of land required for the works, and extra 150 acres upon which it was suggested pollution of the water might arise. The original estimate of the cost of the scheme was £6000; but the additional land would have raised it to £25,000—a quite prohibitive sum for so small a town. A second scheme was then prepared, the essential feature of which was the damming of a small brook at Place Moor, a few miles from Kingsbridge. No difficulty was experienced; and the scheme, which was estimated to cost £13,000, was apparently in a fair way to furnish a solution of the Council's difficulties, when the Local Government Board intimated that, as it was proposed to intercept a stream, the Public Health Act required that the consent of the riparian owners must be obtained. It was pointed out to the Board that the scheme would not "injuriously affect" the owners, as contemplated by section 332 of the Public Health Act. But the Board were obdurate; and as it was considered impossible to obtain the consent of all the owners to the scheme, it had to be dropped. In the new scheme, which has been prepared by Messrs. Taylor, Sons, and Santo Crimp, it is proposed, as in the last, to obtain a supply from Place Moor; but it is not intended to interfere with the flow of the stream. It will be a gravitation scheme; and its cost is estimated at £9900.

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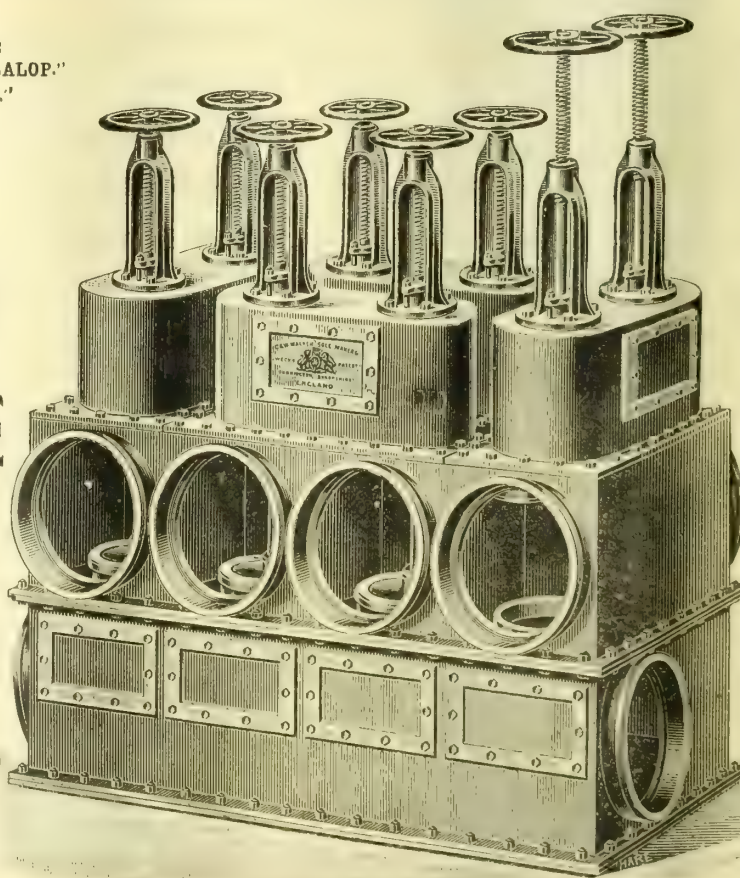
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**New Water Supply Scheme in the Malton District.**—A special meeting of the Malton Rural District Council was recently held to consider a new scheme of water supply for Slingsby and the "street villages" between that place and Malton. Mr. Hornsby, of Hovingham, submitted a plan for obtaining water for all the villages by gravitation from the same source as that from which the Gilling and Stonegrave water supply is procured. Mr. Hopkins, of Grimstone Manor, the owner of the spring, had promised the use of the overflow water and the necessary land for £20 a year; and Sir William Worsley had offered to allow the pipes to be taken through his land free of charge, on condition that a few cottages near Hovingham are supplied from the main. The new scheme met with general approval; and a Committee was appointed to consult with the Engineers.

**Okehampton Water Supply.**—The Local Government Board have at last approved the scheme for obtaining an additional water supply for Okehampton, and given their consent to the raising of a loan to carry out the work. The scheme provides for tapping the head waters of the Reddaven; and it will bring in an entirely independent supply. It was at first proposed to carry the pipes through certain land leased to the War Office. But as difficulties arose with the authorities, an alternative route was proposed; and it is to the latter that sanction has been obtained. The Board recommended that consideration should be given to the question of filtration, in order that the quality of the water might be improved, and security afforded in the event of accidental contamination. The Council have decided to act upon the recommendation. The notices rendered necessary by the alteration in the line of pipes have been served; and the work will probably be proceeded with at once, and finished before next spring.

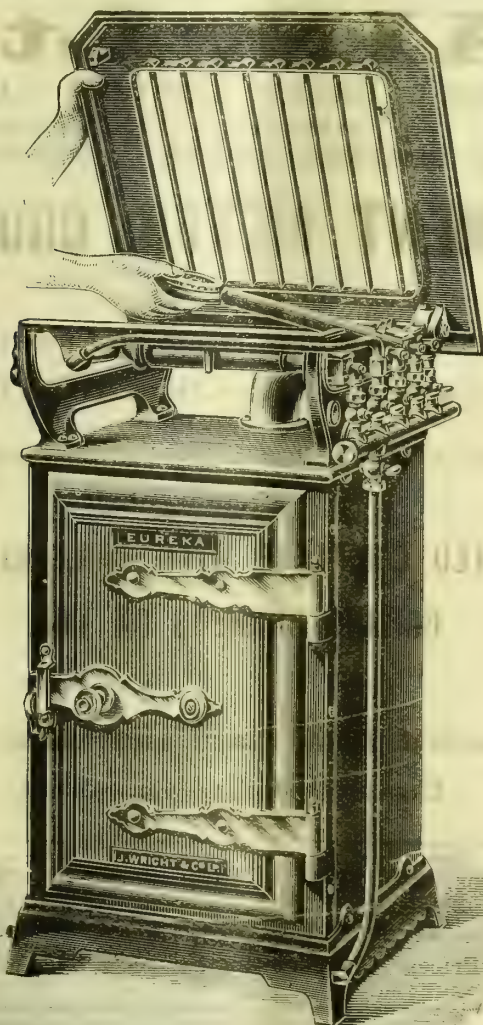
**Registration of Plumbers.**—At the last quarterly meeting of the Worshipful Company of Plumbers, a copy of a memorial to Mr. Balfour was laid before the Court, calling attention to the desirability of the Government dealing with the registration of qualified plumbers in the interest of the public health. It bore the signatures of Lord Aberdeen, Sir C. Cameron (Medical Officer of Health, Dublin), the Lord Provost of Aberdeen, Professor W. R. Smith, of King's College, London, Professor M. Hay, of the Aberdeen University, and other chief officers of the Congress of the Royal Institute of Public Health held at Aberdeen, and about 600 delegates and members representing sanitary authorities, architects, colleges, hospitals, school boards, and other bodies in various parts of Great Britain and Ireland. It was reported that the following resolutions were passed at the Tenth International Congress of Hygiene and Demography held in Paris: (1) "That all plumbers' work, as much in the supply of drinking water as in the removal of soil or slop water, should be the object of particular attention; and that the pipes for the distribution of water, as well as the hydraulic apparatus (reservoirs, syphons, &c.) and the down-pipes for slop water, should be completely protected from frost." (2) "That a professional education, with a test examination before obtaining a diploma, should be demanded of sanitary plumbers, with a view to spreading among plumbers a knowledge of hygiene, and of rational and economic construction in their work."

**The Protection of Water Areas.**—The Gas and Water Committee of the Hull Corporation have decided, on the advice of their Medical Officer of Health, to acquire certain land, rather more than 55 acres in extent, at a cost of about £10,215, so as to form a protective area for their water-works undertaking.

**The Water Finances of the Bolton Corporation.**—In the volume of statistics just issued by the Borough Treasurer of Bolton (Mr. G. Swainson), to which reference is made in another part of the "JOURNAL" to-day, he shows that the water-rental in the past financial year rose from £59,018 to £61,233. On the other hand, the cost of maintenance of the works increased from £5934 to £7134. The total expenditure was £62,654, against £62,873; and the amount transferred to the borough fund was the same as before—£15,000. The sum of £14,000 was spent on capital account during the year; the principal item being £9000 for the extension of mains.

**Sales of Shares.**—Mr. Reeves recently disposed of some £20 shares in the Whitstable Gas Company, at prices ranging from £35 10s. to £36 per share; and some fully-paid £10 shares at £17 10s. and £18 each. At the Yarborough Hotel, Grimsby, a few days ago, Mr. D. Brocklesby sold 15 original shares of £10 each in the Cleethorpes Gas Company, at £21 15s. per share; and 19 new shares of similar nominal amount at £16 2s. 6d. to £16 7s. 6d. At the Mart, Tokenhouse Yard, last Wednesday, 4000 preference shares (£10) in the Dorking Water Company, bearing interest at the rate of 5 per cent. per annum, were sold by Messrs. White and Sons at an average price of £12 each. At an auction sale at Cambridge on the same day, £200 of original consolidated stock in the Cambridge Water Company realized £300 and £298 per cent.; and five £10 shares (£4 paid) produced £56. Last Friday, Mr. Henry Knowles offered for sale by auction £5000 of 5 per cent. consolidated ordinary (new) stock of the Gloucester Gas Company, at prices ranging from £122 10s. to £125 per £100 of stock; the total amount realized being £6193 10s.

**The Water Supply of South Essex.**—The water supply in South Essex appears to be in an extremely critical position, judging from statements made at last Tuesday's meeting of the Essex County Council. Mr. H. E. Brooks said that the failure of the Bills introduced by the South Essex Water Board and by the South Essex Water Company left them, in the district around Grays, no nearer any scheme for supplying the wants of the growing population than they were before. He hoped the County Council would pay particular attention to this subject, and that if, as was likely, further action was taken either by local bodies or by the South Essex Water Board to increase the water supply, the Council would not ally itself, as it did at the last meeting, with the opponents of the scheme of the Water Board. Alderman Russell also spoke of the great necessity for improving the water supply in the district named. Unless something was done, he said, they might possibly have a catastrophe worse than the one at Maidstone. On the proposal of Colonel Howard, it was agreed that a Joint Committee of the Parliamentary and Sanitary Committees should inquire into the general conditions of the water supply of the county.



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**The Transfer of the Clay Cross Water-Works to the District Council.**—The purchase of the Clay Cross Water-Works by the District Council was completed on the 29th ult., at the offices, at Chesterfield, of Mr. R. T. Gratton, the Water Company's Solicitor. The transfer was sanctioned by the Act passed last year; and the parties agreed to a sum of £14,000 as the price; the Council undertaking to discharge a mortgage of £1000, and pay £100 towards the expenses of winding-up the Company.

**Cirencester Gas Company.**—At the annual general meeting of this Company on the 29th ult., the Directors reported that there had been an increase of 1,621,700 cubic feet in the quantity of gas sold in the year ending the 30th of June, chiefly owing to the extended use of stoves and prepayment meters—the latter now numbering 300. The total revenue was £8467; and the expenditure, £5989—leaving a balance of £2478. After deducting the interest on debentures, &c., and the interim dividend paid in April last, the sum available for distribution was £1450. The Directors recommended the payment of the statutory dividends of 10, 7, and 5 per cent. on the different classes of shares. This would absorb £875, and leave £575 to be carried forward. In consequence of the extraordinary rise in the price of coal, amounting to 5s. 6d. per ton, and to the prospective difference in cost to the Company over that of last year of at least £1000, the Directors had been compelled to raise the price of gas 6d. per 1000 cubic feet.

**Sulphur in Cheltenham Gas.**—The Cheltenham Town Council had before them last Wednesday the proceedings of the Lighting Committee, who on the 26th ult. received a report from the Gas Examiner, calling attention to the fact that on four occasions during the month the sulphur in the gas had greatly exceeded the maximum allowed by the Company's Act (25 grains); the average being 33·03 grains. The Committee decided to send a copy of the report to the Directors of the Company, and ask what explanation they had to offer; the further consideration of the matter being adjourned pending their reply. The Mayor (Alderman G. Norman), in submitting the proceedings for confirmation, remarked that the results shown by the tests of the gas in the past month were without parallel in his experience; the nearest approach to them being those of May, June, and July of last year, when the average was 23 grains. In June, 26 grains were reached. On that occasion, the attention of the Company was called to the matter; and, seeing that the average for September was 33·03 grains, or 8 grains higher than the limit, and that on one day it went above 41 grains, he thought the Committee could not have done otherwise than again invite the Company to offer an explanation, and to give some assurance for the future. When the Company were before Parliament, the Council tried to have the sulphur limit made 20 grains; but it was fixed at 25 grains. He could not but believe that some explanation would be forthcoming. He knew that the Company, which was under very able management, had some awkward circumstances to meet at present; but, now that gas was being consumed in so many cottages in the town, and was also largely used for cooking purposes, it was doubly important that the quality should be kept up. The Committee's proceedings were confirmed; and so the matter remains for the present.

**Local Authorities as Colliery Owners.**—Among the other authorities who have considered, or are considering, the question of becoming the owners of a coal mine or mines is the Bradford Corporation. At today's meeting, the members will be invited by Mr. E. R. Hartley to consider the following resolution: "That, in the opinion of this Council, it is desirable that the Corporation should have control of the supply of coal required by the Corporation for use in their various undertakings, and that it be an instruction to the Town Clerk to insert in the Bill to be promoted in the next session of Parliament a clause empowering the Corporation to become the owners of and to work a colliery or collieries, with power to borrow the necessary moneys required."

**Sheffield Gas Company and their Workmen.**—The "Sheffield Independent" is informed that for some time past the workmen in the various departments of the Sheffield Gas Company's works have been discontented with the wages paid; and the result of inquiries is said to have satisfied them that, in proportion to the work performed, their pay is below what workmen receive in similar occupations in Leeds, Manchester, Birmingham, and towns of similar size. They further urge that house rents, coal, and gas have become dearer, and, as their labour is the only commodity they have to sell, they consider that they are bound to raise its price to enable them to meet these extra charges. The men have held a number of meetings, and have agreed upon what they consider should be a minimum advance in each department. Their requests have been forwarded to Mr. Hanbury Thomas, the General Manager of the Company, with a view to their being laid before the Directors. The men, through their Secretary (Mr. C. Brain), ask for an interview, in order that the various matters may be discussed.

**Further Gas Loan for the Wigan Corporation.**—At the monthly meeting of the Wigan County Borough Council last Wednesday, Alderman Holmes, in moving the confirmation of the minutes of the Gas Committee, called attention to the amount the Committee desired to borrow for the gas undertaking. He said that the Council would remember that on the 6th of January last year, the Corporation made application to the Local Government Board for power to borrow £19,626. On the 11th of February following, the Board replied that the available margin of borrowing powers under the Provisional Orders of 1888 and 1893 was £5000. On the 15th of February application was made to the Board for power to borrow £5000 for new mains, services, and other absolutely necessary works; and it was stated that the Corporation would apply for an Order increasing their borrowing powers for gas-works purposes. On the 16th of May a local inquiry was held into the application to borrow £5000. On the 14th of July the Board issued their sanction to transfer £5000 for other purposes. On the 3rd of August application was made for a Provisional Order to increase the borrowing for gas-works purposes; and on the 11th of July this year the Board's Provisional Orders Confirmation (No. 2) Act, 1900, authorized the Corporation to borrow such sums as might from time to time be required for gas-works purposes. The motion having been carried, Alderman Holmes moved that application be made to the Local Government Board for their sanction to the borrowing by the Corporation of £25,000 for the purposes of the gas undertaking; and this was agreed to.

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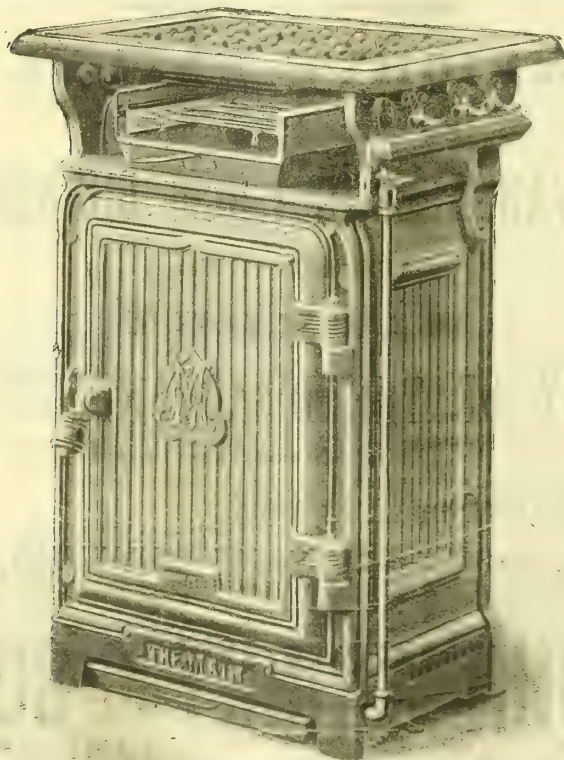
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## EDITORIAL NOTES.

## In the Interest of Good Public Lighting.

A FORTNIGHT ago, we had occasion to notice in these columns the confusion of the street-lighting arrangements on and in the neighbourhood of Waterloo Bridge, in itself one of the glories of London town. It was then remarked that this lack of uniformity and system in the public lighting of the Metropolis is due to the distribution of the responsibility for providing this service among mutually independent Metropolitan highway authorities. Though, as in the case of the Waterloo lamp-posts, this discontinuity of lighting arrangements has obvious disadvantages, on the other hand the independence of the Metropolitan authorities favours experiment, and saves London from that flat monotony of administrative style which becomes so wearisome in some of the admirably-governed Continental capitals. We speak now of the street lighting itself, not of the lamp-posts. Actually, the Strand Board of Works have literally eclipsed the half-hearted electric arc lighting of Waterloo Bridge by the London County Council, and have redeemed the higgledy-piggledy arrangements of the bridge approaches in this regard by a magnificent new display of high-pressure incandescent lighting at the Strand and Wellington Street crossing. It is with deep satisfaction that we record this victory of common sense and economy over the waning attractions of the electric arc. It is one more sign that the forced fashion of electric lighting for streets has had its day, and that local authorities are once more returning to the ways of truth and soberness in this regard.

The installation in question (the work of Messrs. William Sugg and Co.) is entirely upon lines followed by the firm in previous developments of this order of public lighting. That is to say, the units are triple incandescent clusters, aggregating 1000-candle power actual—not nominal. Six tall refuge lamp-columns, serving the whole area of this most important street crossing, are refitted on this principle; and all the neighbouring lights of every description "pale their ineffectual fires" in comparison with this supreme effort of modern gas engineering. Wherefore it is not to be wondered at that those London Vestries and District Boards of Works which are not bound hand and foot to electricity are already beginning to see for themselves, from this and other examples, that the Berlin and Paris Municipalities had reason in abandoning arc lighting for incandescent gas. We are informed that a very interesting extension of this system is contemplated, if not absolutely decided upon, by another London Vestry of the first rank. Hitherto, the increased-pressure system of incandescent lighting has only been applied to isolated lamps, or groups of lamps, to which the high-pressure gas supply could be conveniently carried from a near installation. A scheme has now been devised for applying the method to the whole area of a West-end parish. This enterprise will require the co-operation of the Vestry and the Gaslight and Coke Company; because the latter will have to undertake the distribution of high-pressure gas from several convenient centres. Thus the "transformer" principle, already made familiar by electric lighting practice, will find its parallel in gas engineering.

This gratifying technical development is given full publicity in these columns, because it really constitutes something of which the British gas industry should be glad and proud. The electric lighting interest will find in it a very serious check, and one which it will be extremely difficult to get over. Because the comparative economical situation of the two methods of improved street lighting stands thus: An electricity supply company with a living to make, and no rate-fund to draw upon, will not contract for street arc lighting for less than £30 to £32 per lamp per annum. And even so, they demand (in London, at any rate) that the contract shall be for 30 years certain, or thereabouts. Now, a 1000-candle power high-pressure gas-light means a consumption of 30 cubic feet of gas per hour to midnight, and afterwards of 10 cubic feet per hour for the lesser lighting effect required in the small hours. Adding the cost of mantles, water, maintenance, lighting, and cleaning, the working expense (with gas at 2s. 8d. per 1000 cubic feet) will not exceed £16 5s. per lamp per annum. Spreading the capital cost of the installation over five years—which is as long as a local authority ought to provide for in this respect—there is an additional annual



charge of about £4 15s. per lamp. Say, altogether, the adoption of the best system of gas lighting known and suitable for street-lamps will not cost more than £21 each per annum for the first five years, after which the installation becomes the property of the authority.

Well, now, knowing this to be no fancy estimate, but the positive fact, what becomes of the sole reservation made on behalf of the electric light for the public lighting of Maidstone by no less an authority—not to say partisan—than Sir W. Preece? In our last week's "Electric Lighting Notes" it is recorded that Sir W. Preece candidly advised the Corporation of Maidstone to stick to their cheap incandescent gas street lights, as being so much more brilliant, satisfactory, and cheap than any possible incandescent electric lamps. Such an admission, from this quarter, is significant indeed. It goes, of course, farther than he meant; because if it would be impolitic for the Corporation of Maidstone to substitute electric incandescent for gas incandescent lighting, the same course on the part of a private individual would require some excuse. Sir W. Preece did think, however, that there is no question of the advantage of arc lamps. But what has gone before indicates the existence of a very pertinent question indeed in this connection.

So it all comes to this—that the gas industry is armed and equipped at all points for the struggle with "our friend the enemy." Where the competition is a free and fair one, as between commercial firms doing business upon identical principles, the issue is tolerably clear. Those who prefer electricity to gas will have the former at any cost, if they are able to afford it; and they have a right to exercise their power of choice. But it is otherwise where ratepayers have been deluded into paying for an electric lighting undertaking which cannot maintain itself without assistance from the rates. In such cases, the power of Municipalism is put forth to conceal its own blundering; and there is no fair competition between gas and electricity. If it is one of the chief objections to monopolies that they raise against the people the price of the commodity or the service monopolized, then a municipalized electric lighting service like that of St. Pancras or Poplar is against public policy, because it makes the ratepayers pay twice as much as is needful for that very important necessary of town life, street lighting.

#### The Results of the American Coal Tests.

IN our "Correspondence" columns to-day, we publish the working results of the American coal tests which have been in progress at the works of the South Metropolitan Gas Company for some weeks past, and about which a great deal of anxiety has been evinced—particularly by the Yorkshire press, some of the London papers, and American news agencies. Representatives of these papers have been very persistent in their inquiries at the gas offices in the Old Kent Road since the intelligence was first published that a cargo of American coal had arrived in the Thames for the Company. The tests, however, are now completed; and Mr. C. C. Carpenter will no doubt be pleased to be rid of the liberal attentions of the gentlemen in search of "copy." Gas engineers, too, have been eager to learn the results of this interesting experiment. The information, however, which it is thought advisable to publish (and which only came to hand as we were going to press with this issue of the "JOURNAL") is very meagre; but the average figures given by Mr. Carpenter will perhaps be sufficient to satisfy the gas engineer, though the general public would no doubt like to know something as to Mr. Carpenter's personal views on the chances of American coal in competition with English in gas manufacture. In the figures which he has supplied, no mention is made of the total cost per ton of the American coal delivered on to the works; and, of course, this is a point upon which information would enhance the interest and value of the working results recorded in the letter. Without the figure, a gas engineer will be unable to make a complete comparison with his own working with English coal. At the same time, it does not require any great power of penetration to see that, unless the particular kind of coal upon which the experiments have been made can be delivered on to a gas-works at a price not exceeding that of English coal, it will not pay to bring it here for gas manufacture. But coal is raised in other places abroad, from which the freightage would perhaps not be so great as in the case of the coal which the Company have been testing; and therefore it would not be surprising to hear before long of experiments upon coal mined elsewhere. We do not say

we shall hear of them; but there is the possibility. From the present tests, the Company may not have gained anything but knowledge of what can be done with American coal under English conditions of working; but for their action, and for the results which they make public for the first time through our columns, they deserve the thanks of the gas industry.

#### The Price of Coal.

IN last week's issue we were able to give the facts concerning the purchase by the South Metropolitan Company of the balance of their requirements of coal for the year ending March next. As was then remarked, the Company have neither lost nor gained financially by the courageous policy of waiting pursued by the Directors; but the Board have the considerable satisfaction of knowing that they did not, like the general public and the majority of buyers, risk contributing to the "inevitable" by anticipating it. The announcement that the South Metropolitan Directors have had to pay the same price for the 400,000 tons of coal now bought as for the 600,000 tons they contracted for in the spring may, and will, be taken by the market generally as a sign that lower prices in gas coal are not to be looked for this year. That the existing condition of the gas coal market rendered the getting of better terms for the next few months impossible, unless the coalowners had shown themselves mindful of the future as well as of the present, cannot be denied. It will be seen that we have said "the condition of the gas coal market," because a distinction at present exists between the condition of that and of the coal market generally. Household coal is easier; steam coal is easier; but gas coal, in contrast to the rest, is in full demand. Gas managers, with last winter's experience fresh in their memories, are evidently not disposed to start the coming cold season with short stocks; and an extra maximum fortnight's consumption in store all round means some 700,000 or 800,000 tons to find. Bearing in mind the fact that last April there were roughly no stocks whatever in hand anywhere, the measure of the demand on the gas-coal owners the last few months can be well imagined. The result is, of course, that collieries have no stocks of gas coal; while the current output is taken up at once—the difference between the situation now and twelve months since being that the deficiency in stocks at gas-works has been made good.

In addition to this making-up of stocks, another factor that has tended, and still tends, to keep the market hard, not only in gas-making but in other quality coals, is the increased and increasing exports. When commenting on Mr. Livesey's speech at Horseferry Road early in August, we said: "The most uncertain factor of the situation—one to which we think Mr. Livesey did not, perhaps, give adequate importance—is the export trade; and that is, admittedly, the most difficult to forecast. In our opinion, the continued heavy shipments to other countries will prove sufficient to keep the market stiff for some time to come; so that we do not expect to see it break much this side of Christmas." Since this was written, the statistics of coal exports for three months, July to September, have been published, and show an increase over the corresponding quarter in 1899 of 549,199 tons—the aggregate for the three months this year being no less than 15,241,061 tons. Such shipments must necessarily have a material effect upon the home market. The returns for the last of the three months unfortunately show no sign of the export trade falling off. The quantity shipped in September was 5,140,708 tons, as against 4,857,270 tons and 4,499,968 tons in the Septembers of last year and of 1898 respectively. Germany and France continue our largest customers—they, together with Holland (through which coal passes to Germany), having taken 2,500,000 tons more in the first nine months of this year than in the same period last year. When it is considered that the shipping price of the coal exported averaged 18s. 5d. last month (as against 10s. 10d. in both the preceding Septembers), it will be seen how great must be the shortage of coal on the Continent—France alone has paid us £4,982,855 for coal this year, as compared with £2,391,755 in 1899—and why prices have not fallen in this country.

Apart, however, from the gas coal and export branches of the trade, the condition and prospects of the coal market are more favourable, and afford good ground for hope that prices will become decidedly more easy as soon as the activity always created by the advent of cold weather shall have come and gone. This activity will, moreover, be



much less marked than formerly, owing to the abnormally heavy purchases made by the public (on the ill-informed advice of a section of the Daily Press) a couple of months ago. Then, it may be remembered, the coal trade papers reported that "the demand for house coal at this time of the year [that was early in August] has never been so active since 1872." Our comment was that we would see what the same reports said in two months' time. So we read that, at last Wednesday's market, "the weaker tone was largely attributed to the plethora of coal now in London, which is most unusual at this season of the year. The great railway marshalling stations, such as Child's Hill, Willesden, and Poplar, were reported to be absolutely choked up with loaded waggons. . . . The market was about the most listless experienced for many months. . . . There was an abundance of sellers, and few buyers."

The London market is, of course, not a complete index to the state of the trade, as it is largely a house coal as well as an industrial coal market. But if we look farther and examine the prospects in the great coal-using industries other than gas and railway companies—the iron and steel making, the engineering and shipbuilding trades to wit—there are similar grounds for expecting a lowering in the price of coal. From almost every quarter of the iron and steel trades comes the same story of new orders not being received in sufficient abundance to replace those completed, as well as rumours of works shutting down rather than take orders at reduced prices and pay current rates for coal. From the quarterly shipbuilding returns compiled from "Lloyd's Register of Shipping," issued last week, it appears that the tonnage, other than warships, under construction at the end of September was less than at the end of June by 61,305 tons, while showing a decrease of 143,541 tons compared with the end of September, 1899. Moreover, much of the material used in making the ships that are on the stocks for construction will come not from English but American forges. Furthermore, the Board of Trade returns for last month show the exports of iron and steel goods falling not only below the level of 1899, but also below that of 1898. The figures for the September quarter read: Year 1900, 805,029 tons; 1899, 996,910 tons; 1898, 844,967 tons.

Everything, then, points to a reduced consumption of coal by the great metal working and using industries. This, and the increase of output that will accrue from the opening up of new shafts and seams, will undoubtedly in the end much more than counteract the swollen exports, and will bring down the price of coal generally—provided, that is, that no labour or other complications intervene. The coal consumer has been in such bad luck of late that one feels constrained to insert such a saving clause. The continued strike in America is the latest item in the tale of his misfortunes. It is, however, a long lane that has no turning; and we may be sanguine of the corner being turned before the new Century is many weeks old.

#### The Chairman of the County Council on Gas Questions.

THE first meeting of the London County Council after the holidays is by custom appropriated for the address of the Chairman on the work of the various Committees during the municipal year. It is a good custom, as it refreshes the members' ideas regarding their duties done and undone. Certain of the London newspapers which are not inspired with an overwhelming amount of respect for the London County Council, have a habit of poking fun at these annual performances; declaring them to be mere exercises of the mutual admiration order. It is bad policy, as well as bad manners, to belittle the County Council, and show incivility to the occupant of the chair of this most important body. Rather should those who think that the Council is not what it should be, magnify the dignity of the chairmanship as well as the responsibility attaching to membership, with a view to enhancing the attractiveness of these positions for the best type of citizens. The London of the County Council is "no mean city;" and if several of the members of this body are unfit for the position, the fault lies with the electorate which allowed them to be put there. It is to the credit of Mr. Dickinson, who addressed the Council last Tuesday, that he ended his official oration with an appeal to the people of this great Metropolis to show a little more self-sacrifice in offering to share in public work. If only more of the right sort of public men would come forward and apply

themselves to the work of the Council, there would be less chance for those of the wrong sort. It is, however, a difficult matter to induce Londoners to take their local governing bodies seriously.

Among other topics mentioned by Mr. Dickinson was the past session's experiences of the Public Control Committee in regard to their Portable Photometer Bill. The Chairman recounted how, upon learning from their officers that in 90 per cent. of gas testings by the portable photometer the results showed that the illuminating power of the gas supplied by the London Gas Companies was below the legal standard, while it was quite right at the fixed stations, the Council had deemed it their duty to seek powers to correct the discrepancy. Their idea of the way to do this was to legalize the portable photometer. Parliament did not see the matter in the same light, which seemed to surprise Mr. Dickinson. He told how the Bill of the County Council had been rejected, "on the ground, he presumed, that the tests might be taken in unsuitable premises, and therefore be unreliable." But surely, when the question is looked at calmly, and the grounds of the Council's action examined exactly as Mr. Dickinson stated them, is it not at least fair to hold that the proposal to legalize the portable photometer for the reason given was a hasty one?

Who could possibly say that those 90 per cent. results were necessarily right, and the contrary results of testings at the fixed stations wrong? It was not only suspicion of the unreliability of the portable photometer, for the single reason suggested by Mr. Dickinson, that determined the rejection of the Council's proposal. He is evidently aware of this, for he immediately proceeds to state that the Committee have resolved "to ask the Board of Trade to institute an inquiry, in order to ascertain what was the true cause of the serious difference in the quality of the gas when tested at fixed stations and when tested by a portable photometer." That is quite right and proper; and it would have been better if the same course had been taken before the Committee were so wrongly inspired as to rush into Parliament with their crude, ill-digested scheme of legislation on the subject. The Council would at least not have been made to cut so sorry a figure before that impartial tribunal.

When the Board of Trade are asked to inquire into the "serious difference" between the results of portable and fixed photometer testings, the first step the Department will take (if anything at all is done in the matter) will be to ascertain the existence of the alleged fact. This is one thing that the County Council failed to prove to the satisfaction of Mr. Oldroyd's Committee. Of course, differences were alleged—"chronic" differences, the Chairman of the Committee called them—but the evidence on the point was not convincing. The Board of Trade will not be jockeyed into taking anything for granted. The wisdom of Charles the Second, in the matter of the live fish and the bowl of water, is still a tradition of Whitehall. Government Departments, with no private ends to serve, like to make sure that a thing "is so" before setting about explaining or accounting for it. We should not be surprised if the case for parliamentary action, so rashly adopted as their own by the Council, were to come out of this preliminary inquiry with a different appearance. Mr. Dickinson did not say anything construable into a positive declaration that the Committee would introduce another Portable Photometer Bill next session, but only expressed a harmless hope that the Committee might have a better case next time. They could not well have a worse, or a worse managed one.

Mr. Dickinson's allusions to the other parliamentary work of the session relating to gas supply were of an even more questionable tenour. Thus, with reference to the inquiry held by the Powers of Charge Committee, he asserted that "the Council's case against the Companies was fully established." One scarcely knows what to make of this general statement. It would be difficult to specify off-hand what was the nature of this "case," and still more difficult to prove how the report of this Committee vindicates the County Council. One of the principal recommendations of the Committee was fiercely attacked by all the London Local Authorities north of the Thames, and was struck out of the only Bill that proposed to make it law. From these and other expressions of the Chairman, it might be inferred that the many preoccupations of the County Council prevent the members generally



from having a comprehensive grasp of the gas questions of the Metropolitan area.

#### Municipal Collieries.

STUDENTS of municipal politics will certainly be attracted by the report which we publish elsewhere of the acceptance, by a large majority of the Bradford City Council, of a resolution favouring the acquisition and working of Corporation collieries. This is the development of the theoretical view of the subject submitted by Mr. Priestman to the British Association. Mr. Priestman has not had to wait long for his justification. The Bradford City Council have actually gone the length of instructing the Town Clerk to submit to Parliament, in a Bill to be promoted next session, "a clause empowering the Corporation to become the owners of, and to work, a colliery or collieries, with power to 'borrow the necessary moneys.'" So it has come at last, and Bradford has rushed in where Glasgow, Manchester, and Leeds still fear to tread. At least the action of Bradford will raise the question of the expediency of municipalizing a coal supply in the most pointed manner, and will set the Committee on Municipal Trading upon a higher plane. Naturally, the inquiry that suggests itself first upon hearing this bit of news is the familiar and inevitable "What next?" We submit, however, that this query will not affect the present issue, because it will be answered with "Wait, and see." One thing at a time. The wedge of municipal trading has been driven so deeply into the trade and industry of the nation, that no *a priori* objections to the principle are of the smallest avail to prevent its going farther. Municipal coal mines, like every other suggestion of the kind, are to be discussed upon the merits. There is no antecedent obstacle to such discussion. At the same time, it is difficult to take the Bradford resolution as meaning sober business. It sounds much like a Trade Union Congress resolution declaring the expediency of nationalizing something or other. Yet, what about that instruction to the Town Clerk?

It would be easy to pile up a formidable array of practical objections to the idea of a municipality acquiring a colliery for its own purposes; but most of them could be met. There must remain two or three serious difficulties in the way of any suggestion of the kind, which can be briefly stated. The first is the obviously opportunist nature of the proof of expediency which has so far prevailed with the Bradford City Council. The only argument that seems to have weighed with them was that the price of coal had recently gone up considerably. True; but the conclusion that therefore the Corporation ought to buy and work a coal mine is a curious *non sequitur*. The price of coal may come down; and where will the argument be then? If the rise in price is a reason for purchasing a mine, would the opposite course of the market prompt its resale? It will be necessary to rest the case on a broader basis. We do not say that such a broad base of expediency does not and cannot exist, but only that nothing of the kind was advanced at Bradford the other day. It is intelligible that, if the Corporation of Bradford could lay hands upon two or three collieries precisely suitable for supplying their requirements, and could show a balance of advantage on the purchase and working of these accessories to their established undertakings, the proof of expediency of municipalization in this regard would be enormously facilitated. Short of this actuality, it is not worth while to ask Parliament to legislate hypothetically.

#### The Problem of the British Gas Engineering Profession.

COMPLAINTS continually reach the "JOURNAL" office, from all parts of the country, as to the increasing difficulty of finding competent and in all respects suitable men for the higher posts in the national gas industry. It is not merely that in the profession of gas engineering, as in all other callings, "there is plenty of room at the top." The leaders in all walks of life are selected by a combination of influences beyond the power of man to direct. As a matter of fact, there are singularly few men of the very first flight in gas at the present moment; and the knowledge is not comforting to those who have the interest of the industry at heart, and remember the chances and hazards of this mortal life. But apart from the foremost men of their time, it is being borne in upon those who have to do with the appointment of men to really good posts, from which they might aspire to still better things, that the usual "short list" is both very short, and is apt to contain the same names repeatedly. Below this standard again,

the proper young men who should make the gas engineers and managers of the future are not coming forward. Whether it is that the electrical profession has superior charms for well-educated youth, or what it is, we cannot say. All we do know—and there is no mistake about it—is that gas engineering does not attract sufficient recruits of the best type. City and Guilds Examinations are no test of the facts in this particular employment market. Of course, there is no lack of the men who are promoted—and worthily—from the ranks. But no army can be satisfactorily officered from this source alone. All important industries want a supply of young blood for the higher ranks—enthusiastic, well-educated young fellows, with the instincts and the training of gentlemen, who have no objection to take their coats off at a pinch and go through the hardest mill like the rest. Where are these, in the British gas industry of to-day? The big undertakings do not encourage them. In fact, the best training is not to be had in the largest works. A small, not very well-equipped gas-works, and a turn at contracting work with a struggling firm, will do more to open a youngster's eyes to the stern realities of life than years of routine existence in a large factory. Are the sons of professional men going through this probation in any number? Doubtful. For lack of it, the future of the industry is being beclouded. This is, really, the darkest spot on the prospects of gas engineering in the United Kingdom. It is so different on the Continent. Young Germans and Frenchmen of good social standing, and adequate equipment, are flocking into the gas industry, with the happiest effect on the tone of technical society. Why is it not the same in England? It is a problem that presses for early and complete solution.

#### WATER AND SANITARY AFFAIRS.

THE report which Dr. T. E. Thorpe has sent to the Registrar-General, setting forth the results of his chemical analysis and physical examination of the water supplied to the Metropolis, contains a new feature to which it may be well to call attention. When the present Government Analyst took over the work after the death of Sir Edward Frankland, it was considered desirable that some change should be made in the system of collecting the samples of water. It was thought that not only should the number be increased, but that the places from which they were drawn should be more widely distributed. This view was acquiesced in by the Official Water Examiner (Mr. Charles Perrin); and, with the co-operation of the Water Companies, the necessary arrangements were completed. The result of the change is that instead of only one sample per month being drawn from the mains of each Company, twelve or fourteen samples are taken in each case. With regard to the chemical examination of the water, the full monthly analyses which have been customary are continued, but the places from which these particular samples are obtained are varied from time to time. In the case of the remaining samples, the examination is confined to ascertaining the amount of organic pollution and the degree of turbidity of the water—indicating inefficient filtration or disturbance in the mains. The regular monthly analyses are also supplemented by similar determinations. It will thus be seen that the water supply of London is now being subjected to stricter official supervision than hitherto; and it is to be hoped the results may satisfy those who are always ready to grumble at its quality, and profess to believe that the Companies send specially prepared water to the taps resorted to by the analysts, and an inferior kind to the consumers. As far as the Companies are concerned, they need not fear the additional tests. During the past two months, 200 samples of water were examined—104 in August, and 96 in September; and the worst that can be said about them seems to be that some contained "minute quantities" of suspended matter, while others were "opalescent." This is not very alarming.

As the Thames is the source whence more than half the daily supply of water for the Metropolis is being drawn—116,343,545 gallons were taken from the river last month, compared with 103,814,507 gallons furnished by the Lea, wells, and ponds—any measures which tend to its preservation from impurity call for recognition. As far as the upper reaches of the river are concerned, we know that the Thames Conservancy Board are always on the alert to check the discharge of deleterious matter into



the main stream or its tributaries; and in the course of last year the pollution from seventeen towns and villages, representing a population of more than 36,000, was diverted from the latter. Farms, manufactories, private residences, and other scattered premises, were inspected, and pollution prevented in a large number of cases. Though the condition of the lower portion of the Thames is a matter of less vital importance to the Water Companies than that of the section of the stream which is above tidal influence, where their intakes are situated, there is a certain amount of gratification in reflecting that the river is every year improving in character. Evidence of this was afforded by Mr. W. H. Dickinson, the Chairman of the London County Council, in his address to that body, at their re-opening meeting last Tuesday, on the work of the various Committees during the past year. Referring to the Main Drainage Committee, he said they had had to deal with the enormous bulk of 79,382,570,830 gallons of sewage, and to send out to sea 2,288,000 tons of sludge. But although there was an increased quantity of sewage, the maintenance charges were £5000 less than in the preceding twelve months. Moreover, the methods of precipitation were improving; and the water, which formerly had to be carried out to the ocean at great expense, now ran into the Thames at the outfalls—the effluent being highly satisfactory. Proof of the gradual cleansing of the river reached Mr. Dickinson recently from a distinguished naturalist, who had furnished very striking testimony to the fact that eels were increasing in number and size every year, owing in a measure to the enforcement of old laws and the making of new ones, and largely to the example and efforts of the Council. However “fussy” the proceedings of some of the Committees of this body may be, those of the one having control of the main drainage of the Metropolis do not deserve to be thus characterized.

Another Committee of the Council—the one having charge of all matters affecting the public health—has been doing some good work lately, in conjunction with the Medical Officer of Health, Dr. Shirley Murphy (who has had the valuable assistance of Mr. J. Cantlie, M.B.), in making preparations for isolating any cases of plague that may by chance occur in London. According to a report brought up by the Committee at the meeting of the Council last Tuesday, they are at present in a position to accommodate any number of suspected persons up to a thousand. As Dr. Collingridge, the Port Sanitary Officer, and Dr. Sedgwick Saunders, the Medical Officer of Health for the City of London, are keeping a vigilant eye upon the eastern district of the Metropolis, it may be confidently anticipated that any imported case would be promptly detected and dealt with. The recent epidemic in Glasgow was of a mild description; and it is satisfactory to find that it has been completely checked by the medical and sanitary measures practised with so much energy—chief among them being the isolation of the patients and the cleansing or destruction of linen and clothing. Testimony to this is borne by Professor Zabolotny, of the Imperial Institute of Experimental Medicine in St. Petersburg, who has spent several weeks in Glasgow. The system which worked so well in the northern city will be followed in the Metropolis.

The Local Government Board have also been rendering important service in connection with this matter. Early last week they issued to the several sanitary authorities throughout the country copies of memoranda prepared by their Medical Officer, containing suggestions for guarding against the plague, or dealing with any cases which may arise. While doing so, however, they wish it to be clearly understood that their action must not be interpreted as suggesting that in their opinion there is any present cause for alarm. The step they have taken is simply precautionary. The Board point out that the plague must be regarded as personally infective; and they take typhus fever as the type of disease with which it may be best compared. Writing upon this subject in the “JOURNAL” for the 4th ult., we expressed the opinion that plague, like typhus, should be regarded as a “filth” disease, and that accumulation of decaying matter around dwellings, and the consequent saturation of the soil with impurity, accompanied by poverty, overcrowding, and defective ventilation, would be just the conditions likely to cause its propagation. These conditions absent, the principal factors contributing to the spread and permanence of the plague would be wanting.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 970.)

THE Stock Exchange had a thorough disappointment last week. The bright promise of active business and buoyant prices which appeared to be developing so happily in the week preceding received a disagreeable check. Apparently the sole responsible cause for this lay in the Money Market. Other influences had not deteriorated; and there was no change in the general tendency of affairs either at home or abroad. But things grew flatter and flatter; and prices steadily shrank, until at the close there was not a single department that did not show a long array of reductions. The settlement was not heavy, and was easily adjusted. In the Money Market, there was an abundance available for short loans at easy figures; but discount rates hardened materially. A possible rise in the Bank rate on Thursday was discussed; but no change was made. In the Gas Market, as in others, there was some arrest of the activity which had characterized the previous week; and movements in value were not so uniformly in the upward direction as they have recently been. But, though the list is chequered, there is no change of any importance for either the better or the worse. In Gaslight issues, the ordinary was moderately dealt in at very steady figures; the price never ranging outside the limits of 99½ and 100½; and the best figures predominating at the close. Nothing in connection with the secured issues was noticeable. South Metropolitan was quiet; but it grew firmer as the week advanced, and changed hands at top price on Saturday. Nothing was done in Commercials, except a few “special” bargains; but the *ex div.* quotation showed an advance. Some of the Suburban and Provincial Gas Companies were more in evidence than they have been of late. Alliance was a little better *ex div.*; but Brentford preference fell. The Continental contingent were very quiet, but quite firm; and Union had a further advance. Among the remoter undertakings, Buenos Ayres showed the only change—a fractional fall. The Water Companies were rather stronger in general; and several issues effected some modest advances.

The daily operations were: Gas stocks opened on Monday unchanged, and remained firm, with quiet business. Quotations did not vary. In Water, Chelsea rose 2. There was no increase of activity on Tuesday; but prices showed no falling off. Alliance advanced ½. In Water, East London gained 2, and ditto debenture 1. Wednesday was a busier day, with general firmness. Brentford preference fell 2½. Kent Water rose 2½. Thursday was conspicuous for activity in Gaslight ordinary. Continental Union improved 2; but Brentford preference fell ½, and Buenos Ayres ½. On Friday and Saturday Gas stocks were quiet, but very firm, and unchanged. On Friday, West Middlesex Water rose 1.

### ELECTRIC LIGHTING MEMORANDA.

**The Burden of Poplar—The Extravagance of a Poor Vestry—Hoodwinking the Ratepayers—A Legacy of Loss—Where Electricity Supply does and does not Pay.**

OUR latest national epic poem begins with a somewhat harshly expressed adjuration to “drop a shilling” into the tambourine when we have relieved our patriotic feelings by shouting “Rule, Britannia!” It is a counsel that may well be followed in connection with other affairs besides campaigning in South Africa. Notably, it is something to be remembered in regard to the victorious progress of Municipalism, in such matters as electricity supply. After the shouting Progressive, comes the quiet rate-collector with his ever-rising demands. He sees that the ratepayer duly pays up his extra shilling—a good many shillings usually—at a respectful interval after the inauguration of the newest triumph of Municipalism. This is the natural order of things which the owners and occupiers of the parish of Poplar are about to prove in their own experience. Yesterday week, Mr. Sydney Buxton, M.P., formally opened the Poplar Vestry electricity works, by turning on the switch connected with “ten miles” of street arc lamps. He congratulated the Poplar Board of Works on their “enterprise,” and hoped that before long few dwellings in the parish would be without the electric light. “He had little doubt that in the end the new works would yield a substantial profit.” Mr. Sydney Buxton, for a public man, must be singularly ill-informed in respect of the financial history of parish electric lighting.

After Mr. Buxton, who might have been expected to know better, followed the Chairman of the Board of Works and the Chairman of the Electricity Committee. The former cited Mr. Alfred Blackman, the local Electrical Engineer, as his authority for the promise of a supply of both light and power “at prices considerably lower than those of gas.” The parish begin by setting up 195 arc lamps in the first ten miles of streets; and it is proposed to light 17 miles of other streets by electric lamps fixed to the old street lamp posts. The parish will soon learn which kind of lighting is the cheaper. The Chairman expressed the hope that the successors of the present Board will “not rest satisfied till every street within the boundaries is illuminated by electricity.” We hope that the speaker will live to see the bill, and be satisfied therewith. Mr. A. H. Valentine, the Chairman of the Electricity Committee, said that a Company, whose offer



to supply electricity to the Poplar district had been rejected, "proposed to charge 7d. per unit for lighting and 5d. per unit for power. The Board's prices were 5d., 4d., and 3d. for lighting, and 3d. and 1½d. for power. Poplar had, therefore, gained at once by doing the work itself." The conclusion is distinctly humorous. There is, we believe, a once popular work of fiction still extant, bearing the title "The Gain of a Loss." No further explanation of this paradox in nomenclature is needed than Mr. Valentine's remark. In what other sense can Poplar be said to have "gained" from the decision of the parish Electricity Supply Committee to sell their product at less than cost price? The Company referred to did not propose to go into the business from motives of philanthropy. On the other hand, their quoted prices for current compare not unfavourably with those of other Metropolitan Companies in the same business which just manage to pay their way. The parish Electricity Committee can, of course, make their prices as low as they please, because they have the rates to fall back upon. The Company would have had no such advantage.

The extravagance of the Vestry is very conspicuous in the circumstance of their starting the parish electricity supply with a public lighting connection of 195 arc lamps. It is the last thing they should have attempted to do, if they had the faintest hope of the undertaking doing legitimate business enough to pay its way. Whatever opinions may be held as to the suitability of the electric arc for street lighting—and opinions differ on this as on other subjects—its costliness is beyond dispute. The time for anything but wilful misrepresentation and self-deception on this head is past. Of course, if Poplar is going to do as St. Pancras, Islington, Hampstead, Shoreditch, and every other "enterprising" local authority similarly situated does—rob Peter to pay Paul—there is no more to be said on the point. The public purse is bottomless. But if the accounts are to be properly kept, they will show that these 195 arc lamps cost not much under £40 per annum apiece. That is paying pretty dearly for the Poplar whistle.

A nice legacy the moribund Poplar District Board of Works are leaving to the new Municipal Corporation! The new local authority will find this out when the echoes of Progressive journalistic applause of the enterprise of their predecessors have died away. It is easy to be enterprising at other people's expense. Mr. Valentine told his Company at the recent opening ceremony that "all was being done without touching the rates. They had borrowed the money from the County Council. The expenditure, so far, was nearly £100,000. In order to attract even poor people, installations in private houses would be made free of charge, and meters with slots for money would be furnished, so that consumers could pay as they went along." To say that a local authority can run into debt to the tune of £100,000 without touching the rates can only be true where the money is applied to the purchase of a remunerative property; and the electricity supply of Poplar will not be that for many years, if ever. And if free wiring for poor people is to be indulged in, somebody else must pay for it. How much longer will this municipal thimble-rigging be tolerated by public opinion?

For it is mere hoodwinking of the ignorant and helpless rate-payers to pretend that municipal electric lighting outside a very few large towns is anything but a dead loss. Look at such a favourable instance of profitable electricity supply as that of Newcastle-upon-Tyne, which is done by a Company, so that the published accounts are trustworthy and complete. The capital outlay here is exactly the same as that of Poplar, £100,000; and the lamp-connections number 64,156 for the past year. The working profit for the twelve months amounted to 8·38 per cent. on the mean capital expended, of which 1·02 per cent. went for depreciation. This Company are able to make a profit out of electricity supplied at less than 4½d. per unit all round. There are few like it in the kingdom. Poplar will want a private connection of the same extent before the venture will pay. On the other hand, there is the example of Kingston-upon-Thames, where municipal electric lighting was to be very profitable. In the "Surrey Comet" for the 6th inst., a letter will be found proving that during the five years of the existence of the Corporation undertaking, there has been a net loss per annum of £1780 on an investment now amounting to £50,000. Nor is there any real prospect of the corner being turned, for not a penny has been provided for depreciation of plant now five years old.

#### GAS ACTS FOR 1900.

(Continued from p. 891.)

THE following Acts, obtained last session by Local Authorities, relate chiefly or in part to gas supply:—

The Falkirk Corporation Gas and Burgh Extension Act authorizes the Town Commissioners to compulsorily acquire additional gas lands and construct new works. The gas capital is to be increased by £80,000. Power of inspection of consumers' covered fittings is granted, without appeal.

The Glastonbury Corporation Gas Act empowers the Corporation to purchase the undertaking of the Glastonbury Gas and Coke Company, Limited. In addition to the price of the property, as ascertained by arbitration under the Lands Clauses Acts, the Company are to receive £625 towards their parliamentary expenses of the session, and £200 towards the winding-up

expenses. The Company's officers and servants are to be compensated. It is provided that only one counsel and two expert witnesses on each side are to be engaged on the arbitration. The maximum price is 4s. 6d. per 1000 cubic feet for 15-candle gas; no preference being given to consumers in the borough over outsiders. The test-burner is an argand 24-hole burner, with 7-inch chimney. Four per cent. interest is to be allowed on consumers' prepayments and deposits. The portion of the undertaking in the district of Street may be purchased by the District Council. Consumers' internal fittings which are intended to be covered over are to be subject to inspection by the Corporation, with power of appeal to a Court of Summary Jurisdiction. The sum of £7000 is to be borrowed for gas-works extensions. The sinking fund for the repayment of the original loan capital is to be duly apportioned between Glastonbury and Street according to the revenue arising from gas consumed in the respective areas. In the event of Street purchasing its part of the undertaking, the amount of the sinking fund already apportioned to this portion is to be deducted from the ascertained price. The balance of gas revenue is to be applied in reduction of the price, subject to a charge of 1 per cent. for management, which may go to the Glastonbury district rate fund. Street may have an annual audit of the accounts by a professional accountant.

The Glyncorrwg Urban District Council Gas Act empowers the District Council to supply gas and to acquire their portion of the undertaking of the Llynvi Valley Gas Company. The partition is to cost £3250, and is to embrace all the local gas property except the Gas Company's main in the Great Western Railway tunnel at Cymmer. New gas lands are to be acquired and works erected. The maximum price of 15-candle gas is 5s. per 1000 cubic feet. The rate of interest allowable on consumers' deposits is 3 per cent. The sum of £3500 is allotted for the purchase of the Llynvi property and the costs of the Act, and £7500 for the erection of gas-works, with £500 for working capital. The original gas capital is repayable in 40 years. Any surplus gas profits may go in relief of rates. The agreement for the purchase of the gas-works site is scheduled.

The Morecambe Urban District Council (Gas) Act provides for the transfer to the Council of the undertaking of the Morecambe Gas and Light Company. The transfer is by agreement, the terms of which are scheduled. The purchase price is £141,000. Officers and servants of the Company are protected. As to the distribution of the purchase-money, it is directed that the Board shall prepare a scheme which is to be submitted to the proprietors. If one-fourth of the proprietors present at the stated meeting object to the scheme, a Queen's Counsel is to be called in to arbitrate and settle the matter. The district of supply is defined, and includes several neighbouring places, which are given purchasing powers. The maximum price of 15-candle gas is to be 4s. 6d. for Morecambe and Heysham. Rebates not exceeding 15 per cent. are permitted; notice to this effect being endorsed on every demand note. Consumers' fittings intended to be covered over are subject to inspection, without appeal. The Company receive £500 towards the expenses of winding up. New gas capital to the amount of £40,000 is required. Original gas loans are repayable in 40 years. Surplus gas profits go to the district fund.

The Mountain Ash Water and Gas Act authorizes the Urban District Council, among other things, to borrow £10,000 for gas-works extensions and improvements, repayable in 45 years.

The Ossett Corporation Gas Act authorizes the sale of the undertaking of the Ossett Gas Company, incorporated in 1855, to the Corporation of Ossett, chartered this year. The Corporation are to give to the Company notice to treat within six months after the passing of the Act. The Company are entitled to pay the reasonable costs of opposing the Act and of promoting their own Bill out of their revenue or cash in hand, and also to retain one-half of their reserve fund as it existed on March 14 last. The Manager and Secretary are protected. The Company will receive £225 in respect of winding-up expenses. The undertaking is to be carried on in the ordinary course, as from March 14; but no extraordinary engagements are to be entered into pending the transfer. Unclaimed shares of the purchase-money, if under £500, may be paid into the County Court of Dewsbury. The maximum price of 15-candle gas is 4s. per 1000 cubic feet. For the protection of the Parish Council of Crigglestone, it is enacted that, when the yearly consumption of gas within the parish exceeds 10 million cubic feet, the price is to be the same as within the borough, and is never to be more than 3d. per 1000 cubic feet higher. Three per cent. interest is payable on consumers' deposits, and 4 per cent. on prepaid accounts. Consumers' covered fittings are liable to inspection; but this power must not be exercised beyond the borough without the consent of the Local Authority. There is power of appeal to a Court of Summary Jurisdiction against any order made under this clause; and notice of its existence must be advertised. An agreement with Horbury for sharing the sinking fund is scheduled. Other Local Authorities have purchasing powers, subject to the approval of the Board of Trade. The sum of £25,000 is required for gas-works extensions; all gas loans being repayable in 45 years. Surplus gas profits go to the district fund.

The Walsall Corporation Act appropriates certain Corporation lands for gas purposes. A clause contains the same powers of inspection and prescription of the sizes of consumers' internal fittings as are contained in the Grantham Gas Act—*ante*, p. 890.



Additional gas capital to the amount of £120,000 is required, to be repaid in 40 years.

[Several of the "Omnibus" Corporation Acts of the year contain minor references to gas supply, which will be noticed in connection with the other clauses of these statutes.]

#### WAGES AND HOURS OF LABOUR IN 1899.

In the tenth month of 1900, we receive the full annual report of the Board of Trade on the changes recorded to have taken place in Rates of Wages and Hours of Labour in 1899, a preliminary and incomplete summary of which appeared in the "JOURNAL" on Jan. 30. The report is, we grant, a monument of industry; but the business office which was not able to compile, or the publisher whose living depended upon his possession of business capabilities, who could not turn out such a work in considerably less than nine months, would be the laughing-stock of the commercial world. However, we must be thankful that the Government "Commercial" Department publishes statistics concerning employers and their workpeople during their lifetime, and does not nurse its reports, as the War Office does its medals, till those interested in them are dead and buried. The year in question was so remarkable for the great revival of trade therein witnessed, and will be so often looked back upon as forming part of a notable period in our industrial history, that the salient facts relating to the state of the labour market during the twelve months may well be rescued from the obscurity of a three hundred page volume of statistics, and noted for future reference, as well as on account of their present interest.

The years 1894 and 1895 marked the depth of the depression in trade which followed the abounding times of 1890-91; wages in those years falling heavily. In 1896-7, the balance of wages, setting increases against decreases, was in favour of the working classes; but the real force of the trade revival was not felt until 1898, when wages rose rapidly and substantially. This rate of increase was maintained and exceeded in 1899, as will be seen from the following statistics.

The net increase of wages in 1897 was £45,000 per week as compared with 1896; in 1898 the increase over the preceding year was £95,000; while in 1899 wages again rose £115,000 a week. Great, however, as was the rise of wages last year, it has been considerably exceeded in the eight months of 1900 which had elapsed before the report of the Board of Trade was completed. The changes recorded during this period have effected nearly a million persons, and have resulted in a net increase of more than £150,000 per week—by far the greatest rise yet recorded in any similar period. The aggregate effect of these rises will be better comprehended if we put it that, in 1899, something like £13,000,000 was paid in wages more than in 1896; and that last month the current rates of pay represented an annual wage bill exceeding that of four years ago by £21,000,000. This increase is not, of course, spread equally over the various classes of workpeople throughout the country. Indeed, the percentage of the industrial population affected is comparatively small, though it has increased considerably during the past two years. Excluding agricultural labourers, seamen, and railway servants (with regard to whom exact statistics cannot be obtained), the number of persons whose wages were changed represented from 7 to 8½ per cent. of the industrial population in each of the five years, 1893-7, but rose to 13 per cent. in 1898, and 15 per cent. in 1899. Only, in fact, in the mining industry did the percentage rise above 20 last year; but of the total number of coal miners employed, no less than 94 per cent. had increased wages.

The rise in miners' wages was, it need hardly be said, the most prominent feature of the changes of wages in 1899, as it was the previous year; that rise last year accounting for nearly half the total increase. The upward movement in those wages during 1900 has been still more striking than in 1899; the total rise in weekly wages in the first eight months of this year being more than twice as great as in the whole of the preceding twelve months. This abnormal rise is, of course, as the report points out, closely connected with the rapid increase in the price of coal, which, though taking place partly in 1899, did not exercise its full effect on wages until the present year, owing to the practice of basing changes of wages on the average price ascertained over a previous period of months. The changes in wages in the coal-mining industry in 1899 were almost entirely general in character; all districts participating in the improvement arising from the increased demand for coal.

Next to the tremendous increase in the earnings of the colliers, the rise in the wages of the men employed in connection with the iron, steel, and engineering trades has been the most noteworthy. The great increase in the selling price of pig iron led to a heavy rise in the wages of the blast-furnace men; the 19,237 hands employed in the manufacture of pig iron receiving increments to their wages equal to nearly 5s. per week. Other workers in iron and steel had their rates of pay increased by over 3s. per week; while in the engineering and the shipbuilding trades the rise only represented 1s. 1d. on each man's wage.

We have already said that the rise in wages, as shown by these returns, was not by any means universal last year. This is strikingly exemplified by the fact that the only recorded changes in the wages of gas workers employed by undertakings other

than local authorities are five in number, and affect 371 individuals; while changes in the wages of about 4600 gas workers employed by local authorities are notified. These figures go rather to prove that in regard to private gas undertakings the statistics received by the Board of Trade are not complete, as doubtless the number of men employed by gas companies who obtained increased rates of pay last year considerably exceeded 400. The present is, of course, not a time when gas-workers' wages are likely to be materially raised. Indeed, if, as in such industries as coal mining or iron working, the wages of the hands engaged in gas making were governed by the prosperity of the undertakings, a very considerable decrease would have been made this year therein. Only in the case of the South Metropolitan Company, however, will the hard times for the shareholders be directly felt by the men, who, in consequence of the rise in the price of gas, will receive no profit-sharing bonus.

What makes the impossibility of gas managers giving their hands any higher rates of pay at the present time bear somewhat hardly on the men, is the fact that, on account of the coal "famine" and other various causes, the cost of living is temporarily higher than in recent years. Fuel is dearer, light is dearer, and, worst of all, food is dearer. Rents, too, tend to increase rather than to decline; so that the shilling does not go quite so far as it did two or three years since. But the workman who has the good fortune to be employed by a gas company should bear in mind that, though he may have to forego the plums picked up in times of abnormally good trade by some of his fellows, he has the more than compensating advantage that, when trade is slack, his job is as certain and his wages are as good as ever. Gas-works never have to shut down on account of trade depressions. They, indeed, generally profit by the low cost of coal and materials, and the consequent cheapness of gas, in that they are enabled thereby to secure increased business. What company but is conscious at the present time of the check put upon its expansion by the higher price of gas?

Other companies placed somewhat similarly to gas undertakings as regards the detriment to their prosperity caused by the present state of trade, and the consequent impossibility of acceding to demands from their men for higher pay, are the railway companies. The average wages of railway servants show a slight gradual rise during the past four years; the average weekly wage per head of all employees having increased from 24s. in 1896 to 25s. 3d. in 1899. That the present time, when the companies have enormously heavier coal bills to pay, and no means available for obtaining a correspondingly increased revenue, should have been chosen for a general agitation on the part of railway servants for more wages, shows that their leaders pay no regard to circumstances, and do not give the companies any credit for the advances already granted.

The most striking and satisfactory feature of the report, so far as concerns wages, is that, of the 1,175,576 workpeople (other than agricultural labourers and railway servants) whose wages were changed in 1899, no less than 1,141,303, or 97 per cent., obtained the higher rates by other means than that of a strike. Exactly 50 per cent. obtained their rise by direct negotiation between themselves or their representatives and the employers; 32 per cent. by means of conciliation boards, joint committees, mediation, or arbitration; while 15 per cent. received their increases under the terms of sliding-scales. The percentage of increases obtained after recourse to a strike has fallen steadily since 1896, when it was 9; the figures for 1897 and 1898 being 7 and 5 per cent. respectively. The return for last year, as we have said, only shows 3 per cent.; and even this proportion would have been lower but for the prevalence of strikes for higher wages in the building trade. The fact is, of course, that employers were doing so well that they could better afford to pay more wages than risk a stoppage of production.

The percentage (2·4) of unemployed members of Trade Unions making returns to the Board of Trade in 1899 was lower than in any year since 1890. The statistics for the present year appear to show some diminution in activity of employment, but not as yet to any marked extent; and as, generally speaking, changes in prices and employment precede changes in wages, there is as yet little sign of any check to the upward movement of wages, except perhaps in the Scottish building trades.

As to changes in hours of labour, it may be said that during 1899 an even smaller number of workpeople had their hours reduced than in 1898; but, chiefly owing to some large reductions in the working hours of the employees of public authorities—especially tramway servants in London and Liverpool—the aggregate reduction in hours was greater. In all, 35,949 employees had their time reduced on the average just over 3½ hours per week. The number of workpeople who secured an eight-hour day was not large—being 3316, of whom 2297 were employed by private concerns, and 1019 by public authorities; the latter number including 220 gas workers at Leeds and 160 at Bradford. No reversions from the eight-hour day to longer hours of labour were reported to the Board of Trade.

The death is reported on the 19th of August, in his 54th year, of Dr. A. Heintz, who was the leading authority on the Continent on the manufacture of fire-bricks, &c. After general scientific studies, he became chemist to the Stettin or Didier's Fire-Brick Works in 1873, and thereafter was solely engaged in the fire-clay industry. He was an active member of both the German and the Austrian Associations of Gas and Water Engineers.



# DR. HALDANE'S BLOOD TEST FOR CARBONIC OXIDE IN AIR OR GASES.

PASSING mention has been made in the "JOURNAL" on several occasions of Dr. John Haldane's blood test for carbonic oxide in air or illuminating gas, and also of a new method of gas analysis designed by Dr. Haldane with a view to work in physiology and hygiene. Papers on these subjects have been published by the author since 1895 in the "Journal of Physiology;" but owing to the inaccessible character of these original publications, Dr. Haldane's work is not so well known as it deserves to be. By the kindness of Dr. Haldane himself, we are now in possession of the text of these papers; and by his desire we proceed to describe his methods and apparatus as fully as is necessary for the information of those who are interested in the matter as a branch of gas and sanitary technics.

It appears that, when Dr. Haldane's attention was first called to cases of poisoning by carbonic oxide, he found no satisfactory method for determining small percentages of this gas in the air. And there was special difficulty when, as almost always happens, marsh gas or other hydrocarbons were present along with the carbonic oxide. He knew that hæmoglobin solutions had been used for the qualitative testing of air for carbonic oxide. Vogel appears to have originated this test, his method involving the use of the spectroscope; and Hempel followed on much the same lines. Dr. Haldane proposed to simplify the test with a view to the attainment of approximate results. He relied upon the fact that when a hæmoglobin solution is well shaken with air containing carbonic oxide, the proportion of the hæmoglobin which finally combines with the carbonic oxide varies with the percentage of carbonic oxide present in the air. Then by determining colorimetrically the proportion of the hæmoglobin which has combined with the carbonic oxide, it is possible to infer the percentage of carbonic oxide originally present. This is practically the whole scheme of the test Dr. Haldane proposes. As the author persevered with its use, he found that it contained the possibility of yielding results of considerable and even unexpected accuracy, when various easily avoidable sources of fallacy were detected and eliminated. He now employs it for determining carbonic oxide in coal gas, in substitution for the older and less satisfactory tests given in the text-books.

It will be better for the adequate comprehension of the method to follow it from the author's first attempts through his own subsequent improvements. The sample of air was collected by sucking two or three litres of the air through a clean and dry bottle of about 100 to 200 cubic centimetres capacity. The bottle was closed by means of a doubly tubulated cork, previously soaked in paraffin. Each piece of glass tubing was securely closed by means of a stopper made of about an inch of rubber tubing, into one end of which a piece of glass rod was fitted. For the determination of the carbonic oxide in the air inside the bottle, about 5 cubic centimetres of a solution of defibrinated ox blood, diluted to  $\frac{1}{100}$ th with water, were introduced in the following manner: A pipette having been filled with the blood solution, one of the pieces of glass rod was removed while the rubber tubing was compressed, so as to prevent air from passing into the bottle. The end of the pipette was then inserted in the rubber tubing, and the blood solution allowed to flow into the bottle. Sufficient air was then permitted to escape by the other stopper to enable the pipette to empty itself. The pipette was next removed without allowing any air to enter, and the bottle again securely stoppered. Then the bottle was shaken for a period of 10 minutes—a period which subsequent experience extended to 20 minutes—with exclusion of bright light. This ensured the absorption by the hæmoglobin of all the carbonic oxide it was capable of taking up.

The next stage was the removal of the solution by means of a pipette into one of three narrow test-tubes of exactly equal diameter—say  $\frac{3}{8}$  or  $\frac{1}{2}$  inch—and of at least 12 cubic centimetres capacity. Another of the tubes received exactly 5 cubic centimetres of the original blood solution; and the third was filled with some of the same blood solution which had been shaken up with coal gas to completely saturate it with carbonic oxide. The colours of the solutions in the tubes were then compared. Starting with the original blood solution as the datum, if more than 0.01 per cent. of carbonic oxide had been present in the air in the bottle, the solution that had been shaken up with it would be pinker. If more than 3 per cent. of carbonic oxide had been present, the tint would be sensibly equal to that of the solution saturated with coal gas. An approximate estimate of the amount of degree of saturation might be made by simple comparison of the three tubes. Dr. Haldane developed a quantitative colorimetric test from the same results, by balancing the tints against a carmine solution. He was evidently surprised at first at the delicacy of the qualitative test with hæmoglobin, used in this way; the colorimetric method being far more delicate than the spectroscopic examination practised by his precursors in this line of analysis. He did not then, however, regard it as a very accurate method, owing to the existence of various sources of error. In a later paper this opinion was corrected; the importance of excluding light during the operation having been meanwhile discovered by Dr. Haldane and Dr. J. Lorrain Smith, of Belfast.

We can now pass on to Dr. Haldane's paper of 1898, written after further experience of gas analysis in the course of various investigations into the nature and physiological action of the

gases present in the air of mines, wells, railway tunnels, &c. This paper begins with a description of a special apparatus made for the author by Messrs. C. E. Müller and Co., 148, High Holborn, for the rapid and accurate determination of oxygen and carbonic acid in a sample of air. This arrangement has been used for analyzing samples of "blackdamp" from various collieries. The determination of other gases in the sample can, of course, often be effected by means of special ancillary processes. Dr. Haldane commends this apparatus as being exceedingly useful for the examination of air vitiated by respiration, combustion, &c., as the samples may be collected in small bottles of about 100 cubic centimetres capacity. All that is necessary is to suck the air to be examined into the bottle with the help of a short piece of rubber tubing, and then close it at once with a tightly fitting cork coated with paraffin wax. This system was reported upon in 1897 by the Committee of the Board of Trade on Railway Tunnel Ventilation. Is there any public institution that undertakes the testing of samples of air in this way for all comers?

The particular question of testing air and gas for carbonic oxide by the new method does not arise in connection with the former class of air examinations. In a special division of his 1898 paper, however, Dr. Haldane claims that the blood method "has made it possible to determine directly, and with great accuracy, small percentages (from about 0.005 to 0.3 per cent.) of carbonic oxide in air;" and, further, that it can be conveniently employed for roughly determining in a direct manner the percentage of carbonic oxide in coal gas (which must, of course, be first diluted to about  $\frac{1}{100}$ th with air). Certain improvements and simplifications of the method are then briefly described. The sample is collected in a bottle of 100 to 200 cubic centimetres capacity, in the manner already described. The bottle is then transferred to a basin of solution of defibrinated ox blood, diluted to about  $\frac{1}{200}$ th, and being held upside down and the cork taken out under the surface, the bottle is tilted so as to allow about 5 cubic centimetres of the air to pass out and be replaced by the solution. The cork is then again inserted, and the bottle wrapped in a cloth so as to exclude the light, and shaken pretty vigorously for 20 minutes. The bottle must be perfectly smooth and clean inside, otherwise the solution may become turbid. A 5 cubic centimetre sample of the original blood solution is now measured off into a test-tube; the solution from the bottle being poured off into a similar one. For quantitative determinations, a previously prepared carmine solution is required. This is made by mixing in a mortar 1 gramme of pure carmine with a few drops of liquor ammonia, and dissolving it in 100 cubic centimetres of glycerine. This solution is preserved, and a standard solution prepared from it when required, by diluting 5 cubic centimetres to 500 cubic centimetres with water. Enough of this standard carmine solution is now added from a graduated burette to the tube of original blood solution to bring its tint up to that of the solution from the bottle. Next, the hæmoglobin of the latter solution is saturated with carbonic oxide, by leading coal gas into the test-tube through an india-rubber tube, quickly closing the mouth of the test-tube with the thumb, and shaking for a few seconds. Carmine solution is now added to the contents of the other test-tube until equality of tint is again established. From the two readings of the burette, the percentage saturation of the hæmoglobin is calculated according to the manner laid down in the paper of 1895. It seems that the author should re-publish this part of his work in a clear form, with the necessary conversion tables, if others are to use the method.

Dr. Haldane meets an obvious objection that the sample of air in a tenth of a litre bottle is very small, by remarking that there is no advantage in using more for the method of testing in question. The amount of carbonic oxide taken up from the air by the dilute blood solution is only a minute fraction of the total quantity present in the bottle. The same air might in fact be used several times over for a determination; or a smaller bottle might be employed without making the results more than very slightly too low. When ox blood is not available, and for a merely qualitative test for the presence of carbonic oxide, all that is necessary is a pricked finger, yielding a large drop of human blood, which could be diluted with about 10 cubic centimetres of water, divided into two portions. Shake half of the solution in a small dry bottle full of the air to be tested, and then compare the colour of the two halves of the solution. When there is more than 0.5 per cent. of carbonic oxide present in the air, or when there is little or no oxygen present, the sample must be suitably diluted to bring it within the scope of the method. Coal gas, for example, would require to be diluted to  $\frac{1}{20}$ th or  $\frac{1}{50}$ th with air. This delicacy renders the test exceedingly serviceable for the hygienic examination of air, "since it will detect and estimate percentages of carbonic oxide well under the limit at which there is danger to life. It requires . . . about 0.05 per cent. of carbonic oxide to produce, after several hours, even slight symptoms of poisoning; whereas 0.01 per cent. of carbonic oxide (or 0.2 per cent. of coal gas, or 0.03 per cent. of water-gas or producer gas) may be detected and estimated. Should, however, a still more delicate method be required . . . if the oxygen were first removed from the air, the delicacy of the hæmoglobin test would be increased by more than twenty times, so that it would be possible to detect and estimate as little as 0.001 per cent. of carbonic oxide or 0.02 per cent. of coal gas."



## THE COAL RESOURCES OF THE UNITED STATES.

THE attention of all coal consumers has been drawn of late to the possibility of the United States becoming not only a great coal-using country—it is already by far the biggest coal consumer in the world—but a great coal supply country, exporting on a vast scale to the European, if not to the English, markets. For this reason, and also because she threatens to become a very serious competitor in the metal goods trades, to success in which an ample supply of cheap coal is a necessity, the question of the extent and the probable cost of production of America's coal resources is of interest at the present time. Much valuable information on those points is contained in an article in the current issue of "The Forum," by Mr. Edward S. Meade, entitled "The Coal Supremacy of the United States."

"The most striking facts of the world's commerce of to-day are, perhaps," says Mr. Meade, "the coal famine in Europe and the export trade of the United States. These two facts are closely related. They stand in the relation of cause and effect. The foundation of our (American) cheap production and our large exports is the abundance and cheapness of our coal. The slow growth of the export trade of our rivals is very largely to be explained by the high cost of their fuel. Other important advantages we do, indeed, possess—in our larger use of machinery, more efficient labour, and cheap raw materials. But the most important of all our points of commercial superiority, the consideration which assures us a permanent and commanding advantage in foreign trade, is the superabundance of our coal." These sentences might, thirty years ago, and more recently, have been applied to our own country. There can be little doubt of their accuracy as applied to our American competitors at the present time, though it is, perhaps, hardly correct, in view of the trade returns of the past two years, to speak of the "slow growth" of our export trade. It may, moreover, be pointed out that the actual volume of trade is not the only, nor the true, basis of comparison between this country and the States. Owing to the difference in the population of the two countries, the true comparison between their foreign trades is the value thereof per head of population; and on this basis England is still far in front of the United States.

Nevertheless, the growing industrial activity, coupled with the enormous undeveloped resources of that wonderful country across the Atlantic—which is already beginning to find that foreign trade means foreign political complications, as witness the present difficulties in the Far East—constitute a factor in the situation that cannot lightly be disregarded. Of those undeveloped, or rather but slightly developed, resources, coal is by far the most important. "The nation which has the most abundant fuel and the cheapest power will be the commercial monarch of the future, reigning without a rival. That nation," says the writer in "The Forum," "is the United States." Passing by, with a smile, the truly Yankee extravagance of language—"reigning without a rival"—let us see what the facts concerning the coal resources of this "commercial monarch of the future" really are.

The United States have, declares Mr. Meade, "the most abundant, the easiest mined, and the cheapest coal of any nation;" and he gives figures that (if China be excepted from consideration) fully prove the assertion. As to the abundance, the total area of coal lands in Eastern Europe is less than 10,000 square miles, with seams averaging (say) 3 feet in thickness; whereas the coal area at present being developed in the United States is somewhere about 50,000 square miles, in which the seams average from 5 to 6 feet in thickness, while more than twice that area remains as yet untouched. As to being the easiest mined, there can be no question. Firstly, the coal lies in such enormous quantities near the surface that deep mining is practically unknown. Most of the coal "mines" of the United States do not even go below the water-line. In Pennsylvania (the great coal-producing region of America), 52 out of 71 mines are worked by drifts—that is to say, by tunnels running either horizontally or inclining upward so as to be self-draining, and to permit of loaded trucks running out of them by their own weight. Of the remaining 19, the average depth is under 440 feet, or less than that of the shallowest collieries of England—namely, those in Yorkshire, Derbyshire, and Nottinghamshire. In fact, coal is got in America in immense quantities by what is merely quarrying, and is so plentiful close to the surface that only in cases of exceptionally rich seams—such as the mammoth 30-foot vein in Pennsylvania—is it considered worth while to sink shafts more than a few hundred feet below the surface.

Again, another fact conducing to ease of production is that to which reference has already been made—namely, the comparatively great thickness of the seams in the American coal-beds. This enables a much more general use to be made of coal-cutting machines than would be possible in this country, even were the colliers to agree to employ them, which they will not. "At a thickness of 5 feet, the efficiency of coal-cutting machines is marked; and where these can be advantageously used, a maximum saving of 50 per cent. in the primary cost of working can be made." Coal-cutting machines are, in fact, responsible for about 25 per cent. of the whole output in the States, and are being increasingly used. Moreover, the expense of cutting galleries, as expressed in cost per ton of coal got therefrom, varies inversely with the thickness of the seam. "In thin seams the amount of

rock which must be removed to get at the coal is greater than in thick seams, where the spaces from which the coal has been taken furnish most of the communications. In thick seams, moreover, the coal can often be broken down directly into the cars without blasting or handling." It follows that the output of coal per miner in the States is much higher than in this or any other European country. The annual output per person employed in the mines in England is about 300 tons, and tends rather to decrease than otherwise. In the United States it has steadily increased, until it is now between 500 and 550 tons.

The result of this great abundance of coal obtainable by such a small expenditure of capital, and at so small a labour cost per ton, is, of course, that the price at the pitmouth in America is materially lower than in Great Britain and Europe. From 1885 to 1894, for which period Mr. Meade gives his figures, the pithead price of coal rose, in Belgium from 6s. 10d. to 7s. 2d., in Germany from 5s. to 6s. 4d., and in Great Britain from 5s. to 6s. 5d.; while in France a slight fall occurred from 9s. 1d. to 8s. 8d. In the United States, on the other hand, the price declined very materially—namely, from 6s. 4d. to 4s. 10d. In 1899, the pit price in England remained the same; but in the United States it had got down to 4s. 5d., or 2s. per ton less than here. At the present time, with miners' wages in this country advancing by leaps and bounds, this difference must be something nearer 5s. than 2s. a ton—a difference not sufficiently great to warrant the fear (or hope) of any considerable quantity of American coal finding its way into the English market, but more than enough to enable that coal to supply foreign markets hitherto held by us.

The difficulty at present in the way of the American coal export trade is one of shipping, both as regards the supply of tonnage and the obtaining of return cargoes. So far as the first point is concerned, it is reported that numbers of vessels are on order especially for the purpose; and as to the latter, of course the world must pay for its coal, and if it buys it from America, more goods must be sent there than at present, and the development of her industries obviously must increase her demands upon the world's markets. "Good Americans when they die go to Paris," someone said. However that may be, an increasing number of them, very much alive, visit both Paris and London every year; and the trade in luxuries for America grows rapidly. Still, a ton of coal scarcely bulks as much as its equivalent value in luxuries; and some more prosaic import trade must spring up to overcome the freight difficulty that lies in the path of world-wide coal exports from the United States.

It may not be without interest to close this article with a quotation from Professor Jevons—

Our industry will certainly last and grow until our mines are commonly sunk 2000 or 3000, or even 4000 feet deep. But when that time comes, the States of Northern America will still be working coal in the light of day, quarrying it down on the banks of the Ohio, and running it down into boats alongside. The question is, How soon will our mines approach the limit of commercial possibility, and fail to secure us any longer that manufacturing supremacy on which we are learning to be wholly dependent?

That is the question we have repeatedly urged should be made the subject of expert inquiry, and which must be constantly pressed upon the Government. Is not the foregoing quotation a proof of the knowledge and foresight of Jevons? It was his calculations as to our resources and the growth of our consumption of coal that erred, perhaps intentionally, on the side of pessimism.

## A REVIEW OF THE ACETYLENE AND CARBIDE INDUSTRIES.\*

THE German Acetylene Association have done good service to all interested in scientific and technical progress in relation to the acetylene and carbide industries by commissioning three experts to prepare for publication a first annual report thereon. This report is not confined to one year's progress, as subsequent annual issues will be, but covers in a pithy, yet comprehensive, manner the history of acetylene from the first production of carbide on a commercial scale to the present time. The compilers have carried out their task as becomes acetylene experts of high reputation, and have fully justified their selection for it by the Association. The names of Dr. M. Altschul, Dr. Karl Scheel, and Professor J. H. Vogel are well known to those of our readers who have followed the progress of the acetylene industry as recorded in the columns of the "JOURNAL." In the preparation of the chapter on carbide, they have obtained the assistance of Dr. O. Sandmann, of Nuremberg.

Naturally a work produced by the co-operation of authorities lacks the element of individuality which, even in technical treatises, constitutes no small portion of the attractiveness of a book by a capable and competent author. On the other hand, we know that good matter is often spoiled by faulty treatment; for even those who, by common consent, are masters of their special craft or industry, frequently fail in attempts to impart to others, through the medium of a technical treatise, the principles of that craft or industry. They fail generally through want of recognition of the ignorance of many of their readers. He who would be a successful writer on technology, must imagine himself addressing one who may have no previous knowledge of the


\* "Jahrbuch für Acetylen und Carbide." Im Auftrage des Deutschen Acetylenvereins, herausgegeben von Dr. M. Altschul, Dr. Karl Scheel, Professor Dr. J. H. Vogel. Band I, Jahrgang 1899. Halle a. S.: Carl Marhold; 1900.



subject, and may be unable to follow a greatly involved or discursive treatment of it. It is often more difficult for a technological writer to recognize what is immaterial, and may be omitted, than to fill page after page with valuable information which only the writer and a few equally well instructed readers would be competent to assimilate. We are disposed to speak thus on this occasion because our words cannot be construed into a personal attack, as has frequently been the case when we have commented on the failure of some new aspirant to the thin ranks of the company of successful technological authors. Our criticisms, if apparently at times unnecessarily severe, have not, we believe, been always fruitless; for a writer of the proper stamp really profits by exposure of his failings. To take an illustration from the great army of contemporary writers of fiction, many have, like Miss Marie Corelli, been impelled to better efforts, which eventually have culminated in the production of a *chef-d'œuvre*, by the scathing comments of their early critics, who recognized and pointed out faults which it would have taken their author years to detect without such aid. In the same manner, the "JOURNAL" criticisms of technical treatises have been prompted solely by a desire to raise the average quality of such works above the very moderate standard to which so many authors seem content to work. Especially have we resented attempts to present in different text-books to the public by men of distinction, whose names would have weight with prospective purchasers. A distinguished engineer, physicist, or chemist does not enhance his reputation by putting his name to a more or less slovenly compilation on his special branch of science or art; while he lowers that branch in the estimation of his readers.

We are glad to say that the unpretentious annual report on acetylene and carbide which is now before us appears to be free from the defects which we consider mar so many of our technical treatises. In the compass of about 200 pages, practically all is said about acetylene and carbide that any student or manufacturer can reasonably expect to find in text-book form. The book is replete with facts, stated briefly; while references to authorities are freely given for the benefit of those who desire fuller information on any points. The text is elucidated by the help of a plate and 136 illustrations. The first 50 pages treat of carbide—its manufacture, properties, cost, and uses. Then 110 pages are devoted specially to acetylene. Its chemical and physical properties, generation from carbide, application to lighting and other purposes, and physiological and sanitary aspects are fully dealt with. Next come about 10 pages of chiefly statistical information, followed by 20 pages of abstracts of German patent specifications relating to acetylene and carbide. These abstracts have been prepared by Dr. J. Ephraim, of Berlin. Owing to the system of supervision exercised by the German Patent Office, they are far more valuable than would be a corresponding compilation from the English patent records. We have not detected any errors of importance in the little work, which we commend to the notice of all who desire to have an up-to-date account of acetylene and carbide, and are able to grapple with the German tongue.

#### RATIONAL AND ARTISTIC FITTINGS FOR INCANDESCENT GAS LIGHTING.

THE long dark evenings are upon us; and many gas consumers, who as a class are prone to heedlessness in regard to their lighting arrangements while they are little required, will begin to overhaul and improve; and the advice of gas managers will in some cases be sought as to what is the best and latest in gas-fittings. There are signs of a growing taste among consumers for new types of fittings; and no doubt incandescent gas lighting has had a part in producing this change. In these days the cry is for something new in every direction; and gas lighting has not escaped. The old clumsy water-slide chandelier has had its day, and is almost obsolete; the stiff, ugly pipe pendants will soon be known no more, save in kitchens and factories; and the old-fashioned brackets built up of straight pipes with square and round end pieces or simply curved into  shape, are fast being supplanted by more artistic productions in the modern house. The marvel is that present-day consumers have put up so long with the same class and character of hideous gas-fittings which did duty in the days of their great grandfathers. But we will not grumble with the past. It suffices for us—and, in fact, it pleases us—to know that a change in fashion has set in; and, having obtained a fair start, the new fashion (as in clothing and other matters) is sure to grow. And to the extent of its growth, the homes of gas consumers will be beautified.

We have said that incandescent gas lighting may have had something to do with the change; and as we look back upon the evolution of the newest styles of fittings, no doubt whatever remains as to its being so. A lighter and different style of fitting altogether was demanded for incandescent gas lighting; and in meeting this demand, the manufacturers tried to raise themselves out of the old grooves, and give to the new goods a more ornate appearance. But for a time they were not wholly successful in producing articles of artistic merit and serviceability, at a reasonable charge; and only within the last year or two has anything come on to the market which, combining those three essentials, has attracted our admiration. Many, too, of

the first fittings devised for incandescent gas lighting have not been found to be the best adapted for the purpose. However pretty and bright the fittings, the newness of the parts above the incandescent mantles is quickly destroyed by the products of combustion and heat. They first tarnish, then appear to be burnt, and finally blacken, and quite an incrustation forms. Even a bell suspended above the mantle, or a coronet on the chimney, fails to shield all the surrounding parts—the protectors simply serve to divert the blemishing action. One firm of fittings manufacturers (and others may have done the same) have profited by this experience; and new styles of fittings have lately been brought out in which the main feature is the removal of all brass work from the destructive influence to which we refer. At the same time, the alteration has opened a new outlet for the devising faculties of the producers, and has resulted in the giving to the gas consumer of a good choice of new designs of fittings about which to make complaint one would have to be unreasonably critical.

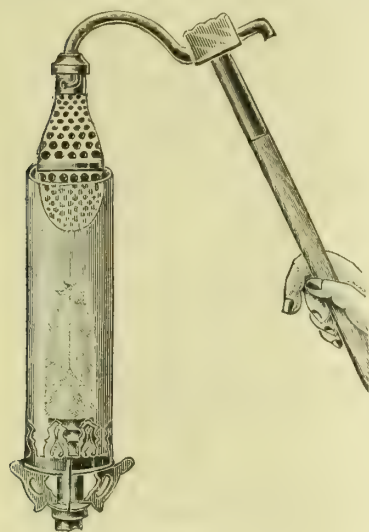
A catalogue containing some really elegant designs of incandescent gas-fittings of the new character was forwarded to us a few days ago by Messrs. Henry Greene and Sons, Limited, of Farringdon Road; and the illustrations were so pleasing that we have since taken the opportunity of visiting their show-rooms to see the fittings themselves, and were not disappointed in them. The firm have given to the new pendants and brackets the name of the "Simplicitas" fittings. They are made of bronze or polished brass, with a highly clean finish, and are novel and chaste in design. The arms of the pendants and brackets are curved after the style of electroliers; so that the lights depend from, instead of being elevated on, the main part of the fitting. Each arm is formed of a double tube, bifurcating from the stem of the pendant or the plate of the bracket until they attain a spread of about 6½ inches at a point a little above the top of the glass shade. An ornamental junction is made at this point, with two separate descending pipes, which



serve in all the styles the twofold purpose of carrying the burner and chimney and supplying the gas, and in one form supports the glass shade, with the gas-tap underneath. In the other form the shade is supported by two screwed clips at the top; and in this case the gas-tap is situated near the base of the arm. From this brief description, and the representative illustration of one of the brackets, it will be seen that there is no part of the fitting immediately in the course of the upward current from the burner chimney. The pendants are made for two or three lights; and the brackets for single lights. The glass shades are prettily designed and delicately tinted; those supported from the top being of the shape of a vase, 9 or 10 inches in depth, wide at the neck, and tapering to the bottom. The pendants particularly will form effective and handsome centres of light, and will greatly enhance the decorative appearance of rooms in which they are used. The advantages claimed by the firm for these fittings are thus set forth by them: "(1) No brass work above chimney to get discoloured by gas fumes; (2) easy removal of globes for cleaning, without risk of broken chimneys; (3) artistic effect and graceful outline of electrical fittings; (4) position of burner such as to give greatest illumination where the light is wanted, and to be within easy reach." Several new ideas in ordinary fittings were also on view in Messrs. Greene's show-room; and some very tasty designs in polished brass are after the style of hammered iron work.



A little novelty which we came across during the visit is a simple and inexpensive hand gas-lighter; and though it does not come exactly within the four corners of the subject dealt with here, it has a connection with incandescent gas lighting, and so may be mentioned. The lighting device (which is fixed to a long handle) merely consists of a curved piece of wire hooked at one end for pulling down the chains of incandescent burners so fitted, with a slotted fixture in the centre for turning taps, and with the igniting medium at the other end. This is contained in a pear-shaped perforated metal basket, and consists of pellets of spongy platinum supported by silky looking wire on a small brass frame of 7 shape, which is fixed, by the aid of two screws, into the headpiece on the end of the wire. The protecting basket is easily removed for renewing the pellets. The lighter we saw had been in use six months without renewal. It is simply held over the glass or globe; and, on turning on the tap, the current of gas itself heats the platinum, and produces ignition—precisely the same as with the fixed self-igniter to each burner.



### PERSONAL.

Mr. ALLAN REID, who for a number of years has been Assistant at the Brechin Gas-Works, has been appointed Manager, in succession to Mr. J. B. Terrace, whose resignation was reported in the "JOURNAL" last week.

At the close of the meeting of the Burgh Commissioners of Broughty Ferry last Tuesday, Mr. A. WADDELL, who is retiring from the post of Gas Manager, in order to take a similar appointment at Dunfermline, was presented with a gold watch for himself and a gold brooch for Mrs. Waddell.

Mr. W. R. HERRING, Engineer to the Edinburgh and Leith Gas Commissioners, has been awarded by the Committee of the Royal Scottish Society of Arts, of Edinburgh, a Macdougall Brisbane prize, of the value of £5, for a paper he read to the Society last winter, on the carbonization of coal for the production of illuminating gas.

The question of the appointment of a successor to Mr. Samuel Stewart as Manager of the Greenock Gas-Works was considered at a special meeting of the Police Board last Thursday. There was a short list of seven candidates; and the final voting took place upon three—Mr. W. Ewing, of Hamilton, Mr. J. M'Nair, of Wishaw, and Mr. W. Mackie, of Port Glasgow. The result was a clear majority in favour of Mr. EWING.

Our readers will see, by an announcement which appears elsewhere, that the Gas Committee of the Birmingham Corporation are taking steps to fill the vacancy in the secretaryship of the Gas Department which will shortly occur by the retirement of Mr. EDWIN SMITH, which was announced in the "JOURNAL" for July 24. Mr. Smith has held the appointment since the acquisition of the gas undertaking by the Corporation in 1878; having previously been Secretary to the Midland Institute.

In response to the invitation of the Gas Committee of the Bradford Corporation, which lately appeared in the "JOURNAL," for applications for the position of Assistant Gas Engineer, in succession to Mr. T. H. Duxbury, who has obtained the engineership of the South Shields Gas Company, 45 were received. Last Thursday these were reduced to three; and the Committee finally selected Mr. ANDREW WILSON, son of Mr. T. Wilson, of Coatbridge, and formerly Gas Engineer to the Perth Corporation, for the position.

**The Construction and Working of Injectors.**—In the seven years which have now elapsed since the publication by the Technical Publishing Company, Limited, of Manchester, of Mr. W. W. F. Pullen's work on "The Theory, Construction, and Working of Injectors," several new patterns have been introduced. These have been duly incorporated in the second edition of the book, which has just been issued. The author, who is Professor of Engineering at the South-Western Polytechnic, has brought a great deal of matter into a small compass; and his text is amply illustrated. An interesting portion of the book is the "Historical Summary," which occupies the last 40 pages. In assigning this position to it, the object has been to reserve it till after the theory of the subject had been discussed, and so enable the reader to appreciate the different stages of development. Mr. Pullen does not put forward his work as being anything more than a collection of notes on injectors. But they are those of a careful investigator, and may certainly be consulted with profit by all who seek information on the subject with which they deal.

### OBITUARY.

WILLIAM SANCROFT RANDALL.

We learn, with great regret, of the death, on the 7th inst., at his residence, No. 23, Wellington Road, Old Charlton, after only a week's illness, of Mr. WILLIAM SANCROFT RANDALL, assistant to the Consulting and Constructing Engineer of the Gaslight and Coke Company, in whose service he had been for 23 years. By his death, the profession of gas engineers loses one of its most gifted and promising members, and the Company an able and zealous servant. Mr. Randall, who was in his 49th year, served his apprenticeship with Messrs. Head, Wrightson, and Co., of Stockton-on-Tees. He subsequently spent some time in the merchant service; but then, abandoning the sea, he obtained an engagement as draughtsman at the Beckton works. Shortly after Mr. G. C. Trewby left Beckton to take up the post of Chief Engineer at Horseferry Road, Mr. Randall was transferred to Westminster, to act as his assistant. The deceased was an associate member of the Institution of Civil Engineers and a member of the Institution of Gas Engineers. His wide culture, genial disposition, and, above all, his sterling worth of character, endeared him to a wide circle of friends. The funeral took place at two o'clock last Wednesday at Mr. Randall's home in Suffolk. A memorial service, held simultaneously at St. Matthew's Church, Westminster, was attended by a large number of his former colleagues.

### COMMUNICATED ARTICLES.

#### THE CONSOLIDATION AND CONVERSION OF GAS COMPANIES' SHARE CAPITAL.

##### A METHOD OF PROCEDURE.

By A. CANNING WILLIAMS, of Scarborough.

In the "JOURNAL" for the 2nd of January last\* were given the summarized contents of Gas Bills for 1900 promoted by gas companies, and, out of the sixteen Bills named, ten propose to consolidate and convert their existing share capital on a 5 per cent. basis; and there can be little doubt that many other gas companies will, at the first opportunity, seek to obtain similar power. Hence the publication of a set of circulars, &c., suitable, *mutatis mutandis*, for use in schemes of stock-conversion may be deemed appropriate.

We will assume that power has been given to a gas company, under an Act obtained in 1896, to convert its "A" (10 per cent.), "B" (7½ per cent.), and "C" (7 per cent.) ordinary stocks into an equivalent amount of 5 per cent. consolidated ordinary stock, and that the directors of the company have decided, in 1898, to ask the proprietors to give them the necessary sanction to the scheme at a special general meeting to be held at the conclusion of the business of an ordinary general meeting.

##### Special General Meeting.

Notice of the special meeting, with a proxy form attached, would be sent to each holder of ordinary stock, in these terms—

DEAR SIR OR MADAM, Important.

I beg to give you notice that a Special General Meeting of the Proprietors of this Company will be held at the Company's Offices on Saturday, the 20th day of August, inst., at the conclusion or adjournment of the business of the Ordinary General Meeting to be held at 11 o'clock in the morning of that day, for the purpose of sanctioning the Conversion of the whole of the Ordinary Stock in the Capital of the Company, issued before the passing of the Gas Act, 1896, into one Consolidated Ordinary Stock bearing a uniform dividend of £5 per cent. per annum, pursuant to Section 4 of that Act.

If you are unable or do not desire to attend the Meeting, and wish to vote by Proxy at the Meeting, or at any adjournment thereof, please complete the attached Form, in accordance with the directions given thereon, and return the same to me, so that it shall be in my hands not less than forty-eight hours before the time appointed for holding the Meeting.—I am, &c.

In order that the object and effects of the proposed conversion may be made perfectly clear to the stockholders, a slip, showing how the various classes of stock will be treated in the event of the conversion being decided upon, should be attached to the notice of the meeting:—

[In Red Ink.]

#### MEMO. FOR INFORMATION OF HOLDERS OF ORDINARY STOCK.

Upon the proposed conversion being decided upon and coming into effect, each Proprietor of £100 of 10 per cent. "A" Stock will be entitled

\* It should be mentioned that the MS. of Mr. Williams's article has been in our hands for some months; but, owing to the extent of the technical matter which has had to be dealt with during the year, and the consequent pressure upon our space, its publication has been unavoidably postponed. In view, however, of the commencement last week of the notice of the legislation of the past session, which included several conversion schemes, the present has been deemed a fitting time to give our readers the benefit of the experience of one who has been personally engaged in carrying out a financial change of the nature referred to.—ED. J.G.L.



to £200 of the new 5 per cent. Stock; each Proprietor of £100 of 7½ per cent. "B" Stock will be entitled to £150 of the new 5 per cent. Stock; and each Proprietor of £100 of 7 per cent. "C" Stock will be entitled to £140 of the new 5 per cent. Stock—amounts higher and lower being treated in like manner.

Upon the conversion taking effect, New Certificates will be issued free of charge; but no Stockholder will be entitled to a new Certificate until he shall have delivered up to the Company his existing Certificate (or Certificates) to be cancelled.

No fractional parts of a pound of the proposed new Stock will be registered.

The next matters to claim attention are the resolutions to be put before the meeting—

1.—The Holders of the Ordinary Stock in the Capital of the Company, present in person or by proxy at this Meeting specially convened for the purpose, hereby sanction the conversion of the whole of the Ordinary Stock in the Capital of the Company issued before the passing of the Gas Act, 1896, into an equivalent amount of Consolidated Ordinary Stock bearing a uniform dividend of £5 per cent. per annum, pursuant to Section 4 of the said Act.

2.—That such conversion do take effect at such time not later than the 1st day of January, 1899, as the Directors shall order.

Old Certificates, &c.

The resolutions having been carried, and a schedule of the proprietors of ordinary stock, showing the amounts held by them and their equivalents of the new stock, having been prepared, the next step is to send out requests for the surrender of the old certificates:—

DEAR SIR OR MADAM,

Conversion of Ordinary Stock.

In pursuance of a Resolution of a Special General Meeting of the Proprietors of this Company, held on the 20th of August last, sanctioning the conversion of the whole of the Ordinary Stock in the Capital of the Company issued before the passing of the Gas Act, 1896, into an equivalent amount of 5 per cent. Consolidated Ordinary Stock, I beg to request you to send me, on or before the 21st instant, your Certificate[s] for the undermentioned Stock, in order that a Certificate for the amount of the new Stock to which you are entitled may be issued to you in exchange:—

£ "A" Stock (10 per cent.)  
£ "B" Stock ( 7½ per cent.)  
£ "C" Stock ( 7 per cent.)

I enclose a circular letter, which kindly fill up and return with your Certificate[s] in the accompanying stamped and addressed envelope.

I am, &c.

[Circular Letter Enclosed.]

[Full Postal Address.]

[Date] \_\_\_\_\_, 1898.

The Secretary of

The Gas Company.

SIR,—In reply to your communication of the Certificate[s] for the undermentioned Stock:—

I enclose herewith

£ "A" Stock.  
£ "B" Stock.  
£ "C" Stock.

Please acknowledge the receipt of the document[s].

Yours faithfully,

The exceptional opportunity for revising the entries in the register of stockholders which a scheme of stock-conversion affords should not be allowed to pass without full advantage being taken of it. Hence, in cases where doubt may exist as to the correctness of the registered descriptions of sole holders, it is advisable that the letter of request for the old certificates should contain an additional paragraph in some such terms as these:—

I may add that your registered description is that of \_\_\_\_\_. If this is not now correct, may I ask you to be so good as to insert your present description at the foot of the form enclosed for your reply.

The word "description" should also be added to the form of reply in such instances, thus—

Yours faithfully,

Description \_\_\_\_\_

Where stock is registered in the names of two or more persons as joint holders, and the correctness of their recorded addresses and descriptions is open to question, it is better to send special forms to the acting parties after the old certificates have been surrendered:—

ACCOUNT [John Smith, Esq., and others.]

I enclose herewith a copy of the names, addresses, and descriptions of the registered holders of Stock on the above Account, and, in order to secure accuracy in the new Certificate about to be issued, I shall be much obliged if you will kindly make whatever corrections may be neces-

sary, and return the form to me by an early post.—Thanking you in anticipation of this favour,—I am, &c.

[ENCLOSURE.]

The Gas Company.

Account \_\_\_\_\_

COPY OF ENTRIES IN REGISTER OF STOCKHOLDERS.			CORRECTIONS.	
Name.	Address.	Description.	Name.	Address.

Date \_\_\_\_\_ 1898 Signature \_\_\_\_\_

If no corrections are required, kindly write "No corrections" across the blank columns.

When the corrections are received, it may be found that in some instances the death of a joint holder will be notified, when, of course, proof of death will be necessary before the name is removed from the register.

The forms for acknowledging the receipt of the surrendered certificates may conveniently be bound in book form, and carbon paper used for the purpose of obtaining duplicates of the receipts issued:—

I beg to acknowledge the receipt of Certificate[s] for the undermentioned Stock:—

£ "A" Stock.  
£ "B" Stock.  
£ "C" Stock.

A certificate for the equivalent amount of 5 per cent. Stock will be forwarded to you in due course.—Yours, &c.

Fractional Parts of a Pound of Stock.

A somewhat troublesome matter in connection with stock-conversion schemes is that which arises out of the fact that the equivalents of the holdings of the converted stock involve, in some instances, fractional parts of a pound. These could, of course, be registered; but to do so would complicate the book-keeping by rendering necessary a shillings column in the register, &c. It is, therefore, in every way advisable to get rid of them by having them all transferred to some person willing to purchase them at their market price:—

DEAR SIR OR MADAM,

Conversion of Stock.

I have to inform you that your \_\_\_\_\_

[are] equal to £ : : of 5 per cent. Consolidated Ordinary Stock. As, however, fractional parts of a pound of this Stock cannot be registered, the Directors have instructed me to state that the Chairman of the Company is prepared to purchase the whole of the said fractional parts at the price of 125 per cent. I therefore enclose a Transfer Deed for signature and attestation, and shall be much obliged if you will return it at your earliest convenience when I will remit you the sum of £ : : .—I am, &c.

On the transfer deed being returned, duly signed by the transferor and witness, the promised remittance is sent:—

I am in receipt of Transfer Deed duly signed, and now have pleasure in handing you postal order[s] value £ : : , in acknowledgment of which kindly sign and return the enclosed post-card, and oblige.—Yours, &c.

[ENCLOSURE.]

I am in receipt of your letter of the \_\_\_\_\_, enclosing postal order[s] value £ : : ; being payment for £ : : of Consolidated Ordinary Stock transferred to the Chairman of your Company.

Signature \_\_\_\_\_

New Certificates.

The new certificates having been prepared, signed, and sealed, they are dispatched to the stockholders—

DEAR SIR OR MADAM,

Conversion of Stock.

I enclose herewith a Certificate for £ \_\_\_\_\_ of 5 per cent. Consolidated Ordinary Stock, as per particulars at foot. Kindly acknowledge its receipt by signing the enclosed form, and returning it in the accompanying stamped and addressed envelope.—I am, &c.,

Particulars above referred to:

£ of "A" Stock (10 p. ct.) converted into £ \_\_\_\_\_ of 5 per cent. Con-  
£ of "B" Stock ( 7½ p. ct.) " " £ \_\_\_\_\_ solidated Ordinary  
£ of "C" Stock ( 7 p. ct.) " " £ \_\_\_\_\_ Stock.

Total amount of Consolidated Ordinary  
Stock, as per Certificate . . . . £ \_\_\_\_\_

[ENCLOSURE.]

Received from the Secretary of the Gas Company, Certificate  
No. \_\_\_\_\_, for £ \_\_\_\_\_ of Consolidated Ordinary Stock.

Signature \_\_\_\_\_



## PRACTICAL NOTES ON GAS MANUFACTURE.

By S. CARPENTER, of East Ham.

(Continued from p. 896.)

## VENTILATION OF PURIFIERS—REVIVIFICATION OF FOUL LIME.

By ventilating the purifiers, and at the same time revivifying the foul lime, this material can be employed a second time for the purification of gas, and the nuisance caused when emptying the boxes will be abated. To effect this desirable object, proceed in the following manner: At the bottom of the side of the purifier, just below the first layer of lime, make a communication with a steam-jet exhauster, and connect its outlet to a purifier charged with oxide of iron. When the foul lime purifier is out of action, remove the plug in the cover. After the vessel has been at rest for about an hour, turn on the steam at the exhauster, which will draw the atmospheric air through the foul material, revivify it, and ventilate the purifier. When the exhauster is first set to work, a vacuum of 4-10ths will be sufficient. The cover of the purifier should not be removed until the exhauster has been running for six hours. It should then be raised, and the vacuum increased to 8-10ths. If the vacuum is too great at first, there is danger of raising the temperature to such a height as to fire the grids—a very serious matter. Two gauges should be fixed—one on the inlet and the other on the outlet of the exhauster. The former shows the vacuum, the latter the pressure. It will require about 24 hours to ventilate a purifier.

Lime is a very delicate thing to handle, and great care should be taken in preparing it for its work of removing the carbonic acid and bisulphide of carbon from the gas. It must be neither too wet nor too dry. It should not be sifted, as this would make it too fine, and cause extra pressure. Nor should it be too lumpy; for if it is, the gas will not go through it, but pass round the lumps, and of course leave the inside untouched. Consequently, the two impurities which are specially acted upon by lime will not be effectually removed from the gas. The best way to prepare the lime for taking out these impurities is this: After it has been properly slaked and well mixed, turn it over, and break all the lumps with the shovel. If any are allowed to remain, they should not be larger than a hazel-nut. Care must be taken not to allow any atmospheric air to mix with the lime while it is in use for purification, as this will interfere with its chemical action.

As I have before pointed out, lime is a very useful material for the purification of coal gas, for the reason that it will remove the three principal impurities; whereas oxide of iron is not so serviceable, as it will only take out one—viz., the sulphuretted hydrogen. Oxide of iron not being of an alkaline, but rather of an acid nature, it has no affinity for bisulphide of carbon. The use of lime, however, is attended with great disadvantage—first, on account of its expense; and secondly, because of the nuisance arising from the evolution of the sulphuretted hydrogen during and after the emptying of the purifiers. But this, as already explained, can be prevented by revivifying the foul material before it is removed from the purifier—thus allowing of its use a second time, which will necessarily reduce the cost of purification. A smaller quantity of clean lime will be required in the first place; and there will be less spent lime to be sent away. If purification is carried on in the manner which has been described, it can be done for about 0.7d. per 1000 cubic feet of gas produced.

The efficient purification of coal gas depends upon the employment of means for arresting the ammonia in the first instance. It has been stated that hydrate of lime has a greater affinity for bisulphide of carbon when the gas contains ammonia than when this impurity has been previously removed; also that the ammonia increases the chemical action of the lime. The writer has not found this to be so in practice; but just the opposite. His experience has been that the hydrate of lime never becomes perfectly saturated or neutralized by the carbonic acid and the sulphuretted hydrogen in the gas, but that a large quantity remains in a caustic state. This is in a great measure owing to the fact that so much of the lime being in the form of nodules, the inner portion of them cannot really be brought into contact with the gas without at the same time exposing the outer surface of the sulphide of calcium to the action of the carbonic acid, whereby, of course, decomposition would be induced, and the sulphuretted hydrogen driven from one purifier to another. In order to avoid this, sacrifice of lime is necessary; and the only point requiring attention is to see that it is not carried too far. When the test at the outlet of the first lime purifier shows that the bisulphide of carbon in the gas is as high there as it is in the crude gas, the purifier ought to be at once thrown out of action, and the foul lime revivified before removal from the purifier. When it is taken out, it must be well spread on the floor, when the nodules can be broken up and the material used again.

The writer is inclined to think that the process of purification of gas by dry lime has not hitherto been fully appreciated, or been worked as it deserved. It was the first agent employed for this purpose, and recent experiments, conducted with the most scrupulous care, and by some of the most experienced manufacturers, have shown beyond question that no material is so well adapted for the complete removal of the carbonic acid, bisulphide of carbon, and sulphuretted hydrogen, if atmospheric air is prevented from entering the purifiers containing it. Hence the lime,

when fully saturated, or "foul," as it is called, does not contain any of the light-giving constituents of the gas, for they have passed safely through the material. A very different result is witnessed when oxide of iron is employed. This only removes the sulphuretted hydrogen, leaving the carbonic acid and the bisulphide of carbon untouched. It is indispensable that all the carbonic acid should be removed from the gas for two reasons. In the first place, if left in it will deteriorate the illuminating power of the gas; and, in the second, it interferes with the chemical action of the lime for taking out the bisulphide of carbon. All the carbonic acid should be eliminated before the gas enters the second lime purifier, which will act for a while as a sulphide of calcium purifier. When the lime in the first purifier has become so saturated as to be inactive, that vessel must be thrown out of use, and the second purifier made the first, and a clean one put on in place of the second.

## TESTING FOR IMPURITIES.

A simple system of testing may be advantageously employed, by which the condition of the lime in each purifier can be ascertained. In the first place, the gas should be tested by lime water twice a day—at the middle and the outlet of the first purifier—for carbonic acid, at the inlet and outlet once a day for bisulphide of carbon, and at the outlet of the second lime purifier for bisulphide of carbon. The condition of the lime in the first purifier, and also approximately of that in the subsequent one, can in this way be known in advance, and the manager be thereby enabled to regulate material in such a way as to obtain steady results. Particular attention should be paid to this matter of testing, as it will keep the manager well posted up as to the impurities contained in the gas. If the ammonia is removed, and the lime and oxide of iron, and also the atmospheric air, are used in the manner described, the gas will be in such a condition as to justify its being called pure.

## TAKING THE TEMPERATURE OF THE GAS.

It is absolutely necessary to frequently take the temperature of the gas as it passes from one apparatus to another, as furnace gas may at times be passing through small holes or chinks in the retorts, and intermixing with the coal gas, which would raise its temperature, and materially interfere with the chemical action of the lime. The writer has found the purification going on satisfactorily, and the sulphur in the gas reduced to 10 or 12 grains in 100 cubic feet, when the following temperatures (taken by him personally at the outlets of the apparatus named) were recorded:—

	Summer. (Air, 68° Fahr.)	Winter. (Air, 40° Fahr.)
Hydraulic main . . . .	132° Fahr.	115° Fahr.
Condensers . . . . .	86° "	50° "
Scrubbers . . . . .	88° "	47° "
First lime purifier . . .	88° "	58° "
Second " " . . . . .	85° "	64° "
First oxide purifier . .	76° "	52° "
Last " " . . . . .	70° "	42° "

(To be continued.)

## NOTES.

## Determining the Hardness of Waters.

Signor G. Venturoli proposes to determine the hardness of a water by precipitating, with an excess of standard sodium carbonate solution, the salts of the earths and alkaline earths which are present, and then titrating back the excess of alkali with standard acid. The following solutions are used: (1) A solution containing 0.429 gramme of anhydrous sodium carbonate per litre (each cubic centimetre of this solution corresponds to 0.00045 gramme of anhydrous calcium chloride). (2) A standard solution of hydrochloric or sulphuric acid of strength corresponding to that of the sodium carbonate solution. (3) A solution of 1 gramme of crystallized ammonium oxalate in 60 c.c. of water. To determine the "total hardness" of a water, 40 c.c. are acidified with hydrochloric acid, evaporated to dryness, the residue dissolved in distilled water, 30 to 60 c.c. of the sodium carbonate solution added, the mixture heated to boiling, and the excess of alkali titrated back with the standard acid. The amount of magnesium salts present is determined by taking 50 c.c. of the water, precipitating the lime by means of 2 c.c. of the ammonium oxalate solution, and then determining the hardness as before in 40 c.c. of the filtrate. The "temporary" and "permanent" hardness of the water are distinguished in the usual manner.

## Productions of the German Continental Gas-Fittings Factory.

The brilliant parliamentary ruling of last session, forbidding British statutory gas companies to manufacture gas-fittings for consumers' use, finds a sharp contrast in the manufacturing experience of the German Continental Gas Company, of Dessau. The large factory in this town, where the Company manufacture fittings, not only for themselves, but also for half the gas companies and gas-supplying municipalities of Germany, is continually being enlarged. The management of this branch of the Company's undertaking has just issued a new illustrated catalogue of specialties in gas cooking and heating appliances, the patterns of which are such as experience shows to be appreciated by the gas consumers of different cities. It is the distinctive feature of these manufactures that they realize rather



the gas companies' than the ironmongers' ideal of what is suitable for consumers' use. The Manager, Herr Funcke, draws our special attention to the new pattern of atmospheric burner with which this year's stoves of the Company are being fitted. It is also made separately as a boiling ring, in two sizes, and has the advantage of always producing a sharp blue flame, even when turned low. The new burner is called the "Continental" model. With a gas consumption of 210 litres ( $7\frac{1}{2}$  cubic feet) of gas per hour, the smaller model brings 2 litres of water to the boil in 15 minutes. The continual production of such novelties shows the benefit of a commercially-spirited Gas Company having such a fittings manufacturing branch attached to it.

### The Desulphurization of Coke.

It is remarked by the "Engineer" that it is a somewhat humiliating, but undeniable, fact that in the interval which has elapsed since proposals were first made to desulphurize coke (or, more correctly speaking, to desulphurize coal during the coking process), practically no progress at all has to be recorded. This reflection is inspired by considerations connected with the iron manufacture; but it applies with equal point to the carbonization of coal in gas making. Nobody nowadays appears to think twice of what was at one time so much talked about. As regards the sulphur impurity in furnace coke, it is admitted that there is not much margin of advantage to make desulphurization worth doing. It is nearly 30 years ago that the latest authoritative paper on this subject was written, by M. Philippart, a Belgian engineer, which condemned the various processes of desulphurization then known, as being unsuitable for practical adoption. The great bulk of the sulphur of coal exists in the form of iron pyrites. There is also in coal a certain amount of organic sulphur, says our contemporary, of which nothing is certainly known; and there is supposed to be more occasionally present in the mineral in the form of sulphate of lime or gypsum. The bulk of the sulphur impurity in coal, however, is as pyrites, which contains two atoms of sulphur, and loses one atom during coking. The fixed moiety is diffused throughout the coke, unequally, as ferrous sulphide. The writer refers to the suggestion of liming coal, recognized by Philippart, with the object of converting the pyritous sulphur into sulphate of lime. It is doubted if this intention is often fulfilled, because samples of coke from limed coal have shown the bulk of the sulphur in the usual form of sulphide of iron. The general opinion of engineers on the subject now inclines to the view that no possible chemical treatment of the coal can be adequate, and that the best cure for sulphurous coal is abundant washing. This is because the pyrites is heavier than coal, and can therefore be mostly washed out of it. Further reliable information respecting the whole problem of desulphurizing coal and coke is admittedly desirable, as the best of what is generally available is stale.

### Turpentine and its Substitutes.

The high price of oil of turpentine during the past year has had the effect of drawing attention to its peculiar qualities, with the object of procuring some substitute for it in respect of painting work. Dr. W. Lippert declares in a German technical journal, that, whereas chemistry is generally equal to the task of finding equivalents for, or even improvements upon, substances used in the arts for which substitutes are demanded, this has not hitherto been the case with turpentine. Although numerous turpentine substitutes have been proposed and are actually on the market, none of them is the equal of the real thing. On the contrary, they are all so inferior to it that they are virtually nothing but adulterants. Dr. Lippert explains the origin and treatment of turpentine. The crude exudations of various species of conifers are steamed in large stills; the volatile oil being readily carried off, while rosin remains. According to the kind of pine from which the turpentine was taken, the resultant oil of turpentine varies in its qualities, and in its odour. The American and French products are much alike; while the Russian is called pine oil, and cannot be used for mixing with paint as it contains a sticky component which does not dry. There is a vulgar error prevalent that turpentine oil only acts as a "thinner" when added to oil paints and varnishes; but this is not so. Turpentine possesses the property of absorbing oxygen from the air, and yielding it up again to the oxidizable substances—such as linseed oil and gums—with which it is mixed. Hence it materially assists the drying process. The commonest of turpentine substitutes or adulterants are petroleum distillates, chiefly emanating from Belgium, and marketed under the names of "patent turpentine," "turpentine," "turpentine," and so forth. These fractions are double-distilled, to remove their distinctive odour. They are very volatile, and it might be thought that they would assist the drying process in paints and varnishes; but this is not the case. If a varnish is thinned with pure turpentine, and also in another sample with benzine, the former will set and dry much quicker than the latter; because petroleum does not absorb atmospheric oxygen. An attempt has been made in Germany to use in place of petroleum the so-called "photogen," a distillation product of the brown coal of Saxony; but it did not answer. A product is being vended under the name of "German oil of turpentine," which is nothing but a mixture of camphor oil and benzine.

The autumn general meeting of the Midland Association of Gas Managers will be held at Birmingham on the 1st prox,

## THE INTERNATIONAL GAS CONGRESS.

### SYSTEMS OF ILLUMINATION GRAPHICALLY COMPARED.

By AD. BOUVIER, of Lyons.

[A Paper read before the International Gas Congress in Paris.]

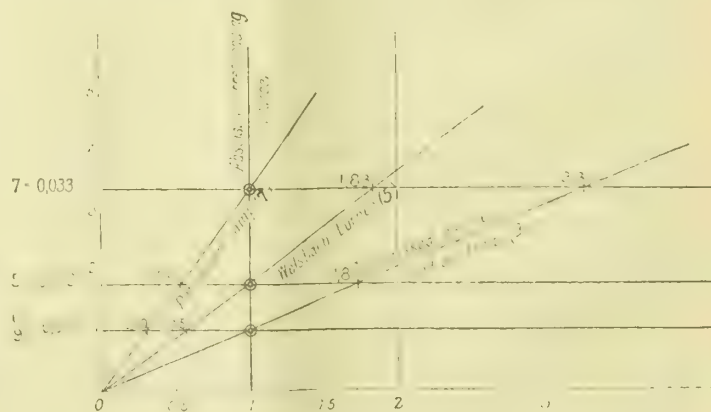
The illuminants in present daily use may be compared from two points of view: (1) As to the gas or energy required to produce a given illumination, (say) 1 carcel-hour; and (2) as to the cost of producing 1 carcel-hour. Comparative figures on the basis of (1) hold good in different towns and countries. Those obtained in respect to basis (2) depend upon local conditions. When these latter are known, the figures can be readily calculated from those obtained in (1). Both these comparative statements can be very usefully expressed in graphic form. I will first give the facts to be thus expressed, and then explain how this is done graphically.

I divide modern illuminants into ten classes, as follows: (1) Gas—batswing burners. (2) Gas—ordinary argand burners, with chimneys—e.g., argand, Bengel, Sugg. (3) Gas—district using 25 per cent. of Welsbach burners and 75 per cent. of various burners. (4) Gas—district using 60 per cent. of Welsbach burners and 40 per cent. of various burners. (5) Gas—Welsbach burners, 1899 model. (6) Incandescent gas under pressure. (7) Burning oil, in ordinary lamps. (8) Electricity—incandescent, models in vogue, June, 1900. (9) Electricity—arc lamps. (10) Acetylene. In regard to Nos. 3 and 4, the average consumption of gas (over the whole town) per carcel-hour will vary according to the burners in use. We may suppose No. 3 to consist of (say) 37.5 per cent. of batswing burners, 22.5 per cent. of argands, and 15 per cent. of Wenham lamps (total, 75 per cent.); and the rest Welsbach burners. Calculation will show the average consumption per carcel-hour to be about 75 litres. On the other hand, a town with 60 per cent. of Welsbach burners will have an average of 50 litres per carcel-hour. We may reduce the efficiencies of these illuminants to a common basis by calculating from the "hourly consumption of a given burner," the "gas or energy consumed per carcel-hour"—denoted by A in the following table:—

Burner or Group of Burners.	Standard Consumption per Hour.	Consumption to Obtain 1 Carcel-Hour.
<i>Gas.</i>		
1.—Hollow-top burner (M. Bouvier, 1888)	0.125 c.m.	0.125 c.m.
2.—Argand burners, with chimney—average (M. Bouvier, 1888)	0.192 "	0.090 "
3.—District using 75 per cent. of various burners, and 25 per cent. of incandescent burners	..	0.075 "
4.—District using 40 per cent. of various burners, and 60 per cent. of incandescent burners	..	0.050 "
5.—Welsbach or similar burner, with chimney (average of 1899), pressure not exceeding 30 mm.	0.110 "	0.078* "
6.—Incandescent lighting with compressed gas	..	0.010! "
<i>Petroleum.</i>		
7.—Large and small lamps (taken over several hours)	..	0.033 kilo.
<i>Electricity.</i>		
8.—Incandescent lamps of good quality (MM. Colombo and Hauptmann)	0.060 K.W.H.	0.0375 K.W.H.
9.—Arc lamps (average)	6 to 20 mp.	0.0100 "
10.—Acetylene	0.050 c.m.	0.0075 c.m.

\* Average yield on the consumer's premises with a consumption of 18 litres. This, however, will soon be exceeded in practice.  
† This result is nearly attained by various burners. It is sometimes surpassed, as by the "Kugel" light of Herr Salzenberg.

The graphic method of comparing these results is to replace the figures by others calculated so that each of the ten sets of data is successively made the unit. For example, 0.033 kilo. of petroleum being equal to 0.018 cubic metre of gas consumed in



a Welsbach burner, it follows that 1 kilo. of petroleum equals 0.545 cubic metre. Likewise 1 cubic metre of gas in the Welsbach burner equals 1.83 kilos. of petroleum. To set these forth



graphically, two ordinates are laid down at right angles. Along the vertical line there are marked off (using any arbitrary scale) values corresponding to the figures given above—0·010, 0·018, 0·033, and so on. If, now, we draw horizontal lines through each of these points, they will cut a series of perpendiculars (dropped on to the horizontal base-line at equidistant points according to a second arbitrary scale) at certain points. If these be joined at O on the diagram, and the lines thus made produced, we get a series of lines at various angles to the base-line, each of which represents one of the cases under consideration. By following the line of any particular gas up or down, until it meets the horizontal line corresponding to the one with which it is to be compared, its equivalent in terms of the second illuminant is read off on the horizontal scale, starting from the left. For example, we find that 1 kilo. of petroleum equals 0·30 kilowatt-hour consumed in an electric arc lamp, or 0·30 cubic metre of compressed gas; so that 1 cubic metre of compressed gas equals 3·3 kilos. of petroleum.

Coming now to the question of cost, we may take the prices current in Lyons—viz., gas at 20c. per cubic metre, electricity at 75c. per kilowatt-hour, petroleum at 40c. per kilo., and acetylene at 2 frs. per cubic metre. We get the following values:—

Comparison with Lyons Lighting.	Consumption for 1 Carcel-Hour.	Cost of 1 Carcel-Hour in Centimes.
<i>Gas.</i>	(A)	(B)
1.—Flat-flame burner. . . . .	0·125 c.m.	2·5000
2.—Argand burner . . . . .	0·090 "	1·8000
3.—District using 75 per cent. of various, and 25 per cent. of incandescent burners . . . . .	0·075 "	1·5000
4.—District using 40 and 60 per cent. respectively. . . . .	0·050 "	1·0000
5.—Welsbach burner . . . . .	0·018 "	0·3600
6.—Incandescent lighting with compressed gas . . . . .	0·010 "	0·2000
<i>Petroleum.</i>		
7.—Large and small lamps . . . . .	0·033 kilo.	1·3300
<i>Electricity.</i>		
8.—Incandescent lamps . . . . .	0·0375 K.W.H.	2·8125
9.—Arc lamps . . . . .	0·0100 "	0·7500
10.—Acetylene . . . . .	0·0075 c.m.	1·5000

The mathematical principles underlying the treatment of these problems are discussed in the "Traité de Nomographie," by M. Mce. d'Ocagne, to which the reader is referred.

It must be mentioned, in conclusion, that the figures given above are true only temporarily. The use of new electric incandescent lamps will, no doubt, render possible a consumption of less than 3·75 watt-hours per decimal candle per hour; arc lighting will likewise reach greater efficiency than 10 watts per decimal candle per hour; petroleum lamps will become more economical, as the incandescence principle is applied to them; while the great improvements which are continually being made in gas-burners and processes will keep this illuminant in a progressive state of efficiency. The graphic method of expressing the relative results will, it is hoped, convince the public that gas can still compete with its many rivals as an efficient and economical illuminant.

THE USE OF HYDROCARBONS AS ILLUMINANTS IN COMPETITION WITH GAS.

By A. LECOMTE, of Paris.

[A Paper read before the International Gas Congress at Paris.]

In this paper, I treat of lighting by volatile hydrocarbons, distributed at the ordinary temperature. The liquids used for this purpose are light petroleum, alcohol, and light oils from coal tar, benzene, toluene, and xylene.

The first is an imported product, and is likely to increase in price. [Its possible substitutes among coal-gas products will be mentioned later.] As regards alcohol, legal restrictions oppose its widespread use; but the following properties of the ideal alcohol for the purpose in view may be quoted from M. Vassilière: "It should possess the highest calorific power, should be without action on metals, low in price, and leave no residue when passed

through a copper tube surrounded by metallic gauze and heated to 100° C."

Benzene mixes with absolute alcohol in all proportions, and to a lesser extent with alcohol containing water. A mixture can be made at 90° C. of 70 parts of benzene and 30 parts of alcohol (as denaturalized by the Government); but less than this proportion of benzene greatly assists the use of alcohol as an illuminant. Other brands of benzene than the purest can be used. So-called 90 per cent., and even 50 per cent., benzene (the latter containing about 60 per cent. of benzene, 30 to 35 per cent. of toluene, and 5 to 10 per cent. of xylene) gives good results. Other tar oils also dissolve in alcohol, but vaporize with difficulty.

The following table gives the properties of these liquids. The flash-points were determined by the very accurate naphthometer of Parich:—

Combustible Liquid.	Density at 15° C.	Flash Point.	Boiling Point.	Total Heat of Vaporization, Calories.
Alcohol, 100° . . . . .	793	+14°	78·4°	261
Denaturalized alcohol, 90° . . . . .	834	+18	77·5	301
Benzene from tar . . . . .	885	-15	82·0	132
Light mineral oil . . . . .	680	-17	70·0	153

The next table, by giving the calorific power in two ways—(1) the products of combustion being cooled to 0° C., and (2) the products escaping at 100° C., and containing uncondensed steam—enables the calorific power to be calculated, and also a closer estimate to be made of the results obtained in practice. Experiments have shown me that the ratio of these two calorific numbers expresses what I may call "the useful heat of a fuel," which can be calculated from its calorific power, and the products of combustion escaping at 100° C. with steam uncondensed.

Examination of the table below will explain the behaviour of various liquids. The experiments of Professor Vivian B. Lewes should be studied in connection with it. His researches on the part played by acetylene in flame luminosity explain how it is, for instance, that alcohol vapour has no lighting power. The temperature produced by the flame is not sufficient to bring about the formation of acetylene in the flame. Lewes's experiment may be cited in which a non-luminous alcohol flame deposited no soot when a fragment of porcelain was introduced into it. But on admitting oxygen to the flame, it became luminous, and gave a deposit of carbon on porcelain. On the other hand, water vapour, by lowering the temperature of the flame, reduces its lighting power. These facts, and Lewes's explanation of them, are of great importance in the phenomena we shall now study.

The principal methods of producing light on this system are:—

(1) *Evaporation in the cold*, by causing air to bubble into the liquid, or by a stream of air passing between surfaces moistened with the liquid. (Van Vriesland system, used by La Compagnie Française du Gaz Aéro-gène.)

(2) *Automatic evaporation in the cold*, by drawing off a mixture of air and vapour. (Adopted by La Compagnie Parisienne des Fontaines à Gaz.)

(3) *Vaporization by heat*. The liquid is converted into superheated vapour before admission to the flame. The superheated vapour takes air with it, and produces a flame, as in ordinary gas lighting. (Alcohol-burner system.)

Method No. 1 requires a fixed installation; Nos. 2 and 3 are portable.

(1) When the compressed air is carburetted by bubbling through the liquid, a diminution of pressure takes place equal to the depth of liquid over the orifices of the air-outlet, which must be made up of minute holes. Large bubbles get carburetted only on the outside. When absorbing substances such as felt, sponge, gauze, or simply metal plates are used, the diminution which then occurs is due, not to the apparatus, but to other causes—of which later. In the Van Vriesland plant, a rotating worm imprisons a certain volume of air at each revolution, and carries it on to the other end of the apparatus in contact with the moistened surface. The proportion of vapour taken up depends on the tension of the vapour, the temperatures of the entering air, the liquid introduced, the external atmosphere, the volume and chemical properties of the liquid, and the hourly make of the machine. When these factors are constant, the gaseous product will be uniform.

Liquid.	PERCENTAGE OF			Density.	CALORIES PER KILOGRAMME.		CALORIES PER LITRE.		Ratio at 100°.
					Products of Combustion at		Products of Combustion at		
	C.	H.	O.		0	100	0	100	
Light petroleum . . . .	84·30	15·70	..	·680	12,168	11,210	8260	7620	·921
Benzene. . . . .	92·30	7·70	..	·885	10,090	9,505	8930	8460	·948
Toluene. . . . .	91·30	8·70	..	·875	10,350	9,775	9000	8550	·944
Xylene . . . . .	90·00	9·40	..	·865	10,540	9,915	9130	8580	·940
Alcohol, 100° . . . . .	52·20	13·00	34·80	·793	7,170	6,372	5690	5060	·905
„ 90° . . . . .	47·00	12·81	40·19	·833	6,170	5,381	5140	4480	·871
„ denaturalized 90° . . . . .	41·50	13·00	45·50	·830	5,850	5,079	4850	4215	·868
Coal gas (Paris type) . . . . .	56·85	24·60	8·55	·400	12,640	11,177	Cub. Metre. 6577	Cub. Metre. 5789	·882



(2) This method goes back to the "Gazo-Lampe" of Mille, which differs but slightly from the modern model first made by La Compagnie Parisienne des Fontaines à Gaz. The former consisted of a rectangular cylindrical vessel containing an inner chamber loosely filled with some absorbent, such as coke or pumice. Light petroleum oil is so used that it saturates the absorbent, without any of it remaining unabsorbed in the apparatus. The air is admitted directly to the inner vessel.

The successor of this model is a rectangular chamber (10 litres capacity), containing *papier mâché* or wood pulp; but this has been lately superseded by the so-called "*Bidon à Sondage*." Here the vessel is charged with absorbent pulp. It is fitted with a central tube, which admits the gas and allows it to be forced down into the interior. The air enters at the top of the vessel, the gauging-rod is lowered a little, and the gas led into a new layer as exhaustion goes on. The air is compelled to traverse the old layers (exhausting them) before reaching a fresh one, and entering the gauging-rod. It afterwards passes to the supply-pipes. If compressed air is used, the gas can supply incandescent burners; if for use only with ordinary burners, it can be placed in the same room as the burners, and goes on making air-gas quite uniformly and automatically. Very large pipes are necessary, since the pressure is only 2 mm. at 3 metres height.

I now pass on to cite some results of mine in the evaporation of combustible hydrocarbons in the cold. To make the conditions as practical as possible, I used a Lecomte water-motor, giving a constant air pressure of about 0·2 metre. The air was controlled by an experimental meter. In its exit thence, it traversed a bottle with three tubulures, in one of which a thermometer was held by an india-rubber bung. On its exit from the bottle,

it entered a carburettor constructed thus: A chamber of thin sheet iron—containing 1·6 litres, with a total outside surface of 8·8 square decimetres, and giving a surface of liquid of 2 square decimetres—was fitted with a horizontal air-supply tube closed at one end under the liquid, and pierced with a large number of small holes in the two sides. The current of air thus kept the liquid in constant agitation, and prevented it from settling into layers of different densities. As the bubbles were minute, very complete carburation took place. Two thermometers in the carburettor (one in the liquid, the other above it) registered the temperatures.

From the tri-tubulated bottle above mentioned, the gas could be led also to four burners, in which a trial combustion of the gas was made. The carburettor was placed on a sensitive balance, and the temperature, volume, and speed of the air used was also noted. The experiments went on until the gas became too poor to burn. The density of the liquid was noted before and afterwards. The foregoing table gives the results.

From the figures shown the heat obtainable per hour from a given quantity of liquid can be found. The heat of vaporization may be divided into three parts: (1) That supplied by the liquid itself in cooling. (This is soon exhausted.) (2) That obtained from the air. (3) That from the external air transmitted through the walls of the apparatus. Of these three, the last is the greatest, and is greater in proportion to the difference in temperature between the liquid and the external air. A current of air is thus set up around the apparatus; and as the temperature of the vessel is below the condensation point of the surrounding air, continuous condensation of water is produced, similar to that occurring on a carafe containing cold water in a room. The heat liberated by the water in its return to the liquid state largely maintains the temperature of the apparatus. The following table is an example of the calculations which can be made. It is based on the figures obtained in the first five experiments on mineral oil in the earlier table:—

Liquid.*	Density at 15°.	Time.	Litres of Air.	Weight Taken Up.	Weight Taken Up per Cubic Metre.	Temperature of Air at Inlet.	Temperature of Liquid.	Temperature of Air at Inlet.	Percentage of Total Liquid Evaporated.	Caloric Power at 100° per Cubic Metre.
A.	682	min.	..	..	..	Deg.	Deg.	Deg.	..	..
		11'0	94	80	850'0	21'0	19'0	19'5	19'1	9,523
		15'0	125	50	400'0	22'0	8'0	9'0	31'0	4,480
		7'0	62	20	320'0	22'0	8'0	9'0	35'7	3,585
		13'0	110	30	350'0	21'5	8'5	9'5	43'0	2,800
		12'0	126	30	338'0	21'5	9'0	9'5	50'0	2,670
		14'0	133	30	222'0	21'0	9'0	10'0	57'0	2,485
		15'0	149	30	201'0	21'0	9'5	10'5	64'2	2,250
	702	17'0	177	30	169'0	21'0	9'5	10'5	71'3	1,895
B.	872	..	..	..	..	20'0	19'5	20'0	..	..
		6'0	53	10	189'0	20'0	16'0	16'0	2'5	1,808
		6'0	54	10	185'0	20'0	14'0	14'0	5'0	1,770
		5'5	54	10	185'0	20'0	12'5	12'5	7'5	1,770
		6'0	55	10	182'0	20'5	11'5	11'5	10'0	1,740
		6'0	57	10	175'0	20'5	11'5	11'5	12'5	1,672
		6'5	61	10	164'0	21'0	10'5	10'5	15'0	1,568
		7'0	61	10	164'0	21'0	10'0	10'0	17'5	1,568
		7'5	67	10	149'0	21'0	10'0	10'0	20'0	1,425
		7'0	69	10	145'0	21'0	10'0	10'0	22'5	1,385
		14'0	139	20	141'0	21'0	10'0	10'0	27'5	1,375
		14'0	141	20	141'0	21'0	10'0	10'0	32'5	1,350
		20'0	218	30	137'5	21'0	10'0	10'0	40'0	1,315
	874	22'0	222	30	135'0	21'0	10'0	10'0	47'5	1,290
C.	829	..	..	..	..	20'0	21'0	21'0	..	..
		15'0	164	10	66'6	20'0	16'0	16'5	2'0	337
		20'0	193	10	52'0	19'0	15'0	15'0	4'0	264
		21'0	228	10	43'7	19'0	14'0	14'5	6'0	222
		49'0	458	20	43'0	19'0	13'5	14'0	10'0	221
		49'0	462	20	43'2	19'0	13'0	13'5	14'0	219
		50'5	462	20	43'2	19'0	13'5	13'5	18'0	219
	838	50'0	464	20	43'1	19'0	13'5	14'0	22'0	218
D.	847	..	..	..	..	16'0	12'5	15'0	..	..
		6'0	52	10	192'0	16'0	10'5	11'0	2'0	1,200
		6'0	52	10	192'0	16'0	8'5	9'5	4'0	1,200
		6'0	53	10	188'0	16'0	7'75	8'75	6'0	1,175
		6'5	61	10	164'0	16'0	7'0	7'5	8'0	1,025
		6'5	67	10	149'0	16'0	6'5	7'2	10'0	930
		12'5	136	20	147'0	16'0	6'0	7'2	14'0	920
		13'0	138	20	145'0	16'0	6'0	7'0	18'0	910
		13'0	138	20	145'0	16'0	6'0	7'0	22'0	910
		12'5	138	20	145'0	16'0	5'5	7'0	26'0	910
		13'0	140	20	143'0	16'0	5'5	7'0	30'0	895
		19'5	209	30	143'5	16'0	5'5	7'0	36'0	895
	851	20'0	211	30	142'0	16'0	5'5	7'0	42'0	890
E.	775	..	..	..	..	16'0	15'0	15'0	..	..
		4'0	32	15	468'0	16'0	9'0	10'0	3'2	3,720
		3'5	34	10	291'0	16'0	8'0	10'0	5'3	2,350
		3'5	39	10	277'0	16'0	6'5	8'0	7'4	2,200
		4'0	41	10	244'0	16'0	5'0	7'0	8'5	1,950
		10'0	89	20	225'0	16'0	4'0	6'0	13'8	1,790
		10'0	100	20	200'0	16'0	3'5	5'0	18'0	1,595
		10'0	103	20	194'0	16'0	3'5	5'0	22'5	1,540
		10'5	102	20	196'0	16'0	3'7	5'5	26'5	1,560
		10'5	106	20	180'0	16'0	4'0	5'5	31'0	1,500
		11'0	111	20	180'0	16'0	4'0	5'5	35'0	1,435
		10'5	120	0	176'5	16'0	4'0	5'5	41'5	1,400
		16'5	122	0	171'5	16'0	4'5	5'5	47'8	1,370
		16'5	177	0	170'0	16'0	5'0	6'0	51'2	1,355
	800	17'0	183	0	161'0	16'0	5'0	6'2	60'5	1,300

A. Light petroleum. B. Benzene from tar. C. Mineralized alcohol (90°). D. Equal parts of benzene and mineralized alcohol. E. Equal parts of light petroleum and benzene.

		CALORIES PER HOUR.				
Time.	Air (Litres per Hour).	Liquid Evaporated per Hour.	Liquid Evaporated per Square Decimetre of Exterior Surface.	Total.	From the Liquid.	From the Air Carburetted.
Min.		Grams.				
11	512	436	49'5	66'50	9'40	1'42
15	500	200	22'7	30'25	0'52	1'88
7	530	172	19'5	26'20	..	1'97
13	550	138	15'7	21'20	..	1'89
12	625	150	17'0	22'95	..	2'00
						20'95
						2'38

The heat derived from the walls is seen to be relatively enormous. Certainly the vessel is only 0·3 mm. thick; but I consider the result is due to the condensation changes mentioned above.

The progress of the experiments referred to in the table can be equally well shown by curves. It is found that the curve of light petroleum is the steepest; that of benzene almost a straight line; while a mixture of equal parts of the two gives a curve which just falls below that of light petroleum, and becomes afterwards almost horizontal. The alcohol curve is very regular. It is curious that a mixture of alcohol and benzene shows almost like benzene alone. This is worth notice in the application to gas enrichment of benzene mixed with a little alcohol—the former to furnish the lighting power, and the latter as a solvent of naphthalene.

Even when the conditions for a uniform gas (see above) are fulfilled, an evaporation carburettor can never give a perfect result. The water vapour of the atmosphere dissolves in the liquid, which becomes heavier. During the winter (10° to 12° C.), I have collected, on the wooden barrels containing mineral oil of about 700 specific gravity, a kind of white deposit resembling sal-ammoniac. Placed in a dish and warmed, it melted and yielded water and mineral oil—about four-fifths water, and one-fifth oil.

These laboratory results may be compared with the figures obtained in practice by MM. de Perrodil and de Morsier, who state: "Assuming the carburettor to be at 5° C., the dilution would be 56·40 litres of air for 1 litre of gasoline; at 10°, this figure falls to 42·30 litres; and at 15° to 32·80." Comparison of these figures with my own, shows that carburetting by bubbling is much more efficient than the surface method; for my figures are higher, though the oil was heavier.

I do not agree with certain other opinions of MM. de Perrodil and de Morsier, and maintain that air gas costs more than coal gas (for equal illumination); that it heats less; and it is of variable composition. On the other hand, air gas is capable of being installed with all the advantages of coal gas as regards convenience in use—a feature, as I show below, that does not distinguish lamps consuming liquid hydrocarbons, which must be heated before use, but are otherwise very economical.

As regards photometric tests of air gas, the table which follows gives the results of my experiments. The last line has been calculated on the assumption that the Dellwik-Fleischer process requires 90 grammes of benzene per cubic metre of water gas



Diluent.	Combustible.	Absorbed per Cubic Metre.	Calories per Cubic Metre (Steam not Condensed).	PERCENTAGE COMPOSITION.				Burner.	Carrels.	Litres per Hour.	Litres per Carcel-Hour.	Hydrocarbon. Grammes per Carcel-Hour.	Calories per Carcel-Hour.	Grammes of Carbon per Carcel-Hour.
				C.	H.	O.	N.							
Air	Petroleum spirit	765	8,570	648	117.0	244	956	Bengel	1.00	51	51.0	39.00	436.0	33.00
	..	..	..	..	..	..	..	Bunsen Lecomte, No. 2	7.80	92	11.8	9.00	101.0	7.65
..	Benzene	465	4,440	430	35.0	244	956	Bengel	1.00	88	88.0	41.00	392.0	38.00
	..	..	..	..	..	..	..	Bunsen Lecomte, No. 2	6.60	175	26.6	12.30	117.0	11.40
Hydrogen	Nil	nil	2,380	..	83.7	..	..	"	6.80	158	23.2	..	55.2	..
	..	..	..	..	..	..	..	"	8.40	210	25.0	..	59.5	..
..	Petroleum spirit	850	11,880	718	215.7	..	..	"	10.00	300	30.0	..	71.5	..
	..	..	..	..	..	..	..	Bray's ooo.	1.20	39	32.5	27.60	337.5	23.30
..	..	..	..	..	..	..	..	" No. 1	1.90	52	27.4	23.20	325.1	19.60
	Benzene	517	7,330	478	122.7	..	..	Manchester steatite (2 slits)	3.15	82	25.6	21.70	305.0	18.40
..	..	..	..	..	..	..	..	Bray's ooo.	1.00	44	44.0	22.70	360.0	21.00
	..	..	..	..	..	..	..	" No. 1	2.50	100	40.0	20.70	327.5	19.20
Gas	Petroleum spirit	1100	17,670	1203	291.0	41	48	Manchester steatite (2 slits)	1.60	63	39.4	20.40	323.0	18.80
	..	..	..	..	..	..	..	Bray's ooo	1.40	45	32.1	35.30	560.0	38.30
..	..	..	..	..	..	..	..	" No. 1	3.80	102	28.8	31.70	509.0	31.30
	Benzene	640	11,490	864	167.0	41	48	Manchester steatite (2 slits)	4.50	140	31.0	34.10	548.0	36.00
..	..	..	..	..	..	..	..	Bray's ooo	1.60	70	43.7	28.00	503.0	37.60
	..	..	..	..	..	..	..	" No. 1	5.00	158	31.5	20.40	364.0	27.10
Water gas	..	..	..	..	..	..	..	Manchester steatite (2 slits)	2.30	102	44.4	28.40	510.0	38.50
	Benzene	90	3,175	301	62.7	289	56	Bengel	1.00	105	105.0	9.45	333.0	31.60

containing 40.4 per cent. of carbon monoxide and 51 per cent. of hydrogen. The apparatus used was the carburettor above described, the temperature of which was kept at 20° C. Each test lasted one hour. The reason for the large quantities evaporated is the fact that the liquid did not nearly approach exhaustion. Tests were made first with the bengel burner, then with an incandescent burner mounted on a Lecomte bunsen, and afterwards with a batwing burner. The carburetted air gas burns well under a mantle, and in the bengel burner; but in the batwing burners, the flame is extinguished on the least draught of air. Hydrogen and carburetted gas, on the other hand, burn very well in these burners. The pressure was 20 to 35 mm.; and the light might have been mistaken for acetylene.

The most notable thing in the table is that the quantities of hydrocarbons removed rise in proportion to the calorific power of the gas. Thus (other things being equal) we get:—

	Light Oil.	Benzene.
Air . . . . .	665 grammes.	465 grammes.
Hydrogen . . . . .	850 "	517 "
Gas . . . . .	1100 "	640 "

The gas plays the minor part of a diluent; but at the same time the choice of this diluent is not immaterial.

It will be seen that 9 grammes of light oil and 101 calories per carcel-hour (or 12.3 grammes of benzene and 117 calories) are required in an incandescent burner. The same burner using hydrogen consumes only 55 to 60 calories. Experiments with a Lecomte burner made in the works of the Paris, Lyons, and Mediterranean Railway Company gave less than 7 grammes per carcel-hour. It is difficult to explain this difference. In the case of air gas carburetted with benzene, the larger quantity of air—say, 26 litres instead of 12 litres per carcel—raises the number of calories from 101 to 117. The same thing is found in testing the flames. Here 41 grammes of benzene replace 39 grammes of light oil, although the benzene is much richer in carbon. I have found a still smaller quantity answer in the case of the "Fontaines à Gaz," due, I believe, however, to the more perfect burner employed. One set of experiments gave me 36 grammes per carcel-hour. This figure fell to 17 grammes when using a "Cromartie" regenerative burner. The light oil burnt alone in a lamp such as is used for petroleum, gave 28 grammes per carcel-hour.

Hydrogen, it is seen from the table, gives a low hydrocarbon figure per carcel-hour, even with a batwing burner. When coal gas is the diluent, the number of calories used is greater than for carburetted air, as is also the weight of the hydrocarbon consumed.

Considering these facts in connection with Professor Lewes's acetylene theory, let it be noted that, if the quantity of benzene used per carcel-hour is only 9.45 grammes, the total quantity of carbon present in the flame is about 31.6 grammes—say, 60 per cent. more than in the flame of carburetted hydrogen. But the heat evolved is almost the same; and it may therefore be admitted that carbon monoxide, which requires comparatively little heat for its decomposition, splits up in the flame into carbon and oxygen—the carbon forming acetylene.

A word may be said on the proper system of carburation, which is not to let the gas take up as much hydrocarbon as it can, but to give it as much as can best yield a mixture of constant composition. The former plan, which is the one followed in all carburettors, can never give anything but a carburetted mixture of variable quality. M. Mallet stated this view very explicitly in 1872.

Passing to another side of the subject, it is well to recall the difference in the efficiencies of ancient and modern illuminants—say, between the old "cock's comb" burner consuming 200 litres of coal gas per carcel-hour, and acetylene burning 6 litres. I consider the future illuminant will be a carburetted gas approaching acetylene in composition. It does not matter

to the gas manager whether a 120-litre burner gives 6 carrels with or without a mantle. In point of safety, the latter system is the better.

We can work out the suggestion of M. Bouvier at the Congress of the Société Technique of 1898—viz., the enrichment of poor coal gas by acetylene—and show that the result of using equal weights of acetylene and benzene is nearly the same; but while the cost of a kilo. of acetylene is 1.15 frs. to 1.25 frs., a kilo. of benzene costs 0.3 fr. But this equality of enriching power only holds good when the proportion of either enricher is small. With larger additions, the consumption of benzene for a given increase in lighting power is three times that of acetylene.

But to leave this slight digression, and return to my subject. The use of vaporized liquid hydrocarbons may be as serious a competitor of coal gas as carburetted air gas. Free-flame lamps burning alcohol and benzene (or other hydrocarbons) in admixture, need not engage our time. They are never likely to compete with gas; but carburetted alcohol may find an application as a motive power for automobiles.

In considering incandescent lighting by liquid hydrocarbons, it is interesting to note that the first incandescent lamp—that of Frankenstein, in 1848—consumed alcohol. Petroleum, petroleum spirit, and alcohol are now the three possible fuels—the first for large outdoor lamps, the two latter for indoor use.

The secret of incandescent lighting by alcohol is to mix the air and alcohol vapour before they enter the flame, so as to obtain a very hot flame of minimum size. This can be easily shown by experiment. Alcohol vapour (density, 1.6) gives a gas 1 cubic metre of which weighs 2.070 kilos., develops 12,100 calories, and requires 11.800 litres of air for its combustion. These figures show the necessity of strongly heating alcohol vapour, and supplying it at such pressure from the ejector that the current may draw in eleven times its volume of air, and yet reach the flame in a state of vapour. My experiments show that the temperature of the vapour emitted by the ejector should be at least twice the temperature at which the gaseous mixture is made—say, 160° C. for alcohol, benzene, and petroleum spirit.

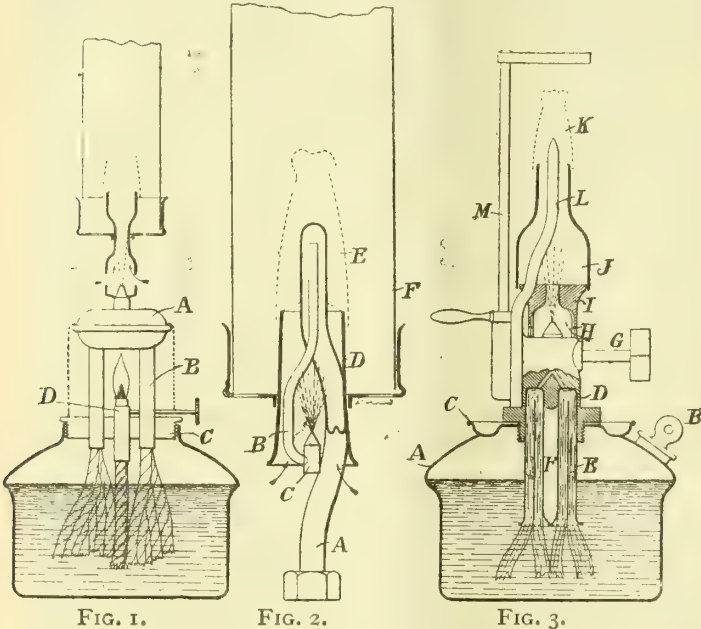
Ditmar lamps, and the systems of Washington, Kitson, and others, can only be mentioned here. The former are marvels of simplicity, but it is almost impossible to regulate them; the latter are adapted mainly for very large lamps.

Of the lamp used for this form of incandescent lighting, the Schlesinger type, shown in fig. 1 (p. 958), is the simplest, and the same time the least efficient. A is a small chamber, supplied with oil by the tubes B, which contain cotton wicks, immersed in the oil below. The frame C carries a small heating burner D, to vaporize the oil in A. An incandescent burner (similar to one used for gas) screws on the heating-chamber. Two minutes elapse before the main burner can be lighted. It is put out by extinguishing the small flame under A. It uses 30 grammes of alcohol (or 20 to 22 grammes of petroleum spirit) per carcel-hour. This low efficiency is due to the imperfect heating of the vapour, the amount of alcohol burnt in the small light, and the low pressure.

Fig. 2 shows Meyerberg's wickless model (1894), which has had many imitators. It consists of a Field tube, inverted and placed in the flame. The liquid enters at A (closed at the upper end), into which the smaller tube B is fitted, and closed at the other end by the ejector C. The gallery D, carrying the mantle E and the chimney F, surmounts the whole. A bundle of metallic threads is placed in the tube A, in order to render the vaporization of the oil more regular. The tube itself is screwed to the vessel in the base. The liquid is supplied to the lamp by storage at a higher level, or by air pressure. Only a few seconds are needed to obtain the full light. When properly adjusted, this burner gives very good results. It uses 14 to 22 grammes of alcohol and 10 grammes of petroleum spirit per carcel-hour (Couderehon and Ringelmann). Its principal defect is choking by the products of decomposition of the combustible vapour.



Fig. 3 shows the alcohol lamp of La Société d'Eclairage, de Chauffage, et de Force Motrice, the principle of which—the use of part of the heat of the flame for vaporizing the hydrocarbon—is also that of the Marcus, Doudard de la Grée, Seegrund, Deselle, and other burners. Though wicks are used, the efficiency is maintained by means of the air pressure; the wicks serve only to aid regular vaporization. A is a hermetically closed receiver with filling-plug B. Above it is a cup C leading to the burner.

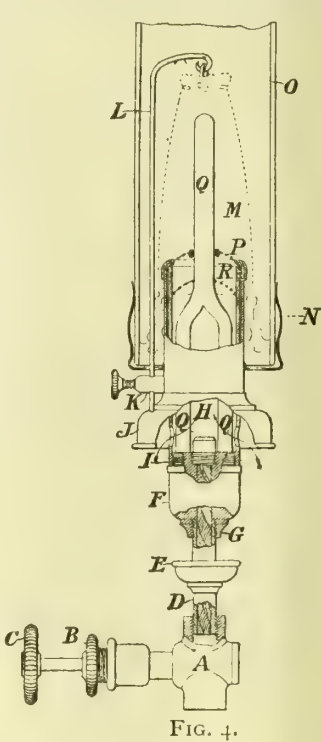


The vaporizer is made of a piece of metal D, connected, by means of a tube E, to the centre of a metal cylinder F. The liquid is vaporized in this cavity, the base of which is perforated with holes leading through the cock G to the ejector H, the bunsen burner I, and the mixing-chamber J, on which latter the mantle K is fixed. The arrangement for conducting the heat is double. It consists, first, of a rod L of good conducting metal, placed in the centre of the flame, and conducting the heat to the vaporizer D; and, secondly, of a rod M, surmounted by a disc, by which also much of the waste heat of the flame is led to the vaporizer.

The lamp A being filled with a mixture of benzene (two volumes) and denaturalized spirit (one volume), and the cap D screwed down, pure alcohol is poured into the cup C and lighted.

As soon as it has burnt away, the cock G is turned on, and the lamp lighted. The temperature of the oil may rise 30° above that of the outside air, and will thus produce a pressure of about 94 centimetres of water. The heat transmitted can be varied to some extent by the rod M. A small lamp of 2·5 carcel-power requires six minutes for lighting-up, and uses 10 grammes of alcohol and benzene per carcel-hour. With larger (up to 30-carcel) lamps, this latter figure may fall to 7 grammes. The lamps must burn in a fairly constant temperature, for a difference of 1° in the external atmosphere causes an alteration in the pressure of 37 mm. of water.

Passing now to those lamps which have no wick, but vaporize the hydrocarbon by means of the heat of the flame, fig. 4 shows



the Lecomte burner, which is notable only for its great simplicity, and for its adaptability to coal gas. In fact, the only modification of fittings required when the lamp is being applied to existing fittings, is a receiver holding liquid to the depth of 20 centimetres. A is a cock fitted to the supply-pipe; B, a screw-nut working with tow; C, a milled screw working the valve A; E, the alcohol cup fitted to A by the pipe D; F, the base of the burner pierced by the vaporizer; G, the vaporizer, which can be rotated by a metallic joint; H, the ejector; I, the bunsen tube, screwing on to the base of the burner; J, the mantle gallery; K, a regulating-screw to adjust the height of the rod L, holding the mantle M; N, the chimney holder; O, the chimney; P, the wire gauze; Q, a forked support, soldered to F, by which the heat of the flame is conducted to F and G.

The following table gives the results of photometric tests of the gas. The price of coal gas has been placed at 0·3 fr. per cubic metre; denaturalized spirit, at 0·65 fr. per litre, or 0·78 fr. per kilo.; carburetted alcohol, at 0·65 fr. per litre, or 0·76 fr. per kilo.; and light petroleum (·680 sp. gr.), at 0·45 fr. per litre, or 0·66 fr. per kilo., which may be regarded as average prices.

Burner.	Combustible.	Observer.	Intensity in Carcels.	Consumption per Hour.	Cost per Hour.	Consumption per Carcel-Hour.	Cost of a Carcel-Hour.
Lecomte Bunsen	Gas	Vautier	E·44	Litres. 115·0	Centimes. 3·45	Litres. 12·00	Centimes. 0·36
Welsbach No. 3.	"	"	12·27	152·0	4·56	12·40	0·37
Lecomte	Gas at 175 mm. pressure	City of Paris	36·00	315·0	9·45	8·75	0·26
Schlesinger.	Mineralized alcohol (90°)	Lecomte	2·20	Grammes. 66·0	5·15	30·00	2·34
"	"	Ringelmann	3·10	121·0	9·45	39·00	3·05
"	Light petroleum	Lecomte	3·20	61·0	4·04	19·00	1·25
Phœbus	Mineralized alcohol (90°)	Sorel	3·61	98·0	7·65	27·10	2·12
Continental	"	City of Paris	6·80	95·0	7·41	14·00	1·09
O. Helft.	"	Ringelmann	4·90	108·0	8·42	22·00	1·72
Schwertlampe	"	Hayduck	6·50	115·0	9·00	17·70	1·38
Denayrouze	"	"	6·56	115·0	9·00	17·50	1·37
"	"	Denayrouze	"	"	"	14·00	1·09
"	"	Ringelmann	2·50	25·0	1·90	10·00	0·76
Lecomte	Alcohol 1 vol., benzene 2 vols.	Sorel	5·20	51·0	3·88	9·80	0·75
"	Alcohol 66, benzene 20, toluene 14 per cent.	"	6·45	65·6	5·00	10·15	0·78
"	Alcohol 62·5, benzene 37·5 per cent.	"	6·26	75·0	5·86	12·00	0·94
"	Alcohol 95° + 2 per cent. of heavy benzene	"	5·45	79·0	6·13	14·50	1·13
"	Mineralized spirit (90°)	"	4·30	30·0	1·98	6·95	0·46
"	Petroleum spirit	P. L. M. Rly. Co.	"	"	"	"	"

It will be seen that the same liquid gives one carcel-hour for 1·1 c. or 2·3 c., according to the lamp; that in the best burners alcohol is twice as dear as gas; that petroleum spirit costs only 30 per cent. more than gas (but not in Paris); and that the efficiency of petroleum spirit used direct as a vapour, is greater than when it is diluted with air.

**Motor Vehicles in Paris.**—We have already had occasion several times to mention in the columns of the "JOURNAL" the revelations of the Paris Exhibition respecting the actual condition of the motor car industry. In a recent report published in the "Engineer," we read that in France, as in England, the most successful motor vans for heavy traffic are coke-fired; and but for the name would not be readily distinguishable from the familiar traction engine. A feature of the French practice in this branch of engineering is the so-called "train scotte," which is, roughly speaking, a goods train of road vehicles drawn by a traction engine capable of steaming at a speed of about 8½ miles an hour. With all three classes of road motors, driven respectively by oil, steam, or electricity, only about one-half of the work

indicated by the engine is transmitted to the periphery of the wheels. This means that in these triumphs of modern mechanical skill only about 5 per cent. of the calorific power of the fuel is converted into useful work on the carriage wheels. This is not creditable to mechanical engineering. The horse beats this duty several times over. Electric motors are not yet in the running. A carriage so propelled cannot go more than 60 miles without being recharged—an operation that takes seven hours for five running hours. The usual limit of a run is about 38 miles; so that an electric road car cannot go more than about 20 miles from a charging station. The weight of the accumulators is 30 per cent. of the whole weight on the wheels; and they rapidly deteriorate and wear out. Two acetylene-gas driven cars—a light victoria and a heavy goods van—are being shown in Paris. With all kinds of motor cars, however, the chief source of expense is the tyres. No make of tyre in the composition of which india-rubber enters will long stand the hard usage of motor car wheels on common roads; and, as a matter of fact, the maintenance of either pneumatic or solid rubber tyres costs several times more than the fuel consumed for driving the carriage.



## TECHNICAL RECORD.

### SELF-LIGHTING GAS-BURNERS.

The very general use of incandescent gas-burners for public and private lighting, which has been the most striking feature in the progress of the gas industry during the past few years, has led to a revival of interest in the question of automatic ignition. The effect of this revival has been seen from time to time in our "Register of Patents," where the various devices for super-seeding the lamplighter, the match-box, and the flash-light have been duly described. These appliances may be divided into two classes—those in which electricity is employed as the igniting agent; and those in which the action of the gas itself is utilized. The characteristics of some of these lighters have been indicated in three articles in the "Revue de Physique et de Chimie," by M. Pierron, who also dealt with the subject at the International Congress of Applied Chemistry held in Paris last July. In his paper on that occasion, which has been given in "Le Gaz," he to a large extent went over the ground traversed in two of his articles in the "Revue," and therefore his productions may be conveniently noticed together.

M. Pierron first of all deals with the various appliances coming into the group of electric igniters; comprising those requiring manipulation at the burner, and those by which ignition is effected from a distance. The Arnould igniter is a portable apparatus consisting of a hardened india-rubber vessel containing a mixture of bichromate of potash and sulphuric and hydrochloric acid. When in use, pieces of carbon and zinc are acted upon by the mixture, and a current is generated which raises to incandescence a coil of platinum wire. When not in action, the position of the igniter is reversed; and of course there is then no contact with the liquid. In the Lux igniter, the current is obtained from the batteries serving the electric bells; and the appliance is operated by pressing a button. In the Barbier igniter, the platinum wire is placed above the burner. By turning a handle, the tap is opened and electric contact set up which causes the wire to glow and effect ignition. In the Loiseau igniter, the simple turning of the tap is sufficient to cause the wire to glow and light the gas. The igniter which bears the name of M. Née is one of the commonest of the kind, and produces an electric spark by the simple turning of the tap; the current being supplied by four or five Leclanché cells. Among the appliances by which lighting is effected from a distance, M. Pierron describes the Auto-Lux, in which ignition is produced by incandescent platinum wire; and the Pôle, whereby this object is attained by means of a spark. He says, however, in regard to them all, that, notwithstanding their great convenience, they have several inherent defects. In the first place, not only must the batteries or wires be kept in perfect working order, but the appliances are liable to fail in their action owing to imperfect contact. Moreover, their relatively high cost precludes their general adoption.

Having indicated the drawbacks to the use of electric lighters, M. Pierron turns his attention to appliances in which the action of gas is utilized. Before describing them, however, he gives a few historical particulars, showing how investigators have tried to utilize the catalytic properties of certain metals for producing automatic ignition. As long ago as the commencement of the present century, it was known that spongy platinum would become incandescent when in contact with alcohol; would condense a large number of gases, with great liberation of heat; and, even at ordinary temperatures, would cause certain gases to mix with each other or with the oxygen of the air, with a like result. Liebig, Edward and Humphry Davy, Dobereiner, Gay-Lussac, Berzelius, Dulong, Zeise, and others, all in turn studied these various phenomena; and the classic experiment of the hydrogen lamp, in which a jet of hydrogen ignites upon spongy platinum, was well known. However, the black of platinum, as well as that of other metals of this group, presented the defect of sometimes rapidly solidifying; thereby destroying the porosity, and consequently the catalytic properties, of the substance. In order to remedy this, it was necessary to find some means of preventing the solidification while preserving the original porosity; and Liebig, about the year 1829, proposed to distribute the platinum black in various porous bodies. Dobereiner, some ten years later, after having manufactured substances with a clay base, stated that it was preferable to distribute the platinum black in natural or artificial meerschaum. Unfortunately, by working in this way, less solid igniting substances were obtained. They could not stand several hours' exposure in a flame; and the few attempts made to apply them practically were not attended by results having any commercial value. But there appeared subsequently a mechanical device patented by Kent, whose Belgian specification is dated Oct. 17, 1895, and afterwards by MM. Canellopoulos and Kratz-Boussac, whose patent is dated Dec. 19, 1895, which allowed of the utilization of these substances for the ignition of gas.

M. Pierron proceeds to examine the various igniters utilizing the action of gas, from the points of view of their chemical constitution and their employment for ignition. The lighting substance used by MM. Canellopoulos and Kratz-Boussac was that prepared by Duke, in which the platinum black was intermixed with silicate of magnesia. By means of an ingenious mechanical

device, the substance remained only a few seconds in the flame on each ignition, and therefore it could be used for a considerable length of time; whereas if it were subjected permanently to the action of heat it would rapidly lose its catalytic properties. The appearance of this appliance led to a revival of the study of igniting substances; and a number of investigations were made with the view of increasing as much as possible their period of usefulness. Starting with the principle that it is the black in the igniting body which, by melting, causes the deterioration of the entire substance, certain inventors sought to obtain a less fusible igniting element with blacks of metals fusible at higher temperatures. Others, ascribing the destruction of the igniting properties of the mixture to the supporting element allied with the platinum, endeavoured to substitute for the usual bodies—clay, meerschaum, asbestos, lava, &c.—those of different chemical composition.

The principle of distribution in a natural porous refractory substance having been indicated by Dobereiner, M. Pierron does not notice any of the patents which, while specifying the use of different mixtures, are simply variants of that principle, but enumerates those only which prescribe substances possessing very distinct chemical functions. First of all, Canellopoulos and Kratz-Boussac, in their French patent dated July 21, 1896, substitute magnesia for meerschaum. Bohm and Sternberg, in their English patent of July 24, mention, in addition to refractory combinations of alkaline, alkalino-terreous, terreous, and heavy oxides, the employment of refractory oxides belonging to this category. MM. Mengers, Franke, and Hurwitz, according to their French patent of March 1, 1897, add the platino or analogous salts of metallic oxides—for example, oxide of silver or copper. M. Killing, in his Belgian patent of Sept. 27, 1897, calcines cotton thread, saturated with a mixture of platinum chloride and thorium nitrate, and in this way obtains a skeleton or framework of platinum black and thorium oxide. In his Belgian patent of March 9, 1898, M. Pierron employs as the supporting element oxides having acid functions (tungstic, titanio, vanadic, silicic, and niobic acids), either alone or in admixture. Finally, other inventors, ascribing the loss of igniting properties to the presence of water, have endeavoured to remove it. Herr Löwenberg, in a French patent dated April 30, 1896, makes use of natural porous refractory substances (asbestos, clay, lava, &c.), but before doing so subjects them to the dehydrating action of fuming sulphuric acid. MM. Perl et Cie., whose French patent is dated June 30, 1898, ascribe the defects of the igniting substances to the presence of hygrometric chloride of magnesium in the Duke combination; and in order to get rid of it, they treat it with hydrochloric acid.

M. Pierron next takes up the subject of the application of the igniting substances. He remarks that Humphry Davy, in 1821, discovered the property possessed by red-hot platinum wire of remaining incandescent in a mixture of the vapour of alcohol and air. This characteristic of metallic platinum, whether in the melted state or as wire, of being the means, when once heated, of causing the combination of atmospheric oxygen with combustible gases, had also been applied to illuminating gas. M. Ste.-Claire Deville, as well as M. Debray, reproduced Davy's flameless lamp by placing a platinum crucible over a bunsen burner, which was extinguished as soon as the crucible was well heated. If the mixture of air and gas was turned on again when the crucible ceased to be red, it was soon observed to become hot and once more incandescent; and it sometimes happened that the gaseous mixture was again ignited. Since 1894, the principle underlying Davy's experiment has been practically applied. Herr Rosenfeld, in his German patent No. 47,128, described a method of igniting gas, consisting in the employment of a piece of spongy platinum furnished with a wire of the same metal. Under the influence of the gas, the sponge develops heat, and transmits sufficient of it to the wire to cause it in turn to become active, and produce combination of the gas and the atmospheric oxygen, with such liberation of heat as to make it glow and cause ignition of the mixture. One method of carrying out this idea was seen in an appliance formerly sold by the house of Serrin. It was composed of a small support, placed at the side of a batwing burner, and surmounted by an igniting block into which the platinum wire passed. The gas caused the block to become red, heat the wire to a state of incandescence, and produce a light. Another form was that mentioned by Herr Drehschmidt in the "Journal für Gasbeleuchtung" for May 18, 1897. It consisted in suspending from the upper part of the glass chimney surrounding an argand burner, or over a mantle, an igniting substance furnished with a platinum wire. As these bodies could not be used for any great length of time when they had to remain permanently in the flame, endeavours were made to produce mechanical devices to withdraw them from its action as soon as ignition had taken place.

This leads M. Pierron to the consideration of non-durable pastilles as igniters. These appliances are divisible into two classes—igniters in which the flame is displaced, and those in which the pastille itself is displaced. There are in existence a number of appliances by which, on simply turning a tap, the gas is brought into contact with a flash-light, and ignited under the action of a catalytic substance. Subsequently the heat expands a tube filled with air or gas, or a metallic pyrometer, causing valves to work, and the central burner is then lighted, followed by the extinction of the flash-jet. The principle being known, M. Pierron contents himself with describing the best example of



its application—viz., the "Self-Lighter," which is shown in the accompanying illustration (fig. 1). It consists of three parts—the central connection, the igniter, and the pyrometer. The first is the

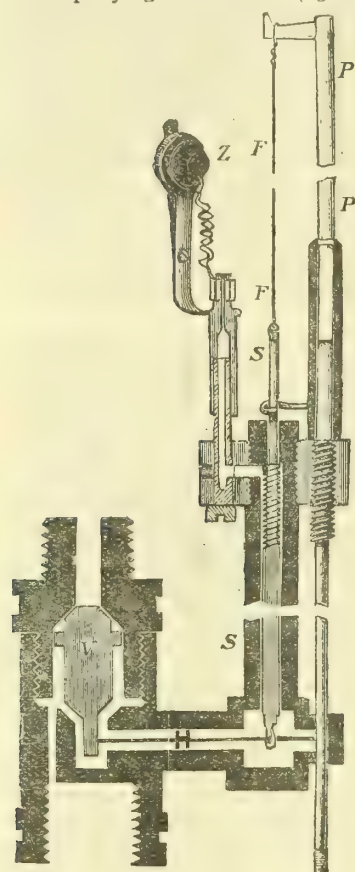


FIG. 1.

heats the pyrometer, which expands, and causes the valve to drop a little, and allow the gas to reach the principal burner, where it is ignited. The flame thus produced imparts additional heat to the pyrometer, the further elongation of which causes the valve to rest upon its seat and cut off the supply of gas to the flash-jet, which is thus extinguished.

Igniting cocks are the next appliances to engage M. Pierron's attention. In these, the pyrometer and valves are dispensed with; and it is the operator himself who, by turning the tap, causes the ignition of the flash-light and the principal burner, and finally the extinction of the former. An example is shown in fig. 2. In ordinary taps, the box has only two holes, and the plug is pierced by a channel. In the self-lighter shown, there is a third hole in the box, by which gas is conducted to the pipe supporting the flash-jet. In addition to the ordinary channel, the plug has two small grooves—one above and the other below it—and going in opposite directions. The object of this arrangement is, when the tap is half open, to send the gas into the groove leading to the pipe supporting the flash-jet. As the tap is opened, the gas is directed only to this jet, at which it is lighted on coming in contact with the igniting substance. On the turning of the tap being continued, the gas passes to the burner, and is lighted by the pilot, which is extinguished when the tap is fully opened. Any kind of burner can be ignited by this appliance; and the principle upon which it is based is one which can be applied in a

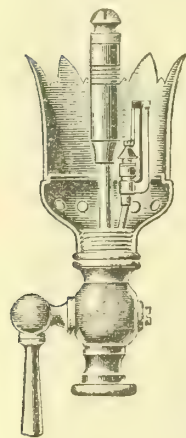


FIG. 2.

variety of different ways.

In the case of igniters in which the pastille is displaced, the igniting substance is first of all subjected to the action of the mixture of gas and air, and after ignition is withdrawn from prolonged influence of the higher temperature. This can be effected either automatically, by means of a small mechanical contrivance set in motion by the heat, or by a movement performed by the operator himself. M. Pierron gives a few examples selected from a number of arrangements which have been suggested. With regard to the former class, mention is made of the device of MM. Perl et Cie., described in their French patent of July 7, 1897. They place the igniting pastille at the end of a spiral wire, as shown in fig. 3. In the first position, the pastille is in the stream of gas; but as soon as ignition has taken place the wire expands, and draws the pastille down into the cold part of the appliance. Von Vietinghoff Scheel describes in his Belgian patent, dated Sept. 20, 1898, a little apparatus constructed by him for placing on the upper part of the chimneys of ordinary argand or incandescent burners. It is shown in fig. 4. It turns on a knuckle-joint C; and the part above the chimney is a little heavier than the counterbalance P. The chimney is covered

by a mica plate pierced with a hole, through which the gas reaches a pastille *b*, furnished with one or more platinum



FIG. 3.

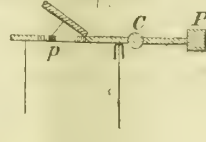


FIG. 4.

wires *f*, which cause ignition. Under the influence of the gaseous current, the appliance rises again, and withdraws the pastille from the action of the heat.

An arrangement in which displacement is effected by the operator, is described by De Romocki and Karl Koenig in their Belgian patent of April 18, 1896. They place the igniter, composed of spongy platinum with wires of the same metal, at the end of a long flexible rod. When the gas-tap is closed or only partially open, the igniter is above the chimney. The gas flows when the tap is turned, and ignition takes place. When the tap is fully open, a catch upon it strikes against the support, and, moving it aside, withdraws the igniter from the action of the hot gases. The latest and simplest device consists in suspending the igniter at the end of a long support held in the hand. When the tap is turned on, it can be placed over the chimney and removed when the gas is lit. To prevent waste of gas, the igniter may be put under a little mica cover, shutting the chimney more or less completely.

When durable pastilles are employed, all mechanism becomes unnecessary. It is sufficient to place them, with their platinum or other wires, in a position where they are permanently subjected to the action of the mixture of gas and air. For example, M. Pierron, in his Belgian patent of March 11, 1898, shows that

two igniting substances, connected by platinum or iridium wires, allowing of easy suspension upon a mantle, can be employed. The glass chimney can also be utilized as the support, &c. Finally, platinum foil can be used (as shown by Herr Breslauer in his German patent of April 10, 1898), or wire gauze. With batwing burners, a special igniter can be made with a pastille fixed in a smoke-plate suspended over the burner. Examples of the two types of igniters here referred to are shown in figs. 5 and 6.

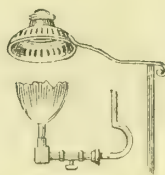


FIG. 5.



FIG. 6.

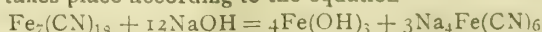
M. Pierron next deals with the subject of self-lighting mantles; but his observations on this part of the subject must be left for another article.

#### THE ESTIMATION OF PRUSSIAN BLUE IN SPENT OXIDE, AND OF CYANOGEN IN GAS.

Dr. A. O. Nauss, of the Karlsruhe Gas-Works, has recently described, in the "Journal für Gasbeleuchtung," a new means for the estimation of prussian blue in spent oxide, which forms also the basis of a method of estimating cyanogen in coal gas.

He refers to the commercial importance which cyanogen preparations have acquired of late years, and to the necessity for a rapid and reliable method of estimating the cyanogen in gas-works products, from which the bulk of the commercial preparations are now derived. He refers to the three recognized methods for the estimation of prussian blue in spent oxide—viz., (1) Knublauch's; (2) the modified Zulkowsky's method; and (3) Drehschmidt's. The first two, though widely used, have the defects and errors inherent to tests made by the help of spots of an external indicator, by which the final point of the reaction is detected with difficulty, or only after protracted experience of the method. Drehschmidt's plan, especially as modified by Burschell, is a very accurate one, as Lubberger's investigations have clearly proved.\* But it is slow and tedious; and an unusual degree of purity of the reagents is necessary, for they must be quite free from chlorine. Bearing in mind the fact that, for use in a technical laboratory, a system of analysis must be as simple as possible without lack of accuracy, Dr. Nauss succeeded in devising the new method, which we will now describe.

It is founded on the decomposition of prussian blue by alkalis, which takes place according to the equation—



The blue is accordingly treated with hot solution of caustic soda of known strength, until the feeble green colour of the liquid

\* See "JOURNAL," Vol. LXXI., p. 586.



finally disappears. An excess of caustic soda actually is employed, and is neutralized with acid of equivalent strength. Further addition of acid changes the golden yellow colour of the liquid to greenish yellow, owing to the reformation of prussian blue. No special indicator is required, as the blue answers the purpose. Care must, however, be taken to work with a thoroughly hot liquid, as the final reaction only then occurs sharply and clearly. If soda solution of  $\frac{1}{50}$  normal strength is used, 1 c.c. is equivalent to 0.001431 gramme of prussian blue. The analysis of a sample of spent oxide should be conducted as follows.

Ten grammes of the oxide are repeatedly agitated in a 500 c.c. flask with 50 c.c. of 10 per cent. solution of caustic soda; and the whole is left at the ordinary temperature until the blue in the oxide has been completely decomposed by the solution of soda. According to Knublauch, 15 hours are needed for this decomposition. The use of the dilute solution of soda avoids the formation of sodium sulphide. The flask is then filled up to the 500 c.c. mark with water, and an additional 5 c.c. of water added to compensate for the space occupied by the oxide. After several vigorous shakings, an aliquot portion of the liquid is filtered off—say, 50 c.c.—which would be equivalent to 1 gramme of oxide. To this is run in from 10 to 15 c.c. of a hot acid solution of iron alum (200 grammes of iron alum to a litre of water and 100 grammes of sulphuric acid), in order to convert the sodium ferrocyanide present into prussian blue. It is heated on the water-bath until the peculiar sweet smell, which probably proceeds from the decomposition of cyanogen compounds which do not form blue, has disappeared. It is then passed through a filter in a hot-water funnel; and the residue is washed with hot water until the sulphuric acid is completely washed out. The filter containing the blue is next put in a flask, to which water is added and brought to boiling with frequent agitation, in order to remove the blue as much as possible from the filter. The blue is then directly determined by means of solution of caustic soda. Sufficient of this solution of  $\frac{1}{50}$  normal strength is added, by degrees, to decompose all the blue. The decomposition takes place rapidly on heating for a short time; and the excess of solution of soda is then titrated back by the gradual addition of acid of  $\frac{1}{50}$  normal strength—the liquid being continually heated and agitated meantime. The heating is essential, as otherwise, even in the presence of alkali, the green colour due to the reformation of prussian blue persists for a short time. When the feeble greenish yellow colour first becomes permanent in the solution, the final point of the reaction is reached.

Comparative analyses carried out by this system and the Drehschmidt-Burschell method gave the following concordant results:—

Sample No.		1.	2.	3.	4.	5.	6.	7.
Percentage of prussian blue	By the new system	8.08	7.02	8.65	8.29	7.63	7.34	7.72
	By the Dreschmidt-Burschell method.	8.15						7.65
		8.11	7.30	8.86	8.11	7.65	7.51	7.63

Parallel tests were likewise made on spent oxides with and without the addition of a known amount of potassium ferrocyanide in solution; and the results were similarly concordant.

Dr. Nauss further describes how the process may be extended to serve for the estimation of cyanogen in gas. One hundred litres of the gas are passed through two absorption vessels in from one to two hours. The vessels are charged with 20 c.c. of solution of ferrous sulphate (1 part of the salt in 10 parts of water), and 20 c.c. of solution of caustic potash (1 part of potash in 3 parts of water); 10 c.c. of each solution in each vessel. The contents of the vessels are washed, after the passage of the gas is ended, into a 500 c.c. flask; and more of these two solutions is added until black sulphide of iron is no longer precipitated. An addition of about 1 gramme of lead carbonate completes the removal of sulphuretted hydrogen. The solution is heated for some minutes, then cooled, and the flask filled to the mark by the addition of water, of which a further 5 c.c. is added to compensate for the space occupied by the precipitate. After vigorous agitation, the contents of the flask are filtered through a dry filter, and 50 c.c. of the filtrate is poured into excess (20 to 30 c.c.) of hot solution of iron alum in order to precipitate the prussian blue, after a little warming on the water-bath with dilute sulphuric acid. The analysis then proceeds as in the case of the estimation of prussian blue in spent oxide, described above. A cubic centimetre of the solution of caustic soda of  $\frac{1}{50}$  normal strength is equal to 0.0007794 gramme of cyanogen.

**Mr. Tesla's Latest "Discovery."**—If a statement contained in the "Globe" last Friday may be taken as correct, the idea of insulating electrical conductors by laying them in troughs and freezing them, to which reference was made in the "JOURNAL" for the 4th ult. (p. 575), did not originate with Mr. Tesla, but with Dr. R. A. Fessenden. It appears that the latter suggested, in a paper presented to the American Institute of Electrical Engineers in 1898, that the conductors could be made hollow, and laid in a trench containing water. Cold brine flowing through the conductors would freeze the water and insulate the conductors, and would serve to cool houses or make ice, &c. Mr. Tesla's American patents were only applied for on the 15th of June last; and, according to Dr. Fessenden, they are invalid.

## THE KITSON HIGH-POWER INCANDESCENT OIL-LAMP.

It is very nearly a year since we first described the Kitson high-power incandescent oil-lamp; and occasional references in the meantime have recorded the successes of the system at exhibitions and elsewhere. The latest was the gold medal awarded at the Paris Exhibition; and in Paris the Kitson Syndicate are now setting up an installation of their street-lamps on a scale which will not be found outside the American towns in which they have been extensively adopted. But starting off on this side in good style under the patronage of the Municipality of Paris, who have a *penchant* for brilliant street lighting, the system is bound to make headway.

At present, the Quai des Tuileries from the Pont de Royale to the Place de la Concorde is lighted by the new lamps; and their location will therefore be well known to those delegates to the recent International Gas Congress who visited the Clichy works of the Paris Gas Company. For a description of the system we must refer readers to the "JOURNAL" for Nov. 28 last; but an idea of the form of lantern and column adopted for this particular installation is conveyed by the accompanying



illustration. Ordinary petroleum oil is used; and the lamps are each fitted with a mantle 2 inches in diameter, giving an actual illuminating power of 995 candles. This type of lamp was recently tested by the Paris Municipality at their laboratory, when it was found that, with a consumption of 400 grammes of oil per hour, each burner gave 10.36 carcels. Those who are acquainted with this portion of the Tuileries will remember how dismal it has been at night, and so poorly lighted that it has been difficult to see one's way on a dark night. But since the new system has been introduced, one can quite easily read a newspaper on any portion of the Quai. The light is seen to advantage on the opposite side of the Seine, in front of the Gare d'Orleans. Undoubtedly the Quai now ranks among the most brilliantly illuminated streets in Paris. There are eleven posts, each carrying three lamps. A less number of lamps, however, would light the Quai quite as well if they were distributed on both sides of the street. The present posts are in one line; and half of the light is thrown over the walls of the gardens. Consequently, as these are closed at night, one-half of the light is wasted. In all probability, the position of the lamps will be changed after the present demonstration has been completed. Early next month, the Kitson Company will commence the erection of a hundred lamps in the Bois de Boulogne.



Incidentally it may be remarked that for some months the same system of lighting has been in operation in the grounds of the Czar's palace at St. Petersburg.

In regard to the cost of operating the Kitson system, the following interesting record has been furnished by Mr. F. H. Richardson, of the North-Eastern Marine Engineering Company, Limited, Sunderland. The figures refer to nine 1000-candle power lamps which the Company have in use, and cover the four complete weeks ending on Friday, the 28th ult.

		Oil Used, Gallons.	Hours Run.
First	week ending Friday, Sept. 7 . . .	41	78½
Second	„ „ „ Sept. 14 . . .	39	68
Third	„ „ „ Sept. 21 . . .	40	72½
Fourth	„ „ „ Sept. 28 . . .	41	71
		161	290
Total gallons of oil at 9½d. per gallon for 290 hours .		£6 7 5½	
Mantles . . . . .		£0 18 9	
Glass . . . . .		0 10 0	
Gauzes . . . . .		0 2 0	
Man's time . . . . .		1 0 0	2 10 9
Total . . . . .		£8 18 2½	

£8 18s. 2½d. is thus the total cost for 9000-candle power for 290 hours, or 8½d. per lamp per hour. The average number of hours the lamps are operated per day is 14½. Mr. Richardson concludes his report with the remark: "The above shows a saving of ½d. per lamp per hour, or 20 per cent. over what the Kitson Syndicate stated."

**The Gas Interest in the New Parliament.**—Two of the London Gas Companies will be represented in the new Parliament. Mr. John Aird, whose return for North Paddington was noticed last week, is a Director of the Gaslight and Coke Company, and Sir J. C. R. Colomb, K.C.M.G., who retains his seat for Great Yarmouth, is upon the Board of the Commercial Gas Company. Sir F. T. Mappin, Bart., the Chairman of the Sheffield United Gaslight Company, was returned last Tuesday for Hallamshire. Sir Frederick, who has been both Mayor and Master Cutler of Sheffield, is a Liberal; and his majority over the Conservative candidate was 1750, as compared with 895 at the previous election. Mr. Norval W. Helme, who has defeated Colonel Foster, the Conservative member for Lancaster in the old Parliament, has for some years been Chairman of the Gas Committee of the Corporation. Last Saturday, Sir William Arrol was again returned for South Ayrshire with an increased majority.

**Acetylene Lighting in Bavaria.**—According to a recent report by Mr. F. D. Harford, the Second Secretary to Her Majesty's Legation in Munich, acetylene lighting is making good progress in Bavaria. A very large firm, who erect extensive acetylene installations, principally for factories, has been commissioned by the Bavarian State Railways to light several railway stations with pure acetylene, and to erect the necessary plant for lighting railway carriages with acetylene oil gas. The railway station at Oberhausen is now attached to the acetylene gas-works of the firm alluded to; and further orders for lighting with acetylene oil gas have been placed with others. The first acetylene gas-works for lighting small towns was erected at Hassfurt—a place of 2500 inhabitants; the price being rather less than ¾d. per hour, and the illuminating power 20 candles. There are 26 other small towns lighted in this way in Germany; and Mr. Harford says it would appear that the Empire is likely to make herself as pre-eminent in the acetylene industry as she has done in that of electricity. He cites Mr. F. Rose, the British Consul at Stuttgart, as his authority for the statement that at the close of the past year there were 120 firms engaged therein in Germany.

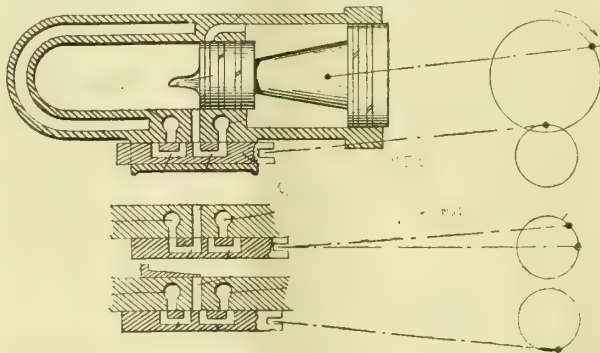
**Acidity of Moorland Waters.**—In a paper read before the British Association, Mr. W. Ackroyd, F.I.C., Public Analyst for Halifax, dealt with the above subject. He remarked that in 1881, when the action brought by Mr. Milnes against the Huddersfield Corporation was much under consideration, no satisfactory explanation could be afforded of the circumstance that moorland waters may give rise to plumbism; and it is only during the present decade that it has been clearly understood that the plumbo-solvent action of these waters is to be associated with acidity, due to carbonic anhydride and peaty acids. It may be very high, as from peaty gathering-grounds of small incline (say 1 in 44), or comparatively low, as in those of steep inclines (say 1 in 12). In the former case, violent action on lead precludes the use of the water for domestic consumption; and in the latter even a limit must be placed on the degree of acidity allowable. Mr. Ackroyd has never learnt of the occurrence of plumbism where the acidity of the water has been under the equivalent of 0.5 part of sulphuric acid per 100,000 parts of water; and this he tentatively proposes as a limiting standard of acidity for potable waters of moorland origin when the acidity is determined with phenolphthalein as the indicator. The average acidity of nine samples of water not above suspicion in this respect was 0.63—ranging from 0.53 to 0.91; while, on the other hand, 61 samples above reproach, from neighbourhoods where plumbism has not been known, had an average acidity of 0.27, the extremes being 0.20 and 0.41 part.

## REGISTER OF PATENTS.

**Gas-Engines.**—Melhuish, A. G., of Peckham, S.E. No. 20,602; Oct. 14, 1899.

This invention relates to a method of distributing or regulating the inflow of the combustible mixture to the cylinder of a gas-engine, and also the outflow of the exhaust gases; the object being to so construct and arrange the operating parts, that ordinary mushroom, butterfly, or other valves, that fall or are pushed upon their seating (and their consequent rattle and noise, and their liability, by the adhesion of foreign matter upon their faces, to get out of order), are dispensed with. Moreover, the operative parts before mentioned are so placed that no orifice (inlet or outlet) occurs in the combustion chamber or working part of the cylinder, except at the part near the end of the piston stroke, where there is less liability of leakage during the expansion of the exploded charge.

The invention is particularly applicable to the class of engine described in patent No. 9038 of 1895. The working cylinder is arranged without a valve, and the port that communicates with the atmosphere and is uncovered by the working piston, at or near its extreme out-stroke, is covered by a slide or D-valve, operated preferably by an eccentric from the crank-shaft. This D-valve slides upon a face in which there are three ports—one (say) above and the other below the port communicating with the cylinder—one of the ports communicating with an air supply, and the other with an exhaust-pipe. The slide or D-valve, when in action, alternately puts the air-supply port and the exhaust-port in communication with the middle port leading into the cylinder; the position of the eccentric on the crank-shaft being so arranged that the following operations take place in the sequence required (it should be said here that the top of the working piston is fitted or formed with a deflector, for directing the incoming gases to the combustion end of the cylinder). At the point nearly coinciding with the extreme outstroke of the working piston, the



middle port is passed by the piston, and the slide or D-valve puts the middle port in communication with the exhaust-port for the relief of pressure in the working cylinder; the relation of the eccentric to the cranks being such that the D-valve is moved to cut off the exhaust, and open communication with the air-inlet at the same time that the working piston opens communication with the larger cylinder for suction to take place. This causes an inrush of air and gas to enter the working cylinder, and be deflected towards the combustion chamber, for compression by the return stroke, when communication is again opened to the exhaust-port by the slide or D-valve for the discharge of the contents from the larger diameter cylinder. The slide has a hole or small port, which, coinciding with the gas-inlet at the same time as the air-admission port, allows the gas and air to enter together.

In the accompanying diagram there is shown a sectional plan of the cylinder as constructed in the 1895 patent, but without valves; also views showing the different positions of the slide-valve.

**Discharging the Products of Combustion from Gas-Fires, &c.**—Beutier, L., and Vernier, C., of Paris. No. 21,417; Oct. 26, 1899.

The patentees claim as their invention the construction of an apparatus for the discharge of the products of combustion arising from gas-fires (and more especially from bath-heating appliances), consisting of a pipe with a shoulder, provided at its inlet end with a kind of suction lantern, and at its outlet with a valve-box furnished with an inclined plate, in which are formed apertures adapted to be closed by valves maintained open owing to their own weight. The admission lantern is provided with a collar, into which the discharge-pipe fits; this latter being mounted upon the apparatus "in such a manner that there exists in the piping a continuity of passage, through which the air of the room may be drawn, so as to pass out through the valve-box." The suction-lantern forms, in reality, a preliminary orifice for the evacuation of the foul air during the continuance of each air current.

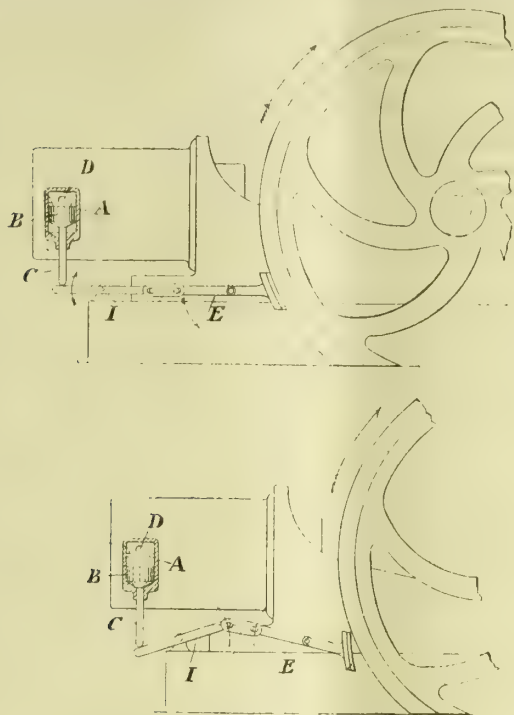
**Starting Gas-Engines.**—Bellamy, A. R., of Stockport. No. 21,050; Oct. 21, 1899.

The patentee remarks that, in starting gas-engines, it is a common practice to turn the fly-wheel by hand until the crank is in the best position to receive the starting impulse. Gas or explosive mixture is thus admitted, or forced into, the cylinder and combustion-chamber behind the piston, and, when a certain compression is reached, fired. It is found, however—and particularly with large engines—that the compressed charge behind the piston has a tendency to start the engine before the explosion takes place, thus moving the crank from its position, and neutralizing the efficiency of the initial explosion. To prevent this, brakes have been used which have been taken off by hand just prior to the explosion; but the object of the present invention is to provide means whereby such braking surface shall be automatically removed upon the initial or starting explosion taking place.

To effect this, there is provided a cylinder A, having a piston valve B sliding therein, and carrying a piston or stem C, the end of which protrudes out of the cylindrical casing. The cylinder A is in communication with the combustion-chamber of the engine by means of a port D. A suitable brake-lever E is mounted in juxtaposition with the flywheel (or it might be a brake-pulley, or other revolving part of the engine); and



this brake-lever is connected to a pivoted lever I. The tendency of the flywheel being to turn in the direction of the arrow, the brake-lever E and lever I are affected as shown by the arrows; but motion in this direction is resisted by the stem C of the piston-valve, which is arranged to be in contact with the lever. The brake-block is thus maintained in frictional



contact with the flywheel. On the initial or starting explosion taking place, the pressure of the gases is conducted to the cylinder A, through the port D, forcing the piston-valve B down upon its seat, as shown. The stem of the piston thus turns the pivoted lever I upon its fulcrum, raising the attached link, and thus removing the brake-block from contact with the flywheel.

**Working Two-Stroke Cycle Gas-Motor Engines.**—Abel, C. D.; a communication from the Gasmotoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 23,236; Nov. 21, 1899.

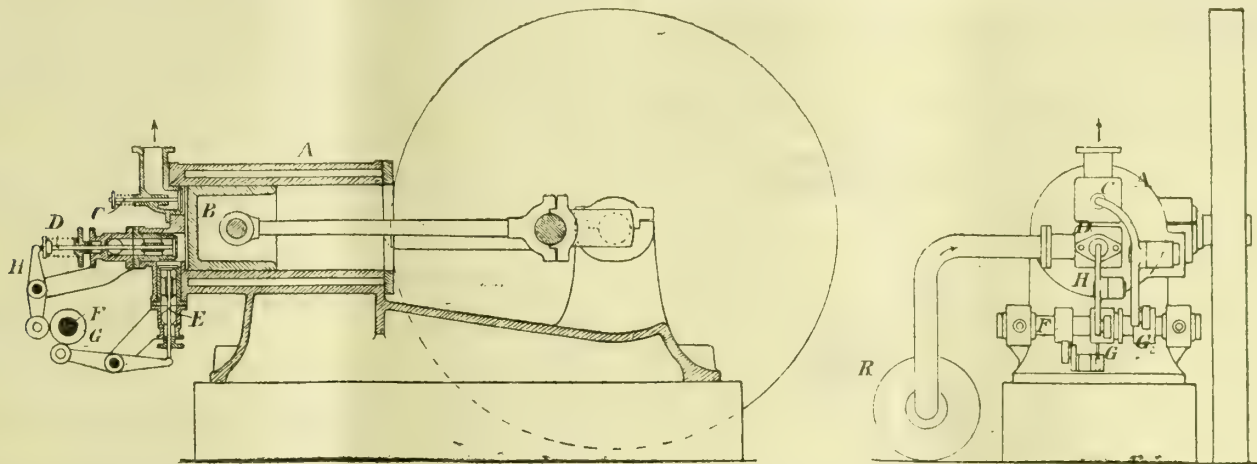
This invention relates to means for working two-stroke cycle gas-motor engines, whereby homogeneous compressed charges of gas and air mixture are introduced and ignited within the working cylinder, after this has been cleared of combustion residues and still burning gas particles, whereby "an absolutely reliable ignition is ensured, while the heat

generated by the combustion is utilized to the greatest possible extent." According to this improved method of operating, there is forced through the engine cylinder (which has no compression space), shortly before the piston reaches the inner dead-centre, a scavenger charge of air, which carries with it the remaining combustion gases and any particles of still burning gas mixture, and discharges the same through the discharge-valve. On the piston arriving at the dead-centre, the discharge-valve and scavenger air-valve are closed, and a previously formed homogeneous mixture of gas and air is introduced into the cylinder through a charging-valve, while the piston is performing a certain portion of its out-stroke. After this, the charging-valve being closed, the charge is ignited, and the expansive action due to the heat generated causes the piston to complete its out-stroke in doing work.

This method (say the patentees) differs from the known methods of working two-stroke gas-engines heretofore employed, in that the premature ignition of the charges which frequently occurs with the known arrangements is avoided, owing to the entering combustible charge becoming fired by residual burning gas particles, or by the highly heated combustion residues of the previous charge. On account of this premature ignition, it was, generally speaking, not practically possible to work two-stroke motors by means of previously formed homogeneous explosive mixtures, as the store thereof contained in the reservoir would be liable to be exploded by such premature ignitions. The two parts of the mixture—namely, the air and gas—had, therefore, to be stored separately in different reservoirs, or in the same reservoir, without being mixed before entering the cylinder; and owing to the shortness of the charging period, they had not time to mix thoroughly so as to ensure a reliable ignition and rapid combustion.

The suggested new method of working, however, "effectually avoids the liability to premature ignition by causing the combustion residues and particles of burning gas to be swept out of the cylinder by a scavenger charge of air, enabling explosive charges to be used of a perfectly homogeneous nature previously formed outside the cylinder." On the other hand, two-stroke gas-motors in which a scavenger charge of air has already been used for clearing out a compression space existing in the cylinder behind the piston when at the end of the in-stroke, differ essentially from the present improved method, both as to the manner of forming the charges and as to the volume of the scavenger charge of air required.

With such motor-engines, the ignition of the charges is effected when the piston arrives at the inner dead-centre; so that the introduction of the charges must necessarily be effected already during the compression period. Consequently, not only the compression space, but also a considerable portion of the space passed through by the piston, requires to be filled with clearing air or air for combustion, into which the gas then enters; and therefore the mixing of the gas and air constituting the combustible charge can only take place in the cylinder itself. Furthermore, with existing methods, a considerable quantity of air is necessary for the scavenger charge, as this has to force out a large volume of combustion gases contained in the compression space, and a large portion of the cylinder. The scavenger charge remaining in the cylinder no doubt (the patentees remark) serves as the air supply for the next explosive charge; but, owing to the unavoidable mixture of the scavenger charge with the combustion gases, a very large volume of air must be employed in excess of that required for the explosive charge, if all the combustion gases are to be expelled.



According to their present invention, on the other hand, only a comparatively small quantity of air is required for the scavenger charge—namely, only slightly more than the volume represented by the small dead-space or clearance between the piston and cylinder end, so that a saving is effected both as to work done and weight of engine. Lastly, a very energetic cooling and clearing of the piston's surface is effected, as the scavenger charge has to force its way at high speed through the very narrow clearance or dead-space between the piston and cylinder end, whereas with the existing methods the scavenger charge has to pass through the large capacity of the compression space and part of the cylinder, in which it consequently only travels at slow speed, and with imperfect contact for cooling purposes.

The illustration shows a longitudinal section and end view of a gas-motor engine working according to the present invention. A is the engine cylinder; B, the piston; C, the discharge-valve; D, the admission or charging valve for the explosive charge; E, the valve for the scavenger air-charge; and R, the reservoir for the compressed explosive mixture. Towards the end of the discharging period, the air-valve is opened, and the entering air (supplied in any suitable manner) drives the remaining combustion products out through the open discharge-valve. At the dead-centre, both valves are closed. On the other hand, the charging-valve is opened, and admits compressed explosive mixture into the cylinder during the first part of the piston's out-stroke, which charge is ignited directly after closing the charging-valve. The pressure in the cylinder then suddenly rises, and then gradually decreases, during the remainder of

the piston's out-stroke, after which the discharge-valve is opened. The valves are actuated by means of a way-shaft F, driven from the engine-shaft, and having cam-discs G, which effect the opening of the valves through rollers and levers H. The regulation of the engine is obtained by varying the duration of the admission of explosive mixture, and consequently the volume of each explosive charge.

**Internal Combustion Motors.**—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 12,734; Oct. 31, 1899.

This invention relates to internal combustion motors operating on the four-stroke or "Otto" cycle. It has for its object the regulation of the power developed at each ignited charge by varying the volume of gas and air drawn in to make such charge—these volumes being altered automatically by the governor, within certain limits, so as to be suitable for the load the motor has to drive without cutting out charges. This maintains a more equable rate of speed. The means employed for carrying out this object are mainly in connection with the gas-valve and the charge-admission valve, with the gear employed to operate them.

The illustration (p. 964) shows an elevation (partly in section) through the admission-valve, and a plan of same (also partly in section) through the admission-valve and the gas-valve.

One lever A is arranged to open the gas-valve B and the charge-admission valve C, by means of a cam D and a substantial roller I; while a second lever F, cam G, and roller H (or its equivalent) control the valves







## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Results of the American Coal Tests of the South Metropolitan Gas Company.

SIR,—We have had many inquiries as to the working results from the American coal recently tried at several of our works. I shall be glad if you will permit me to make use of your columns for my reply, as the information will probably be of interest to many of your readers.

Gas made per ton (corrected to 30 in. and 60°), 10,550 cubic feet.

Illuminating power, 16½ candles.

Coke, very good hard, and close grained. Quantity sold over weigh-bridges, 11½ cwt. per ton of coal carbonized; or, adding that used for fuel; a total of about 14 cwt. per ton.

Tar and ammonia, similar in quality to the production from Durham coal; but the tar is rather more viscous.

The coal is very clean and free from sulphur, and is readily handled in inclined retorts set at 32° angle.

CHARLES CARPENTER,  
Chief Engineer.

South Metropolitan Gas Company,

709A, Old Kent Road, S.E., Oct. 13, 1900.

### The Allowance to be Made for Fast and Slow Meters.

SIR,—I have only just seen your issues for the last few weeks, and observing the discussion upon the testing of gas-meters, I should like to make one or two observations.

First, as to the tables of percentage of error. Your correspondents are wrong in thinking these incorrect. They are not. The Sale of Gas Act, 1859, says a meter must not vary "from the true standard measure of gas more than two per centum in favour of the seller or three per centum in favour of the consumer."

What the table gives is the figure of percentage of variation from the true standard—i.e., the gasholder. Thus, if a meter indicates 100 cubic feet when only 95 feet have been passed, that meter, according to the Sale of Gas Act (and the tables) is 5·26 fast (5 feet in 95). This is surely the only reasonable way in which a thing can be compared to a standard—i.e., in the percentage of that standard. If it were practicable to shut off the meter when 100 cubic feet had passed on the holder, it is obvious that the reading on the meter index would be 105·26, or 5·26 fast as compared with the standard 100 feet. When it comes to using this table as a means for correcting an account which has been paid upon the reading of the index, this is, of course, another matter, and is not the purpose for which the tables are intended. A correct calculation can, however, easily be made in such a case as that pointed out by "B. R. P."

What I wish to make clear is that the tables (for which, by the way, the late Mr. F. W. Hartley was not responsible) are correct according to the Sale of Gas Act, for which purpose they are intended. They were compiled by the Metropolitan Board of Works.

As to corrections for temperature, Mr. Hartley, in a later edition of his "Gas Measurement," put the thing in a very concise and correct manner; and these instructions are embodied in the new edition.

Westminster, S.W., Oct. 11, 1900.

JACQUES ABADY.

## LEGAL INTELLIGENCE.

### Compensation to a Beckton Gas Stoker.

At the Woolwich County Court last Wednesday, his Honour Judge Addison, Q.C., had before him the case of *Albert v. The Gaslight and Coke Company*. It was an action brought under the Employers' Liability Act to recover compensation for injuries received by a stoker through the alleged negligence of the Company in providing defective appliances. Mr. F. Watt appeared for the plaintiff; Mr. Lothouse represented the defendants. Plaintiff's case was that he had been in the employ of the Company 26 years, and on the 26th of March was at work charging the retorts by a stoking-machine which travelled, loaded with coal, over rails. The machine should have had a guard on each side, so as to knock away any obstruction on the rails. Plaintiff had his foot on the line, and if there had been a guard, it would have pushed his foot away; whereas the wheel passed over it, inflicting permanent injury. He was six weeks in the Seamen's Branch Hospital; two of the outer bones of the foot having sustained compound comminuted fractures. The wound had healed; but the injury to the tendon of the foot was permanent. He used to be paid 5s. 9d. a day; but since August he had been taken back into the service of the Company at a reduced rate of wages—viz., 4s. a day. He was unable to work at the retorts, and did odd jobs in the yard. He had a wife and twelve children. He and most of the witnesses were Germans. For the defence, it was stated that the mechanical stoker moved very slowly (at the rate of a mile in 1½ hours), allowing ample time for the plaintiff to remove his foot out of danger. The machine had guards when the accident occurred—in fact, it was just the same then as now. There were 48 machines at work at Beckton. The guard left a space of ½ inch between it and the rail; and plaintiff probably got his foot in. It was urged that there was no defect in the appliance, and no fault on the part of the Company. His Honour gave judgment to the effect that the plaintiff was to be paid 10s. 6d. a week, the difference between the old and the present wages.

**Record Water Consumption in the Tees Valley.**—During the week ending Sept. 29, a record was made in the quantity of water supplied by meter in the Tees Valley Water Board's district—viz., 69,201,000 gallons. The previous highest record was 68,000,000 gallons in a week, when the Middlesbrough Corporation required 3,000,000 gallons for filling a large gasholder tank. The ordinary consumption for the week ending Sept. 29 was 20,000,000 gallons; bringing the total to 89,208,000 gallons.

## MISCELLANEOUS NEWS.

### THE POSITION AND EXTENSION OF THE CARLISLE CORPORATION GAS-WORKS.

Report by Mr. Corbet Woodall.

The minutes presented by the Gas Committee at the Meeting of the Carlisle City Council last Tuesday, contained a report by Mr. Corbet Woodall on the question of the extension of the gas-works, as well as one (dated April 30 last) by Mr. C. B. Newton to the Gas Committee. Mr. Newton's report was of some length; and in it he laid stress upon the need for an increase of the manufacturing plant at the gas-works, and advised that the extensions be made at Boustead's Grassing—the first instalment to consist of plant for the production of 500,000 cubic feet per day, at an estimated cost of £33,000. Owing to the importance of the question, the Committee are going to hold a special meeting to consider it.

The following is the full text of Mr. Woodall's report, excepting the introductory paragraph:—

The position with regard to the gas works and supply is as follows: The demand for gas has overtaken the productive capacity of the plant at the gas-works; it has, indeed, considerably passed that capacity. I am informed that for two winters all the retorts have been in full work, and that only by the limitation of pressure, involving as it must have done some inconvenience to consumers, has the catastrophe of a total extinction of the lights been avoided. No gas undertaking is in a safe condition which has not a reserve of retorts in hand in midwinter. In your case there was no such reserve; and the whole number when doing their best could not furnish sufficient gas to meet the demand. If inconvenience was felt last winter, the same must be experienced to a greater extent in the winter coming, because the demand is increasing; and no provision whatever has been, or can now be, made this year to meet it.

The growth of the business is shown by the following table:—

Year.	Gas Made. Thousands.	Increase. Total.	Per Cent.	Make. Per Ton.	No. Con- sumers.
1894 ..	232,790				
1895 ..	250,154	17,364	7·45	10,713	7347
1896 ..	260,423	10,269	4·10	10,778	7705
1897 ..	275,539	15,116	5·80	10,525	8450
1898 ..	282,278	6,739	2·44	10,729	8633
1899 ..	297,742	15,464	5·48	10,480	9150

From this it appears that, notwithstanding efforts to check the supply, the increased make last year was rather in excess of the average for the past five years. It is desirable to bear in mind that, if the demand grows at an average rate of 5 per cent. compound, the output must double in fourteen years. There can be no doubt that extensions of the producing plant are already considerably overdue.

Choice of three courses has been put before the Committee by which the needed power may be obtained. These three practically cover the possibilities available. They are: (1) An extension of the short retort-house so as to increase the facilities for the making of coal gas. (2) The erection of a plant for the manufacture of carburetted water gas as a supplement to the existing coal-gas apparatus. (3) The erection on the land at Boustead's Grassing of works and plant supplemental at first to the existing works, but extended later so as to provide for the whole supply.

Dealing with these in order, I have no hesitation in saying that the first is open to such grave objections that it is practically impossible. Already the site of the works is fully occupied. A gas-works requires, in addition to the space for plant, a considerable (proportionate) area for the storing of coal, the handling of materials, and for treating and storing coke. The absence of room for the latter is one of the greatest of the present difficulties. Now if additional retorts are built, these will not only occupy space difficult to find, but they will also require an increase of coal storage, and they will add to the quantity of coke to be dealt with. Having regard to the situation of the works and to its already congested condition, any increase of the output of coal gas will inevitably make the works a nuisance, and their removal a necessity. This method, then, should not be adopted.

The carburetted water-gas system has great advantages, where, as in your case, space is limited; among others: (a) The area occupied by the producing plant is much less than is necessary for coal-gas retorts of the same power. (b) As no coal is used, it is not necessary to provide coal-stores. (c) The process does not produce coke, but consumes it. If the demand for coke is slack, and the disposal of it difficult, carburetted water gas provides a welcome outlet for the surplus. (d) The cost of the plant is considerably less than that for coal gas. (e) The use of cannel might be discontinued, cheaper coal gas made, and the enrichment to the quality required effected economically by the carburetted water gas. (f) The actual cost of making a mixed gas of 20-candle power will be less at present prices than if cannel and coal only are employed. These conditions need no enforcement. If the quantity of gas required is to be provided at the present works, carburetted water gas offers the only, and at the same time efficient and economical, method of producing it.

Mr. Woodall next discusses the question of the removal of the works. He says: If the demand for gas continues to grow rapidly, the necessity for this drastic measure will have shortly to be considered. I do not think you should count upon adding more than 60 per cent. to the producing capacity of the works by means of carburetted water gas; and bearing in mind that there is a deficiency now of 10 per cent., such an addition would be exhausted in about five years. The proposal to erect a retort-house and plant for making a million feet daily at Boustead's Grassing, and to set retorts at first equal to half-a-million, keeping both works in action through the greater part, if not the whole, of the year, does not commend itself to me. I would much prefer to see complete works for at least a million erected straight away whenever the new station is decided upon. My reason is that such works would supply all the gas required through about eight months of the year, during which the old works could be closed down. During the winter months the excess could be made at the old works, and only a comparatively inexpensive staff would be required there. The cost of completing the works would be about £5000



only—a sum not worth considering when it is remembered that the first half million will cost over £30,000. Considerable extra cost will attach to the running of two works together for a business such as yours. I would advise, therefore, that no important renewals should be made at the old works after the new is decided upon, but that the whole of the manufacture should be concentrated on the new site as the old apparatus is worn out.

Whenever a new manufacturing station is built, I would advise that it be placed as far away from the town as possible. The land at Boustead's Grassing which has already been scheduled for the purpose is, in this respect, not suitable. While it is considerably further from the populous part of the city than are the present works, it is yet so close that it will shortly be reached and passed by houses. I would strongly advise that new land be scheduled, of that held by the Council, at the greatest distance possible. The question of the interference by the present works with the amenities of the city is one upon which the Council are the best judges, and need no outside advice. That removal must take place within a comparatively short term of years is extremely probable; and it is for the Committee to decide whether, under the circumstances, more money should be spent on the old works.

If my view as to the situation of new works commends itself to the Committee, then it follows that, as parliamentary powers are necessary for the acquisition of additional land, it will not be possible to start new works for at least a year, or to have them ready for use before the winter 1902-3. This is too long a period to wait; and, in my opinion, the circumstances all point to the wisdom of erecting carburetted water-gas plant at once, and making preparation for the removal of the works within possibly five or six years. An alternative to this plan would be to leave the present works undisturbed, and to erect a carburetted water-gas plant at the Grassing immediately; letting the removal wait to an indefinite period.

The reasons I have given against erecting a section of coal-gas plant are two—first, that a retort-house should not be placed so near the town, but should be pushed as far to the south as possible, necessitating further parliamentary powers and consequent delay; second, that assuming the Committee to be content with the land they have, a retort-bench, if erected, would need to be worked practically all through the year; and this would involve either (a) the carrying on of two stations or the concentration of the whole work, with the necessary large expenditure of capital, on the Grassing land. Neither of these objections would attach to the erection of the carburetted water-gas plant: First, the working of the plant causes no smoke, and little, if any, smell, so that it can quite safely be placed on the present land; secondly, such a plant can be lighted up and let down without suffering damage. It can, therefore, be run at such times, and for such periods, as convenience and economy dictate. This plan is, in my opinion, the best that the Committee can follow.

Apart from the present urgent need for additional works which a properly designed water-gas plant seems alone able to satisfy, such a plant will be of decided value to the undertaking. I have named some of its advantages earlier in this report, and to have the alternative in times of high-priced coal of calling in the aid of oil palpably strengthens the position of the Committee. It would be necessary to transport the necessary coke from the Citadel to the Grassing; but this would not be a heavy charge. The plan proposed will make the first cost slightly heavier than if the plant were erected on the old works. A new building must be erected for the generating plant, and a small relief holder will be needed. On the other hand, a building properly designed will be more convenient than the cramped space proposed to be used, and the small holder will cost less than the value of the old one which it was proposed to adopt, and which would be withdrawn from the present storage capacity. There would be no objection to the erection of the purifiers necessary for the carburetted water gas on the land now available at the Grassing. If the Committee decide to confine the works to the present site, then I would advise that the present condensers be removed and a coke yard or store formed at the north end of the small retort-house.

## THE SHREWSBURY CORPORATION AND THE GAS COMPANY.

### Suggested Purchase of the Gas-Works.

At the Meeting of the Shrewsbury Town Council on Monday last week—the Mayor (Mr. R. S. Hughes) in the chair—the preliminary skirmish took place in what may possibly be one of the leading contests in the first session of the new Parliament. It arose on a letter which had been received from Messrs. Stevenson and Bursall (who, it may be remembered, were consulted by the Corporation in connection with the arbitration proceedings early in the year with respect to the damage done to the Gas Company's mains by sewerage operations), pointing out that, according to the Company's accounts for the ten years 1890 to 1899, they had apparently for many years been going on without any working capital, and had had large overdrafts from their bankers. They ought, it was urged, some time ago to have called up their remaining authorized capital, and used it for trading purposes, instead of paying high interest to the bank. Another point which the writers thought required elucidation was that during the years 1891 to 1899 the Company did not spend anything on works out of capital; for it was quite beyond belief that in this time they had not done anything to extend their works, mains, or meters. The only solution which could be offered was that whatever extensions had been made were paid for out of revenue. This conclusion was, they said, borne out by the fact that during the years 1890 to 1899 inclusive the Company had been spending in repairs and maintenance of works and mains an average of 8-78d. per 1000 cubic feet of gas sold. In an undertaking of this size and description, it should be difficult to spend as much as 5d. per 1000 cubic feet on the average of the years; and therefore the balance of 3jd. would in all probability be used in providing extensions of works, mains, service-pipes, and meters, and possibly also a portion of the 5d. allocated as the full amount which ought to be laid out upon repairs and renewals. There was no doubt whatever in the writers' minds that had the Company been working under a standard price and a sliding-scale instead of a maximum price and a maximum dividend, they would have reduced the price of gas materially; and, indeed, had only a proper

amount been expended upon repairs and renewals, the price would have had to be reduced at least 3d. or 4d. per 1000 cubic feet. They went on to say that the Company had come to the end of their capital, and must in a very short time apply to Parliament for further powers. It was a matter, therefore, for the Corporation to consider whether, as they were the owners of the electric lighting plant and the water-works, and thus had absolute control over the streets, with the exception of the gas-mains, it would not be advisable, from this point of view alone, to acquire the gas undertaking. The Corporation were in an exceptionally good position now to secure it, if they desired to do so; and, indeed, it would be better for them to purchase now than at a later period. There was no doubt in the writers' minds that it would be greatly to the advantage of the town if the undertaking were in the hands of the Corporation; and they thought the present was an opportunity which would not return for many years. Purchase by the Corporation would not, they said, do any harm to the shareholders; for, as a matter of fact, in every gas purchase each shareholder had received more than the market value of his shares, unless there had been some gross mismanagement. In conclusion, Messrs. Stevenson and Bursall informed the Corporation that if they decided to acquire the Company's undertaking it would be necessary to proceed by Bill next session.

Mr. DEAKIN (Chairman of the Lighting Committee), dealing with the statements in the letter, said the 3jd. per 1000 cubic feet sold, to which Messrs. Stevenson and Bursall had called attention, might not appear a matter of very great moment; but if they took into consideration the quantity of gas sold by the Company during the last ten years—viz., 1,309,691,663 cubic feet, or an average annual sale of 130,969,166 cubic feet—it represented an annual overcharge to the gas consumers of the borough and district amounting to £2046 11s. 9d. This represented an equivalent to 5d. in the pound on the borough rate, and was distinctly, if the letter was worth anything at all, an overcharge spent on improving works and property out of revenue, instead of the money coming out of capital account. It totalled up in the ten years to the large sum of £20,463 17s. 6d. This was sufficient for his purpose, which was to show the necessity for a thorough and searching investigation into the matter. If application were made to the Court of Quarter Sessions for the appointment of an accountant to investigate the Company's affairs, he believed regard would be had to this overcharge, and the Company made to refund some of the money. Alluding to the recommendation to the Corporation to purchase the gas undertaking, he remarked that this was a very large question; and he was not prepared to say whether or not it would be wise. However, it was clear the Company intended to apply for a new Act; and therefore he thought the Corporation should insist on having inserted therein a clause giving them power to purchase, if they desired, by arbitration or valuation. He moved that the letter be referred to the Estates and Parliamentary Committee.

Mr. WOODHOUSE asked with what object the question was to be investigated. Was it with the view of ultimately trying to purchase the gas-works, or of referring the matter to the Court of Quarter Sessions, and trying to get proof of the charges made in the letter? He should like to remind the Council that they had had a little experience quite recently of fighting the Gas Company.

Mr. DEAKIN said, with regard to the reference to Quarter Sessions, if they made out a satisfactory case to the Recorder, the payment of all costs would fall on the Company.

Mr. WOODHOUSE said there was a point which Mr. Deakin did not touch sufficiently. The Company had spent money in improving their property; and he thought they would be able to show that, in order to be up to-date, it was necessary for such expenditure to be incurred periodically. The Company had, within the last twenty years, appealed to the public more than once for capital, which had been subscribed and spent; so that any reference that might ultimately be made to Quarter Sessions had another side besides the one mentioned by Mr. Deakin.

Mr. HOW said he rather agreed with Mr. Woodhouse. He thought it should be made quite clear that the Council were not animated by any feeling against the Company, but only with the desire to protect the ratepayers.

Mr. DEAKIN, in reply, said he did not propose to rush into hostile litigation, or anything of the kind; but he considered he should be failing in his duty as Chairman of the Lighting Committee, if a letter such as the one they had before them, came to him, and he did not submit it to the Council. It never occurred to him that there was any rivalry between the Company and the electric light undertaking. The electric light was making very satisfactory progress indeed; but he was sure it would never do the gas undertaking any harm. The more electric light was used, the more gas was sold. This was the case in every instance. If this question were referred to the Committee, it should not be simply for them to watch the new Bill, but for the purpose of considering the whole subject.

The letter was unanimously referred to the Committee.

Commenting upon the proceedings above reported, the "Shrewsbury Chronicle" says: "The Estates and Parliamentary Committee should proceed with their deliberations promptly, but warily, remembering that not so very long ago the Corporation tried a fall with the Gas Company, and came out of it very badly. The firm of Engineers advise the Shrewsbury Corporation that now is a very favourable time to purchase the Gas Company's undertaking, and they give certain reasons for their recommendation, not the least potent of them being the intention of the Company to apply for further powers in the next session of Parliament. It would doubtless be a good thing to acquire control of the gas supply of the town, because it ought to be possible to purchase, at a valuation or by arbitration, on such terms as would ultimately make the investment a paying one for the town. But the Council are hampered by other heavy responsibilities; and it is doubtful whether a policy of purchase would have the support of the majority of the ratepayers at the present time. Already the public debt is very heavy, and the water supply problem still awaits solution; and, fearful that for some years at least the gas-works might be a burden and not a profit, the ratepayers will probably hesitate before they endorse their purchase. The suggestion that the Town Council should watch the Company's Bill, and endeavour to get a clause inserted giving power to purchase on equitable terms, is, however, one that is well worth consideration. The expense would not be great, and the position of the Council would be immensely improved if at any subsequent period they resolved to buy."



## METROPOLIS GAS SUPPLY.

## Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult.

I.—*Illuminating Power.* The average illuminating power in standard sperm candles at each of the testing-places was as follows:—

*The Gaslight and Coke Company—*

Fenchurch Street, E.C.	17'0
Kinghorn Street, Cloth Fair, E.C.	16'6
Dorset Buildings, E.C.	16'4
Ladbroke Grove, W.	16'6
Vincent Terrace, N.	17 0
Carlyle Square, Chelsea	16'2
Camden Street, N.W.	16 4
Graham Road, Dalston	16'7
Kingsland Road, E.	17'2
Vinery Villas, St. John's Wood	16'9
Lambeth Road, S.E.	16'3
Hornsey Road, N.	16'6
George Street, Hampstead	16'6

*Commercial Gas Company—*

Wellclose Square, E.	16'6
Parnell Road, Old Ford	16'8

*South Metropolitan Gas Company—*

Hill Street, Peckham	16'9
Bedford Road, Clapham	16'4
Stoney Lane, Tooley Street, S.E.	16'6
Lewisham Road, S.E.	16'8
Blackfriars Road, S.E.	16'6
Burrage Road, S.E.	16'7

It will be seen from these results that the average illuminating power was higher than the parliamentary standard—16 candles—at all the testing-stations. The following were the only deficiencies reported during the quarter: Carlyle Square, on July 2, 15'83 candles; Bedford Road, Clapham, on Aug. 2, 15'88 candles.

II.—*Purity.* The presence of sulphuretted hydrogen in the gas on any day was not reported during the quarter, except on one occasion—viz., on July 14 at Lambeth Road. The average amount of sulphur in other forms than this was considerably less than the quantity permitted—17 grains—at all the testing-stations. Several excesses of sulphur in the gas made by the South Metropolitan Company were reported during the quarter by the Official Gas Examiners. Ammonia was generally present in the gas more or less frequently during the quarter, but only in slight quantities. The amount allowed—4 grains—was not exceeded at any of the testing-places.

## BIRMINGHAM CORPORATION GAS SUPPLY.

## The Extensions at Nechells.

Last Thursday, the Chairman (Mr. J. H. Lloyd) and members of the Gas Committee of the Birmingham City Council were afforded an opportunity of inspecting the additions which are being made to the gas-works at Nechells, at a cost of about £250,000. These extensions, which are being carried out to the plans and under the superintendence of Mr. Henry Hack, M.Inst.C.E., were described in the "JOURNAL" for Oct. 18, 1898. The works as they stood before the latest addition was undertaken—Saltley and Nechells combined—were capable of turning out daily 10½ million cubic feet of coal gas and 4 million cubic feet of carburetted water gas. The extensions, which are expected to be completed in time for the work of the coming winter, will give an additional producing power of 5 million cubic feet of coal gas and 2 million cubic feet of carburetted water gas. But this full advantage will not be apparent just yet; for while the new plant is being erected, it is the intention of the Committee to demolish two of the older retort-houses and reconstruct them. It is estimated that this will mean in the coming winter a reduction of the present producing power of 10½ to 8 million cubic feet. This represents the demolition of one old retort-house; the second will share the same fate later on.

The principal new feature in the works at Nechells is the gigantic retort-house, 324 feet long and 114 feet wide, consisting of four benches, each of 13 beds of eight retorts on the inclined system (the angle being 32°); giving in all 416 retorts. All the settings are on the regenerative principle, after the Salford model. The benches are arranged for the charging to be done from the middle of the house, and the discharging towards the outer side walls, in order that there may be plenty of air where the hot coke falls. This is a point on which, characteristically, Mr. Hack has considered the comfort of his men. The width of the staging in the middle of the house, between the two lines of benches, forming the charging-floor, is 40 feet; and there is a railed-off central opening to the coke-floor level, extending nearly the whole length of the house. The height of the retort-house, from the coke-floor level to the discharging-floors at the sides of the house, is 12 feet. The charging-floor in the middle is 13 feet higher; and the height of the roof from the coke-floor is 64 feet. The loftiness and open structure of the roof, the openings in the charging-floor, and the arrangement of the discharging-floor, make the retort-house one of the best ventilated and the coolest in England. When the installation is finished, the coke from the retorts will be removed by a De Brouwer conveyor.

From the new retort-house the gas will be conveyed by a 36-inch main to the purifying plant, which is now in course of erection, but will not be completed for another year or so—a portion of the work having been postponed in consequence of the present high cost of material and labour. Other accessories bring the cost of the new producing plant to about £150,000. The necessary additional storage, represented by two gas-holders on the Nechells side—one holding 4 million cubic feet and the other 8½ millions—accounts for the balance of £100,000. In addition to the work now being done at Saltley, Mr. Hack is superintending the erection at the Swan Village works of carburetted water-gas plant to produce 1½ million cubic feet of gas per day. At present, the total producing power of all the Corporation gas-works is about 36 millions daily, which represents roughly an average day's consumption.

## THE LONDON COUNTY COUNCIL AND GAS AND WATER QUESTIONS.

The first Meeting of the London County Council after the summer recess was held last Tuesday, when the Chairman (Mr. W. H. Dickinson), as usual on the resumption of the sittings of the Council, addressed the members on the work of the various Committees during the year ending the 31st of March last.

Referring to the operations of the Public Control Committee, he remarked that the subject of the method of testing gas had engaged much of the Committee's attention. The experience of the Council's officers, which had been very extensive, showed that in 90 per cent. of the tests made by the portable photometer the illuminating power of the gas, as supplied to the consumer in London, was below the legal standard, and this notwithstanding the fact that the gas, as tested at the fixed stations, complied with the requirements of the law. This discrepancy appeared to call for correction; and accordingly the Committee advised the Council to seek powers to enable them to test the gas at other places than the testing-stations, by means of the portable photometer. The Bill introduced by the Council for this purpose had, however, been rejected by a Committee of the House of Commons, on the ground, he presumed, that the tests might be taken in unsuitable premises, and therefore be unreliable. He hoped the Committee might devise some scheme which would meet this objection, and enable the Council to be more successful in their next application to Parliament. In the meantime, they had resolved to ask the Board of Trade to institute an inquiry in order to ascertain what was the true cause of the serious difference in the quality of the gas when tested at fixed stations and when tested by the portable photometer.

With regard to the Parliamentary Committee, in addition to their ordinary duties, they last year had to arrange for the Council's evidence being taken before the Select Committee of the House of Commons specially appointed for the purpose of inquiring into the powers of charge of the Metropolitan Gas Companies. The Council's case against the Companies was fully established, and the report of the Select Committee contained some important recommendations for reducing the standard price of the gas supplied by the Gaslight and Coke Company and other Companies, for altering the sliding-scale, for transferring the Gaslight and Coke Company's area south of the Thames to the South Metropolitan Gas Company, and for regulating the charges for gas supplied through automatic meters. The Bill promoted by the Council for legalizing the use of the portable photometer was eviscerated by the omission of its principal proposal; but it passed into law for the purpose of effecting certain restrictions upon the Gas Companies in their power of charging for the use of prepayment meters.

Coming to the work of the Water Committee, he said that they were evidently convinced that some comprehensive scheme for amplifying the supply of water to London was urgently needed. They did not believe that the Water Companies' plan of constructing enormous reservoirs in the neighbourhood of Staines, and storing therein the winter floods of the Thames, could ever be anything but a stopgap. They presented a most instructive table showing what the natural flow of the river had been from May to December in the years 1898 and 1899, as compared with the average flow over a period of 17 years. From this it appeared that, while the average daily flow in September had been 491,500,000 gallons, that in September, 1898, was only 213,400,000 gallons; and while the average in August had been 472,900,000 gallons, the flow in August, 1899, was only 231,100,000 gallons. When it was borne in mind that the Balfour Commission reported that London would, within 31 years from now, require to draw 300,000,000 gallons of water daily from the Thames, and that, in the opinion of the Commission, at least 200,000,000 gallons should be left at all times to flow down the river, it was clear not only that the amount of reservoir accommodation necessary for storing the winter floods in sufficient quantity to provide for summers like those of 1898 and 1899 would be far greater and far more costly than the Balfour Commission ever suspected, but also that in the end London would be compelled to resort to new sources at much greater expense than if this were undertaken now. He believed that, if the present opportunity were lost, future generations would look back to their action with much the same feeling of regret as that which had been expressed at the action of the City of London when, in 1612, it gave over the control of the New River undertaking to private hands.

## LOCAL AUTHORITIES AS COLLIERY OWNERS.

## The Bradford City Council Affirm the Principle.

In accordance with notice, Mr. E. R. Hartley last Tuesday invited the attention of the Bradford City Council to the following resolution: "That, in the opinion of this Council, it is desirable that the Corporation should have control of the supply of coal required by the Corporation for use in their various undertakings, and that it be an instruction to the Town Clerk to insert in the Bill to be promoted in the next session of Parliament a clause empowering the Corporation to become the owners of, and to work, a colliery or collieries, with power to borrow the necessary moneys required."

Mr. HARTLEY, in submitting his proposition, proceeded on the assumption that the advance in the price of coal amounted to about 5s. per ton which, he said, was a very moderate estimate, having regard to the actual increase which had been enforced. The additional price on the quantity of coal consumed by the Corporation was equal to a rate of about 10d. in the pound. The consumption of coal in the whole city was estimated at 1,500,000 tons a year, so that the people of Bradford would, at present prices, pay an extra £375,000 a year. The total sum received in rates by the Corporation was about £400,000 a year; and he asked the Council to try to imagine the situation which would be created if the rates were doubled. Really, the increase had crept along so insiduously that consumers had scarcely realized the full gravity of the position. A statement had been made that an increase of £7000 in the charges for water would drive the trade out of Bradford; and if half the coal consumed in the city was required for trade purposes, the outlook must become positively alarming when a tax of something like £200,000



was imposed. There was really nothing new in the acceptance of such a principle as that contained in the resolution. It was a step in the right direction; and after a supply had been secured to fulfil the needs of the Corporation, he was sure the undertaking would prove so successful that action would be taken to provide the whole city with a municipal coal supply. The burden had become intolerable, and no one realized it more than a business man. Asking why coal had increased in price, he said the output was greater than usual; and it could not be traced to any marked advance in the wages of the colliers. Both arguments were false. The plain truth was that a comparatively few people had obtained a monopoly of one of the natural resources; and they were taking advantage of their position while the attention of the people of this country was directed away from affairs at home. The increase in the price of coal to the nation was nearly equal to the whole of the national revenue. It was certain that unless the people secured possession of that terrible monopoly, it would crush their industries almost out of existence.

Alderman Wood seconded the proposition.

Mr. LAND opposed the resolution from a business point of view. Admitting that it was an outrage on both large and small consumers that they should be charged such high rates for coal, he said he could not see how the Manchester, Glasgow, Bradford, or any other Corporation could attempt, with any prospect of success, to provide their own coal supply with one or two collieries. Even in the case of the Gas Department, it would be dangerous to have to rely upon half-a-dozen or even a dozen collieries, considering the risks of labour troubles—in fact, the Gas Department had purposely contracted to be supplied from at least twenty different collieries, in order to ensure regular delivery. He submitted that such an undertaking as that proposed would be a dangerous one for the Corporation, and he hoped they would hesitate before pledging themselves to a resolution which would undoubtedly involve an expenditure of two or three millions sterling.

Mr. J. TRIFFITT was likewise antagonistic. In his opinion, this was not the best time to buy a colliery; for in four or five years the cost would be £60,000 or £70,000 less.

Mr. ABRAM PEEL considered the principle a good one, and said the movement ought to be helped.

Mr. A. PRIESTMAN observed that the combinations which were being organized all over the country, and particularly the Fine Cotton Spinners' combination, had power to purchase collieries to supply themselves cheaply with coal. These large trusts, composed of sensible business men, had come to the conclusion that they must get over the terrible monopoly which dominated the coal supply by going into colliery work themselves. If this were the case, surely the Bradford City Council ought to consider it worth while to pay some attention to the arguments which had been brought forward in support of the resolution Mr. Hartley had submitted.

The resolution was carried by a large majority.

#### THE ALLOCATION OF MUNICIPAL TRADING PROFITS.

At the Annual Conference of the Incorporated Society of Accountants and Auditors, held in the Town Hall, Leeds, last Thursday, a paper on the above subject was read by Mr. C. H. WILSON, a member of the Corporation.

In the course of his paper, the author said there were people who held the opinion that municipal trading concerns, such as gas, water, lighting, and traction undertakings, should not be worked to produce much profit; but he had never heard of anyone objecting to borough funds swallowing up the profits derived from market rights, cemeteries, &c. To such objectors he commended the following observations: (1) No business, municipal or otherwise, ought to be carried on at a loss; and (2) no municipal trading can be set up except with the consent, and at the cost, of the whole body of ratepayers—the cost of Acts of Parliament being almost invariably charged to the borough funds. The principal argument brought against employing municipal profits in relief of rates was that the municipalities should give consumers the benefit of all the profit made by reducing the price of the commodities or accommodation furnished. This was fallacious, for the following reasons: (1) The representatives of the ratepayers were not sent to the Council to give their time to act for consumers, but for ratepayers; (2) the workers should not be overlooked; (3) the ratepayers' credit should not be pledged for borrowing powers without some compensating advantage; (4) the city funds should not alone be charged with losses; (5) it had now been proved that corporations could supply at a better rate than companies; (6) the city fund should not be charged with the cost of obtaining powers without a compensating advantage; and (7) the ratepayers did not pay large salaries for the benefit of consumers alone. He was strongly of opinion that no more money should be extracted from the ratepayers than was absolutely necessary; and, further, that the prosperity of a town might be seriously interfered with by allowing the rates to fluctuate needlessly, as in these days, when new industries were constantly springing up, they might be frightened away from some places by such fluctuation, and others derive benefit in consequence. Another matter having an important bearing on municipal trading was the operation of the sinking funds imposed by Parliament. Sinking funds had the effect generally of rendering unnecessary the depreciations written off by private trading concerns; but, in spite of this fact, there were many members of corporations who inflicted hardship and loss on present-day ratepayers by preventing profits that would otherwise be available for aiding rates being so applied. The application of revenue profits to capital expenditure was nothing less than filching the money from present-day ratepayers, as otherwise such profits must undoubtedly be used in relief of the rates. In addition to being morally wrong, the system was also in direct conflict with the fundamental principles of the Acts under which municipal trading alone was possible. Great as had been the work of municipalities, it was by no means finished. There were many problems yet to be solved; but they could not be dealt with adequately, if the trading profits were not allocated properly, without seriously increasing the rates, which were already sufficiently high. He had always advocated the automatic passing of trading profits to the city fund. In Leeds, they had spent on capital account £4,773,991, and

against this a sinking fund of £905,021 had been accumulated. Losses amounting to £36,507 had been charged to the city fund, and, on the other hand, £269,673 of profit had been used in the relief of rates, while £93,502 of revenue profits had been spent on capital account.

The discussion upon the paper was opened by Mr. G. Swainson, the Borough Treasurer of Bolton, who entered a protest against the recent action of the London Chamber of Commerce in seeking to secure a limitation of the sphere of municipal trading. Personally, he thought such trading should go a little farther. He advocated the municipal control of the milk supply. Mr. Whittaker (Southampton), on the other hand, thought there ought to be some limit placed upon municipal trading. In Southampton, they had taken to supplying "ha'porths" of tea, soap, sugar, &c., in their municipal lodging-houses. Mr. Swainson now wanted them to go in for supplying milk; but he thought a limit should be drawn there. Municipalities could better watch over the interests of a town by seeing that those who undertook to supply articles should do so properly, than if they undertook to supply them themselves. If municipalities were to conduct these gigantic businesses, they could not get councillors to devote the necessary time and care to the work without some remuneration; and, as a result, they would require men adequately paid and properly qualified to manage their business. There would be another grave danger to be guarded against—that of men yielding to the temptation, which would be always before them, to accept secret and illegal commissions. If municipalities conducting big trading concerns were managed by poor men, there would always be this temptation. Mr. Lloyd Price (Manchester) argued that, while in theory there was nothing which a municipality might not take up, the limits fixed by usage were well defined. He would divide the matters in which municipalities might engage into essential and non-essential, including under the latter heading tramways, gas, and electric lighting. He quite agreed with the author of the paper that municipalities were entitled to make profits. But there were some points to be considered. For instance, in Manchester they had an installation for supplying hydraulic power, the cost of which was borne by every ratepayer, though the number of those using the power was very small. Mr. Stapleton (Cork) considered that municipalities made a mistake in not applying ordinary business principles to their undertakings in the manner in which they ought to be applied. Mr. Blandford (London) expressed the opinion that the first charge on municipal trading ought to be the reduction of the cost, and not reduction of the rates. The Chairman (Mr. F. Walsley) said experience showed that corporations did the work at less cost than private companies. He supported the theory that the former were entitled to trade in things which were possessed in common, such as gas and water, and also to extend to municipal enterprise the principle of accumulation and creation of profits. Mr. Wilson, in reply, said he had no sympathy with directors of railway companies sitting in the House of Commons, and using their influence to prevent municipalities from extending their tramway system. At the same time, he desired to impress on the conference that they ought to safeguard their position by showing that they did not intend to have anything to do with absurd municipal trading. There was a strong socialistic tendency throughout the country, which aimed at municipalizing everything. As accountants, they ought to stand up against this tendency; and in London especially, in connection with the establishment of the new municipalities, accountants might do much to resist it by applying themselves to public work.

#### COLWYN BAY DISTRICT COUNCIL PROPOSE TO PURCHASE THE GAS-WORKS.

A Special Meeting of the Colwyn Bay and Colwyn Urban District Council was held last Tuesday, to consider the question of promoting a Bill in Parliament for the transfer of the Gas Company's undertaking. Mr. G. Bevan, the Chairman, moved a resolution, authorizing the promotion of the necessary Bill. He explained that in the Gas Company's Act of 1896 the Council had five years in which they could purchase the undertaking without opposition and by valuation. The five years would expire in June next; and so it was necessary to serve the notices for a Bill in the ensuing parliamentary session. The gas-works was a very profitable undertaking; and it had grown at an enormous rate. In 1896, when the Council should have purchased the works, the output was 12 million cubic feet; while in 1899 the gas made and sold was 25 million cubic feet, so that in three years the output had more than doubled. It would therefore be very foolish if they failed to get possession of the works when they could do so at a fair price. Mr. J. Roberts, in seconding the motion, said it would be unfortunate if they had to raise the rates of the town any further; and if they had the gas profits to assist in providing the public expenditure, it would be beneficial to the whole of the district. They could also have cheaper gas, and could have full control of the public lighting. Mr. W. Davies said that last year £200 of the ratepayers' money was spent on the matter; and when the audit came, they should have that looked into. At Rhyl, it was recently said that £35,000 had been paid for what was only worth £16,000. He expected something of the same kind would occur at Colwyn Bay. The best consumers were sure to take electricity instead of gas. Why not wait a few years, and allow the competition of electricity to bring down the value of the concern. Dr. J. E. Brooks having supported the motion, the Chairman said as to the Rhyl Gas-Works purchase, there was no clause in the Act there which enabled the Council to buy at a valuation and without opposition, as was the case at Colwyn Bay. The Colwyn Bay works were practically new, and those at Rhyl were old. Even though the Rhyl Council had paid double the value—according to some people—they now made a profit of about £400 a year. The rise in the price of coal was greatly in favour of the Council. On the motion being put, only two votes were recorded against it.

The Bradford City Council last Tuesday endorsed a proposal of the Gas Committee that the wages of the purifying and yard men should be increased—the former from 6d. to 6½d. per hour, and the latter from 5½d. to 6d.



## ELECTRIC LIGHTING NOTES.

Application is to be made to the Local Government Board by the Harrogate Corporation for permission to borrow £10,000 for extensions to the buildings and plant at the electric light station.

The Rochdale Corporation electric lighting works, which have just been completed at a cost of about £30,000, commenced last Wednesday night to supply some of the shops in the principal streets.

The Stratford-on-Avon Town Council have resolved to make application for an Electric Lighting Order, and to oppose a similar proposal on the part of the United Electric Lighting and Traction Company.

At last Thursday's meeting of the Court of Common Council, the Streets Committee presented a scheme for the testing in future of all electric meters within the City, under the direction of the Electric Inspector, at the expense of the City of London Electric Lighting Company and the Charing Cross and Strand Electricity Supply Corporation; each Company to contribute, in addition to the other expenses, £200 per annum to the Corporation in respect of the Inspector's salary.

On Monday last week, the electric light undertaking of the Poplar District Board of Works, which has cost close upon £100,000, was formally inaugurated. The installation has been laid out by Mr. Alfred Blackman, formerly Electrical Engineer to the Aberdeen Corporation; and it will be carried on under his supervision. The present total capacity of the station is 32,000 8-candle power lamps; but space is left for large extensions. The arc lamps erected in the chief thoroughfares number 195; and it is proposed to convert 680 ordinary street-lamps by fitting them with incandescent electric lights. There are 65 miles of streets in the three parishes of Poplar, Bow, and Bromley; and upwards of 30 miles of mains have already been laid. Arrangements have been made with the National Electric Wiring Company for free installations for private consumers; and current will be supplied under the maximum demand system for lighting at 5d., 4d., and 3d., and for power at 3d. and 1½d. per unit. The Company who desired to light the district proposed to make charges of 7d. for lighting and 5d. for power. Arrangements are being made for the supply of meters on the "slot" system. It is stated that applications have already been received for 5000 8-candle lamps.

Last Friday, Colonel C. H. Luard, R.E., held an inquiry at the offices of the Hornsey District Council into their application for a loan of £73,500 for carrying out an electric light installation for the parish. The scheme has been prepared by Mr. R. Hammond, who has been appointed Consulting Engineer to the Council. It is on the continuous-current three-wire system—the pressure being 480 volts; and it has been approved by the Board of Trade. The feeders and distributing mains will cost about £31,000. There are seven feeding-points, totalling 15,372 yards, and 18,034 yards of distributors. The mains will be triple concentric covered cables, laid in stoneware in the footways and in iron in the roadways. The boiler plant is estimated to cost £3445, and the engine-house plant, £16,165. The two dynamos will be capable of furnishing any pressure between 480 and 550 volts, and of running up to 640 volts; and each will be able to give off, when working at any pressure between 480 and 600 volts, 300 kilowatts sustained for two hours continuously. The transformer will be capable of developing 150 amperes at 155 volts as a maximum load. The buildings will cost £8500. The public lighting is put down at £4700, and will include 94 arc lamps. Meters, connections, &c., come to £4575; and the general charges and contingencies, to £5112. The revenue from private lighting, at an average charge of 5d. per unit—say, 450,000 units—and meter-rentals is estimated at £9775; from public lighting, at £1787. The cost of generating, &c., 539,000 units at 2-25d. per unit, is reckoned at £5522; and interest and principal (say at 5½ per cent.), at £4226. A net profit of £1764 is looked for. The buildings will adjoin the sidings of the Great Northern Railway. The population of the parish is 80,000, and the rateable value upwards of £500,000.

Gas managers who may have expected that gas would feel more keenly than electricity the effects of the present "hard times" will note with some amount of satisfaction two points in the statement made last Tuesday by Mr. T. H. Shaw, the Chairman of the Electricity Committee of the Bradford Corporation, on the results of the working of the department during the six months ending June 30. It will be remarked that the increase in the expenditure has exceeded the increase in income, and that the net profit has been reduced by £761 compared with the corresponding period of last year. Mr. Shaw said the total income for the six months was £17,723, as compared with £13,256 in the June half of last year, or an increase of £4467. The total expenditure (including interest and sinking fund) was £16,751, as against £11,523 for the corresponding period of the preceding year. The net profit was, therefore, £972, as against £1733; being a decrease of £761 on the corresponding period of the preceding year. The number of consumers was 1178, as against 965, or an increase on last year of 22 per cent. The total number of units consumed was 1,449,409, against 996,807, or an increase of 45 per cent. (irrespective of current supplied for public lamps). The total profit since the opening of the works (in September, 1899) to June 30 last, after paying interest and sinking fund, amounted to £26,986; and the amount written off for depreciation had been £14,372—leaving the sum of £12,613 to be appropriated as the Council might direct. The trade profit—that was the profit before charging interest and sinking fund—for the half year worked out to £3 7s. 2d. per cent., on a capital outlay of £241,838; and the net profit—i.e., after charging interest and sinking fund—showed a percentage of 8s. on the same outlay. Taking the June half year and the preceding December half year together, the trade profit amounted to £18,186; representing £7 10s. 5d. per cent. on the capital outlay. The net profit for the same half years amounted to £4369, and represented £1 16s. 2d. per cent. on the capital outlay.

The report which Mr. S. E. Fedden, the Sheffield Corporation Electrical Engineer, presented to his Committee, and which we noticed in the "JOURNAL" for the 4th ult., has been under the consideration of Mr. Robert Hammond, and he has commented thereon. It will be recollected that Mr. Fedden generally discussed the question of the electrical supply of the city; but of present importance was his recommendation that an estimated sum of £41,895 should be spent upon additions and alterations. He also advised that the erection of a larger station should be taken in hand without delay. The effect of Mr. Hammond's report is a complete agreement with the views of Mr. Fedden as to the plan to be adopted. One of the interesting points is that Mr. Hammond is in entire accord with Mr. Fedden as to the advisability of putting the works in a position

to supply electrical energy, at a low rate, suitable for motive power. While not sharing the opinion of the promoters of Power Bills that electrical energy will be adopted by large steam users in preference to steam, Mr. Hammond is decidedly of opinion that there is a very large field for the substitution of electrical energy for steam in a host of small industries, and this opinion has recently been confirmed by a visit which he has made to the principal cities on the Continent. He suggests that in applying to the Local Government Board provision should be made for a capital outlay on motors, in order to put the Corporation in a position to let them out on hire—a plan which, he says, has met with great success in Bradford. As the earliest possible delivery of plant is highly important, Mr. Hammond advises the Corporation to endeavour to secure one, or, if possible, two, of the sets at present in use at the Paris Exhibition. While agreeing with Mr. Fedden that the carrying out of his scheme will put the present works on a footing to give the best possible results as a whole, Mr. Hammond is glad to note that he is not content to stop at that consummation, and that he is preparing designs for polyphase works on completely modern lines, which will form, as the demands of the customers require, an excellent supplement to the present works. He hopes that the advisability of dealing with the public lighting is still having the attention of the Electricity Committee, as this would form a profitable adjunct to the existing business. The report was considered at the last meeting of the Committee, but nothing was decided in regard thereto. It was stated that the deputation appointed at the last meeting had concluded that it was unnecessary to make the proposed visit to Paris, and that Mr. Fedden had gone alone to the Exhibition, and also to Nuremberg and Frankfurt.

A few months ago, the Town Clerk of Kingston-on-Thames (Mr. H. A. Winsor) wrote to the Surrey County Council a letter in the course of which he stated that the Corporation had "the strongest possible desire to construct and work electric tramways for the borough;" and he cited "the successful management of their electrical undertaking by the Corporation" in proof of "their capacity to establish and work in connection with it a successful tramway system." A local resident examines these statements in a letter to the "Surrey Comet." He points out that when it was proposed to establish electric lighting works, it was held out that the scheme would not only prove a great boon, but that the profit would undoubtedly be a substantial relief to the rates; and the Chairman of the Tramways Committee makes use of the same argument in favour of the Corporation working the tramways. Having heard doubt expressed as to the pecuniary benefit derived from the electric light undertaking, the correspondent in question examined the accounts as published by the Corporation, and found that the following loans had been raised for 25 years: In 1893, £10,000; in 1894, £6000; in 1895, £7772; and in 1898, £19,654—making a total of £43,426. In addition to these, the Corporation have obtained power to raise £20,000 more. Of the larger total, £5094 has been repaid; leaving a balance of £38,332. The capital expenditure to March, 1900, was £50,674; and the working from 1895 to 1899 resulted in a total deficit of £6365. Deducting £4837, principal paid off, there is left a net deficit of £1528. No provision has been made for the renewal of machinery, &c., which has now been in use for upwards of five years. The correspondent made many inquiries as to what this should be, and found from experts of many years' standing that the "life" of machinery is sixteen or seventeen years, and that consequently it should be at least 6 per cent. on plant and electric appliances, except cables, upon which it should be 5 per cent. To simplify matters, he takes the whole at 5 per cent., with this result—

	Capital Outlay.	Depreciation at 5 per cent.
To March, 1895 . . . . .	£19,505	£975
" 1896 . . . . .	22,680	1134
" 1897 . . . . .	27,733	1386
" 1898 . . . . .	35,598	1780
" 1899 . . . . .	39,693	1985
Total . . . . .		£7260
Add depreciation of building (cost £7975) . . . . .		112
Add net deficit, as above . . . . .		1528
Total . . . . .		£8900
Or a net loss per annum of . . . . .		£1780

The writer of the letter points out that the works have been in operation between five and six years, and that consequently in about twelve years the machinery must be replaced by new. Unless, therefore, a fund for depreciation is established, the cost of such machinery must be defrayed by a further loan. If the further £20,000 for which powers have been obtained is expended, another £700 to £1000 per annum must be added to the £1780. He thinks it will be confessed that these figures are not calculated to induce the burgesses to extend their municipal trading to tramways.

The Town Clerk of Canterbury (Mr. Henry Fielding) has a conscientious regard for the pockets of those whom he serves; and it is plain that he takes something more than a superficial interest in the work which comes to his hand. Electric light works, like gas and water concerns, are having experience of the vagaries of rating authorities; and the Canterbury electricity and refuse destructor installations are instances. The valuer for the Guardians has put the assessment for the electric light works at £700, and for the refuse destructor at £230; while the valuer for the Corporation says that £300 and £120 are the proper respective figures. Against the Guardians' assessment, the Corporation Electric Light Committee determined to recommend the Council to appeal; but, with a view to, as much as possible, do away with any friction which might unhappily be provoked—and which ought not to exist between two bodies such as the Corporation and Guardians of Canterbury—the Town Clerk has taken a step which should give universal satisfaction in the city. To the Town Clerk, it was obvious that the two valuers had adopted different systems of arriving at the assessment, and equally obvious that there can only be one correct method. He fully recognizes that it is only fair that the property should be assessed at its proper value, and says that the Council have no desire for preferential treatment. Then the only point at issue between the Corporation and the Guardians appears to be, what is the "correct method" of assessment; and, in the interests of both parties, and to prevent a



recurrence of dispute, Mr. Fielding has suggested to the Guardians that the system of arriving at the assessment and rateable values should be defined and adopted once and for all, and that to produce this desirable result recourse should be had to arbitration. The Guardians see the wisdom of the Town Clerk's suggestion, and have acceded to it. But they propose that, prior to the matter going to arbitration, the present valuers should meet, and try to come to an arrangement on their figures; and, failing a settlement satisfactory to both authorities, then an arbitrator should be appointed, whose decision should be final. With regard to the suggested reference to the present valuers, so far as we can see, no good, lasting result could ensue from it, as both gentlemen have already committed themselves. However, at a recent meeting, the Town Council endorsed the enlightened action of the Town Clerk, and passed a resolution on the subject, by which they agree to abide by the decisions of an arbitration as to the present assessment and as to the method to be adopted in the future. The resolution also provided for the drawing up of an agreement for reference, and the Town Clerk suggested that the choice of an arbitrator be left in the hands of the President of the Institution of Civil Engineers. If now the rating of the Canterbury electricity works is not put on a satisfactory basis, and expensive litigation arises, the fault will rest with the Guardians.

#### PROPOSED PURCHASE OF THE FALMOUTH WATER-WORKS.

It has been decided by the Falmouth Corporation to lay before the ratepayers a proposal for the acquisition of the water-works, based upon Mr. Phillips's report—*ante*, p. 789. A meeting of the Town Council on the subject was held last Tuesday. A report was presented by the Water Committee which summarized the criticism of Mr. Phillips on the present supply as follows: (1) The sources of the streams are liable to pollution with most objectionable matter; and the streams are further liable to serious risk of contamination at various places on their way to the reservoir. (2) The provision for filtration is inadequate, and the arrangements unsatisfactory. (3) The Company have not given a constant supply of water, the service—more especially in the higher parts of the town—being insufficient and intermittent. Throughout the summer, water is frequently turned off the whole of the high-level system during the night, and sometimes on the low-level system during the day. (4) It is generally admitted that the water is liable to pollution through insuction when the supply is intermittent. (5) The pressure of water and the supply from some of the hydrants is not sufficient in case of fire. (6) The storage is insufficient to provide for dry seasons; and some of the mains are too small to provide an adequate supply. The Committee were of opinion that there was little or any chance of the Company taking the steps necessary to remove these objections; and, therefore, the only hope of this being attained, and the water supply placed on a thoroughly efficient and satisfactory basis, was dependent on the undertaking becoming the property of the ratepayers. Mr. Phillips was of opinion that, in view of the great dissatisfaction which exists,

Parliament would grant the Corporation power to acquire the undertaking. As to the works needed to improve the supply, some of them might be postponed; but the filter-beds and storage-tanks must be enlarged and improved, and the distribution pipes cleaned and enlarged where necessary. His estimate of the cost of the undertaking and the more immediate improvements was £74,500; and although the outlay of this sum would probably be attended by an increased charge on the rates for the present, the Committee considered that the benefits to be derived would more than compensate for this.

The Mayor (Alderman F. G. Bowles), in order to bring the matter before the ratepayers, moved that a Bill be promoted for the purchase of the water-works.

Dr. Banks, in seconding the motion, said that, while the water was not dangerous, it was unsightly. An important point for the ratepayers to consider was that the Corporation could not make the Company do all that was considered necessary by their Engineers, because the Company's Acts of Parliament were ancient, and they were well protected. He thought the ratepayers would willingly pay more for a better article. For his own part, he was strongly in favour of the acquisition of the undertaking.

Mr. Mead thought the attitude of the Mayor towards the scheme was unfortunate. The resolution should be the real expression of the opinion of the Council, and not the mere formal handing on of the scheme to the ratepayers for their decision.

The Mayor said he was quite willing to pay a better price for a better article; but he was not prepared to bias his fellow ratepayers.

The resolution was carried by 11 votes to 2; and a meeting of the ratepayers is to be held to decide whether the scheme shall be proceeded with.

#### NEW YORK WATER SUPPLY.

In the "JOURNAL" last week (p. 918), we dealt further with an important report by Mr. John R. Freeman on the above subject, of which a full abstract has appeared in the "Engineering Record." It may be remembered that Mr. Freeman received instructions to "get together as much reliable information on New York's need for more water" as was possible in the time available; and the result of his investigations was to show that the situation of America's greatest city is one that is fraught with the gravest dangers, which only those who can appreciate who have had to do without water for a time. He indicated three remedies for this serious condition of affairs—viz., the restriction of waste, the construction of municipal works, and the purchase of water from a private company. These are dealt with in detail by our contemporary, whose remarks thereon may be shortly noticed.

The waste problem in New York is considered at great length in the report, as the city is now using less water per head than Boston, Philadelphia, Washington, Buffalo, Albany, Pittsburgh, Chicago, Cleveland, Detroit, Denver, and other large cities. Admitting that more than half the present supply is wasted, it is held that the cost of this is so low

#### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 945.

Issue.	Share.	When ex-Dividend.	Dividend of Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend of Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
590,000	10	Oct. 12	10½	<b>GAS COMPANIES.</b>				60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½		6 7 3
100,000	10	"	7½	Alliance & Dublin 10 p. c.	184-194*	+½	5 7 8	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106		5 13 2
800,000	100	July 2	6	Do. 7 p. c.	13-14*		5 7 2	851,070	10	Oct. 12	7	River Plate Ord.	10½-103*		6 10 3
200,000	5	May 16	6	Australian 5 p. c. Deb.	101-103		4 12 4	250,000	Stk.	June 28	4	Do. 4 p. c. Deb.	99-101		3 19 8
40,000	5	"	6	Bombay, Ltd.	6-6½		5 6 6	260,000	10	Sept. 28	8	San Paulo, Ltd.	11-12		6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255		4 14 11	185,000	Stk.	Sept. 14	10	Sheffield A.	234-239		4 3 8
270,000	"	"	9	Do. New	177-182	-3	3 10 5	209,750	"	"	10	Do. B.	231-259		4 3 8
60,000	"	"	5	Do. 5 p. c. Pref.	137-142		3 6 8	447,427	"	"	10	Do. C.	232-237		1 4 5
159,375	"	June 14	4	Do. 4 p. c. Deb.	116-120		4 6 11	5,641,885	Stk.	Aug. 15	5½	South Metrop. 4 p. c. Ord.	128-133		4 0 10
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230		4 7 6	1,520,000	Stk.	July 12	5	Do. 3 p. c. Deb.	94-97		3 1 10
226,320	"	"	7	Do. A. Ord. Stk.	150-160		4 7 9	380,940	Stk.	May 16	5	Southampton Ord.	110-115		4 6 11
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max.	117-118		4 17 7	70,825	Stk.	July 12	4	Do. 4 p. c. Deb.	117-122		3 5 7
420,000	30	Sept. 28	10	British	39-41		4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p. c.	112-117		5 2 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c.	24-26		4 5 6	250,520	"	"	4½	Edmonton B. 3½ p. c.	80-85		5 6 11
79,000	10	"	9	Do. 7 p. c.	19-21		4 6 17 2	61,550	"	June 14	4	and 4 p. c. Deb.	111-115		3 9 7
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	84-84*	-¼	4 0 0	123,380	10	Jan. 12	5	Tuscan, Ltd.	7-8		6 6 0
220,000	Stk.	June 14	4	Do. 4 p. c. Deb.	98-100		6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98-102		4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25		5 10 4								
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	134-144		5 7 2								
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	54-56		4 12 8								
550,000	Stk.	Oct. 12	12½	Commercial Old Stock.	265-275*	+1½	3 15 3								
286,425	"	"	9½	Do. New do.	200-210*		5 0 0								
288,237	"	June 14	4½	Do. 4½ p. c. Deb.	139-138		4 0 0								
800,000	Stk.	May 31	9	Continental Union, Ltd.	175-180	+2	4 0 0								
200,000	"	"	7	Do. 7 p. c. Pref.	170-175		4 7 6								
51,600	Stk.	"	14	Croydon A 10 p. c.	—		5 10 0	780,404	Stk.	June 28	11	Chelsea, Ord.	332-307	+2	3 11 8
178,400	"	"	11	Do. B 7 p. c.	—		5 10 0	150,000	"	"	5	Do. 5 p. c. Pref.	155-160		3 2 6
655,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p. c.	115-120		3 14 1	160,000	"	"	4½	Do. 4½ p. c. Pref. 76	143-148		3 0 10
60,000	"	"	5	Do. 5 p. c. Pref.	130-135		5 10 0	175,785	Stk.	Sept. 28	4½	Do. 4½ p. c. Deb.	143-148		3 0 10
486,090	10	July 27	11	European, Ltd.	19-20		5 10 0	654,740	"	June 14	4½	East London, Ord.	194-199	+2½	8 10 4
184,060	10	"	11	Do. 47 10s. paid	14-15		5 10 0	797,687	"	"	8	Do. 4½ p. c. Deb.	147-152		2 19 3
14,993,075	Stk.	Aug. 15	4½	Gas- 4 p. c. Ord.	99-101		4 7 2	700,000	50	June 14	7½	Do. 4½ p. c. Deb.	97-99	+1	3 0 7
2,600,000	"	"	3½	light 3½ p. c. max.	92-94		3 14 6	310,000	Stk.	Sept. 28	4	Grand 10 p. c. max.	107-110		3 8 2
8,799,735	"	"	4	and 4 p. c. Con. Pref.	114-117		3 8 5	708,000	Stk.	Aug. 30	14	Junction 4 p. c. Deb.	180-185		2 19 3
8,993,975	"	June 14	8	Coke 3 p. c. Con. Deb.	98-95		6 10 4	160,000	"	"	7	Kent	300-305	+2½	4 11 10
70,000	10	May 31	10	Hongkong & China, Ltd.	134-144		3 9 4	1,043,300	100	June 28	10½	Do. New, 7 p. c. max.	200-210		3 6 8
3,800,000	Stk.	May 16	8	Imperial Continental	208-213		4 13 11	406,200	100	"	8	Lambeth, 10 p. c. max.	293-297		3 10 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p. c. Deb. Red.	99-101		5 14 3	850,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb.	205-210		3 16 2
75,000	5	June 14	6	Malta & Medn., Ltd.	42-54		4 12 7	500,000	100	Aug. 15	14	Do. 4 p. c. Deb.	127-130		3 1 7
560,000	100	Oct. 1	6	Met. of 15 p. c. Deb.	105-108		4 11 8	1,000,000	Stk.	July 27	4	New River, New Shares	408-413		3 7 10
260,000	100	"	4½	Monte Video, Ltd.	104-106		6 1 8	902,300	Stk.	June 14	7½	Do. 4 p. c. Deb.	124-133		3 0 2
541,920	20	May 31	3½	Newcastle & Gateshead Con.	210-215		3 5 5	126,500	100	"	5	Do. 4 p. c. max.	195-200		3 15 0
667,946	Stk.	Aug. 30	8½	Do. 8½ p. c. Deb.	104-107		5 15 3	489,200	Stk.	"	7½	wark 7½ p. c. Pref.	185-190		3 18 11
299,855	Stk.	June 28	8½	Oriental, Ltd.	74-77		4 11 5	1,019,586	"	Oct. 12	4	and 4 p. c. Deb.	156-160		3 2 6
150,000	5	May 16	8	Do. New, £4 10s. pd.	52-61		4 11 5	1,155,066	Stk.	June 14	10	Vanxhall 4 p. c. Deb.	127-132*		3 0 7
135,000	5	"	8	Do. Do. 1879, £1 pd.	12-13		4 11 5	200,000	"	"	4½	West Middlesex	275-280	+1	3 11 5
15,000	5	"	8					200,000	"	Sept. 14	5	Do. 4½ p. c. Deb.	140-145		3 2 1
												Do. 5 p. c. Deb.	97-99		3 0 7

\*Ex. div.



(about \$1 per head annually for domestic purposes), and the time and expense of checking the waste are so great, that the subject should not be allowed to retard the construction of works for a future supply. It is Mr. Freeman's belief that public opinion in New York will probably not sustain the metering of all domestic supplies. He recommends that an investigation of the leakage from street mains and services should be made, and new regulations be framed so as to encourage the use of meters on all services. Such a plan would result in the gradual reduction of waste, beginning with the stoppage of the serious leaks in the mains, and ending in the metering of domestic services at the request of the individual consumers to save money.

The second method of relief—the construction of municipal works—very naturally divides itself into the special problems of New York and Brooklyn. The most available source is certainly the Ten Mile River, combined with the Upper Housatonic, which furnish water flowing at present through Connecticut. From this source, 750 million gallons a day can be delivered at the city limits under a head of 300 feet at a cost not exceeding \$10 per million gallons. This supply would answer the purposes of New York and Brooklyn for years to come; and it is unquestionably the cheapest and best from an engineering point of view. Unfortunately, grave interstate legal questions are involved, which Mr. Freeman believes can be speedily settled. This view of the case is probably too hopeful, for the matter was considered some years ago by the Counsel of the Croton Aqueduct Commission, who found no legal means of securing water from this source. If the suit between the States of Kansas and Colorado is settled by the Supreme Court of the United States speedily in favour of allowing the appropriation by the citizens of one state of the waters entering another, it may be possible to turn to the Ten Mile River for the supply of Greater New York. Otherwise Mr. Freeman will probably find that his recommendation for the construction of works on this plan will be rejected by the legal profession.

Fortunately, however, there are other sources of supply from which ample volumes of water can be obtained at a cost below that now paid by the city for its present supply. Two of these are especially attractive. An ample supply of water can be brought from the Adirondacks by gravity, and delivered, at an elevation of 300 feet, at the city line at a cost of \$25 to \$50 per million gallons, according as the supply ranges from 800 down to 200 million gallons daily. An ample supply can also be obtained by constructing filters and pumps at Poughkeepsie, and using the Hudson River as the source. This water can be delivered at an elevation of 300 feet for less than \$50 per million gallons. The plan will involve the construction of storage reservoirs in the Adirondacks to let down water whenever there is any sign of brackishness in the Hudson at Poughkeepsie, for without such reservoirs a large draught from the river at this place would probably cause the salt water to move up stream and injure the supply during portions of the summer.

So far as Brooklyn is concerned, if the New York Legislature will permit, from 75 to 125 million gallons of excellent water can be obtained from Suffolk County, on Eastern Long Island, at less than \$40 per million gallons. If legislative permission to develop this area cannot be got, the supply must be obtained from New York.

There are still other sources which may be utilized. The Wallkill will probably deliver, if properly developed, upwards of 300 million gallons per day by gravity. The basin of this river presents undesirable features, however, and the water is considered rather hard. The Esopus and connecting watersheds can be developed to yield 200 million gallons a day at about \$30 per million gallons. These would be attractive plans were it not for the importance of providing works capable of furnishing at least 500 million gallons daily. It should be added that all these figures of cost include interest, depreciation, maintenance, and a sinking fund to pay off all bonds in forty years.

The third method of obtaining the supply is to accept the proposition of the Ramapo Water Company. It provides for 200 million gallons daily from the Esopus at \$70 per million gallons for a period of fifty years, at the expiration of which time a new contract must be made, or he city must build works.\* In the light of Mr. Freeman's studies, the acceptance of such a proposition would be an act utterly unwarranted by any condition of the problem.

Our contemporary concludes by saying that, unfortunately for New York, the results of this investigation were made public at the beginning of a season of political activity; and it was too much to expect that they would receive the attention they deserved. There was no question whatever, however, that an appropriation should be immediately made for surveys for an additional supply of an ultimate capacity of at least 500 million gallons per day. The direction of this survey should be placed in charge of an Engineering Committee of a few members of sufficient experience to carry it on with despatch, for all the haste consistent with reliability was imperative. The "Engineering Record" does not believe that it is feasible, for legal reasons, to consider the Housatonic watershed, and therefore holds that the work should be devoted to the Adirondack and the filtered Hudson River water systems. An appropriation of \$100,000 is the minimum set by Mr. Freeman for such a survey; and it is regarded as none too large when the urgency of the situation is considered. If undertaken now, plans for the initial construction could probably be ready in a year. It must be constantly borne in mind that the design and construction of any adequate works cannot be finished much within the five-year limit allowed by the condition of the present works, even if the surveys are commenced at once.

\* The Company's proposals were fully described in the "JOURNAL" for Jan. 2 last (p. 39).—ED. J. G. L.

**Duddon Water for Barrow.**—Although the Barrow Corporation added a third large reservoir some months ago to increase the water supply, it is still inadequate to the town's requirements; and it is proposed to obtain parliamentary powers to draw water from the higher reaches of the River Duddon, near to where the counties of Lancashire, Westmorland, and Cumberland meet. There is no intention to disfigure the valley in any way, or injure the classic river. The scheme will embrace the heightening of the water in Seathwaite Tarn, by constructing an embankment 20 feet high.

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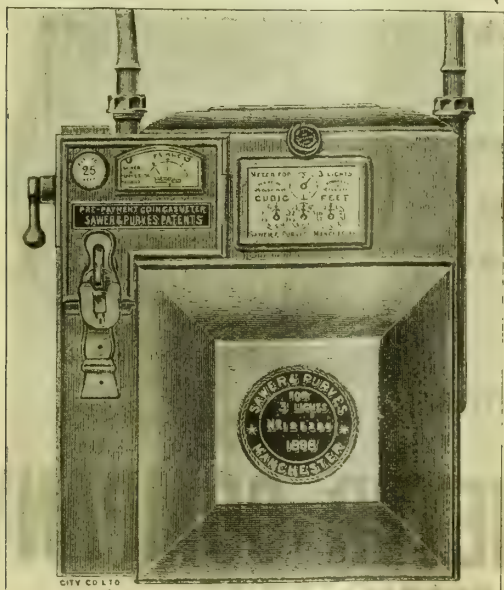
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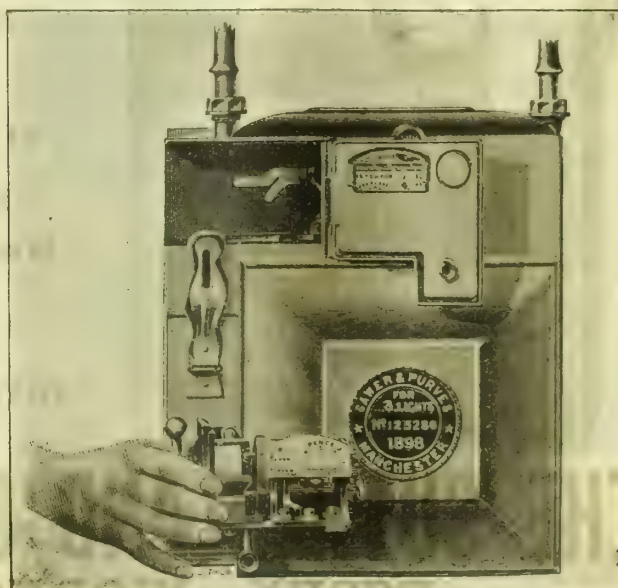
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## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The appointment of Mr. W. Ewing, of Hamilton, to be the successor of Mr. S. Stewart in the management of the Greenock Gas-Works is an event which I feel I cannot pass by in silence. Since he went to Hamilton, about nine years ago, the output of gas has more than doubled; the gas-works have been almost entirely renewed and extended; the capital of the undertaking has been increased from £22,000 to only £35,000; and the price of gas has been reduced from 2s. 11d. to 2s. 1d. per 1000 cubic feet. This is a good record; and it will be difficult for whoever may be appointed in Mr. Ewing's stead to work up to it. I anticipate it will be difficult for Mr. Ewing to do in Greenock anything like what he has done in Hamilton. He is succeeding a very different sort of person; and, while he will have excellent works to deal with, he will not have the advantage of a low capital, nor the opportunity of doing much to reduce it. He is going to a place where the output is more than twice what it is in Hamilton, and is undoubtedly improving his position. At the same time, he is about to tackle a much harder task.

The Directors of the Oil-Gas Enrichment Company, Limited, in their seventh annual report and accounts, dealing with the year to Sept. 30, state that the balance at the credit of profit and loss is £546, which they recommend be disposed of as follows: To pay the fixed dividend of 5 per cent. on the preference or "A" shares, £250; leaving to be carried forward to next year £296. The Directors regret that the continued rise in the price of gas oil still interferes with the extension of the Company's operations. They have, however, now acquired on behalf of the Company the patent No. 20,125 of 1896, granted in favour of Mr. W. Young, Mr. S. Glover, and Mr. T. Glover, for "improvements in the manufacture of illuminating gas," the acquisition of which will, in their opinion, increase the Company's business. The Directors, with much regret, report the death of Mr. George Harrison, one of their number, whose deep interest in the Company since its formation had been of great value to his colleagues and to the Company generally. They recommend the election of Mr. Samuel Glover, of St. Helens, to fill the vacancy.

The first installation of inclined retorts in Scotland, apart from experimental benches, has been erected in the Aberdeen Gas-Works. There are eighteen retorts in the bench. On Wednesday, the Gas Committee of the Town Council visited the works and inspected the new plant.

There was a criticism of a senseless sort, of the Dundee Corporation Gas Department, uttered by a Mr. High, at the last meeting of the Town Council. He found from the minutes, he said, that they had received £2279 for coke; and he considered that they should have obtained £7500 for it. He calculated that they should have had an annual profit of £48,800. It seems that in Committee Mr. High had asked for information, and that it is being prepared for him. This speech, which he made in open Council, was therefore premature. It resulted in nothing except his unburdening himself of a few reflections of a splenetic nature. Indeed, the only purpose, good or bad, which his introduction of the subject could have served, may be fitly described as

"keeping the pot boiling;" the intention being not to let the public forget that a "gas scandal" has been unearthed.

At the annual meeting of the Carnoustie Gaslight Company, held recently, the customary dividend of 7½ per cent. was declared. During the past year, there was an increase of 1,700,000 cubic feet in the manufacture of gas, which was largely due to extra consumption in cookers and gas-engines. Unaccounted-for gas was reduced from 7 to 4 per cent. The price of gas was raised by 5d. per 1000 cubic feet. The Manager (Mr. J. W. Napier) has only been one year at Carnoustie; but he has in that time effected many improvements, including the erection of a retort-bench with regenerative settings. In recognition of his good services, the Directors have advanced Mr. Napier's salary by £30 a year.

The Banff Gaslight Company (which is so thoroughly well managed by Mr. W. Marshall) have had a very successful year. The output increased by nearly a million cubic feet; and the revenue rose from £1919 to £1984. A dividend at the rate of 5 per cent. was declared at the annual meeting. Mr. Marshall is just completing the construction of a gasholder tank upon land adjoining the works, which has been reclaimed from the sea. The structure is of concrete. The whole of the work has been done by the gas-works staff; and when it is completed its cheapness will be a surprise to many.

Some time ago, the embankment of a reservoir at Loch Glow, in Fifeshire, gave way, and the rush of water created great damage. This week it was stated, at a meeting of the County Council, that the opinion of Counsel had been taken as to who was liable for the cost of repairing the damage. The opinion was to the effect that the County Council were liable, but that the Council have a claim for relief against the special water district, in so far as the district is able to bear the burden. The balance remaining to be met amounts to £1631. The County Council have imposed a rate of 2s. 6d. per pound upon the special water district, which will realize about £300. It will thus take five years of this very high assessment to clear off the liability.

Arbroath is unfortunate in its water supply. The Town Council have expended about £8000 in extending the underground workings from which the water is pumped; and now the work is completed, it is found that the supply is no more than 11-362 gallons per head per day. This is altogether inadequate; and something will require to be done to augment it. Already the subject seems to be in the minds of the members of the Corporation. At a meeting this week, it was stated that a long report by Mr. McCulloch, of Edinburgh and Dundee, had been received. Someone elicited the information that this report did not deal only with the works which are completed, but referred to schemes for the future. On this being ascertained, the question arose as to who had ordered the matter to be reported upon. It was then realized that something had been done which was not altogether regular; and the whole subject was continued to a future meeting.

The Burslem Town Council are making application to the Local Government Board for sanction to borrow £31,000, for a period of thirty years, for the purposes of the gas undertaking.

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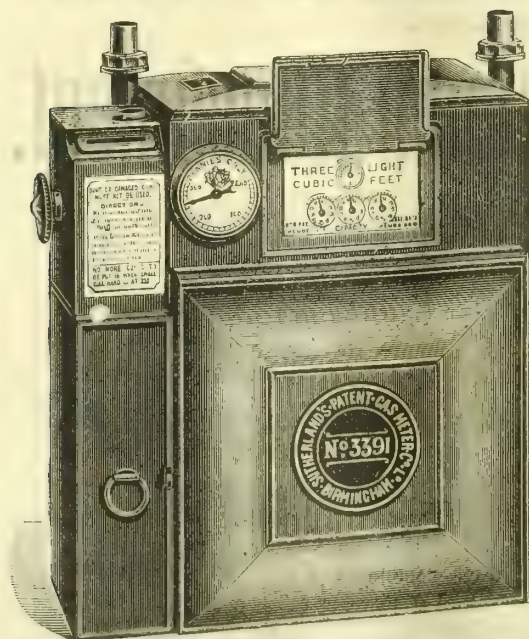
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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 13.

**Sulphate of Ammonia.**—In the early part of the week, the market was quiet. Subsequently, however, buyers showed more interest; and the inquiry thus set on foot resulted in a good business being done in the last day or two both for prompt and forward delivery. For this month's delivery, the buying was mainly done at the rates current last week; and the market closes firm at £10 12s. 6d. f.o.b. Leith, £10 11s. 3d. f.o.b. Hull, and £10 13s. 9d. to £10 15s. f.o.b. Liverpool. The chief interest of buyers seems, however, to have centered round forward delivery; and up to £10 15s. has been paid for delivery to end of the year. For the early months of next year, sellers demand a premium on this figure.

**Nitrate of Soda** is rather firmer at 8s. 1½d. per cwt. for ordinary, and 8s. 6d. for refined quality.

LONDON, Oct. 13.

**Tar Products.**—The continued depression in the value of creosote and tar oils, and the limited business which is being done in pitch—an article which buyers are talking lower—is having an effect upon the prices being offered for tar. Several of the high-priced contracts let earlier on in the season, must, at to-day's prices, entail serious loss on the distillers. Benzols, although perhaps not so firm as a few weeks ago, are looked upon with hope, for large quantities are now being taken off the market for gas enriching; and this for the next month or two will be a constantly increasing quantity. Carbolic acid is easier, and business is reported at 2s. 8d. and 2s. 9d. There is little doing in anthracene, the price of which is nominal.

The week's quotations average out as follows: Tar, 15s. to 22s. Pitch, east coast, 36s.; west coast, 33s. Benzol, 90's, 10d.; 50's, 11½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1d. Crude naphtha, 4½d. Heavy naphtha, 11d. Creosote, 1½d. to 2d. Heavy oils, 3d. Carbolic acid, 60's, 2s. 9d. Naphthalene, 70s. Salts, 45s. Anthracene, nominal, "A," 4d.; "B," 2½d.

**Sulphate of Ammonia** is still flat. The Scotch market is inconvenienced by the restrictions on shipment due to the plague. The present price may be taken as £11 10s. to £10 12s. 6d. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The position throughout the coal trade of this district presents no appreciable change. All descriptions of round coal still meet with a steady demand, with very little going into stock, and prices well maintained at late rates. In view of the almost entire absence of stocks of any moment, the outlook in the house-fire coal trade is, however, not a very satisfactory one for consumers; and coalowners are regarding with some apprehension the position in which they may be placed during the ensuing winter, should an exceptionally severe season bring forward any great pressure for supplies. For the moment, there is no talk of any further advance in prices; but a great deal will depend

upon the character of the winter. It would not be at all surprising if there should be some further stiffening up in quoted rates for house-fire qualities, the list prices for which remain exceedingly firm at about 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Common round coals meet with a moderately good demand for inland requirements and for shipment. Although not quite so pressing as it has been, the inquiry is still fairly active; and in most cases all that collieries are raising is moving away freely, at full prices—averaging 12s. 6d. to 13s. per ton at the pit for inland sales, with 16s. 6d. to 17s. obtained for steam coals delivered at the ports on the Mersey. The only difficulty collieries have is still with regard to engine classes of fuel, supplies of which continue plentiful on the market—not so much from Lancashire coalowners as from outside districts—and very much will depend upon the probable improvement in the cotton trade as to whether local prices can be maintained against competition from other quarters. So far, Lancashire collieries have not officially reduced their list rates, which, for best qualities, remain steady at about 10s. 6d. to 11s. per ton at the pit, with inferior sorts of slack to be bought at about 9s. 6d. The prices at which slack is obtainable from outside districts show some easing down, and are much below local quotations. The position in the coke trade remains fairly strong as regards the better qualities suitable for foundry purposes, which are still in good demand and firm at recent quotations, ranging from 18s. to 31s. per ton at the ovens, according to quality. The commoner cokes, for furnace purposes, however continue weak, at from about 15s. to 20s. at the ovens.

**Northern Coal Trade.**—The northern coal trade is decidedly weaker. The end of the Baltic season necessarily throws a considerable quantity on to the market; and the steam coal trade, which first feels this, acts upon other kinds of fuel. Hence best Northumbrian steam coals have been sold at 17s. 6d. per ton f.o.b.—a price that is about 1s. lower than that of a week ago. Steam smalls are also rather weaker at 10s. 6d. per ton. In the gas coal trade, the demand has increased, and should continue to do so for two months. Deliveries are heavy on the large contracts; and there is comparatively little coal for occasional sales. The price under contracts is about 16s. per ton f.o.b.; and for occasional quantities, from 17s. 6d. to 18s. In regard to coke, export qualities are easy at from 29s. to 31s. per ton f.o.b. Blast furnace coke is from 27s. to 27s. 6d. per ton, at the Teesside furnaces. Gas coke is in larger production, but is still comparatively scarce; and the quoted f.o.b. price is from 24s. to 25s. per ton.

**Scotch Coal Trade.**—The export trade continues to shrink. If the movement goes on, it will soon affect prices. These can scarcely be said to be touched yet; but there is already a difficulty in disposing of inferior sorts of dross. The general expectation is that prices will now begin to decline. The quotations are: Main, 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. 6d. to 17s. The shipments for the week were 216,058 tons—a decrease of 28,274 tons upon the preceding week, but an increase of 71,172 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,463,291 tons—an increase of 1,682,559 tons upon the same period of last year.

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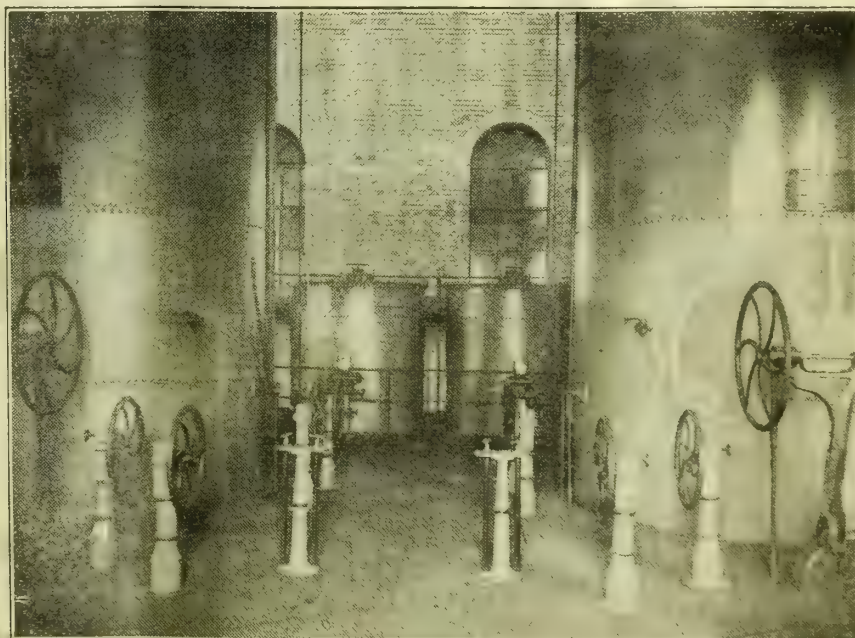
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**Dorking Water-Works Purchase Question.**—At a recent meeting of the Dorking District Council, a resolution was passed in reference to the promotion of a Bill for the acquisition of the water-works; but it was afterwards held by the Clerk to be invalid, inasmuch as a majority of the whole body did not vote for it. At the meeting of the Authority on Thursday, the matter was reopened; and a resolution was passed to the effect that, in the opinion of the Council, it was desirable to apply for power to take over the Water Company's undertaking at the earliest possible moment, and instructing the Clerk to take such steps as might be necessary for promoting a Bill in the next session of Parliament, either in conjunction with the Rural District Council, or on behalf of the Urban Council alone, for the purpose of acquiring the undertaking, pursuant to powers conferred upon the two Councils by section 6 of the Water Company's Act of the past session, particulars of which have appeared in our columns.

**A New Filter-Bed at the Chester Water-Works.**—Last Tuesday, on the invitation of the Directors of the Chester Water Company, the members of the Health Committee of the Corporation visited the water-works, to view, before the water was turned on, a reconstructed filter of large capacity, which has just been completed. This filter, together with one adjoining it, has been re-formed on the most approved plans. The water from the reservoir, into which it flows on being pumped from the river, passes on to the surface of the bed in the first instance, and thence by slow percolation through graded sand to the pipes below, thence to the pure-water tank; but when it becomes necessary to cleanse the surface of the bed, pure water from the tank is brought under the bed, and is forced—or, rather, rises by natural gravitation—through the sand to the surface, carrying off into adjoining drains all accumulated impurities which may have been deposited. The present average rate of filtration is 24½ gallons per square foot of surface per 24 hours, as contrasted with 44 gallons to the same area and time in past years, and the recognized standard of 144 gallons of the Local Government Board.

**Protecting the Water Supply of Hull.**—At the meeting of the Hull City Council yesterday week, the minutes presented by the Water and Gas Committee stated that the Chairman (Alderman Massey) had been negotiating with the owners of land at Cottingham, with a view to the purchase of such land, on the fringe of the wells at Cottingham, as would protect the water supply of the city from contamination by the surface drainage from land covered with nightsoil. The quantity of land required to prevent the risk of contamination of the water supply would be a little over 55 acres; and the price now asked was £10,215. The Committee resolved thereupon that the area of land as shown on a plan submitted should be acquired by the Corporation, in order to prevent the risk of contamination. Alderman Massey moved the confirmation of the minutes, but altered the resolution so as to make the purchase of the land permissive, and not compulsory; thus providing for future contingencies. A little objection was raised as to the price proposed to be paid; and an amendment was moved that the matter be referred back for further consideration. But this was rejected by 44 votes to 14; and the original motion was carried.

**Honiton Water Supply.**—After a long delay and much fruitless agitation, there is a prospect of something being done for the improvement of the water supply of Honiton. Messrs. Besley, Son, and Nicholls have been awarded the first premium in a competition for schemes for effecting what the Council require. On the recommendation of the Water Committee, the Council decided last week to invite a representative of the firm named to visit the town and advise the Committee as to the details of the scheme. An amendment in favour of deferring action until after the municipal elections which are due to take place on the 1st prox. was defeated.

**Proposed Improvement of the Tiverton Water Supply.**—A scheme for the improvement of the water supply, at an estimated cost of £5800, has been before the Tiverton Town Council. Of the proposed outlay, £3250 is to be spent on substituting piping for the open lead in which the water is collected and conveyed to the town; while the balance is to provide for two covered service reservoirs. The Streets Committee, who had discussed the scheme, recommended that it should be carried out, and application made to the Local Government Board for a loan for the purpose. After some discussion, however, it was decided that the Council should visit the site of the works, and that the matter should be further considered at another meeting.

**The Maintenance of Strikers Out of the Rates.**—At the meeting of the Merthyr Tydfil Board of Guardians on the 6th inst., a letter was read from the Local Government Board disposing of the appeal by the Chairman and 39 other Guardians against the Auditor's surcharge of £6709, the amount expended in stoneyard relief to able-bodied workmen during the coal strike of 1898. The Board confirmed the surcharge, but said they were prepared in the exercise of the equitable jurisdiction conferred upon them, to remove the liability; and a certificate was enclosed accordingly. At the same time, they thought it right to add that, as the circumstances did not appear to them to necessitate the consideration of the particular reasons which raised the question of objection to the form of relief—viz., the allowance in money—their decision should not be regarded as involving the acceptance of, or an expression of opinion upon, the reasons referred to them.

**Preliminary Engineering Expenses.**—The "Local Government Journal" remarks that "the Local Government Board have a peculiar doctrine with regard to the preliminary engineering and legal expenses incurred by Rural District Councils in relation to schemes of sewerage and water supply. If these schemes lead to the execution of works, the cost falls upon the particular parish benefited, in pursuance of section 229 of the Public Health Act, 1875, which declares that the expenses of the construction, maintenance, and cleansing of sewers in any contributory place, and the providing of a supply of water thereto, so far as the latter expenses are not defrayed out of water-rates, shall be special expenses. It often happens, however, that, owing to unforeseen difficulties, or an alteration of circumstances, schemes which have cost much money to prepare are not carried out; and in these cases the Whitehall Board hold that the above provision in the Act of 1875 does not apply, and that the expenses fall upon the common fund of the whole rural district."

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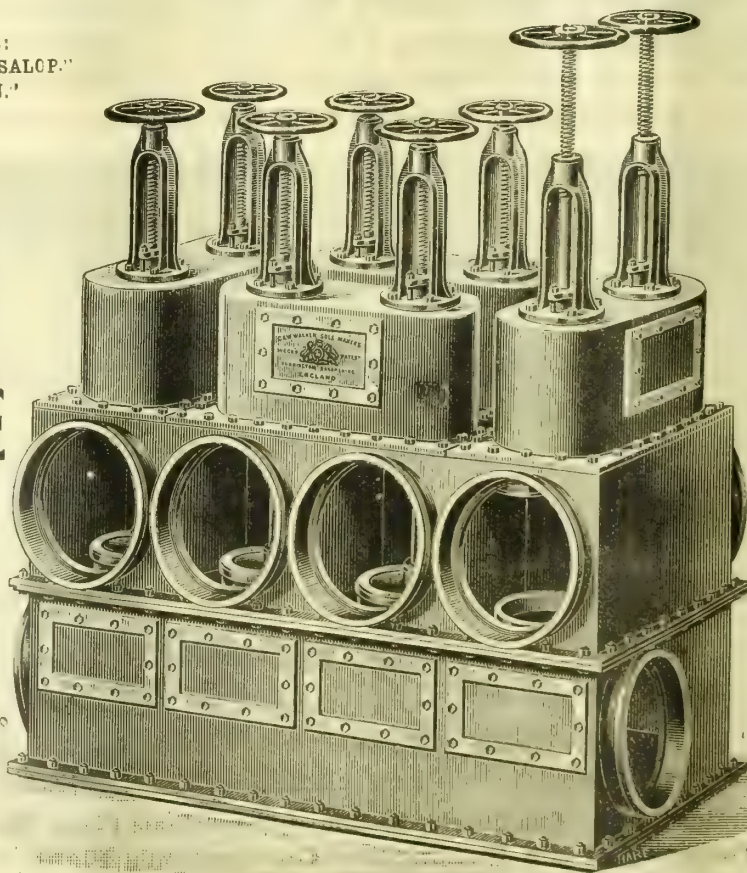
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**Darlington Gas-Works Profits.**—At a recent meeting of the Darlington Town Council, the accounts of the Gas Department for the half year to the end of June were presented. They showed a profit of £3868, of which £1943 had been placed to the credit of the district fund. It was remarked that, though much more had had to be paid for coal, there was a great increase in the profit compared with the corresponding period of last year.

**A Possible "Competitor" for the World's Coal Supply.**—The recent increase in the cost of coal all over the world has led to the development of the coal mines in Spain, although insufficient means of transport threaten to paralyze the trade in those provinces where extensive beds of coal exist. Spain consumed last year 4,609,520 metric tons of coal and coke, of which only about 40 per cent. was imported, chiefly from England. The proportion of native fuel has increased every year since 1896. Most mines in Spain are worked with Spanish capital.

**Gas Traction at Blackpool.**—Reference has on several occasions been made in the "JOURNAL" to the above subject. When the gas-motor trolleyway was opened in 1896, the line only ran from Blackpool to St. Anne's-on-the-Sea. In October of the following year, however, it was completed to Lytham—the entire distance being about seven miles. The journey has hitherto occupied 60 minutes; but, under parliamentary powers recently granted, the limit of speed has been increased from eight to twelve miles an hour. The new arrangement was inaugurated last Wednesday, when the journey was performed in 35 minutes.

**A Change in the System of Gas-Meter Inspection in Manchester.**—At the fortnightly meeting of the Gas Committee of the Manchester Corporation last Friday, it was resolved to adopt a new system for informing consumers of the quantity of gas passing through their meters. At present the total amount used during the quarter is put upon the gas bill at the end of that period. For the future, the inspectors, who examine the meters twice quarterly, will on each occasion record the quantity which has passed through since the previous visit upon a card to be left in the meter-box. The consumer will thus have an idea of how his indebtedness is progressing, without having to wait until after the close of each quarter.

**Proposed Purchase of the Poulton-le-Fylde Gas-Works by the Local Authority.**—The Poulton-le-Fylde Urban District Council having decided to purchase the undertaking of the Gas Company, a meeting of ratepayers was held last week to pass the usual resolution. Mr. J. R. Gaultier, in moving that the Council be authorized to carry out the purchase, under the powers conferred upon them by section 32 of the Poulton Gas Order, 1888, gave some particulars concerning the works to be acquired. He pointed out first that the Order referred to expired in July, 1902; and that if they did not buy the undertaking by then, their right to do so would be gone for ever. The Company, he added, were bound to sell at a price to be mutually agreed upon, and failing agreement by arbitration. The net revenue for the last three years was £539, which, capitalized on the same basis as that adopted for the Swadlincote Company, would give £12,127 as the purchase price. As to how the money would be found, he had worked it out on the assumption that fifty years would be allowed for repayment; and at 3½ per cent. they would have to

pay in principal and interest £511 per annum. The income of the Company for the year ending the 30th of June last was £632, which would increase in the future. But taking this figure as a basis, they would have a balance of £120 a year, which could be used in the way of reducing the rates. Mr. J. Swarbrick seconded the motion; and it was carried unanimously.

**The Halifax Corporation and the Gas Supply of Adjacent Townships.**—At the last meeting of the Sowerby Bridge District Council, it was reported that the Gas Engineer (Mr. J. Marsland) had furnished the Halifax Corporation with the various particulars as to the mains, &c., in Skircoat and Warley which they proposed to take over. The amount to be paid by the Corporation is £5000 for Skircoat, and £4181 for Warley; these sums being calculated on the basis arranged by the two bodies. A letter having been read from the Gas Engineer to the Corporation (Mr. T. Holgate) confirming the terms, it was decided to forward an account for the £9181.

**Bolton Gas Supply.**—The Gas Committee of the Bolton Town Council met last Friday, and included in the business set down was that of receiving the usual quarterly financial statement from the Office Superintendent (Mr. W. Walch). It showed a gratifying and remarkable increase in the takings. In the three months ending the 30th ult., the receipts amounted to £27,439, against £24,037 in the corresponding quarter of 1899, when the price of gas was 3d. per 1000 cubic feet higher. The cash received by the Department from the 1st of April to the 30th of September aggregated £79,474, which is £4479 more than the sum taken in the corresponding period last year. With the commencement of the present quarter, the price of gas is increased by 2d. per 1000 cubic feet; and the Committee hope by this means to be able to hand over for the relief of the rates, at the end of the present financial year, at least £20,000, despite the fact that coal will cost about £25,000 more than last year.

**Wages at the Walsall Gas-Works.**—At the meeting of the Walsall Town Council yesterday week, the Gas Committee reported that the men employed at the gas-works, having reopened negotiations with respect to their application for an increase of wages, had sought a further interview with the Committee; and, a deputation having attended and submitted modified proposals, an arrangement had been come to by which an increase of wages would be given as from the 1st inst. to the various classes of workmen, amounting in the aggregate £903 13s. per annum, or about one-half the amount represented by the application received from the men in the first instance. In granting this increase, the Committee had been influenced by the fact that, while all the workmen employed by the Corporation in the various departments had within recent years received additions to their wages, the men employed at the gas-works had not received any increase for the last twelve years. With the advance now given, the wages of the men would compare favourably with those paid to any similar class of men employed in any gas-works in the district. While the total annual sum to be paid would make a considerable drain upon the resources of the undertaking, the Committee ventured to hope that it would not be all loss, but that the men would, by increased and diligent interest in their work, show their appreciation of the spirit in which the Committee had met them.

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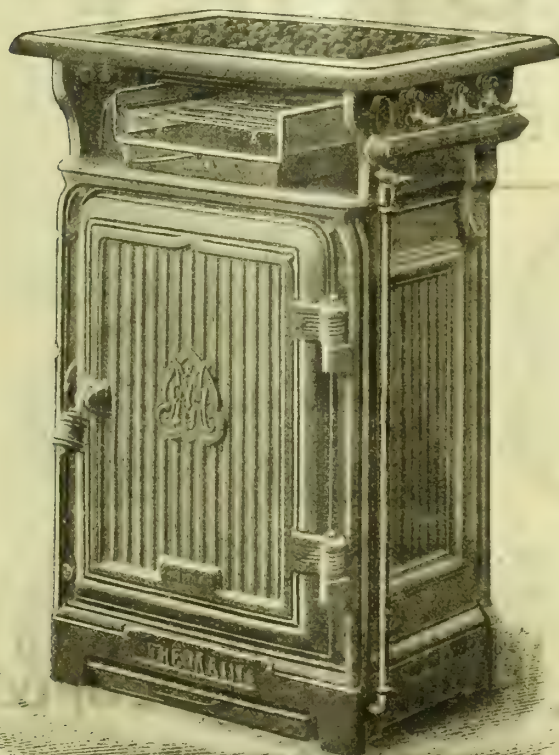
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**Tynemouth Water Supply.**—The conveyance of the North Shields Water Company's undertaking to the Tynemouth Corporation has now been completed, and the entire concern is in the possession of the municipal authorities. The sum of £75,000 has been paid for the works, with 5 per cent. interest from the date of arbitration until the conveyance was signed—the Duke of Northumberland receiving £11,000 of the amount, with his proportion of the 5 per cent. interest. There are certain expenses against the £75,000, and several sums to be added to it, which bring the total payable to the Company down to about £64,000. The payment to the Company was made the week before last; and the Corporation's liability to the Duke will be met as soon as his Grace's signature to the conveyance has been formally obtained. Against the 5 per cent. interest which the Corporation agreed to pay, is to be placed the full revenue from the undertaking during the period covered; and as the revenue has largely increased in the interval, the 5 per cent. will be very much more than covered.

**Fatal Oil Gas Explosion.**—At Bristol yesterday week, an inquiry was held by the City Coroner (Mr. H. G. Doggett) into the circumstances attending the death of John Henry Masters, aged 26, who was injured by an explosion at the Midland Railway oil-gas works, at which he was employed. The accident happened on Monday, the 1st inst.; and details were furnished to the Coroner by Mr. W. Meed, the foreman. On Sunday afternoon, witness inspected the works, when everything was apparently in order. He was called to the place at 4.30 a.m. on Monday, when he found the engine-house and other buildings on fire, with the gas blazing out of one of the high-pressure pipes. Witness immediately procured the key, and cut off the gas. Deceased had meanwhile been removed to the coal-stage, and a doctor was fetched prior to his conveyance to the Infirmary. Witness, on a subsequent examination, found a burst in one of the pipes, about 4 feet from the engine. This piece he cut out and now produced. In April, 1891, he had seen the pipe subjected to a pressure of 200 lbs. to the square inch. The ordinary working pressure was 150 lbs. There were no lights in the engine-house; but in the boiler-house, which was divided from it by a door, there were gas-jets. It was witness's opinion that, when the deceased noticed the escape, he opened the door to find out where it was; and an explosion occurred, caused by the accumulated gas becoming ignited at the light or the boiler fires. It would have been possible to turn off the gas without entering the engine-house, if the deceased had had the presence of mind to do so. J. A. Dezzant, a locomotive driver, deposed that he heard the explosion, and, on looking round, saw that the roof of the gas-house was blown off and the premises on fire. They saw the deceased run out from the engine-house all in flames, and found him in the carriage shed quite conscious. Mr. F. H. Stalvies, locomotive superintendent at Bristol, and supervisor of the oil-gas works, furnished technical evidence, in the course of which he stated that the burst was due to a defect in the pipe. Mr. H. F. Mole, the House Surgeon at the Infirmary, stated that deceased was severely burnt. Death was due to congestion of the lungs, following on the burns. The Jury returned a verdict to this effect, adding that the explosion was due to a faulty pipe, and suggested that another hand be employed day and night at the works.

**The Loans for the Loughborough Gas and Water Works Purchases.**—At a special meeting of the Loughborough Town Council yesterday week, formal resolutions were passed by which it was agreed to raise a sum not exceeding £152,994. Included in the amounts was £40,000 in respect of the water-works, £87,098 for the purchase of the Loughborough Gas Company, £2000 for compensation to the Gas Company's officers, and £8750 for the redemption or payment of all mortgages to the Gas Company. The stock (to be issued at £95) must be redeemed at par in 1960, or it may be redeemed at par at the option of the Corporation in 1920.

**Colonial Gas Association, Limited.**—Reporting upon the working of this concern during the year ending June 30 last, the Directors are enabled to state that the revenue again shows an increased profit over the preceding year. There has been an advance in the consumption of gas; and the indications of returning prosperity in the Colonies continue to be encouraging. The accounts disclose a profit of £4171, from which £1171 was paid to the shareholders as an interim dividend. After providing for interest on debentures, &c., to June 30, there remains a balance, including the amount brought forward, of £2216. The Directors now recommend a dividend, for the second half of the year, at the rate of  $4\frac{1}{2}$  per cent. per annum, free of income-tax (making  $3\frac{3}{4}$  per cent. for the year). This will absorb £1745, and leave £471 to be carried forward.

**Gas Loan for Barnoldswick.**—Mr. M. K. North, Assoc. M. Inst. C.E., recently held at Barnoldswick an inquiry respecting an application made by the District Council to the Local Government Board for sanction to the raising of £6000 for gas-works purposes. The Clerk (Mr. C. Thornton) stated that in August, 1892, the Council purchased the gas-works at a cost of £13,850, and in the following year obtained an Act of Parliament, under which the application was being made. The population of Barnoldswick at the last census was 4131; the assessable value of the town, £16,338; and the rateable value, £14,472. At the time of the purchase, the Gas Company made, on an average, 7 million cubic feet of gas per annum; and during the six years the undertaking had been in the hands of the Council the average was 20 millions. The number of consumers on the books at the time of the transfer was 364, but it had been increased to 852; and they had 1660 meters and 240 gas-stoves in use. When the Council took possession, the annual receipts amounted to £1200; for the year ending March 31 last, the income from the gas-works alone amounted to £3568. The estimated population now was 7000, and the cause of the increase in the production of gas had been the extensive building operations which had been carried on; Barnoldswick having grown very much since the formation of the Council. The sum of £1679 was required for mains and valves, £400 for service-pipes, £1000 for cookers, £1000 for meters, £1000 for a generator setting, £280 for a retaining-wall, £280 for a reservoir, and £40 for sundries. The Engineer (Mr. D. E. Garlick) said that there were now some  $7\frac{1}{2}$  miles of mains; and the present application was for means to lay another 3 miles. The pipes were chiefly required for new streets and for cookers; 762 additional meters had been put in, and 214 stoves. At the close of the inquiry, the Inspector visited the works, and expressed his satisfaction therewith.

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GAS, STEAM, WATER GALVANIZED-TUBES, &c.

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**Portland Gas-Works Transfer.**—On the 1st inst., the Portland gas undertaking was handed over to the Portland District Council. It will be remembered that Mr. W. A. McIntosh Valon was accepted by both parties to fix the sum to be paid by the District Council to the Company, which he placed at £28,656. All parties agreeing, the District Council were, by the consent of Lord Morley, able to promote a late Bill giving them power to purchase. Mr. Valon, being named in the Bill as the Valuer between the Company and the District Council, attended at Portland on Sept. 29 to value the stocks and make the necessary arrangements for the transfer on the following Monday. The matter, therefore, is now completed.

**Sheffield Gas Company and their Workmen.**—Referring to the paragraph which we quoted last week from the "Sheffield Independent," Mr. Hanbury Thomas, the General Manager of the Sheffield Gas Company, has written to our contemporary as follows: "I was surprised to see it stated that the wages paid by the Sheffield United Gas Company are 'below the pay of workmen in Leeds, Manchester, Birmingham, and towns of a similar size,' as such is not the case. As a matter of fact, the Company pay to their stokers the highest wages of any gas undertaking out of London, as the following rates, taken from the report on 'Standard Time Rates of Wages,' just published by the Labour Department of the Board of Trade, will show: London, 6s., 5s. 10d., and 5s. 9d. per shift of eight hours. Leeds, 5s. 2d. per shift of eight hours. Manchester, 5s. 3d. per shift of eight hours. Birmingham (hand stokers), 5s. 3d. per shift of eight hours. Birmingham (stokers employed on machinery), 5s. 9d. per shift of eight hours. Sheffield (both hand and machine stokers), 5s. 9d. per shift of eight hours. And the list further shows that no other towns pay more than 5s. 6d. per shift. I may add that the wages of the stokers were advanced in November last from 5s. 6d. to 5s. 9d. per shift, and that the rates of pay of all other classes of the Company's workmen have been similarly increased during the past twelve months."

**The Transfer of the North Bierley Gas Company's District to the Bradford Corporation.**—Among the minutes of the Finance and General Purposes Committee which were adopted at last Tuesday's meeting of the Bradford City Council, were two or three interesting ones referring to the gas supply of the North Bierley Company's area. In the first place, respecting the transfer of this district to the Corporation, it was reported that a Sub-Committee appointed to negotiate with the North Bierley Company had considered communications from the Solicitors of the Company with regard to the proposed payment of shareholders in Corporation mortgages instead of cash, and had given instructions for arrangements to be made as far as possible for shareholders to take three, five, or seven year mortgages at  $3\frac{1}{4}$  per cent. interest. The North Bierley Company had also been requested to raise by 3d. per 1000 cubic feet the price of gas supplied by them in the districts of Shelf and Cleckheaton, so as to accord with the provisions of the Local Act of last year. The Gas Engineer was instructed to report as to the Corporation supplying gas to the Toftshaw and Lower Wyke districts, where the inhabitants at present purchase gas from the Drighlington and Brighouse Companies respectively, though these districts are within the North Bierley gas area, purchased by the Corporation.

**Threatened "Boycott" of Penny-in-the-Slot Meters.**—According to the "Daily Chronicle," a Protection League has been formed among the gas consumers of St. Luke's Peabody Buildings, who, in the event of the Gaslight and Coke Company refusing to concede to them a reduction in the price of gas, pledge themselves to "strike" against the Company by not using the penny-in-the-slot meter in their rooms. Residents in the Clerkenwell, Drury Lane, and Islington Peabody Buildings are invited to join.

**The Gas and Water Works Purchase Question at Aldershot.**—Last Tuesday evening, a meeting of the Aldershot Ratepayers' and Tradesmen's Association was held to ascertain the views of the members on the above subject. The Rev. J. W. Pickance presided; and he was supported by a goodly number of members of the District Council, including the Chairman (Mr. J. May). The result of considerable discussion was the adoption of a resolution to support the application made to the Chairman of the Council to call a public meeting, as mentioned in the "JOURNAL" last week.

**Proposed Purchase of the Wells Water-Works.**—A special meeting of the Wells Town Council was held yesterday week for the purpose of taking the necessary formal steps for promoting a Bill in the next session of Parliament for power to acquire the works of the Wells Water Company. The Mayor explained that so far matters were progressing very satisfactorily; and he moved that, in the judgment of the Council, it was expedient to acquire parliamentary powers to enable them to purchase the water-works, and to carry out other matters connected therewith. This was seconded by Mr. J. C. Davis, and unanimously agreed to.

**The Bristol Gas Company's New Holder at Horfield.**—At the meeting of the Bristol Town Council last Tuesday, the Sanitary Committee reported that the Bristol Gas Company have erected a gasholder in the urban district of Horfield, and the Company consider it necessary to provide means for draining the surplus water from the tank. By section 6 of the Bristol Gas Act, 1899, the Company are prohibited from passing the water into the Boiling Wells Stream; and the Urban District Council of Horfield have no sewer capable of draining the property. In these circumstances, the Company have applied to the Committee for the terms upon which they might be allowed to drain the premises by means of the Corporation sewer. The Committee are willing to receive the drainage of the property, but are of opinion that the Horfield Urban District Council, who will receive the general district rates accruing upon the premises, should pay a proportion of the rates to the Corporation as consideration for draining them by means of the city sewer. The Committee therefore recommended that they be authorized to enter into an agreement conferring on the Company the right to drain the property in the manner proposed, in consideration of a payment by the Horfield Council to the Corporation of an annual sum at the rate of 3d. in the pound on the rateable value of the gasholder, from time to time—"the agreement to be determinable by twelve months' notice at any time, and to contain such other provisions as the Town Clerk may consider necessary for the protection of the interests of the Corporation." This proposal was assented to.



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ALSO:  
GAS-FITTERS,  
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(i.e. CLEANING AND  
REPAIRING),  
CANVASSERS, &  
INTERVIEWERS.



The Municipal Commissioner at Bombay is advocating the introduction of water-meters, for preventing the waste of water and enabling the residents to be provided with a constant supply.

We have received from the Technical Publishing Company, Limited, Manchester, "The Chemistry of the Materials of Engineering," by A. Humboldt Sexton, Professor of Metallurgy in the Glasgow and West of Scotland Technical College.

In a report which stands upon the *agenda* for the meeting of the London County Council to-day, the Public Control Committee furnish a short summary of the Metropolis Gas (Prepayment Meter) Act and the South Metropolitan Gas Act of last session.

A motion was before the Southend Town Council last Wednesday, instructing the Law and Parliamentary Committee to promote a Bill in the ensuing session of Parliament for the acquisition of the gas-works; but after a very brief consideration, it was rejected.

On Thursday, a Local Government Board inquiry was held at Whaley Bridge with reference to an application by the Chapel-en-le-Frith Rural District Council for sanction to borrow £2158 and £6172 for the water supply of Chapel-en-le-Frith and Fernilee respectively.

The Water Committee of the St. Helens Corporation have decided that all plumbers authorized under the Corporation should be registered under the provisions in this respect of the Worshipful Company of Plumbers, with a view to ensuring the appointment of none but competent workmen.

An eight-hour day has been conceded to the stokers employed by the Hartlepool Gas and Water Company.

The New Sunlight Incandescent Company (1900), Limited, has been registered with a capital of £100, in £1 shares, to acquire the goodwill, business, trade marks, and designs of the New Sunlight Incandescent Company, Limited (incorporated in 1899). The Directors are those for the time being of the Welsbach Company.

As the result of the scraping of the water-pipes, the average daily delivery into the Workington reservoir of the Cockermouth and Workington Joint Water Committee is above 620,000 gallons, or an increase of 134,000 gallons. The cost of the scraping was £470 14s. 7d. It is understood that it is to be carried through to Workington.

The exports of coal from the United Kingdom amounted last month to 4,115,197 tons, as compared with 3,763,206 tons in September, 1899, and 3,506,218 tons in September, 1898. In one way or another, coal left this country in the first 39 weeks of the year to the aggregate extent of 43,086,752 tons, as compared with 41,642,044 tons and 34,516,416 tons in the corresponding periods of 1899 and 1898.

A French authority has computed that the annual production of calcium carbide has already reached 256,000 tons. Taking £15 per ton as the average price of the carbide, the total value of the product is more than £3,800,000 per annum. The cost of manufacture is about £8 10s. per ton with water power, and about £12 per ton with steam-engines. It is claimed, however, that at Meran, in Austria, the price has been brought down to £7 10s. per ton.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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##### OXIDE OF IRON.

**O'NEILL'S** Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

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##### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

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"Volcanism, London."

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#### ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At today's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE. Apply to SADLER AND CO., MIDDLESBROUGH.

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[For Illustrated Advertisement, see Oct. 2, p. 864.]

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David's Water and Gas Company, Penbrooke-shire, a thoroughly practical and capable FITTER, to Tap Mains and Lay Services. Accustomed to work with Wrought-Iron Tubes, and with knowledge of inside Work.

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For Particulars, apply to H. C. SHEPHERD, Manager and Secretary, Gas-Works, Cricklade Road, SWINDON.

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State, by letter, Age, Experience, and when Disengaged to No. 3579, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### WORKS Manager required in Engineer-

ing Works. Must be steady and capable of turning work out cheaply and expeditiously. One used to Gas Plant preferred.

State, by letter, Age, Experience, and Salary expected, to No. 3574, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FOREMAN. Experience of Inclined Retorts and raking Furnaces necessary. Wages £2 per week; Eight-Hour Shifts.

Apply, with Testimonials, to the undersigned not later than Oct. 23.

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Preliminary inquiries as to the duties of the Office should be addressed to the Secretary of the Gas Committee, Council House, Birmingham. Experience in the Financial and Commercial Management of a Gas Undertaking or of a large Manufacturing Business is desirable.

Copies of Applications for the appointment may be forwarded to members of the Gas Committee; but Candidates are earnestly requested to abstain from canvassing the members of the Council or of the Gas Committee.

## SCUNTHORPE URBAN DISTRICT COUNCIL.

## APPOINTMENT OF GAS-WORKS MANAGER.

**THE Scunthorpe Urban District Council** invite Applications for the Office of WORKS MANAGER of their new Gas-Works.

Applicants must thoroughly understand the Management of Gas-Works, and be able to read and fix Meters, and do any ordinary Fitters' Repairs on the Works, Mains, and Service-Pipes. The person appointed will be required to reside on the Works, and will have House, Gas, Coal, and Rates free.

The output will probably be about 9 million cubic feet to commence with; and it is expected to rapidly increase under proper management.

Applications, in Candidates' own Handwriting, stating Age, Experience, and Wages required, with not exceeding three Testimonials, must be sent to me, at my Office, Trafford Street, Scunthorpe, before Three p.m., on Tuesday, the 16th day of October, 1900, and should be marked on the cover "Gas-Works Manager."

By order of the Council,

FRANK C. HETT,

Clerk.

Scunthorpe, October, 1900.

**WANTED, 2200 yards of 4-inch Cast-IRON WATER-PIPES.** Must be strong. Price, delivered at Wigan, to the MOSS HALL COAL COMPANY, LIMITED, near WIGAN.

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Also Two old PURIFIERS, 22 ft. by 8 ft., with 10-inch CONNECTIONS and Two Anderson 10-inch FOUR-WAY VALVES and Four 10-inch RACK and PINION VALVES and LIFTING APPARATUS.

The whole can be seen at the Company's Works in position, and to be pulled down and removed by the purchaser.

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AND OF A SUM NOT EXCEEDING

£100,000 THREE PER CENT. CONSOLIDATED

DEBENTURE STOCK.

**THE Directors of this Company** will be

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Ordinary Stock, the 15th of November, 1900,

Debenture Stock, the 1st of December, 1900,

and will be registered in the Company's Books free of Expense.

The Minimum Prices below which no Tenders will be accepted are as follows—viz.,

Ordinary Stock, £100 per Cent.,

Debenture Stock, £94 per Cent.

Forms of Tender, with full Particulars and Conditions, may be obtained on application at this Office.

By order,

JOHN WILLIAM FIELD,

Secretary and General Manager.

Chief Office: Horseferry Road,  
Westminster, S.W., Oct. 2, 1900.

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J. DONALDSON,

Engineer.

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## RETORTS AND FIRE-BRICKS.

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Specifications, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Tuesday, the 30th of October, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E. & M.Inst.E.E.,

Engineer and Manager.

Offices: Millstone Lane,  
Leicester, Oct. 12, 1900.

## IMPERIAL CONTINENTAL GAS ASSOCIATION

(INCORPORATED BY ACT OF PARLIAMENT.)

**NOTICE is Hereby Given, that the**

HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 6th of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June, 1900, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 23rd inst. to the 6th prox., both days inclusive. The Dividend will be paid on the 13th of November.

By order of the Board,

ROBERT W. WILSON,

Secretary.

21, Austin Friars, London, E.C.,  
Oct. 15, 1900.

## TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

## SALE BY TENDER OF £10,000 FOUR PER CENT.

PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £103 per Cent.

IN PURSUANCE OF THE TOTTENHAM AND EDMONTON GAS ACT, 1898.

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intention of the Directors of this Company to SELL BY TENDER £10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 7th day of December next; such Stock being a portion of the Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of Proprietors, held on the 24th day of February, 1900, in pursuance of the Powers under Sections 15 and 17 of the above-mentioned Act.

Particulars, Conditions, and Form of Tender may be had on application at this Office, and sealed Tenders must be sent in not later than Four o'clock in the afternoon of Monday, the 19th day of November next.

By order,

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Secretary.

Offices: Willoughby Lane,  
Tottenham, Oct. 12, 1900.

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**BOROUGH OF KENDAL.**  
(GAS DEPARTMENT.)

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The Committee reserve the right to modify the above-mentioned Specification and Plans, so as to enable Makers of Patent Cable and Spiral-Guided Gasholders and other persons wishing to avail themselves of Patent or other rights or facilities to tender in accordance with the Contractor's own Designs. Such alternative Designs, with complete Plans and Specifications, to be submitted to the Engineer, and approved by him before the Tenders are made.

Sealed Tenders, endorsed "Tank and Holder, Contract No. 2," to be delivered to the undersigned not later than Twelve o'clock noon on Wednesday, Oct. 31, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) JOHN BOLTON,  
Town Clerk.

Kent Street, Kendal,  
September, 1900.

**NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.**
**SALE OF ORDINARY STOCK.**

**THE Directors have instructed Mr. ROBERT MACK to SELL BY AUCTION**, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 7th day of November, 1900, at Twelve o'clock at noon,

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Secretary.

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**MR. ALFRED RICHARDS** begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

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By order of the Directors of the

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By order of the Directors of the

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AND OF THE

CORPORATION WATER UNDERTAKINGS

OF

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FOR THE YEAR 1899-1900.

Compiled by

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Chartered Accountants.

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## EDITORIAL NOTES.

## Local Authorities' Conference on the London Gas Question.

A FURTHER stage in the development of the London Gas Question was marked on Wednesday last by the holding of a conference, at the London County Council offices, of representatives of the multitudinous Metropolitan Local Authorities, under the presidency of Mr. E. A. Cornwall, the Chairman of the Parliamentary Committee of the County Council. The business before the meeting was to consider the prices of gas, and other matters connected with the general subject. The Chairman reviewed the history of the gas supply of London in an able speech; his point of view, of course, being that of an uncompromising censor of the existing state of things. He looked back fondly on the age of competition; speaking with unaffected regret of the period when "consumers were able to buy "from whichever Company they pleased at the lowest "price, and make the best bargain they could." He might have added, "and bad was the best," compared with the prices and conditions of the supply of gas to-day; but that would have introduced an element of impartiality into his discourse which would have spoilt its symmetry. Mr. Cornwall's main point was the failure of the actual settle-ment to satisfy the consumers. He gave an estimate—none too modest—of the amount of extra dividend which, as he politely put it, the Gas Companies have "pocketed" by reason of the sliding-scale arrangement; but he naturally omitted to state the corresponding amount of reduction of gas prices which rendered this process possible. Now, whatever opinions may be held as to the relation of these quantities being altogether or even largely one of cause and effect, it is distinctly unfair to mention one and absolutely ignore the other.

The unfairness of the Chairman in this respect brought its own swift retribution, in the shape of a muddled and wasted meeting. Mr. Cornwall really ought to have known better. He, at any rate, has no excuse for making believe that the gas question of London can be disposed of by any off-hand expedient based upon an *ex parte* statement. The London County Council have tried several "falls" with both the Gas and the Water Companies of London, in just this one-sided style; and they have always come off second best. They will continue to experience the same fate, so long as they persist in ignoring the facts and the real difficulties of the questions to which they address themselves. Mr. Cornwall talked about this and that parliamentary move of the Gas Companies as being "very "shrewd," or "very clever." This qualification does not agree with his accusations of stupidity—or mismanage-ment, which is the same thing—against the same subjects of his somewhat rancorous censure. The truth of this part of the matter is that the Companies always know what they want of Parliament, and occasionally get it. Their opponents are not so clear, and cannot be so long as they shut their eyes to entire aspects of the questions. There-fore it is their parliamentary campaigns are bootless.

Mr. Cornwall gave his case away when he declared that "the consumers had had no benefit whatever" from the sliding-scale; which, of course, includes the auction clauses, here completely ignored. What is the use of Mr. Cornwall or anybody else calling a meeting ostensibly to consider the complete question of the Metropolitan Gas Supply, and never once mentioning the premium capital of the Com-panies, which is the first thing staring a would-be reorganizer in the face? Granting, for the sake of the argument, that his indictment of the Gaslight and Coke Company is well founded, what is to be done without injuring the inno-cent? But Mr. Cornwall was hopelessly at sea respecting other matters—notably the asserted case for the portable photometer. He should not have said that London gas can only be tested "by giving many hours' notice to the "Gas Company, and at special points," because the state-ment is not true. This is merely a sample of the kind of falsehood and loose talk that gets its deserts in the Parlia-mentary Committee Rooms.

Mr. Trenner, a delegate from Holborn, had a point (such as it was) in regard to the possible redemption of the Gas Companies' obsolete capital by devoting to this purpose the extra sliding-scale dividend. After him, the delegates talked at large about many things without evolving any distinct policy. Mr. Wallace, of Camberwell, prudently reminded the conference that it was useless to pass resolu-tions calling for a revision of the sliding-scale of price and



dividend "unless they knew what they meant, and meant "what they said." The inevitable Sir Albert Rolit, that typical Town Clerk of his time, brought the conference to book, when the Chairman evidently wanted a lead, with the suggestion that they should base their deliberations upon the recommendations of the Powers of Charge Committee. Hereupon Mr. Trenner scored again, with a resolution to omit from Recommendation No. 1 the reference to waiting until the Companies went to Parliament of their own accord. His familiar query, "Why should London wait?" carried this motion; but he had to give up for the time his point about applying extra sliding-scale dividends to redeem obsolete capital, possibly on account of the difficulty of defining what is obsolete and unproductive capital in every case.

The upshot of the whole business, however, was little enough. A resolution was passed declaring "that, in the opinion of this conference, the time has arrived when the sliding-scale, 1875-76, needs revision in the interests of "gas consumers." Several other resolutions of greater or less significance, which will be found duly set out in our report of the proceedings, were also passed, including one declaring "the practice of the Gaslight and Coke Company of treating the north and south differentially . . . is a grievance which ought to be redressed." This conclusion seems very tame. The sinking-fund resolution was carried by itself after all; and Mr. Trenner has the satisfaction of knowing that the honours of the day were his. Several of the delegates seemed to have a better grasp of the subject than the Chairman. There is still a good deal to be hammered out at the Lord Mayor's conference on the same business, which has been fixed for the 31st inst. at the Guildhall. Meanwhile, those who purpose attending the meeting will be well advised to look into that matter of the premium capital of the Companies, so as not to have the second conference labouring under the disadvantages placed upon the first.

#### Elections Past and Future.

THE General Election is over; and the country has given the Government the answer to the question put, as we remarked a month ago, in the form of a "short point." Also, as we then observed, a clean sweep has been made by the great mass of the electorate of the men of sectional issues and small side causes. The unanimity of the big, and what it is customary to regard as the more enlightened, constituencies has been most impressive. And, further, it is pleasant to be able to record, the wish we expressed for the return of "honest gentlemen" has been most conspicuously gratified. All the old and trusted servants of the public who wished to be back again at Westminster have had their desire; and many of those who had forfeited the confidence of the public have been sent about their business. The Government now stands before the world stronger than ever after its touch of the soil, with a free hand for anything after the more pressing work of the hour shall have been disposed of. The professional Labour Leaders, so styled, have had a bad time of it. Political capital was sought to be made out of Mr. Chamberlain's blunt declaration that men of this stamp are of little or no use in Parliament. But the electors were of his mind in most places where their opinion was asked upon the point. True, the disappointed Labour candidates for parliamentary honours had their perverse opinions on the great question of the election to thank for their rejection, even more than their classification; but it is a matter for congratulation that so many working-class constituencies saw the fallacy of the pretension upon which this class candidature is based.

It really looks as if the new Parliament will turn out to be of even better composition than the old one. As usual, the Bar supplies more members than any other profession. On the theory of class representation, or delegation, of course this would be a defect. About one in six of the new House of Commons has been called to the Bar; but that does not mean that this large proportion of members are lawyers in anything more than the description. It speaks well for the character and all-round ability of the followers of the legal profession that they should command the suffrages of so many diverse constituencies, town and country. There ought, one would think, to be very little bad law perpetrated by a Parliament so leavened by lawyers; and yet one is reminded of the old saw about the bad shoeing of blacksmiths' horses and cobblers' wives. Statute law is a safe "draw" for judicial scorn; yet most

Judges have sat in Parliament and had a hand in the manufacture of laws. Next in number to the legal contingent come the gentry and landowners, pressed closely by manufacturers, merchants, newspaper proprietors and journalists, the liquor trades, bankers, and so forth, down to the "estate agents, architects, and accountants," who form a class of two! Still, what matters the classification, so long as the members are personally "good men and true"?

No sooner have the echoes of the Parliamentary General Election died away, than preparation has to be made for that minor general election in London which is to give the Metropolis its new local authorities. Among the non-descript rejected of the London parliamentary boroughs were numbered the most notorious of the London County Council politicians. How the men of the same "stripe" will fare next month, remains to be seen. Already the newspaper organs of Progressivism are getting ready the haloes for their favourite candidates; for it is a curious twist of municipal politicians of this brand to claim a monopoly of all the civic virtues. We noticed last week that one of these newspapers unctuously adjured the London municipal electorate to return borough members who would strive to make municipal employment the pattern as regards pay and privileges for all employers of labour to follow, at whatever distance. It is to be hoped that the issue of this pandering to the working-class voter will be taken fairly and squarely at the coming election. It is high time that the ratepayers reminded the London County Council and the other Metropolitan authorities that the world does not exist for the coddling of their working-men pets. There are some other interests to be considered than those of the Trade Union bricklayers, plasterers, carpenters, and paviors, who seem to think that the earth and the fulness thereof belong to them, and that county councils and local boards of every kind have nothing better to do than to see that they get it.

Naturally, the conduct of the County Council in this regard is copied by the other authorities. Here is Poplar, for instance, building its electric lighting station at first hand, employing labour directly. What did Mr. H. E. Jones have to say the other day about the extravagant and unnecessary paving work done at the East-end, apparently with the chief object of finding employment for an army of workpeople? A nice object-lesson in vestry morality, too, is the sealing, at the eleventh hour, by the Vestry of St. George's, Hanover Square, of an electric street lighting contract to run for thirty-one years. Then there is the case of Hackney, where Vestry electric lighting and other extravagant enterprises have run the rates up from £63,757 to £193,495 in the last five years. Mr. Dickinson, the Chairman of the London County Council, has just started the Hackney electricity works, which is one of the "dust-cart and dynamo" delusions, and cost £250,000. In his speech on this occasion, he urged his audience, "as soon as the new light was ready, to cut off their gas!" Two can play at that game.

Whether for good or for evil, in these first London borough elections few new men are coming forward. The old vestrymen are competing against one another for the reduced number of seats. Obviously, in these circumstances, there is no guarantee that the fittest will generally survive. The heavily-subsidized vestry labourers will look after their friends. But still, unless every gleam of common sense has departed from the Metropolitan ratepayer, he will take the trouble to vote for the candidates who do not engage to make an earthly paradise for labourers at his expense. It is all very well to bang the big drum of Progress at the head of a procession of Trade Unionists anxious above all things for "soft jobs;" but it must by this time be perceived by those who look on that the term is a misnomer. After all, true Progress is a plant of very small growth in this weary world. Not very much can be done directly in this cause by a municipal corporation. To keep the town clean would be Progress enough for one generation of London municipalizers. There is not much glory to be won in this way; but a clean street is more credit to a Corporation than a cooked balance-sheet. To be always clamouring and arranging for some new thing seems to be some people's ideal of municipal efficiency; we would rather see it in the removal of some old eyesore, the stopping of some chronic leak of public money. If the public can only find out the men who will be contented to do this drudgery in their interest, and



do it thoroughly, these are they who should be selected for the new borough councils; but we are not over-sanguine on the subject. Such faithful servants of the body politic do not, as a rule, advertise. They are not picturesque figures. The popular newspapers cannot make anything out of them. They do not tickle the popular fancy; and therefore they are passed over. The efficiency of all governments, in the last place, is the accident of their composition. If there happens to be a good man or two in the body, its business will be well done; otherwise not. The democratic or aristocratic form of the government is of no significance; but only the former is possible for this country, now and henceforward. If the democratic form is inspired by the ablest and best spirit of the Age—if, that is to say, its character is truly aristocratic—then the result of its operation cannot be otherwise than happy, useful, and economical.

#### An Apologist for the Coalowners.

THE address read to the annual meeting of the South Staffordshire and East Worcestershire Institute of Mining Engineers yesterday week by the President, Mr. F. G. Meachem, who is the Manager of the Hamstead Colliery, has attracted some attention, as being in the nature of a defence of the coalowners' action in forcing up the price of coal to its present level. We do not think that the owners have any reason to feel grateful to Mr. Meachem for his efforts on their behalf, as his outline of the policy that has been and is to be pursued by them is as unsatisfactory from the standpoint of the consumer—which is to say from a national point of view—as could well be imagined, while many of his arguments are nothing but specious fallacies. The policy which, according to Mr. Meachem, has been partially adopted in the past, and which he urges should be fully adopted in the future, by the colliery proprietors, is, "co-operation, not competition." The coalowners have been a down-trodden, self-sacrificing, philanthropic body of men in the past—content to take a miserable profit, or even to work at heavy loss, if they might only be allowed to contribute to their country's prosperity. But, failing of the national appreciation which their unselfish conduct should have won, they have at length been driven by the apparition of starvation to take measures to protect themselves. So, in future, coal is only to be sold "at a remunerative rate;" and the coalowners are to settle the definition of "remunerative" for themselves. "A selling-price basis," says this representative of the collieries, "fixed as a minimum, which shall be a remunerative one, seems to me as necessary as having a living-wage basis among the operatives." Times have changed, indeed, when a colliery manager is found talking about the miner's "living wage" (which no man has ever yet succeeded in defining) as being "necessary;" and what a counting of chickens before they are hatched for the manager to make all his calculations of future profits without allowing for the action of that most inconvenient factor the "law of supply and demand"!

And what about our position in the commercial markets of the world? Oh, says this great economist, that is easily arranged. Let the combined trades, coal and iron, form a Board of Representation, "whose task should be the collecting of information in reference to selling prices of foreign-made iron on the English market;" and then the Board could "so arrange the price of coal as to allow of the making of iron at such a price as would enable English makers to compete in every market." This, says the "Colliery Guardian," is "a most valuable suggestion," which may prove to be the germ of the solution of the problem contained in the possibility of an era of permanently dear coal. We have no hesitation in describing it as a suggestion which is only saved from being mischievous by its own obvious absurdity. As if, forsooth, the ironmaster and the coalmaster would ever agree as to what price the first should pay the second, even supposing they could jointly obtain sole command over that price! But the most astonishing thing about this precious suggestion is that its author coolly ignores the requirements of any other buyers of coal beside the ironmasters, or the effect of high prices upon any other industry in the country. "The household consumer," he has the effrontery to declare, "certainly could not expect the same consideration as the manufacturer"—why, he does not condescend to explain—"and the observance of a little more economy on their part would certainly minimize the effect of high-priced fuel." It would, we may remark, also minimize the coal

owners' business. But what about the railway companies, the gas companies, and other not altogether insignificant consumers of coal—are they entitled to no "consideration"? Unless the colliery proprietors really wish that insult should be added to the injury that the present price of coal is inflicting upon almost every trade in the country, they had better silence Mr. Meachem.

Increased demand, says Mr. Meachem, should be placed first among the causes of the rise in the price of coal. That, we suppose, is why he suggests increased economy to coal consumers as a method of compensating for the high price he is so anxious to maintain. The logic is as good as when he first says that a tax on coal exports would not reduce the demand from abroad, "for, if coal is a necessity to the foreign purchaser, an import duty would but force a higher price, and not restrict his purchasing," and then remarks later that "a tax would do no good whatever, and would open our markets to foreign colliers." We are asked to accept as conclusive evidence that the coalowners are not reaping tremendous profits at present—Mr. Meachem having previously explained that it is only by means of such "grand years for collieries" as this that the bad years are rendered endurable—the facts that colliery assessments have materially increased (a proof, evidently, that the valuers do not think the owners are doing very badly), that the Workmen's Compensation Act imposes an extra cost of 2d. per ton (this has been stated by other authorities to be less than 1d. per ton), that stores have gone up in price, and that wages have been considerably increased. Seeing that wages have only risen because of the higher price of coal, and that all the other reasons put together only account for a few pence per ton, while the charge for capital remains practically constant, we must really be forgiven if we remain unconvinced. And how are the balance-sheets of the coal-mining companies to be explained? And what did Mr. Meachem mean when he said that "the present price of coal affords us, as an institute, matter for congratulation in which the coal trade at large may certainly share"?

#### Mr. C. H. Wilson on the Allocation of Municipal Trading Profits.

IT appears impossible to get away for a week from the controversy over municipal trading at a profit. In the last issue of the "JOURNAL" we reported in abstract the paper on the subject read by Mr. C. H. Wilson, a member of the Leeds Corporation, to the Incorporated Society of Accountants and Auditors, meeting in that city, with some notes of the discussion. We yield to nobody in respect for the profession which Mr. Wilson adorns, and only wish its members had more to do with the auditing of local authorities' accounts. If this were the case, possibly the modern fashion of municipal trading would in many quarters lose some of its attractiveness. It is not the smallest of the benefits that the new order in the local government of London will confer upon the ratepayers, that at last the borough accounts will be properly audited, which has not been usual with the Vestries. But, with all our esteem for accountants, when they are also honest men, we do not take them for more reliable guides on questions of policy than other capable citizens. Mr. Wilson, therefore, spoke as a townsman of Leeds when he advocated the general and systematic subsidizing of rates out of the disposable profits of municipal undertakings. We cannot see that he added materially to the well-known case on this side; while several speakers subsequently exposed some of its weaknesses. It seems particularly ungracious on the part of a Leeds man to advocate the surcharging of gas consumers to relieve the rates; seeing that it was by following the contrary policy that the great expansion and prosperity of the Leeds gas undertaking was ensured in the most critical period of its fortunes. He would be a bold man who should say that the Leeds gas property has improved and been a greater credit to municipal administration since that policy went out of favour at the Town Hall. Speaking as an accountant, Mr. Wilson was quite within his province in drawing attention to the hardship inflicted on ratepayers by the cast-iron rule of making all Corporation capital redeemable. If it could only be properly discriminated, that portion of a Corporation's estate which has a perpetual value, such as land, might safely be excepted from the operation of a sinking fund. This question is increasing in importance with the imminence of large schemes of housing improvement. Mr. Wilson utters a rather uncertain note, however, on the



doubtful subject of the equivalence of loan redemption and works' depreciation. This is a very important matter; and it is to be regretted that he rather belittled it in his anxiety to make the best showing for municipal trading at a profit.

#### The Need of Using Young Men.

SPEAKING the other day at Halifax, upon the education scheme of the town's Chamber of Commerce, Mr. Carnegie called attention to the wisdom of making use of young men before they get their originality and enterprise rubbed out of them by routine's daily grind. Referring to the need of giving young men a sound commercial, technical, and general education—a need which the Halifax Chamber of Commerce are endeavouring to supply, so far as their sphere is concerned—Mr. Carnegie remarked that, while this was an essential to the commercial success of the nation, something further was needed. Not only must the young man be educated; he must be used. Employers had their part to perform. The young man of exceptional ability "must be called up and made a partner"—that is to say, must be given a position of importance in the concern, in which he can use his abilities to the best advantage. The great secret of success in America is, said Mr. Carnegie (and who more qualified to speak on the subject?), that employers there are always on the look-out for, and make the best use of, clever young fellows. Is that not a lesson which many employers in this country—and we would say especially Boards of Directors who do not depend for their livelihood on their Company doing something more than just earn the normal dividend—need to have brought home to them? Full well we know that in many a Gas Company the major portion of the able man's life is wasted in doing work far beneath his capacity, while he is waiting for another man's shoes, so that, when the vacancy does occur, he who twenty years before would have been eminently suited to fill it, has had his energies diminished by years of monotonous drudgery, his initiative and ability have decayed or perished for lack of exercise, and—he is given the post! In one case out of three perhaps (though probably not so frequently) is the "senior" man the best to succeed when the head man goes. In the majority of cases, the younger, keener, fresher man is he who will give the best return for the salary. It will be said, maybe, that the younger man will lack the experience of the older. Well, in some cases, this might be a weighty argument. We are not arguing that a young man is necessarily, only that he is very often, the best fitted for responsibility and power. But does not the accumulated experience frequently act upon the man in the same way as barnacles act upon a ship—making him slow rather than swift in action? The man who has run in a groove for a quarter of a century, who has got to think that what has been is the best and ever shall be, how is he to rub up the rusty machine when he cannot see the rust, to strike out new lines when the old are so much the easier for him to run upon? The chances are he will choose the line of least resistance, and adopt as his motto: "Anything for a peaceful life." Yes; Mr. Carnegie is right; for an employer to be most successful, he must look out for the clever young fellows, and use them.

We learn from the Hon. Secretary of the Midland Association of Gas Managers (Mr. Charles Meiklejohn, of Rugby) that the date of the autumn general meeting in Birmingham, announced as the 1st prox., has been changed to Thursday, the 8th.

Mr. Henry O'Connor, of Edinburgh, has been awarded a diploma of merit by the Edinburgh Association of Science and Art, for a paper on "The Gas We Burn," which he read before the Association in November last year, and noticed in the "JOURNAL" at the time.

According to the "Wealth and Progress of New South Wales, 1898-9," by Mr. T. A. Coghlan, the Statistician to the Colony, the largest output of coal—4,597,028 tons—was recorded for last year; but the fuel has so fallen in price that this considerable quantity was sold at about the same figure as three-fifths of the output in 1884. The average price at the pit mouth was 5s. 9d. per ton last year, as compared with 9s. 4d. per ton in 1885.

Mr. Edward A. Harman, M.Inst.C.E., Gas Engineer to the Huddersfield Corporation, was duly elected a member of the Sanitary Institute at the last meeting of the Council. Mr. Harman has done a considerable amount of work in connection with the disposal of sewage, and has made several interesting experiments with the sludge; obtaining therefrom illuminating gas to the amount of about 6000 cubic feet of 13-candle power per ton of material used (containing 28 per cent. of moisture). Particulars of the experiments appeared about two years ago.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1037.)

THE abundant supply of floating capital by reason of the large Government disbursements, and a strong demand for gold for the United States and the Continent, have caused some uncertainty as to the future course of the Money Market. The Stock Markets have naturally felt the effect of this; but, in addition, the aspect of affairs in China, and the prolongation of the guerilla warfare in South Africa, are checking business. With the continued absence of public buying orders, dealers have found it difficult to maintain the value of speculative securities in most departments; and prices at times during the past week have shown a drooping tendency. Investment stocks, however, have been firm owing to the ease in money rates; and Consols, Indian Government stocks, and some of the Colonial issues mark an advance. In the Gas Market, as in other gilt-edged securities, there has been a firm tone, though the dealings have been on a small scale throughout; and very few changes have taken place. In Gaslight issues, the ordinary was again moderately dealt in between 99½ and 100½; while in the secured issues, the 3 per cent. debentures were in request, and rose 1. The other Metropolitan Companies remain very quiet, with an occasional official record of business. In the Suburban and Provincial Gas group, the only feature is a rise of ½ in Alliance and Dublin 10 per cents; but a little business has been done in Brentford old and new stocks, and also in Brighton "A." The Continental group was again very quiet; the dividend announcement at the rate of 5 per cent. for the half year by the Imperial Continental having had no effect upon the market—business being done at 210 and 210½. Oriental showed weakness. There was a little dealing in San Paulo and Monte Video. As regards Water Companies, the chief feature was the demand for Southwark and Vauxhall ordinary, which has advanced 3, and the "A" debentures 1. There was also some inquiry for New River shares, which are quoted at an advance of 2.

The daily operations were: The week opened with renewed quietness in Gas and Water stocks; and prices were well maintained. A few bargains were recorded in Gaslight ordinary, Imperial Continental, and Monte Video. There was a little more activity on Tuesday; but prices were unaltered. Wednesday, however, saw a rise of 1 in Gaslight 3 per cent. debentures, and ½ in Alliance and Dublin 10 per cents. Southwark and Vauxhall "A" debentures gained 1. Thursday was also an inactive day; and prices remained unaltered in Gas and Water stocks. Gaslight ordinary changed hands at 100, Imperial Continental at 210, Brighton "A" at 152½, and Brentford new at 181½. Friday and Saturday, particularly the latter, were very quiet; but on Saturday Vauxhall ordinary further improved 1.

### ELECTRIC LIGHTING MEMORANDA.

A Peculiar Transaction by the Vestry of St. George's, Hanover Square—Is it a "Job"?—The Competing Offers—Extravagance Wins.

THE elections of the new Metropolitan Boroughs will be held on Nov. 1; and most of the moribund London Vestries and Boards of Works have already held their last meetings. With great consideration for their successors, several of these disappearing bodies have made arrangements in advance for carrying out the most important and expensive local public works. We noticed last week how the ratepayers of Poplar have been committed to an extravagant electric lighting "enterprise" of which the old authority have appropriated the glory, leaving the new borough to pay the bill. Electric lighting is almost the only trading affair in which London local authorities can indulge, happily for the ratepayers. The ingenuity of the old Vestries has been equal to committing the ratepayers to costly engagements on this account, even where there has been no attempt to set up parochial electricity supply. But the most glaring example in point that has come under notice is the action of the St. George's, Hanover Square, Vestry. This is how the matter stands in the bald record published in the current number of the "Electrician": "A special meeting of the Vestry was held last week to receive a report from the Electric Lighting Committee in regard to the electric lighting of the streets. At the outset, a communication was read from the Gaslight and Coke Company asking the Vestry to postpone their final decision, as the Company had under consideration a more comprehensive scheme for the better lighting of the parish, at much less cost than the scheme for electric lighting. Notwithstanding this, the Committee recommended that the agreement with the Westminster Electric Supply Corporation be approved and adopted, and that the seal of the Vestry be affixed." An amendment to refer the matter to the new Municipality was defeated; and the Vestry sealed the fate of the ratepayers for thirty-one years after their own demise.

On the face of it, a more scandalous "job" was never rushed through a Metropolitan local authority. What the reason was for this indecent haste, did not transpire. One vestryman said that the question of the parish lighting had been before the Vestry for fourteen years. We suppose it has occupied the attention of this august body for a very much longer period than that—ever since public street lighting was introduced, in fact.



But why this consideration should have been allowed to prevent the matter being deferred for another year, or at least left over for the new Municipality to decide, is a mystery of Bumbledom. We do not, of course, accuse the Westminster Electric Lighting Company of malpractices in this connection; for, as a business firm, they naturally snapped at a fat contract while they had the chance of getting it. What the Vestrymen could have been thinking of to do a thing that lays them open to such injurious reflections, passes the wit of ordinary mortals to conceive. Where was the cause for hurry? We know what was the nature of the offer the Gas Company had to submit. It was alluded to in our first "Editorial Note" last week. The officers of the Distribution Department of the Company, being cognizant of what was going on between the Vestry and the Westminster Electricity Supply Corporation, considered, as men of business, what alternative proposal they could make to the Local Authority. High-power incandescent gas-lamps suggested themselves; but all gas technicians know quite well that this system of lighting has hitherto been in the experimental stage, and has only been applied to isolated groups of lamps. No gas company has yet organized a high-pressure gas-service for the public lighting of a large town district involving 600 lamps. Even the Westminster electricians, with nothing to learn in this respect, have two years in which to erect this number of lamps in St. George's, Hanover Square.

Naturally, therefore, the Gaslight and Coke Company had to decide whether they would be justified in making the fresh departure proposed by their officers, and incurring the new and additional responsibility of supplying high-pressure gas under the same conditions as those governing the usual run of street lighting work. Estimates had to be made and passed; but the outcome was the conclusion of which we gave the general points last week—that the improved lighting could be done for any Metropolitan parish, in 1000-candle power units, for a working expense of £16 5s. per annum, with £4 15s. a year extra for the first five years to wipe out the cost of the installation, which would thereafter be the property of the parish. The St. George's Vestry would not wait a week to allow the Gas Company's Board to adopt and submit a firm offer in these, or similar, terms. Instead, they rushed into a thirty-one years' contract to pay at the rate of £32 per annum for every 750 watt arc, £22 for every 500 watt arc, £4 per annum per 120 watt incandescent lamp, and £3 for every 60 watt lamp. And they are not to have the lamp-posts, or anything! The pill was slightly sugared by the addition of some petty, and utterly futile, allowances. Thus, there is to be "a cumulative rebate of  $\frac{1}{4}$  per cent. per annum for each year after the first full year during which any lamp has been used. This is a curious provision. In addition, in the tenth and twentieth year of the contract the Vestry are to be entitled "to refer to an arbitrator the question whether the charge should be varied in consequence of the adoption by the Company of any improvement or method which had resulted in a substantial alteration in the cost of public electric lighting." Why, this is after the stale old model of the Paris Gas Treaty, with its provision for price revision by a Technical Commission; which never yet ordered a half-penny reduction. It reproduces the worst features of the Continental "concession," which has hitherto been unheard-of in this country. Whatever the defects of our English system of regulating such matters, it does recognize the economic truth that the price at which the vendor can afford to sell an article depends chiefly upon the prosperity of his business, not upon its technique. At St. George's, they have elected to bind the ratepayers for a generation to pay through the nose for electric street lighting, under a set of cast-iron rules which absolutely debar the public from all hope of getting anything better or cheaper during the whole of this outrageous period. It may be doubted whether a Vestry has the legal right to enter into such a contract, for such a time; but there can be no doubt whatever of the moral character of the arrangement. Arc lamps at £32 a year ought to be good business for the Company, whose Manager deserves a compliment on his address in pulling off such a deal in the nick of time. But if the Local Government Board have no power to interfere, in the peculiar circumstances, there must be a screw loose in the London Local Government Act, 1899.

#### AFTER ELEVEN YEARS OF PROFIT-SHARING.

THE valuable Paris Gas Conference paper of M. Hedde, of Paris,\* on methods of interesting gas workers in their employment, forms an excellent supplement to our appreciation of Dr. Gilman's useful work.† M. Hedde is particularly worth reading by English gas managers, for the sake of the un-English standpoint naturally taken by him in regard to the different divisions of his subject. It almost strikes one as an oddity, nowadays, to find "fixed wages" put in the first place among means for interesting workpeople in their work. The Trade Unions and their Socialist instructors have so effectually divorced the idea of earning wages from that of the obligation to do honest and dutiful work, that it comes with quite a shock to be reminded that it used to be regarded as one of the chief duties of man to be a "profitable servant," in his place and degree. Let us take the liberty of pausing for a moment on this old aspect of work, in order to impress it upon those who may be tempted to rely over-much on any premium-device for evoking faithful service, that no such ex-

pedient can be anything more than an encouragement, an accessory, or a recognition of the operation of a deeper, stronger motive. No system of profit-sharing or other means of encouraging good workers can make bad workers into good ones. If the spring of honesty and dutifulness to his salt is not in a man, these expedients will not plant it in him. If the very soul of the workman is saturated with Collectivist sentiment, nothing that can be done for him—no amount of wages, even—will reconcile him to his position in the industrial system, to say nothing of interesting him in his work. Therefore, the history of all successful profit-sharing or other premium schemes for the encouragement of workpeople, is in the first place a history of the weeding-out, and the consistent exclusion from employment, of all those whose hearts are not, and cannot be, in their work. This is a point which is far from being generally understood. We are not sure that even Mr. George Livesey has fully grasped the meaning of that animosity to his scheme of profit-sharing which has dogged its progress from its inception, and that lesser, but still mortifying, indifference to it which persists among some even in the South Metropolitan preserve.

When an employer has got hold of a man whose heart is in his work, how shall he be encouraged to put forth the best that is in him? Practically, nobody in authority in the industrial world acts on the assumption that the payment of wages is all the encouragement, as well as all the recompense, that faithful work deserves. Obviously, wages are, and must always be, the chief consideration for the reward of labour, if only by reason of the preponderating amount of this payment. But there is always something more, regular or apparently accidental. Although the whole strength of Trade Unionism is arrayed against the operation of natural selection in the labour market, yet the principle cannot be wholly suppressed, even in the most society-ridden trades. Every promotion, every advance of pay or position, is in one sense an act of encouragement of the recipient and of all others who can hope for a similar experience. So that it cannot truly be said that present wages are everything to a workman. It has come to pass, through the course of time, that some employers, like Mr. Livesey, have persuaded themselves that what is called profit-sharing is upon the whole the best known means of systematizing this adventitious encouragement of faithful work. We have recently been favoured with a statement of Mr. Livesey's opinions upon this matter, after eleven years' experience of his application of it in the case of the South Metropolitan staff; and we are glad to be able to place the sense of this ripened judgment on record, after having published Dr. Gilman's and M. Hedde's views.

Theoretically, as everybody concedes, profit-sharing is unexceptionable. The difficulty arises when the most perfect ideal system has to be adapted to imperfect human nature and non-ideal industrial systems. The principle of profit-sharing has failed to bear the stress of this adaptation, in many instances; but Mr. Livesey declares that, being convinced of the soundness of the policy that all those who are engaged in a business undertaking should have a direct and personal interest in its prosperity, he is now able to testify that his experience of the working-out of the policy has been more gratifying than he ever expected or even hoped. That is much to say. But, of course, the success is not unqualified. There is a minority of South Metropolitan men with whom the experiment has proved a failure financially, and perhaps morally. These men bear no animosity to the principle; but they simply take their bonuses in cash as soon as they can, and spend them—too often, to their own loss and detriment. Indeed, they cannot help having a certain friendly feeling towards employers who provide them with this "unearned increment," entirely as an act of good will; and perhaps this feeling tends to make them more satisfactory servants than they might otherwise be. Hence, even in the case of these unthrifty ones, who treat their bonuses as so much deferred wages, the system is not all a failure.

Naturally, Mr. Livesey would prefer the whole of the South Metropolitan profit-sharers to be thrifty. He rightly regards as the best citizens those who save their cash bonus, and take the fullest advantage of the facilities offered by the Company for the investment of these savings. A staff having this co-partnership with the Company must be a tower of strength to the undertaking, a credit to the system, and a help to themselves. It is very surprising that from the commencement of the scheme, with what was very largely a new staff of workmen, to whom it was necessary to pay the first bonus in cash, in order that they should realize its possession, from 40 to 45 per cent. of the men did save the money. After five years' experience, it was deemed expedient to make only one-half of the bonus payable in cash; the balance being required to be left with the Company at interest. This resulted in nearly 40 per cent. of the cash portions being saved, thus making the grand total of 70 per cent. of the bonus invested, and only 30 per cent. withdrawn. The attention of the Profit-Sharing Committee was concentrated upon this withdrawn proportion, with fair success. In 1898 it was brought down to 27 per cent., in 1899 it was further reduced to 22 per cent.; and this year it has come down to 16 per cent. Out of the year's bonus of some £24,000, less than £4000 has been withdrawn. This is regarded as very good, but still not quite satisfactory; because there is reason to believe that the amount spent brought very little good to many, and much harm to some. The strength of the whole position lies in the shareholding, especially at the present juncture, when, owing to the

\* See ante, pp. 839, 897.

† See ante, pp. 406, 691, 756, 827.



advanced price of gas, the bonus under the scheme is stopped for the time being. Although the premium does not come in, the men say that "they still have their dividends on the stock ;" and so they rest content.

Of course, Mr. Livesey realizes, and allows for, the fact that the thrift aspect, or development of the scheme, is not the whole of it. It is understood that the Profit-Sharing Committee take a lenient view of all those cases of withdrawals of the bonus for which reasonable cause can be shown. There must always be instances where a better or more pressing use for a sum of money exists than the Company can afford. Therefore there will never be unanimity of practice in this regard. A strong point is made of the fact that the men are the absolute owners of their bonuses ; and they can do what they please with them. Nevertheless, in such a fellowship as the staffs of the South Metropolitan and Crystal Palace District Companies now are, men chronically impecunious and shiftless are not well regarded by their fellows. It is not as if the sharing of profits were expected to be a substitute for the ordinary play of economic influences which in the long run fix rates of wages. Men are paid their current value in the labour market, just as though no profit-sharing existed. It will be remembered that recently gas workers' wages rose in sympathy with the advance of wages in the brickmaking and other occupations affected by season stokers. The point is that in a working companionship where the majority are solvent, thrifty citizens, enjoying the self-respect arising from possession of "a stake in the country," shiftlessness comes to be reprobated as it is in other social orders.

The longer-headed among the workpeople do not see why the skulkers should go on sharing profits they never attempt to earn. Consequently, it is their fellow-workmen in these circumstances—not only the employers—who find out the "Wait-a-bits," and make things unpleasant for them. And see how beneficently the natural process of separation operates in this connection—among the shiftless and the skulking are found all the Socialists, the disaffected, the shop-lawyers, and the agitators, or those who would be agitators in favourable circumstances. Under the ordinary conditions, it is these men who lead the rest against their employers. No sort of kindly or considerate treatment, nor any amount of money paid away in wages, will save workpeople from falling helplessly under the influence of agitators of their own class. Every little bit of friction, such as must inevitably occur in the internal economy of a great industrial establishment, gives these agitators their opportunity ; and it is mere adroitness in making use of these occasions, and the "gift of the gab," which has sent most of the self-made "Labour Leaders" into comfortable berths and public notoriety at the expense of their dupes.

But under Mr. Livesey's system, the tables are turned. The talkers and the skulkers are utterly powerless to influence a two-thirds majority with stock certificates showing which side their bread is buttered. Out-at-elbows Socialism, smelling vilely of beer, dare not challenge well-to-do citizens' allegiance to their own, even if this happens to coincide with their employers', interest. The Workman-Director is the true working man's representative, not the scheming individual from outside who clamours in and out of season for a "recognition" which he does not get, for the reason revealed in the following story : Says one Irishman to another : "Pat, I saw ye walking down the street yesterday in grand company ; but ye did not recognize me. I suppose ye did not know me." "Faith," was the reply, "it was just because I did know ye that I didn't acknowledge ye."

Short of the Workman-Director, profit-sharing and even co-partnery lack the guarantee of permanence. The glowing words of Jules Simon, quoted by M. Hedde, may be borrowed for use in this connection, "poor and soured by their poverty, ignorant and ashamed of their ignorance, workmen always fear being deceived or exploited. Words cannot dispel their error ; they must be persuaded by the long and sure system of institutions." The surest means an agitator can adopt for playing upon the passions of working people is to tell them that they are being "put upon." Hitherto there has been nobody of their own order to cite as the living refutation of this slander upon employers. Promotion of workmen to be foremen and masters of their own works does not meet the case, for obvious reasons ; but a director of a great company, who is at the same time a workman, belongs to a different category. He is the best "institution," in the sense of Simon's phrase, to convince the workman that he shall not be defrauded of his rights.

**Gas v. Steam Engines as Electric Power Producers.**—Professor Krone, in a communication recently presented to the Société Electro-Technique of Hanover, claims to have established a comparison between the cost of electric power produced by steam and gas engines. According to his figures, the cost of an electric horse-power-hour is 16 per cent. less with a gas than with a steam engine. The author describes a small electric station installed at Clausthal. It has two gas generators and two engines of 70-horse power each, making 140 revolutions per minute. The engines run with great regularity, as evidenced by the fact that when one-half the load is thrown off, the speed does not rise more than 3 per cent. These engines are connected directly to two dynamos of 46 kilowatts each. During one year the quantity of combustible (anthracite and coke) necessary to produce 1 horse-power-hour of electric energy averaged about 2·3 lbs.

## CONCILIATION IN TRADE DISPUTES.

THE revival of labour troubles which has been recently witnessed, and the terms of settlement which brought to a close the most serious of the actual stoppages of work—the strike on the Taff Vale Railway—serve to call public attention once more to the barbarism of the method of settling trade disputes by recourse to strikes or lock-outs ; though, unfortunately, in these days, when the prayer seems to be "Give us this day our daily sensation," public attention is rarely centred upon any subject for a sufficient period of time to produce any good result. This is why inconvenient questions to which more attention is being given than is relished by the powers that be, are so frequently relegated to the leisurely consideration of a Royal Commission. It is calculated—and, in most cases, only too correctly—that by the time the august body of Commissioners have decided upon their procedure, have heard witnesses, adjourned for a few months now and then, and have finally agreed upon a report, the public will have considerably allowed their interest to be diverted to other newer topics ; and the end sought will have been achieved. The interest aroused of late in the subject of conciliation *versus* strikes as the means of determining disagreements between employers and employed has, we fear, been but fleeting. The occasion may, however, be well taken by those whose interest in the question is direct, and something more than that of only partially affected spectators, to once more consider the likelihood of the more rational method superseding the barbaric, and the conditions precedent to that most desirable consummation.

There is now, we believe and hope, a growing, if not strikingly apparent, tendency on both sides to adopt the more peaceful and less costly procedure of referring matters in dispute between masters and men to a Conciliation Board or Committee. Several such bodies are in regular operation in some of our leading industries—especially in the coal and iron trades—and are productive of excellent results. The Board to be instituted as the outcome of the Taff Vale dispute will, it is to be hoped, prove that the method of reference to a representative body can be successfully applied to an industry so vast, and so diffused, as that carried on by the great railway companies of the kingdom. We have spoken of a "representative body," advisedly ; for that, as is pointed out by a correspondent of "The Times" in a recent article dealing with the subject, is a prime necessity. It is absolutely essential to the success of a Conciliation Board that the members thereof should be drawn from, and really represent, the men concerned in the disputes to be settled by it. The Taff Vale Directors showed their appreciation of the necessity of dealing with the men themselves, instead of with the official of a Union not primarily representing the employees concerned, but intervening as third parties in the dispute, by refusing to recognize the authority of Mr. Bell to negotiate with them on behalf of the men ; and they were right.

It was argued by some of the journals who always start with the assumption that the men have justice on their side in any trade dispute, and by others of whom one might have expected more logical sense, that the Taff Vale men had as much right to be represented by Mr. Bell as the Directors had to represent the shareholders. But the Directors of a company are actually shareholders, with, necessarily, a substantial stake in the undertaking ; whereas Mr. Bell was not even a Taff Vale workman, and had no interest whatever in the dispute, other than that of winning a victory for the glorification of the Society who employ him. Directors, moreover, are not only individually shareholders, but for all administrative purposes they are the shareholders—that is to say, they are the only executive shareholders, and their acts are the acts of the whole body. The demand of the Taff Vale men to be represented by the Secretary of the Amalgamated Railway Servants Society was equivalent, not to the representation of the shareholders by the Directors—in other words, by themselves—but to those Directors claiming to be represented by some official of an Amalgamated Railway Shareholders' Protection Association, who would have had no personal interest whatever in the affair. It may then be taken to be an essential feature of a Conciliation Board that it should be truly representative. If its jurisdiction extend over more than one firm, care must be taken that the employees and the partners or directors of each business concerned are duly represented.

It is, furthermore, very necessary that the representatives of both sides should also be plenipotentiaries. This need is very clearly put by the correspondent of "The Times" to whom reference has already been made : "No settlement of a difficulty often involving intricate and complicated details is probable, or even possible," he writes, "save by a discussion of the points at issue between persons who are either plenipotentiary or at least empowered to determine all but questions of great principle. It is impossible to discuss satisfactorily complicated differences, if point after point has to be referred to mass meetings of men who have heard no arguments, and have no means of appreciating concessions made by the other side. Herein lies one of the greatest obstacles to the success of Conciliation Boards. The representatives of employers, as a rule, know that their decisions will be supported ; the representatives of the employed are too often obliged to accept a decision *ad referendum*, only to find themselves thrown over by those who sent them to negotiate. The good sense of Englishmen may be trusted to reduce the effect of this obstacle as time goes on ; but at present it unquestion-



ably operates, not only to deter employers from entering into conference, but to discount the effect of conferences when they take place."

Another objection that can always be urged, in theory, against Conciliation Boards and Committees is the impossibility of enforcing their awards without the aid of some compelling power. This theoretical objection, like many others, is not found in practice to be so formidable as it appears. Awards are constantly being made by such bodies, and are almost invariably accepted loyally by both parties. If any means of enforcing acceptance be deemed necessary, there is always open the plan adopted in the boot trade—of the men and their employers severally depositing sums of money, out of which fines for non-acceptance or breaches of the Conciliation Board's awards can be paid. As a rule, however, the Englishman's honourable preference for keeping to a bargain will prove to a large extent efficient.

In regard to the settlement of trade disputes by means of Conciliation Boards, as to every other point of difficulty that arises in the course of the employment of large bodies of men, it may be said that patience, common sense, and fair dealing with the men will accomplish much—above all patience. We hope that the pacific influence of the bodies already established for the adjustment of labour troubles may be increasingly felt, and that more such institutions will be created. As Lord Avebury recently said at the Paris gathering of the Association of Chambers of Commerce, we are looking to these Boards to diminish the unfortunate strikes which are injurious to capital and to labour. Lord Avebury added: "It is my conviction that, if there had never been a strike in the United Kingdom, wages would now be higher than they are. Strikes have tended to diminish the confidence which is felt by investors; they have driven a large amount of capital abroad; and if it had not been for the fear that money invested would not receive a reasonable remuneration, I am firmly convinced that we should have had more manufacturing enterprise and a greater development of the railway system in our country, which would have involved a greater demand for labour, and consequently an increase in the rate of wages." We wish the British working man would put that in his pipe, and smoke it.

#### THE CHAMBERS OF COMMERCE IN CONGRESS.

FROM the reports that were given in the Daily Press of the proceedings at the Congress of the Chambers of Commerce of the United Kingdom recently held in Paris, it was possible to gather that those proceedings were of considerable interest; but as the reports were, in consequence of the pressure on the columns of the newspapers, extremely meagre, we deferred any notice of the speeches delivered at the congress until fuller accounts were to hand. The "Chambers of Commerce Journal" has now published a full report of the meetings in the form of a supplement to the October issue; and we are able to note the points that are of interest to our readers, who are, most of them, very closely concerned with the commerce of this country.

Nothing, we firmly believe, could have done more to promote mutual respect and friendliness between this nation and her nearest neighbour, and to remove their mutual suspicions and misunderstandings, than the series of gatherings of leading English professional men and merchants representing our principal industries that has recently been held in Paris. Englishmen have been led to see, more clearly than before, that the froth of the Parisian journalist is not the voice of the French people; Frenchmen to see that the said journalist is even wider of the mark in his daily descriptions of the perfidious Englishman than they had previously realized. As Mr. Lionel Holland said at the inevitable banquet which terminated the visit of the delegates to Paris, the reception accorded to the Association "was proof positive of how hollow was the notion that there was any lack of cordiality in the relations between France and England." Lord Avebury, speaking on the same occasion, took pains, moreover, to show that, not merely is there no cause for hostility between the two nations, but that there is in their case a most cogent argument in favour of peace—namely, that each is a very large customer of the other, and that the cessation of that commerce would be even more costly to both nations than the tremendous expenditure that would be entailed by a war between them. As Lord Avebury pointed out, 20 per cent. of the total imports into France are purchased from England—representing annually the sum of 700 million francs—while we buy from France goods to the value of 1200 million francs, or one-third of her total exports. It is, therefore, evident that the prosperity of France is advantageous to England, and the prosperity of England still more so to France. It may not be strictly within the province of a technical publication such as the "JOURNAL" to refer at any length to questions of international relations; but so much ill-considered, and therefore mischievous, language has been used, not only in the editorial and correspondence columns of many of the loose-tongued and some of the better-class newspapers in this country, but also in the correspondence columns of our own and other technical journals, in regard to the advisability or otherwise of Englishmen visiting the Exhibition in Paris, that we may be pardoned for going out of our way to emphasize the grave responsibility that must rest upon the shoulders of all and each of those who at any time

shall think fit to use provocative language in regard to, and unduly magnify, the utterings of men whom the French people themselves really hold to be beneath contempt.

To turn from questions of international manners to the real business of the congress. The President's Inaugural Address was commendably short. The Companies Act passed during last session was mentioned as deserving of approval; but Lord Avebury wisely pointed out that too much must not be expected of such legislation, as the power of Parliament to protect fools from their own folly is necessarily limited, and that so long as British investors can be found to trust strangers who make flowery promises of immense profits and high dividends, nothing Parliament can do will be able to prevent bogus companies being brought into existence. Human nature is a factor that no statute has ever succeeded in eliminating, and which no statesman can ignore. In regard to no problem is this more true than in regard to that sought to be dealt with by another measure (not yet beyond the stage of discussion) to which Lord Avebury referred—namely, the Prevention of Corruption Bill, "in which the Chambers of Commerce have taken considerable interest." The Municipal Trading Committee was mentioned by the President as being the outcome of steps taken by the Association; but as the Committee have not completed their labours, Lord Avebury, whose views on the question of municipal megalomania have recently been the subject of notice in the "JOURNAL," did not enlarge upon the evidence so far taken. Brief references to the present prosperity of this country, and the threatening dangers thereto from two different classes of warfare—war between country and country, and war between employers and employed—the hospitality of the French people, and the opportunity afforded by that and similar congresses in Paris to maintain and increase the good feeling at present existing between Great Britain and France, closed the Inaugural Address.

The first subject on the agenda for discussion was one affecting the gas industry, in common with all other undertakings dependent for their success upon the intelligence and knowledge of their servants—viz., that of Technical and Commercial Education. This was introduced in a very able speech by a staunch advocate of wider opportunities for the acquirement of technical training, Sir Albert K. Rolit, M.P. The Paris Exhibition, he remarked, was a splendid object-lesson in the advantages of commercial education, and in the benefit of knowing another language than one's own. In fact, the Exhibition might truly be said to afford a liberal commercial education in itself. The ideal to be set before the nation, said Sir Albert, is not to teach business or commerce to boys, but to build up a basis of sound general knowledge, by means first of the ordinary mental discipline of the schools, and then by the teaching of special subjects and the encouragement of habits of correctness and exactitude. For this purpose, more money is needed, and, said the speaker, none could be more wisely and profitably expended. Other countries are spending money freely on this subject. "Are all those countries wrong in the expenditure of their funds, and are we right in doing comparatively little?" Mr. Hemelryk, of Liverpool, who seconded, and Mr. Millar, of Edinburgh, who supported the resolution (urging the extension of technical and commercial education, the representation of Chambers of Commerce on Boards of Education, and the granting of financial assistance by the Government), did not add much of value to the discussion. In fact, the two suggestions made by them—the one that school holidays should be shortened, and the other that boys should be sent to business first, and then taught commercial subjects at night schools—will by no means commend themselves to everyone. "All work and no play," is not good for anyone, least of all for boys.

A discussion took place, but no definite conclusion was arrived at, upon the weak spots in the Bankruptcy Laws, not the least of which is the difficulty of ascertaining sometimes what is and what is not the law. "If," said Sir Albert Rolit, "they could reform parliamentary procedure by getting more consolidating Acts passed, that would be one of the greatest reforms possible." And in no case is consolidation more needed than in the Bankruptcy Laws. Anyone who has had much experience in dealing with cases of bankrupt gas consumers will heartily endorse this expression of opinion. Parliament, said Sheridan, first passes an Act, then it passes an Act to amend that Act, then another Act to amend the Act amending the Act, and then another one to explain certain clauses in the Act, adding certain clauses to the Act amending the Act, and so on. An exaggeration, doubtless, but with a large substratum of truth.

Upon the consideration of the Workmen's Compensation Act, it was resolved that any future amendment of this Act "should provide (a) for a clearer definition as to what constitutes contributory negligence within the meaning of the Act, and (b) for the framing of rules of procedure which will limit the increasingly large number of vexatious and frivolous claims to which employers are subject, and reduce the costs frequently exacted from claimants." The mover of the resolution, referring to Sir Albert Rolit's remarks as to the need of more consolidating Acts, said that in the matter of employers' liability such consolidation was badly needed. "As a matter of fact, employers and the insurance companies at the present time were not attacked under one particular Act, but under two or three. Notices of cases were usually given under Common Law, the Employers' Liability Act of 1880, and under the Workmen's Compensation Act; so that if the unfortunate employer could not be tripped up



by one Act, he could be knocked down by the other." Allowing for some extravagance of language, this is undoubtedly what is frequently done; and it is essential that employers should know more clearly than they now do the extent of their liabilities.

As to the first half of the resolution, it must be remarked that it is easier to say that a clearer definition of contributory negligence should be provided than to lay down such a definition. The circumstances of every individual case must be considered; and no definition can be drawn which would make clear what is and what is not gross, wilful misconduct beyond the possibility of dispute, in the majority of cases. The second part of the resolution is more practical. Something could, and should, be done to prevent the exploiting of workmen's claims for the benefit of no one but firms of pettifogging attorneys. "Men calling themselves solicitors, but entirely unworthy of the name, were," said the mover, "going up and down the banks of the Thames urging workmen to bring actions," working on the "no damages, no costs, but 50 per cent. or more of any compensation obtained" principle. That such is the case, we can confirm of our own knowledge. It would be very difficult to prevent such rascality; but the exacting of a guarantee of costs in more cases, or the requirement of an affidavit from the solicitor of the terms of his agreement with his client as to costs, might put a stop to many faked-up actions. It is an absolute fact that men often lose heavily by falling into the hands of these legal sharks; for the employer who is not legally liable, but who intended doing something for the man, will naturally shut his purse and put up his back when Mr. Sharp Attorney comes on the field.

Numerous other subjects were discussed during the four days of meetings; but, except a resolution urging the Government to adopt the metric system of weights and measures in the Government Departments, none can be said to be of sufficient interest to our readers to warrant mention in these columns.

#### WATER ACTS FOR 1900.

THE following Acts relating to water supply were passed in the last parliamentary session:—

The Great Berkhamstead Water Act incorporates and confers powers upon a limited Company formed in 1864. The limits of supply are defined as being a circle of 3 miles radius from Great Berkhamstead Parish Church, with the exception of Chesham, which is only to be supplied by consent of the District Council. The existing share capital of the Company is consolidated and converted into 4 per cent. stock, with the addition of £40,000, and with one-fourth loan on both classes of stock. The Company are not to take any water from the River Thames or its tributaries, or from any land within 500 yards of the river, without the consent of the Conservancy. Metered supplies may be charged at the rate of 1s. 6d. per 1000 gallons.

The Higham Ferrers Water Act incorporates a Company for supplying with water the borough named, in Northamptonshire. The supply is to be made effective within three years. The capital is £72,000, with one-third loan. The water-works include a storage reservoir on the Sywell brook, a pumping-station in the parish of Mears Ashby, and a service reservoir in the same parish. The Sywell brook is a tributary of the Nene; and compensation water is to be provided at the rate of 100,000 gallons per day. The works are to be completed within five years. The Local Authorities within the limits of the Act may jointly, but not otherwise, purchase the undertaking, after 20 years. Clauses are inserted for the protection of the Wellingborough Rural District Council. The Rushden District Council are to be supplied in bulk. Rates for domestic supplies range from 9 to 6 per cent. The maximum price for meter supplies is to be 1s. 6d. per 1000 gallons. The Northampton Corporation are protected.

The Woodbridge District Water Act incorporates a Company for the supply of parts of the parishes of Woodbridge and Melton lying to the westward and northward of the Great Eastern Railway. The supply is to be made effective in four years. The capital of the Company is £20,000, carrying a 7 per cent. dividend, with one-fourth borrowing powers. The water-works are to consist of a well and pumping-station and service reservoir in the parish of Woodbridge, to be completed within four years. The supply is to be constant, and at such a pressure as shall carry the water 30 feet above the highest land in the district. Rates for domestic supplies range from 8 to 6 per cent. The Company are to sell their undertaking to the District Council on requisition, subject to the consent of the Local Government Board.

The following Acts confer additional powers on the Companies named.

The Bristol Water-Works Act extends the powers of the Company for the protection of the purity of their supplies. The Company are authorized to make and enforce bye-laws for the regulation of any of their drainage areas outside the City boundaries. The Company are to compensate any landowners or occupiers injuriously affected by their bye-laws, which are not to interfere with the rights of the Bristol Gas Company under the Act of 1847 or any other statute. Certain sewerage agreements of the Company with the Rural District Councils of Axbridge and Clutton are scheduled and confirmed.

The Dorking Water Act empowers the Company to raise £16,000 of additional capital, to include a sum of £2235 over-

spent on capital account. Dividends are to be 7 per cent. ordinary or 5 per cent. preferential. Borrowing powers are in the proportion of one-fourth. Additional lands are to be acquired by agreement. Certain works constructed are confirmed. The Local Authorities may promote a Purchase Bill in the next two sessions. The Company pay one-half of the Local Authorities' expenses on their opposing petition.

The East London Water-Works Act authorizes the Company to construct two additional storage reservoirs for collecting the water of the River Lea. The necessary land is to be compulsorily acquired within five years, and the works must be completed within seven years. Clauses are inserted for the protection of various interests and local authorities. Special provision is made for emergency supplies. An excess of water may be temporarily taken by the Company from the Thames. Molesey Weir is to be adapted to the purpose of measuring the flow of the river. The Company may raise £1,800,000 of new capital as 3 per cent. debenture stock, under the customary conditions applying to the stock issues of the London Water Companies. The Act is not to be regarded as increasing the capital value of the undertaking in the event of purchase by a public authority within seven years.

The Lambeth Water-Works Act enables the Company to raise additional debenture stock to the value of £750,000 under the usual conditions, as in the preceding Act. An additional reservoir at East Molesey is to be constructed within seven years, with connections from Molesey to Surbiton. The Company are to maintain for three years the roads through which their trunk mains pass. Many protecting clauses are inserted in the Act. Excess water may, under particular conditions, be taken from the River Thames. The water required for the first filling of the reservoirs is to be paid for at the price of 10s. 3d. per million gallons, and is not to be reckoned as excess water.

The Mid-Kent Water Act extends the limits of supply of the Company to numerous parishes, to be made effective in five years. A special provision is made for main-laying in the parish of Chilham. The authorized works include wells and pumping-stations in the parish of Charing. The provisions of the Act of 1847 as to the repair of roads are amended. The East Ashford Rural District Council are protected. The Ashford Urban District Council have also secured special terms. The Company have a general power to acquire wells and water-works within their limits of supply. Additional capital to the amount of £40,000 is to be issued, with one-fourth loan.

The North Pembrokeshire Water and Gas Act enables the Fishguard Company to enlarge their undertaking and supply the parishes of Newport and Dinas, in Pembrokeshire. The name of the Company is accordingly changed. The additional water-works comprise a reservoir for impounding the waters of the Pont Caen brook, and a service reservoir at Llanllawer. The capital powers of the Company are increased by £40,000.

The North Warwickshire Water Act enables the Company to extend their limits of supply over a number of parishes, to be made effective in three years. Additional wells and pumping-stations are to be constructed in the parishes of Meriden and Stoneleigh, to be completed in seven years. Drainage agreements may be entered into, and contracts made for supplies in bulk. Nothing in the Act affects the rights of the Corporation of Coventry to sink wells in the district; and the Company are forbidden to sink a well within 1½ miles of the village well of Berkswell. The rate for public supplies is 9d. per 1000 gallons. Additional capital is sanctioned, to the amount of £48,000 of 7 per cent. ordinary or 5 per cent. preference capital, with one-third loans. Local authorities may purchase their portions of the undertaking in ten years, jointly or separately.

The Rickmansworth and Uxbridge Valley Water Act extends the Company's limits of supply over a scheduled area. The amount of water taken from the valley of the Colne is limited to 300,000 gallons per day. Records of the rise and fall of the water in the wells are to be kept when the pumping exceeds 1,000,000 gallons per day. The maximum price for metered supplies of water is 3s. per 1000 gallons. The Company may raise £150,000 of additional 7 per cent. capital, with one-fourth borrowing powers. Numerous water and other local interests are protected.

The St. Albans Water-Works Act authorizes the Company to acquire further lands, and make an adit leading into their pumping-station at Holywell Hill. The Company are forbidden to take any water from a tributary of the River Thames without the consent of the Conservancy. If the Company's pumping operations affect the River Ver, compensation is to be made. The water is to be laid on constantly, under such pressure as the Stone Cross reservoir affords. New capital to the amount of £60,000 is authorized, with one-fourth loan.

The Southport Water Act sanctions the construction of additional works, including a service tank in the parish of Aughton, and a high-level pumping-station, with water tower and tank, in the same parish. The Company may raise £40,000 of 7 per cent. capital, with one-fourth loan. The Act is not to enhance the transfer price of the undertaking as against the Joint Board for Southport, Birkdale, and West Lancashire, who may promote a purchase Bill next session.

The Westgate and Birchington Water Act defines and extends the limits of supply. A new adit is to be made at the Company's existing works; and another adit is sanctioned. The new works are to be completed within five years. The Company may



raise £20,000 of new 7 per cent. ordinary or 5 per cent. preference capital, with one-fourth loan. Part of the water-works property of the Margate Corporation is to be sold to the Company. Within two years the Isle of Thanet Rural District Council may take unopposed steps to acquire the undertaking.

The Wetherby District Water Act extends the limits of supply, and authorizes the construction of a well and pumping-station in the parishes of Thorne and Barwick. The works are to be completed within seven years. The capital is increased to £85,000, with correspondingly greater borrowing powers.

### THE CHEMISTRY OF ENGINEERING MATERIALS.

THE man who is engaged in the practice of general engineering is usually far too much concerned with the physical properties of the materials which come to him in the course of his business to inquire very closely into their chemical composition. Yet these properties are to so large an extent dependent on the chemical composition, that experiments on the former must always lead to unsatisfactory, if not absolutely incorrect, results if due regard is not paid to the latter. These considerations, taken in conjunction with the fact that most text-books devote little space to the chemistry of materials, led Mr. A. Humboldt Sexton, of Glasgow, to prepare a handbook thereon which has just been published.\*

In the course of his introductory remarks, the author points out that the chemical questions likely to be of interest to the engineer, or which may arise in his practice, are the composition of the materials, the changes that may be brought about therein by the treatment to which they are subjected in the process of manufacture, the action of the various substances with which they may be brought in contact when in use, and the changes which take place in the processes of manufacture, by which various constituents are taken up or eliminated, and the materials assume the form in which they are used. Having offered some remarks on these matters, he proceeds to classify materials in two groups—metallic and non-metallic. In the former are the metals and the alloys; in the latter, structural materials, fuel, water, lubricants, paints, &c. In dealing with the first group, he very naturally gives the foremost place to iron—treating of its chemistry, sources, and manufacture—and then goes on to steel, the hardening, tempering, and preparation of which he explains. The working of the two metals is next considered; and a chapter is devoted to the subject of their protection from rust. Four methods are indicated—(1) coating with other metals, (2) with oxide films, (3) with paints or varnishes, and (4) enamelling. Painting is the almost universal plan adopted for protecting iron and steel from atmospheric corrosion; and the author acknowledges that, if well done, it is attended by fairly satisfactory results. Of all the pigments in use, the most suitable, when the paint is required as a preservative, is red oxide of iron. It is not only very stable, and possesses good body, but has no action on the metal. After dealing with the microstructure of iron and steel, the author considers successively the physical and chemical properties of lead, zinc, tin, &c., and then devotes a chapter to the alloys.

The group of materials next taken up are non-metallic—wood, stone, &c., clay ware, bricks, tiles, &c., cements, and mortars. Wood is specially valuable for structural purposes owing to the ease with which it can be worked up. But, of course, the nature of its constitution renders it liable to decay. It therefore needs preservation; and creosote is the best agent to employ. Stone used for building purposes is exposed to the air in all weathers, and is consequently subject to the corrosive action of moisture, carbonic acid, and other acids in the atmosphere of towns, as well as to the disintegrating action of frost. Chemical analysis helps to the formation of a judgment as to the probable durability of this valuable material. With regard to its preservation, the author does not consider that any of the agents used have been an unqualified success. His remarks on clay and clay ware (including fire-bricks) are interesting; and so are those on mortars and cements. As to the last-named material, he is careful to explain that chemical analysis alone does not give conclusive evidence as to the quality of a cement. Fuel is the next subject; the influence of its constituents on its heating power being clearly set forth. Coal—the universal fuel—is first taken, and its varieties described; then solid prepared fuels, including coke. In connection with the manufacture of this material, drawings are given of the beehive and what is incorrectly called the "Simon-Carve" (meaning, of course, the Simon-Carvès) oven. Liquid fuel is briefly dealt with; and then the author passes on to gaseous fuel, which he says offers so many advantages that it is rapidly coming into use wherever suitable gas can be obtained at a sufficiently cheap rate. The various kinds of gas—coal, producer, Mond, water, and oil—are next considered; the second being described at the greatest length. Illustrations are given of the Siemens, Thwaite, Wilson, and Dowson producers, as well as of water-gas plant. The author acknowledges that producer gas could never have

come into successful use had it not been for the introduction of the regenerative furnace by Siemens. This furnace is described and illustrated. The remaining chapters are devoted to water and its analysis, lubricants, paints and varnishes, and minor materials. In connection with the first-named subject, some remarks are offered on the prevention of scale; purification of the water before it enters the boiler being recommended as the best remedy for this trouble.

The text of the book, which occupies 332 pages, is freely illustrated. It covers ground previously unoccupied, except by larger treatises beyond the reach of ordinary students, for whose use it has been specially prepared; no higher claim for the work being made by the author than that of serving as an introduction to more important books on the subject.

### PERSONAL.

Mr. PERCY S. HOYTE, Engineer and Manager of the Plymouth and Stonehouse Gas Company, was married on the 8th inst. to Miss Margaret M. Fannie Hutchison, of Glasgow; and last Wednesday he was presented by the Company's employees with a handsome eight-day clock as a wedding gift. The presentation was made by Mr. J. Ward, the foreman, who congratulated Mr. Hoyte on his appointment as Engineer of the works, and wished him and Mrs. Hoyte much happiness. Mr. Hoyte, in reply, thanked the men for their gift, and for the kindly feeling which had prompted it, and said that he should endeavour to foster a good understanding which it was desirable should exist between the Engineer and the men.

### OBITUARY.

The death is announced, in his 69th year, of Mr. RICHARD MELLOR, Chairman of the Meltham Gas Company. Deceased was for twelve consecutive years—from 1887 to 1899—Chairman of the Local Board and the Urban District Council.

A remarkable career has closed by the death, last Tuesday, of Mr. GEORGE CRAVEN, of Rochdale. He was in his 93rd year. The point of interest in his life which may be mentioned here is the fact that he was the Chairman of the Lighting Committee of the Board of Commissioners for some years prior to the acquisition of the gas-works by the town in 1844. There was a bitter quarrel between the Commissioners and the Gas Company, who were then charging 7s. per 1000 cubic feet for gas. Failing to get the terms they desired, the Lighting Committee refused to have the Company's gas, and for a considerable time oil-lamps were again burned in the streets.

**Institution of Civil Engineers.**—The meetings of the Institution will be resumed on Tuesday, the 6th prox., at 8 p.m., when the President, Mr. James Mansergh, will deliver his Inaugural Address. After the presentation of medals recently awarded by the Council, he will hold a reception in the Library.

**The Gas and Water Works Directories for 1900-1901.**—We have received from Messrs. Hazell, Watson, and Viney, Limited, copies of the above-named works, which have just been issued. This is the 24th edition of both works, and we learn from the title pages that the contents have been revised up to August last. The Editor states in his preface to the Gas-Works Directory that the revision "has been of a most exhaustive character; every effort having been made to get the latest returns and the most recent changes in the price charged for gas." These, as we know, have been numerous—in fact, unprecedentedly so; and it is to be hoped that use of the book will afford ample proof that they have all been duly recorded. In recent years, the Electrical Section has been bound up with the Gas Section. Owing, however, to the increased number of electric light undertakings in operation, it now forms a separate volume. In addition to the statistical and other information furnished as to English and Foreign gas and water works, the directories contain lists of the officials connected with them, and of the Associations of Gas and Water Engineers and Managers.

**A Reservoir Bank Injured by Lightning.**—Mr. Clark Olds, the President of the Erie (Penn.) Water Board, has called attention, in the "Engineering Record," to an accident which happened to their reservoir, as a possible means of explaining one cause for the bursting of dams. The reservoir has a capacity of 32 million gallons, and is constructed with earthen embankments 27 feet high, lined with brick, grouted in portland cement, on a clay puddle a foot thick. One evening last June, lightning struck the embankment near the south-west corner, and tore a hole downwards, at an angle of 45°, which emerged in the lining of the reservoir just at the water-line, splintering the brick so as to require a patch about 2 feet square. The hole on the surface of the embankment was about the size of a rat-hole; and the sod was cut in furrows for some distance round it. On account of the heavy rain which accompanied the thunderstorm, the engineer had slowed down the pumps, and the surface of the water in the reservoir had fallen slightly during the night. If it had risen, the embankment would probably have given way before morning without any apparent cause, as the damage was not discovered till daylight.

\* "The Chemistry of the Materials of Engineering." A Handbook for Engineering Students. By A. Humboldt Sexton, Professor of Metallurgy in the Glasgow and West of Scotland Technical College. Manchester: The Technical Publishing Company, Limited; 1900.



## COMMUNICATED ARTICLE.

## PRACTICAL NOTES ON GAS MANUFACTURE.

By S. CARPENTER, of East Ham.

(Concluded from p. 953.)

## FURTHER NOTES ON PURIFICATION—THE USE OF AIR.

Much has been said as to the best way of using hydrate of lime for the purification of gas from carbonic acid and bisulphide of carbon. It will not be out of place now to notice the different methods which have been employed for the purpose. First, the crude gas was passed into the purifier charged with oxide of iron, and partly purified from sulphuretted hydrogen; then it was sent on to the lime purifiers, for the removal of the carbonic acid and part of the bisulphide of carbon; and afterwards to the oxide of iron purifiers to take out the remaining sulphuretted hydrogen. As the oxide can only remove the last-named impurity, instead of doing good, it only interferes with the chemical action of the lime on the gas. Subsequently another method was tried—viz., to put one layer of oxide of iron and one of lime in each purifier; but this also affected the lime. A third plan was to send the crude gas through cream of lime; but this was of no use. Finally, the gas was passed into two purifiers charged with hydrate of lime before it entered the oxide purifiers; and this was found to be the only practical way of using the material for purification. The gas was decarbonated, and the bisulphide of carbon reduced to about 10 or 12 grains per 100 cubic feet.

It has been said that the best way to employ atmospheric air in connection with purification is to draw it into the vacuum main, and mix it with the gas before it enters the lime purifiers, as this will cause the lime to be more active in taking the bisulphide of carbon out of the gas; but, after thirty years' practical experience, the writer is bound to say that air should not be allowed to get into the lime purifiers. If it is, the result will be that the oxygen will break up the sulphuretted hydrogen, fixing its sulphur in the lime, and setting the hydrogen free. It would be done in this way: The oxygen of the air would oxidize into water the hydrogen contained in the sulphuretted hydrogen, and at the same time set free the sulphur, which gets fixed in the lime in the purifier. And instead of the lime becoming hydrogenated sulphide of calcium, which has a powerful affinity for bisulphide of carbon, it becomes hydrated sulphide of calcium, derived from the decomposition of the sulphuretted hydrogen by the air; and the lime in the purifier would be almost converted into pure sulphide of calcium—a compound which has little or no affinity for bisulphide of carbon. Moreover, it is very probable that the nitrogen of the air would unite with the hydrogen to produce ammonia, or with carbon to form cyanogen.

The writer is aware that it is a great saving to use atmospheric air in purifying gas, in order to keep the oxide of iron in an active state for removing the sulphuretted hydrogen. But, as pointed out in a previous article, it must be admitted at the right place, which is at the inlet of the first oxide purifier—the quantity being from  $1\frac{1}{2}$  to 2 per cent. By using the air in this way, the oxide will purify about three times as much gas as it otherwise would. The object of the writer's method of working lime purifiers is to decarbonate the gas, and to effect absorption of the bisulphide of carbon by the alkaline sulphide of calcium. The bisulphide is a sulphur acid in its nature, and the sulphide of calcium is alkaline, and has great affinity for the sulphur acid in the crude gas. It neutralizes part of the bisulphide of carbon, and reduces the amount of this impurity. As much of it as possible should be removed from the gas. When it is present in large quantities—say, from 15 to 30 grains per 100 cubic feet of gas—it gives rise to sulphurous acid during combustion; and by taking more oxygen from the air, it becomes sulphuric acid. If there is any ammonia in the gas—say, from 2 to 4 or 5 grains per 100 cubic feet—it will become ammonium sulphate, which is very corrosive. Either of them will rapidly destroy any textile fabric—especially paper and linen—and all kinds of brass.

To sum up, take out of the gas all the ammonia, as it will interfere with the chemical action of the lime; all the carbonic acid, as its presence lowers the illuminating power of the gas; as much as possible of the bisulphide of carbon, as it has a deleterious effect upon the air of a room; and all the sulphuretted hydrogen, as this impurity will cause blackening of ceilings.

## THE SIZE OF LIME PURIFIERS IN RELATION TO THE MAKE OF GAS.

Where lime is used for purification, the writer's advice is to utilize the purifiers to the best advantage. This may be done in the following manner: In each of the boxes have, if possible, four tiers of grids, and on each tier have the lime about 4 inches thick. Four thin layers are better than two thick ones from 8 to 9 inches deep, as it is surface rather than thickness of lime that is required, because the gas should pass more slowly through the lime for the removal of bisulphide of carbon than the other impurities. Having four layers of lime in small purifiers will be very helpful, as there will be four surfaces of the material instead of two. The layers of oxide of iron should be from 12 to 18 inches thick. There is a great difference between lime and oxide of iron, as the former will remove three impurities from the gas, whereas the latter only takes out one.

When erecting new purifiers for lime, they should be made one-third larger than those for oxide of iron, so that the gas may pass slowly through the material. It is also to be observed that the displacement of the sulphuretted hydrogen from lime by carbonic acid depends to a considerable extent upon the rapidity with which the gas is passed through the sulphuretted lime. For example, when carbonic acid is brought slowly into contact with lime in the form of sulphide of calcium, nearly the whole of the sulphuretted hydrogen will be expelled before the carbonic acid appears in the issuing gas; whereas if the carbonic acid is brought more rapidly into contact with the lime, a large portion of the sulphuretted hydrogen will remain behind. If the gas is passed too quickly through lime, it cannot properly perform its chemical function on all the impurities. Where practicable, it is well to have large purifiers, so that they may be equal, owing to their greater superficial area, to passing the gas at a slower rate. Where there are only two layers of lime, the gas has a tendency to creep up between the side of the purifier and the lime; and if there are any weak places, the gas would pass through the material much more quickly there than at the other part of the layer. If there are four layers, there is not this tendency; and if there should happen to be a weak place, it is only 4 inches instead of 8 or 9 inches deep.

If the lime is properly laid on the grids, the gas will not have the "creeping" tendency just referred to, nor will there be any weak places in the material. Care should therefore be taken, when laying the lime, not to shoot it on to the grids direct, as this will cause it to lie thick in the place where it has been shot. To obviate this trouble, it should be laid in this way: Place on the grids a piece of board about a yard square, then shoot the lime on to the board, and remove it with a shovel to the grids. The lime will not then be heavier in one place than another. After the gas has passed through the first layer of lime, there will not be so much carbonic acid for the second to take out; it will consequently remove a larger portion of the sulphuretted hydrogen. The gas which passes into the third layer will contain very little or no carbonic acid for a while; and then the lime in that layer will become temporarily hydrogenated sulphide of calcium, and that in the fourth layer will be converted into this material, and the bisulphide of carbon reduced to about 10 or 12 grains per 100 cubic feet of gas. Two lime purifiers will be sufficient for any make of gas; but the size will, of course, be suited to the production.

## RECAPITULATION AND CONCLUSION.

In this short series of articles the writer has traced the crude gas from the hydraulic main first into the condensers, where it is cooled, and where the tar and watery vapours are deposited from these vessels through the scrubbers, to take out the ammonia and arrest portions of the carbonic acid and sulphuretted hydrogen, and thence to the purifiers. He has shown that the purification of coal gas from ammonia, carbonic acid, sulphuretted hydrogen, and two-thirds of the bisulphide of carbon, can be accomplished without any great difficulty by adopting the method of working the lime and oxide of iron purifiers he has described. He believes that such a process of purification will be found not only more convenient but also more economical than any system of purification by means of lime, oxide of iron, and atmospheric air, apart from the great saving of labour effected by revivifying the lime, and using it a second time. He would again point out, however, that before attempting the purification of gas, the retort-house should be put in good order. The manager should see that there are no holes or chinks in the retorts, as the furnace gases, which contain sulphur and carbon, would pass over with the gas to the lime purifiers, and cause high results in sulphur other than sulphuretted hydrogen, by interfering with the chemical action between the crude gas and the lime. Instead of the lime reducing the sulphur, it would really increase it. Nor should air be allowed to pass into the lime purifiers. If either furnace gas or air enters the lime purifiers, it will be impossible to keep them under control. By working the purifiers in the way explained, no difficulty will be experienced in purifying the gas from carbonic acid, bisulphide of carbon, and sulphuretted hydrogen. In fact, if the conditions under which lime acts efficiently upon the sulphur impurity contained in the crude gas are fully understood, the purification of gas from carbonic acid and bisulphide of carbon becomes a pleasure rather than a bugbear; lime, as already remarked, being the best known agent for the purpose. All that has been here written upon the materials employed in the purification of coal gas, and upon the best method of conducting this operation, is the result of practical experience extending over about fifty years; and the writer's object has been, as intimated at the outset, to bring together a few notes which may prove useful to some managers, or to students preparing for the profession.

Reference has already been made in the "JOURNAL" to the wood gas produced in the Riché retort. Mr. James M. Neil, writing in the "Engineering and Mining Journal," gives the calorific power of the gas as 340·8 British thermal units per cubic foot, and that of water gas and coal gas as 324·5 and 590 units respectively. Each retort produces 180 cubic feet of gas; 1 ton of wood yields more than 25,000 cubic feet of gas and about 400 lbs. of good charcoal. The gas does not give an illuminating flame; but if a mantle is used, it furnishes a light of 50-candle power.



## THE INTERNATIONAL GAS CONGRESS.

## MECHANICAL CONVEYANCE OF COKE IN THE PARIS GAS COMPANY'S WORKS.

By M. LOUVEL.

[A Paper read before the International Gas Congress at Paris.]

Some few years ago the Paris Gas Company completely altered their coke-yards, and introduced mechanical means for effecting the greater part of the operations required for dealing with the coke, the annual make of which is over 15 million hectolitres. The object of this paper is to describe these mechanical arrangements.

Before examining each apparatus in detail, it may be interesting to point out the lines on which the various machines have been made. It was necessary, in putting up the plant, to utilize existing material and fittings. The carrying of the coke inside the stores was managed by wicker baskets and canvas sacks of 1 hectolitre, and by sheet-iron skips of 10 hectolitres. The baskets and sacks were carried on men's backs; while the skips were run on three wheels and lifted by cranes. The problem for solution, so as to effect all the operations by mechanical means, was complicated by the many different sizes of coke produced by the screens. They are five in number, and deliver to various parts (put the coke into carts, railway waggons, heaps, or take it to the stores). Further, the work is very irregular; and, when the cold weather comes on, the yards present a scene of great activity, so that it is necessary to allot to them all the men disposable.

Except for the filling of the waggons in bulk, which is done by the skips, all the coke operations are carried out in sacks containing 1 hectolitre, or 40 to 50 kilos. (88 to 110 lbs.). This small unit-weight allows one man to attend to the necessary movements at the beginning or end of the apparatus by himself, which he would not be able to do with a skip. A hectolitre of coke weighing from 40 to 50 kilos. can be handled in a sack weighing 2.5 kilos. (5½ lbs.), and carried in a basket weighing 11 kilos. (25 lbs.). When the sack is carried directly by a conveyor, the wrapping used for the transport weighs only 2.5 kilos., or 25 kilos. (55 lbs.) for 10 hectolitres. When, on the other hand, a sheet-iron skip is used, there is a dead-weight of 340 kilos. (750 lbs.) to carry 10 hectolitres of coke.

From the lightness of the weight carried (52.5 to 55 kilos. at the most), extreme lightness in the construction of the apparatus for the conveying of the coke is allowable. As the sacks are necessarily separated one from the other—owing to the unavoidable time taken in filling them—the conveyors only need to support, without the men required for the working, a permanent weight of 30 to 40 kilos. per metre run, which is very little. Under these conditions, without much expense, the girders may be made with large spans, and their supports may be placed as far as possible outside the coke-heaps—in positions where they will not impede the passage of the carts. The use of sacks

allows, moreover, of adopting the "mono-rail" carried on light supports, which are easily moved and replaced.

The Paris Gas Company sought to construct very simple plant, without having any complicated gearing. All the machinery adopted requires the same fittings; and it is thus easy to repair any portion without having an elaborate supply of parts in the stores. It is also interesting to remark that the trials made, for several years past, prove that coke-dust does not cause any abnormal wear and tear, when the apparatus is properly kept up. The use of electrical dynamos, driven from shafting existing in the workshops, or from specially placed gas-engines (by giving power at isolated points in the yard), has allowed of various machines being adopted, which required to be started and stopped instantaneously, without the need of any special attendant. One of the great advantages of installing such machinery is being able to have at will either a small or great amount of motive power. As the men no longer carry heavy loads, and as their work is reduced almost to directing the sacks, they can produce very good results without fatiguing themselves.

Each apparatus will be examined separately. The names of those to be described are as follows: 1. Small truck for carrying the coke. 2. Automatic tip-cart. 3. Crane for the filling of waggons and different skips. 4. Transporters; bucket elevators for coke in bulk. 5. Stacking coke; sack-conveyors for carrying and stacking; rope transporter; mono-rails. 6. Conveyor; lifter; drier. 7. Hectolitre-charger. 8. Sack-lifter to back. 9. Portable elevator for taking coke from heap. 10. Machines and various apparatus.

I.—*Small Trucks for Carrying the Coke.*—These trucks are used to carry the coke from the quenching-yard to the hoppers feeding the screens. Their capacity is about 40 hectolitres. They weigh when empty 2600 kilos. (51 cwt.), and run only on rails. They are made up of a wooden frame, mounted on cast-iron wheels, and of a sheet-iron body, which can be swung on one side. The turning centre-line of the truck can itself be shifted in the arc-shaped guides, which causes the deadening of the shock, and the avoiding of lifting the wheels at the moment of tipping the waggon. One of the sides has a door with lugs which, on being lowered, forms a discharging shoot between the bottom of the truck and the hopper. The truck, having arrived at the right of the hopper, the door is lowered, and the tipping effected by means of a lever. The effort required is very slight, as the truck with its open door is all but balanced. The return of the waggon, and of the door, is carried out by means of a special lever made up of two unequal pieces joined together by a hinge. The labourer placed at the opposite side of the hopper puts his lever into a wrought-iron strap fastened on to the truck. He pulls it from top to bottom, and thus returns the truck on to the frame in its position for travelling. The hinge is so arranged that, in this movement, the two lengths of the lever remain in a line one with the other. It allows the labourer, after the return of the truck to its normal position, to fold up the piece which he keeps in his hand; the other length remaining in the strap. He then fastens to the moveable end a chain which, passing over two small grooved pulleys, is directly fixed to the flap of the door, and works downwards on the lever. This lever, turning on the hinge as a centre, actuates the chain, and shuts the door. This arrangement has the advantage of necessitating only one man to open and shut the door, and avoids accidents which might result to the labourers from the sudden falling of the door.

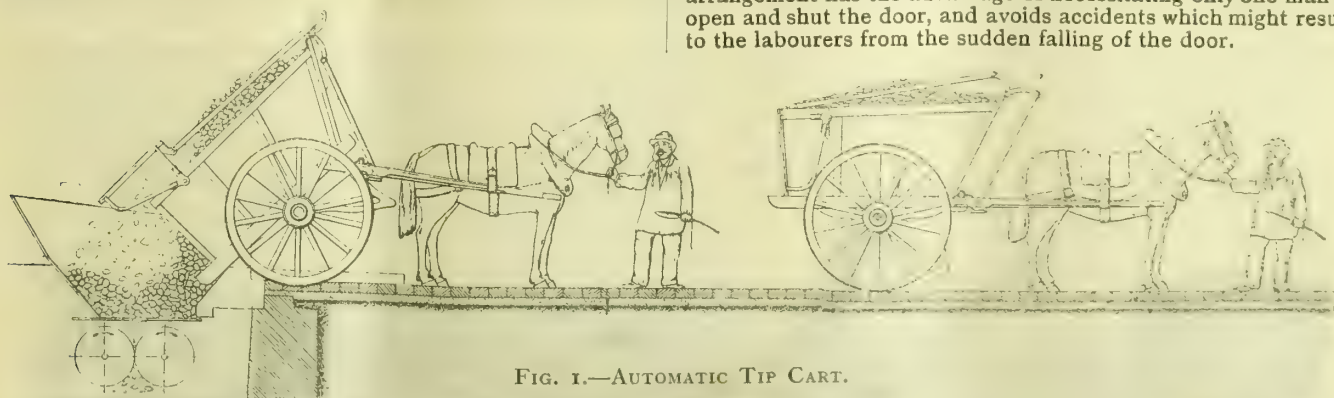


FIG. 1.—AUTOMATIC TIP CART.

II.—*Automatic Tip-Cart* (see fig. 1).—The principle of the action of the tail-board consists in the fact that, during the movement of it, the shafts fastened to the horse undergo very slight displacement, while the body of the cart itself turns on the axle. It results from this, that the distance which separates the shafts from the middle of the front of the cart increases in sufficiently large proportion, while the cart passes from the travelling to the discharging position. The tail-board is fastened to the shafts by connecting-rods AB, DE; the bent lever BCD working from the point C (fig. 2). It is also joined to each side of the box of the cart by a wrought-iron arm turning on the point R. A is a fixed point of the shafts linked at O with the body of the cart. In the emptying position, the shafts make, with the bottom of the cart, an angle AOA' of about 53°; the dotted line CBA becomes CB'A', and the end D of the bent lever BCD becomes D'. The connecting-rod DE and the tail-board turning on the point R become D'E'; and the bottom of the cart is thus left quite open. C is a fixed point of the box of the cart. During the righting of the cart, the rigidity of the connecting-rods compel the tail-board to return to its position; the weight

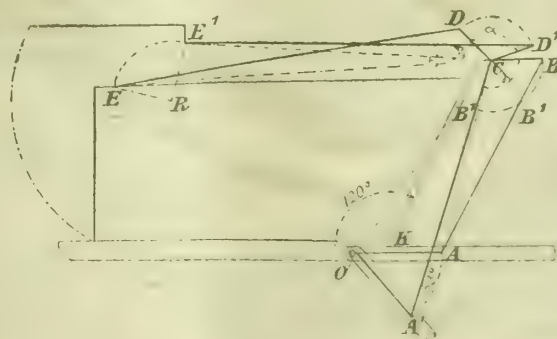


FIG. 2.—AUTOMATIC TAIL-BOARD OF COKE CART.

of the board itself assisting. The wheels of the cart during the emptying are held in a groove of sufficient depth that the effort necessary to pull the cart out will be greater than that required



for righting it. Thus, when the horse draws the shafts, the cart begins by assuming its normal position, and afterwards leaves the groove.

III.—*Skips and Cranes for Filling Railway Waggon with Coke* (see fig. 3).—In some works of the Paris Gas Company (La Villette and La Landy), railway lines have been laid along the screening shed. The ground of the shed is raised to the level of the floor of the waggons, which is advantageous for loading with sacks. For filling waggons with coke in bulk, cranes and special

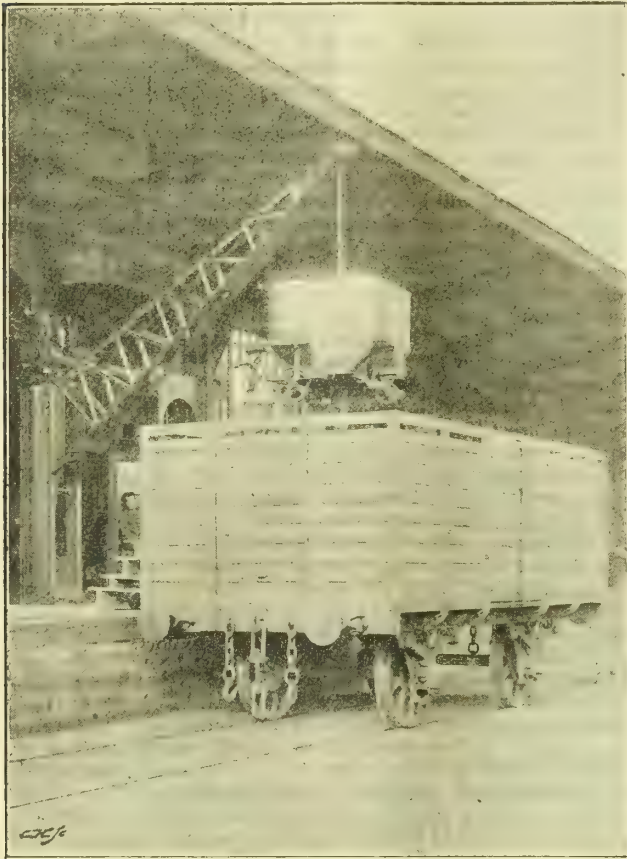


FIG. 3.—SKIP AND CRANE FOR FILLING RAILWAY WAGGONS.

skips are used. The cranes, on the Caillard system, consist of a vertical shaft supported by one of the roof pillars, and of a gib, the span of which allows of placing the skips in the centre of the waggons. The motive power is taken from the general driving-shaft of the screens; and the slowing down is obtained by means of a screw of sufficiently small thread, so that only under the

action of the skip and of the coke is it able to be turned. A disconnection can thus be effected, and the skip stopped, at any point whatever in its lift, without fear of seeing it fall by its weight. The skips have a capacity of 10 hectolitres, and empty through the bottom. They are mounted on three wheels, two of which in the rear run on a fixed axle; the third in front being able to be turned in all directions. The contact-surface of the support of this roller with the skip is made up of a cast-iron ring, forming a circular groove filled in with balls. Owing to this arrangement, the guiding of the skip is easy, and only requires one man to attend to it. The weight of the empty skip is 340 kilos. (750 lbs.); and filled with 10 hectolitres of coke, about 740 kilos. (1633 lbs.). These skips open at the bottom on pulling a hand-lever. The doors are balanced.

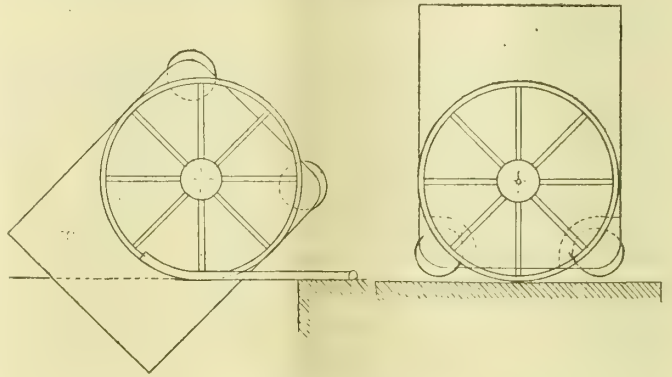


FIG. 4.—HAND TIPPING SKIP.

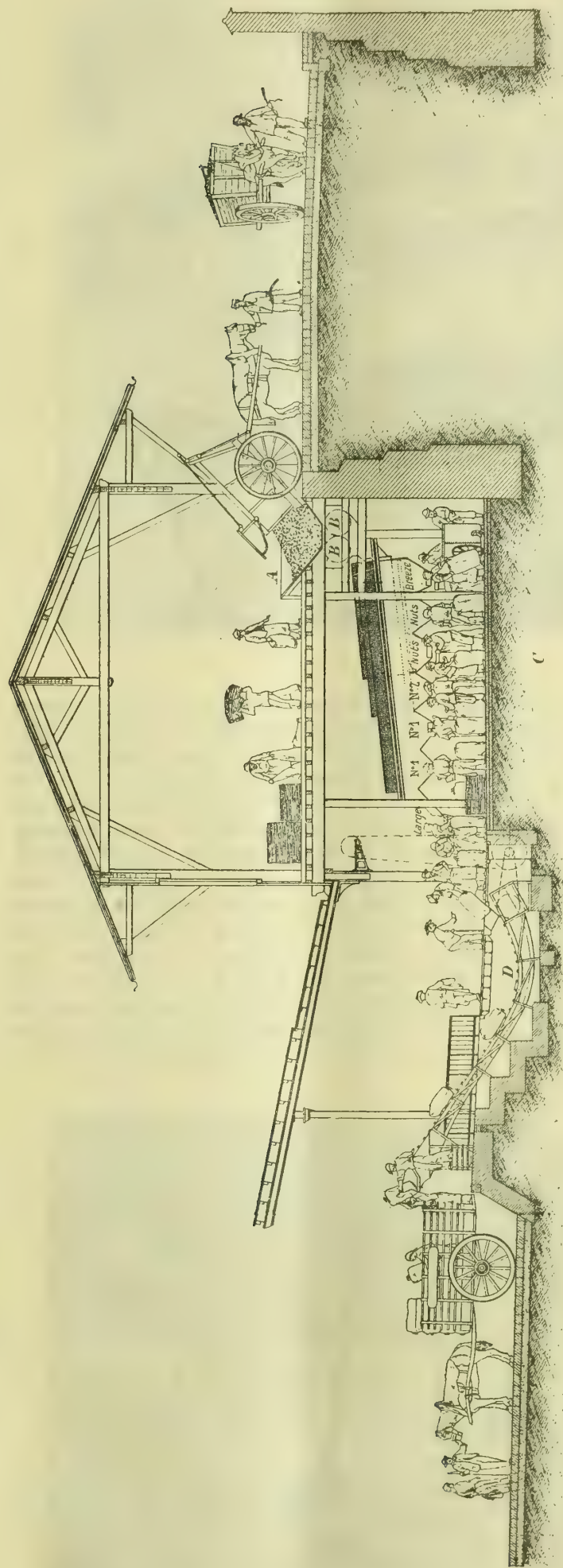
*Tipping Skip* (see fig. 4).—This skip, of rectangular shape, is carried on two large wheels 800 mm. (31·5 inches) in diameter, the axle of which is situated below the centre of gravity of the vessel when full of coke, and above it when the skip is empty. The full skip is thus in instable equilibrium; but on inclining it either to the front or back, it becomes supported on a roller placed centrally between the wheels, and thus forms a tricycle and travels in a steady way. To empty the skip, it is led above the openings where the coke is required; the large wheels run on to the U irons which guide them; and, the roller having lost its support, the skip is turned over by a push from the workman. The empty skip recovers itself; its centre of gravity being below the axle. The capacity of the skip is 430 litres. It is easily managed by one man.

IV.—*Transporters; Bucket Elevators for Coke in Bulk*.—The bucket elevators used in the coke-sheds of the Paris Gas Company are made up of buckets of sheet steel, 2·5 mm. thick. One of them is shown suspended by the crane in fig. 3. Their shape and capacity vary according to the power required, and the more or less winding route which they have to follow. The chain which connects them is a detachable link chain; the links being placed at the right of the buckets, and furnished with lugs to which they are bolted. On each side, the buckets have rollers which travel between two guiding angles, and which form



FIG. 5.—STACKING CONVEYOR.





A. Hopper. B. Breakers. C. Screens. D. Conveyor for Loading Carts.  
FIG. 6.—PLANT FOR TIPPING, SCREENING, BAGGING, AND DESPATCHING COKE.

the framework also of the transporter. The angles (which are curved according to need) allow the buckets to follow a winding course, such as the situation may require. It is necessary, however, for the route of the buckets to be always in the same vertical plane. At the two ends, the chain passes over a sprocket wheel—one wheel mounted on the driving shaft, the other on a shaft carried by adjustable plunger-blocks, which allow of the chain stretching more or less by moving the shaft. In some cases, the shaft is also the driving one.

V.—*Stacking Coke*: (1) *Sack Conveyors for Carrying and Stacking*.—These conveyors, which are very much used in the coke-yards of the Paris Gas Company, enable sacks of coke to pass over long distances, and to be raised to the tops of heaps of 20 metres (65 feet) in height, without requiring any manual lifting. They are of different types, according to the purposes for which they are intended. They are made up of a conveying chain, furnished with push-plates, on to which the sacks are put, and of a fixed metal framework for supporting and guiding the chain. The speed of the chain varies between 30 and 40 centimetres (11·8 and 15·75 inches) per second.

*Horizontal Transporters*.—The horizontal transporters are generally placed along the walls. The carrying chain is put 1·20 metres (4 feet) above the ground; so that it can be easily loaded or unloaded at any point whatever along its course. By

means of this apparatus, it is easy to carry the sacks from all the screens close to the plant for stacking, or for the carts or railway waggons. The length of these transporters may be very great. At Clichy, they are 65 metres (213 feet); at Villette, 80 metres (262 feet).

*Stacking Conveyor* (fig. 5).—The framework of the stacking conveyor is made up in the same way as the horizontal transporter; but it has, in addition, side foot-ways. It stands on metal piles firmly anchored in the ground, and hidden at times in the coke. These conveyors have an inclined portion starting from the platform of the screening sheds and ending at the top of the nearest heap. Some are continued horizontally, for supplying the tops of other heaps. Advantage is taken of the conveyor passing above the railway sidings for conveniently filling the waggons with sacks of coke, which slide down shoots into them. Apparatus of the same kind allows of passing the sacks underground, where the roads are obstructed by cart traffic, and carrying them directly to a suitable height for filling trucks. (See fig. 6.)

(2) *Rope Transporters* (fig. 7).—As well as these conveyors, the Paris Company use rope transporters for stacking coke. The endless metal rope is here both carrier and driver. It revolves at the two ends of the course on two grooved pulleys of large diameter on a vertical shaft. One of these is the driving pulley,

and can also be adjusted in its own plane so as to vary, as desired, the tension of the rope. The cable, or rope, is supported at various points on horizontally placed rollers. The sacks are put into corbel-supports resting on the rope by means of leather-bushed chairs. These chairs, or cushions, are, in addition, furnished with two grooved rollers, which run to the two extremities of the course, and, where the rope winds round the end pulleys, up on to an angle pathway. This circular track, situate at the loading point, is long enough to accommodate a good number of corbel-supports. These, on being loaded, are pushed by hand up to where the leather fitted chair comes into contact with the rope, which then carries them away. The speed of the cable being only from 20 to 30 centimetres (7·87 to 11·81 inches) per second, two men placed on the coke heap itself can seize the sack as it passes, and empty it. The uncharged corbel-supports continue to be carried along by the cable up to the semi-circular track round the return pulley. This is fitted with fingers for carrying along the track the corbels which, having run a half-circumference concentric with the return pulley, come of themselves to ride on the return rope, and so are carried back to the loading point.

(3) *Mono-Rails* (fig. 8).—Mono-rails permit of an easy transport of sacks on to the coke heaps. They start from the top of the heaps, at the arrival points from the conveyors and





FIG. 7.—ROPE TRANSPORTERS.

elevators, and radiate from these centres, so as to carry the sacks right to the spot where they are emptied. The sacks carried by the conveyors are placed on corbel-supports, furnished with rollers, which run on the mono-rails. A slope of 10 to 20 mm. per metre is given to the departure mono-rail. All the corbels, or sack-carriers, are joined together by a small cord, so that those loaded, in coming down the slope, by their weight pull up the empty ones on the return mono-rail. The carrying of sacks by mono-rails is further adopted for running long distances, by hanging the rail from the walls of the coke-breaker buildings and stores. At the Clichy works, for example, the sacks, which are raised by a lift to the upper floor of the house, are placed on the corbel-supports of a mono-rail fixed to the wall of the building. The total length (going and returning) of this mono-rail is 390 metres (426 yards). It is worked entirely by gravity. The empty sack-carriers are raised to the loading point by an endless rope, furnished with claws, which lay hold of them automatically.

VI.—*Conveyor-Lifter-Drier* (fig. 9).—To satisfy the requirements of a certain number of consumers, it is necessary to diminish the quantity of water in the coke coming from the quenching yard. To do this, the Paris Gas Company have put up at the Clichy works drying apparatus of great power. It consists of a conveyor made up of a series of plates, fitting into one another, so as to form a continuous surface 1·80 m. (5 ft. 11 in.) wide and 66 m. (216 ft. 8 in.) long, circulating in a highly heated enclosure. Each perforated sheet-iron plate has two rollers travelling on rails. They are all connected to the links of two detachable endless chains. At the two ends of the travel, the chains pass round two wheels of the same diameter, and mounted on the same axle—driving the plates by their motion. The wet coke coming from the screen is thrown continuously on to the drying table by means of a chain of buckets. The coke, spread in layers of 10 to 20 centimetres (3·94 to 7·87 inches), is carried away by the table at a speed of 30 to 40 mm. (1·18 to 1·57 inches) per second; and, after a journey of 30 to 40 minutes in the highly-heated casing, falls through a sheet-iron shoot on to a bucket elevator, which, in turn, throws it into the railway waggons for delivery. The casing through which the table moves is made up of an iron framework, which serves to support the out-going and return run of the table, and which is provided over all its surface exposed to cooling with sheet-iron boxes

full of sand, forming an isolating covering 130 mm. (5·12 inches) thick. The top, formed of sheets covered with 200 mm. (7·87 inches) of sand, supports at 50 mm. (1·97 inches) above the coke layer, a series of sheet-iron pipes, in which circulate the fumes from two heaters. Every seven metres (23 feet), the pipes open out into the rectangular boxes in which they lie, so as to allow of their expansion. The play left between the collars of the expansion boxes and the pipes, allows the steam set free by the coke to unite with the fumes, and be discharged with them into the air by the chimneys of the heating apparatus. The distribution of the heat ensures the gradual warming of the coke in the first third of its travel in the drier; in the second third, a very high temperature is kept up; and in the third part, it is gradually reduced to 100° C., at the coke-outlet. The motive power is obtained from a dynamo of 11,000 watts. The capacity of the conveyor is from 300 to 350 hectolitres of coke an hour. The apparatus not only has the advantage of drying, but also of conveying the coke. The elevators and conveyors work automatically; and the coke put into the hopper is dried and carried to the railway waggons, a distance of 80 metres (262 feet), without being touched by any workman.

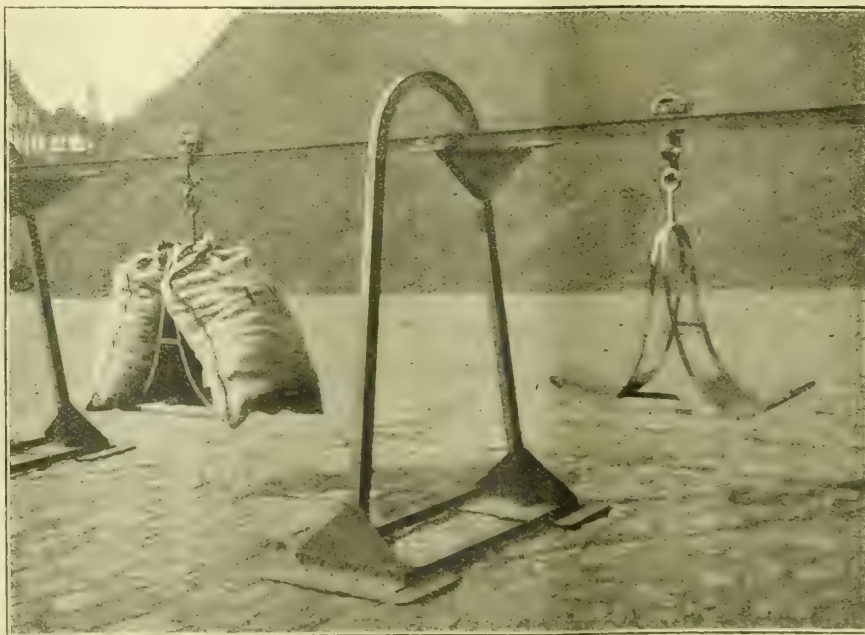


FIG. 8.—MONO-RAILS FOR TRANSPORTING SACKS.



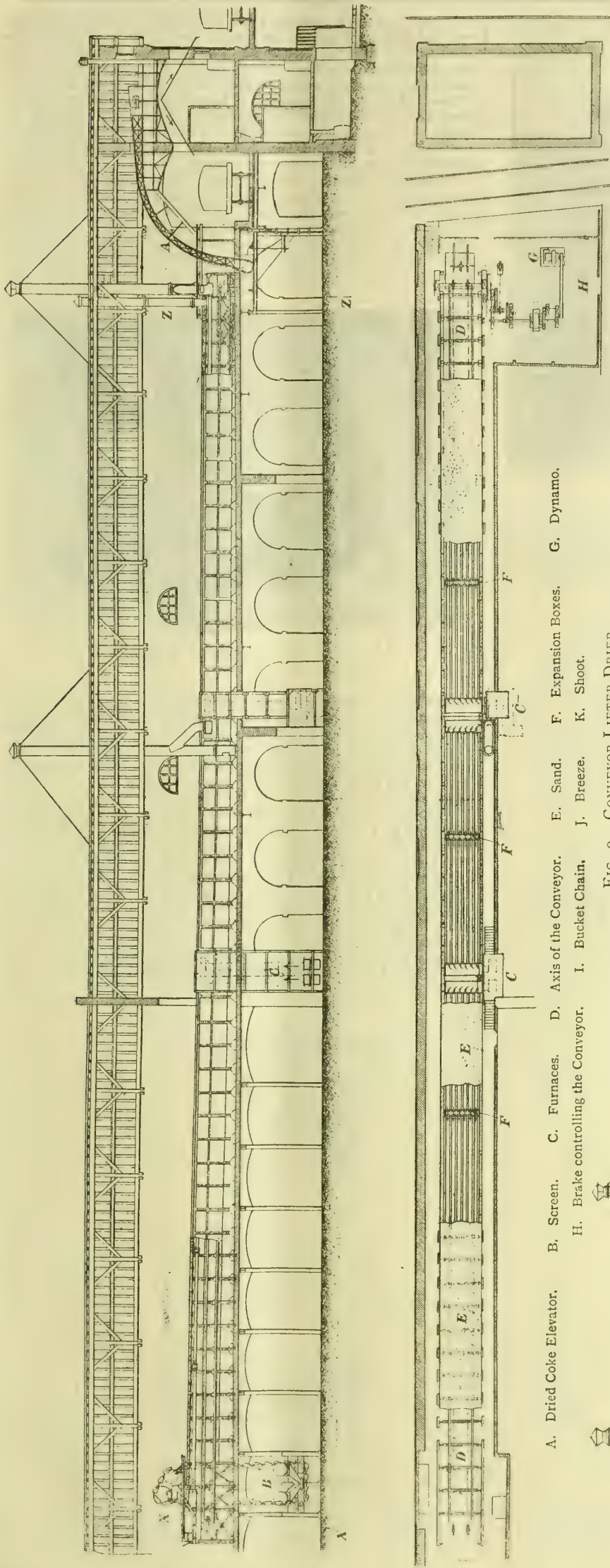
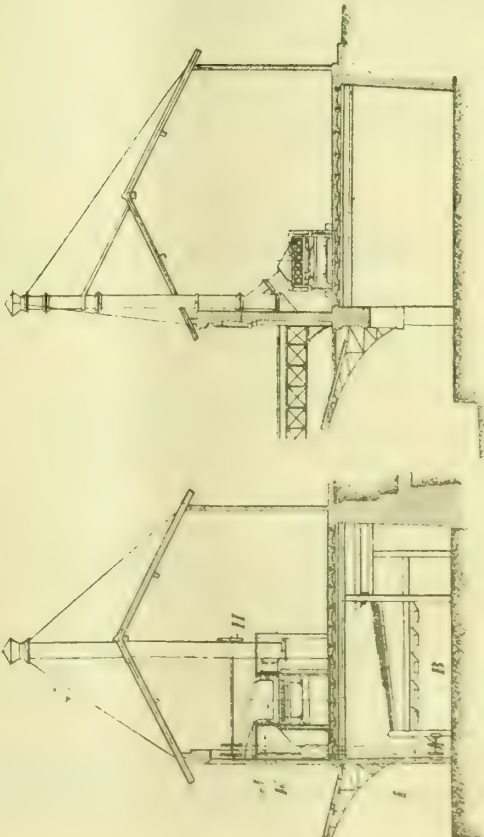


FIG. 9.—CONVEYOR-LIFTER-DRIER.

VII.—*Hectolitre-Charger* (fig. 10).—This apparatus is used in the yards of the Paris Gas Company for measuring and putting the coke into sacks. The small total height of the apparatus (1·25 metres, or 49 inches) allows of the placing of the hectolitre-charger under the shoots of the screens. The arrangement is such, however, that sacks 80 centimetres (31·5 inches) high can be filled, and that without almost any effort on the part of the workman, who very easily manages the measurer with only one hand. The sheet-iron hectolitre measurer is cylindrical, and it carries, fixed at diametrically opposite generating-lines (fig. 11), two arms, making an angle of 67° 30' with the generatrices of the cylinder, and each provided with two rollers B and C. The bearing rollers B run on two rails all but horizontal; the rollers C, of much smaller diameter, run on the same rails, which, at two-thirds of the course, are separated by a short distance—thus forming a prime of two vertical slides into which the rollers C drop. By continuing the advance of the hectolitre-charger, the rollers C go down into the vertical slides, giving to the measurer, through the supporting arms of the axes, a tipping movement on the centre line of the rollers B. These, owing to their large

diameter, are not able to fall into the vertical slide. They run, moreover, on a rail at the right side of the opening.

The hectolitre-charger is put into action either by means of a hand-lever, or by a treadle and lever arrangement. Directly the hand-lever or treadle ceases to be worked, the weight of the measurer itself returns it to its position for filling. So that the hectolitre-charger may completely empty itself, it is necessary that the generating-lines of the cylinder take an angle of 45° to the horizontal. The angle to which it is necessary to turn the measurer on the centre line of the roller B is therefore of  $135^\circ - 45^\circ = 90^\circ$ . This turning is done in two equal divisions of  $\frac{135^\circ}{2} = 67^\circ 30'$  each. For this reason the radii of the rollers are in relation, so that the angle of the line BC, which joins their centre with the generatrices of the hectolitre, is equal to 67° 30'. (See the position of the hectolitre when filling.) During the first phase of the turning, the roller C goes down into the vertical groove until the roller B finds itself standing perpendicular to this groove. At this moment the line BC is vertical. The angle which it has covered is, therefore, 67° 30'. (See the



SECTION ON THE LINE X X.

SECTION ON THE LINE Z Z.





FIG. 10.—HECTOLITRE CHARGER.

intermediate position.) During the second phase of the movement, the roller B continuing to advance along the horizontal rail, the roller C rises in the vertical slide, and finally comes to

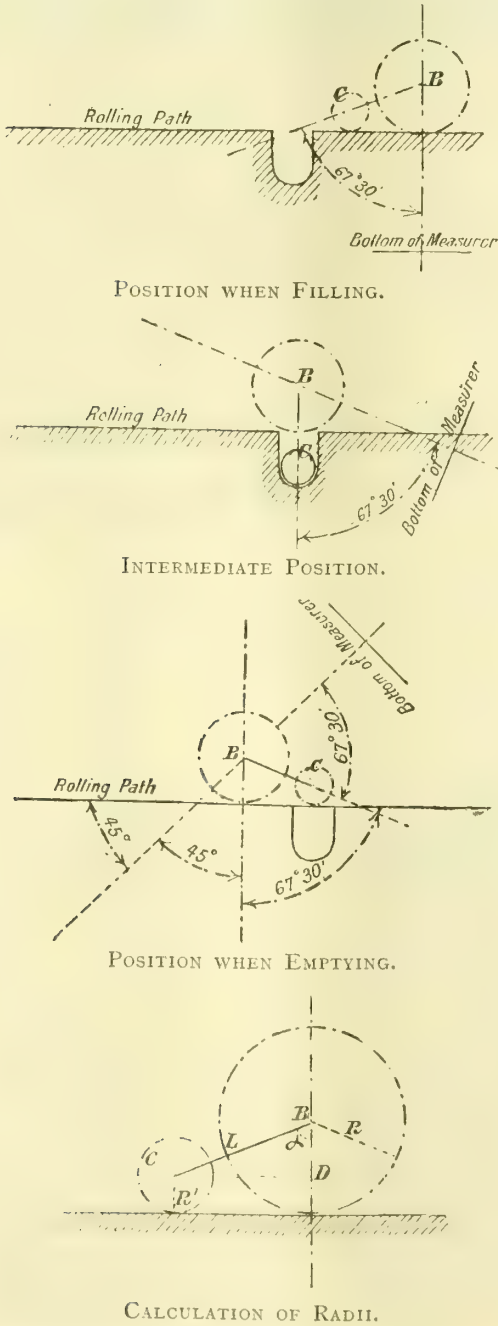


FIG. 11.—DIAGRAMS OF WORKING OF HECTOLITRE CHARGER.

take up a similar position to its initial one, on account of the vertical passing through the centre line of the roller B. Now the line BC makes a new angle of  $67^{\circ} 30'$  with the vertical. It has, therefore, turned a total of twice  $67^{\circ} 30'$ —that is  $135^{\circ}$ . The arm support of the axles of the rollers B C, being invariably connected to the hectolitre, has turned  $135^{\circ}$ , and its generating lines have passed from the vertical position to one making an angle of  $45^{\circ}$  with the horizontal. This apparatus being quite moveable, it may be taken from one screen to another, and even put at the foot of the coke heaps.

VIII.—*Sack-Lifter to Back.* (Fig. 12).—These lifts, placed near the screens or the sack-stores, enable a man to put a sack on his own back without effort. Different systems are used by the Paris Gas Company; but they differ only in the method of driving—from the shaft of the coke-breaker to the elevator plates. These plates, of which there are two or four to each apparatus, have an alternate movement from bottom to top and from top



FIG. 12.—SACK-LIFTER TO BACK LEVEL.

to bottom. This raises the horizontal part of the tray from the ground level to a height of 1.40 metres (55.15 inches), and then returns from this height to the ground level. A pause in the travel of the tray, at the two ends of its stroke, allows the workman to put the sack on the plate when it is at the ground level; and, on the other hand, to tip the sack and take it on to his back, when the tray is at the top of its stroke.

*Description of the Apparatus with Two Trays.*—The motion is obtained by means of two horizontal shafts placed in the same vertical plane—one at the top A of the sack-lifter, the other at the lower part B. (Fig. 13.) On to the top shaft are keyed three toothed wheels. The shaft is carried by a single plummer-block, which can be adjusted vertically by means of a screw and nut, so as to increase or decrease the distance of the top shaft from the bottom one. The middle wheel C is connected to the driving shaft of the coke-breaker by a Ewart chain. The bottom shaft B, held by a single fixed plummer-block, carries two toothed wheels of the same diameter, and opposite the out-

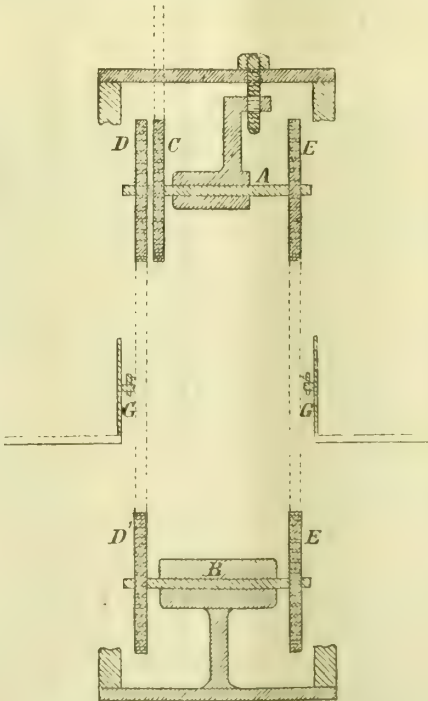


FIG. 13.

SACK-LIFTER TO BACK LEVEL.

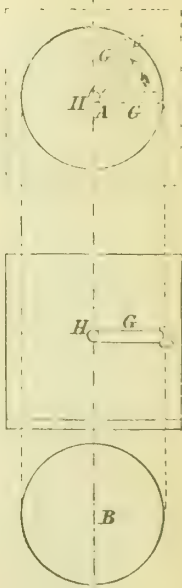


FIG. 14.



side wheels of the top shaft D D' E E'. On each of these pairs of wheels runs an endless Ewart chain; and each chain works a tray by means of a crank G, connected at one end to one of the chain links, and at the other to a pin H fixed in the centre of the vertical part of the tray or plate. The crank is the length of the inside radius of the toothed wheels. As long as the link fastened to the crank moves vertically—covering the space which separates the two shafts—the crank remains horizontal (the chain being stretched), and starts the ascending or descending tray. From the moment when the link reaches the toothed wheel, the crank-pin, fixed to the tray, finds itself at the height of the centre of the wheel, and the crank becomes a radius of the wheel, and describes (being carried on by the chain) the upper half-circum-

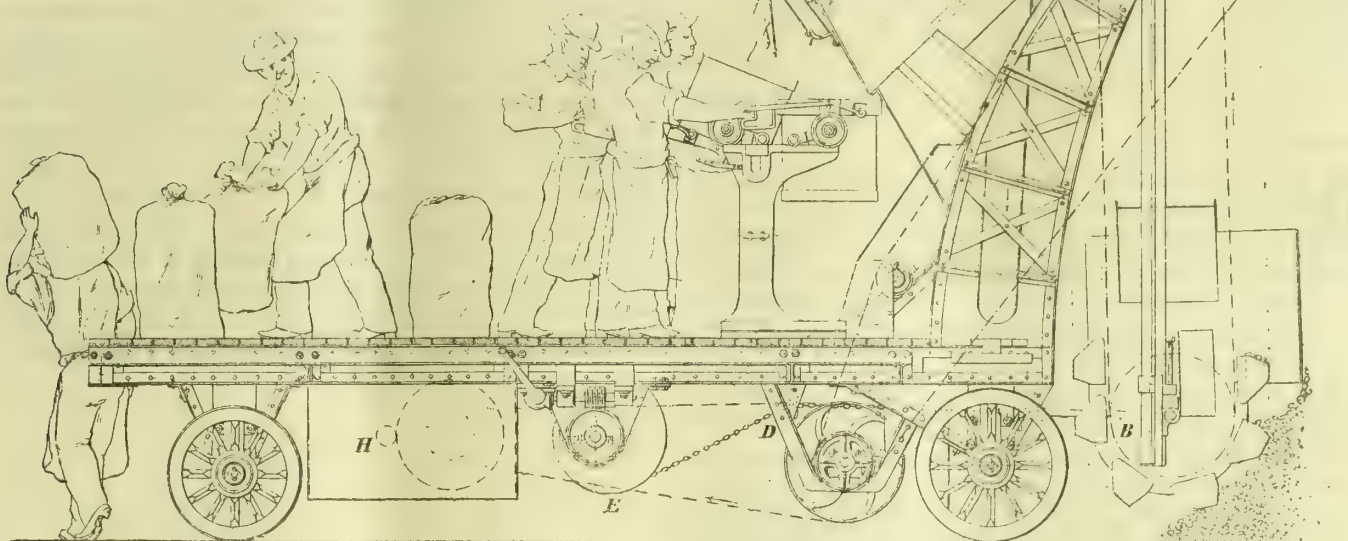


FIG. 15.—PORTABLE ELEVATOR FOR TAKING COKE FROM THE HEAP.

ference of the top wheel or the lower half-circumference of the bottom one. (Fig. 14.) The pin fixed to the tray remains at the height of the centre of the wheel during this half-revolution; and the tray remains still during the corresponding time. These stops in the moving of the trays are utilized, at the bottom for placing the sack on the plate, and at the top for taking hold of it and putting it on the back. Irons of  $\sqsubset$  section, which form the framework of the elevator, are used as guides, and as the track for the four small cast-iron rollers fastened to the trays.

IX.—*Portable Elevator for taking Coke from the Heap* (fig. 15).—The arrangement for taking the coke from the heap consists of a chain of buckets, mounted on a swinging metal arm A B. This arm is moveable about a horizontal axle C, arranged so that the weight of it always tends to push into the coke heap the lower part of the elevator or drag. The depth at which the buckets go into the heap is regulated by a counter chain B D E, which winds itself round a common windlass E. The shaft B, which carries the lower wheels of the elevator chain, is mounted on adjustable plunger-blocks, which allow of regulating at will the tension of the chains. The coke, raised by the buckets up to the top of the elevator, is thrown into a hopper, the sides of which act as sifters. The dust slides by side shoots into baskets or sacks placed on the ground. The clean coke is put into sacks by means of three hectolitre-chargers of the type already described. The motive power is supplied by an electrical motor H of 3500 watts; and the driving is done by belting, and by a detachable Ewart chain from the top part of the elevator or drag. The electric current, given by a generating dynamo in the machine-room of the coke-breakers, is carried by isolated cables, passing above the heap to the elevator. Receiving boxes for the current, placed at different points in the yard, allow of reducing to a minimum the length of the moveable cables required. The whole apparatus, with its sorting hopper, the three hectolitre-chargers, the driving dynamo, the speed reducers, and the common windlass, is mounted on a moving platform, which is used as a loading dock; so that it all may be easily removed from one heap to another by two horses. The total weight on wheels is 6000 kilos. (5 tons 18 cwt.). The capacity of the plant varies from 350 to 450 hectolitres per hour, according to the kind of coke put into the sacks.

X.—*Machines and Different Apparatus*.—Continual use is made by the Paris Gas Company of various other machines and apparatus for the mechanical conveying of coke and coal. Mechanisms like those used in all industries where heavy loads have to be carried, and not applying specially to coke and coal, need only be mentioned without describing them. Electric capstans allow, by means of cables and headstocks placed at fixed points, of easily and quickly moving waggons on railway sidings, at the right of the loading apparatus. They do away with the often dangerous use of horses on the congested roads of coke-yards. In short, thanks to these means, the working of waggons and locomotives on turn-tables is made much more rapid. Elevators, hoists, and lifts of various types, serve to raise coke sacks or skips to the

different floors of buildings. They are driven either by steam, gas, or electricity, according to the special conditions which present themselves at the time of their construction. The use of portable railways is very efficient and very economical for making or removing coal and coke heaps. The rails used by the Paris Gas Company are, preferably for portable ways, double-headed, 6 metres long (19 ft. 8 in.), weighing 35 kilos. per metre, and mounted on oak sleepers by means of cast-iron chairs and steel wedges. At the Boulogne Gas-Works, which receive coal by water, and which are not connected with any of the great Railway Companies' systems, the transport is done by Decauville lines. The lines are fixed, and there are guard-rails where they are passed over by carts. They are, however, moveable to the site of the heaps. The small waggons may be tipped on the side, and the hauling is done by horses.

*General Remarks*.—All the plant has been designed and carried out according to the instructions given by M. Léon Bertrand, the Engineer attached to the office of the Company, by the works department of the Paris Gas Company, under the direction of M. Louvel, the Chief Engineer of this work, assisted by M. Béguin, the Assistant-Engineer. They have been especially helped in their efforts by M. Helmer, the Inspector of the boiler workshops, and MM. Trouvé and Hosselet, the chief agents of the coke-yards at Clichy and La Villette.

#### NOTES ON THE PUBLIC LIGHTING OF THE TOWN OF GUAYAQUIL.

By M. CHARLES GUICHARD, of Paris.

[A Paper read before the International Gas Congress in Paris.]

This paper might have as a sub-title: "Defensive Means to be Used against Nocturnal Insects;" for, in the course of it, the author will often be obliged to refer to beetles, moths, and mosquitoes—those imprudent friends of the light, which are quite as dangerous to incandescent mantles as the natural enemies, wind, torrential rains, and even earthquakes. It may be said that, apart from the initial difficulties of introducing gas, there were others to be overcome; and it was thought that a description of the means and apparatus adopted might give useful information to those who may have to do similar work in such countries, and might suitably supplement papers already read on companion subjects at previous meetings.

Guayaquil is a town of 70,000 inhabitants, and the most important in the Republic of Ecuador. It is situated at the foot of the Andes, on a very flat peninsula, formed by the alluvia of the Rio Guayas—a very rapid river, having a width of 1876 metres (about 2050 yards). It is by this river, also, the depth of which at low water is 15 metres (nearly 50 feet), that the works are supplied with coal.

Before speaking of the public lighting itself, the author thinks



it necessary to say a word as to the gas supply and its distribution, as the nature of these two important things was the cause of preventing the adoption of incandescent gas before his arrival at the works. The agreement with the town specifies that the gas sent out by the Company must be the product of "the best known coals," without indicating in any way the quality or lighting power. The Company carbonize an equal mixture of caking coal from Canada and England, with the addition of 20 per cent. of Scotch boghead. The make of gas was 30 cubic metres, on an average, from 100 kilos. of coal (10,765 cubic feet per ton). There are at the works two Beale exhausters; but there is no photometer for measuring the lighting power. The gas, however, is very good—so good, indeed, that the burners in the public streets consume only 70 litres (2.472 cubic feet) of gas per hour. The regenerative burners sent from France, and regulated for Paris gas at the rate of 150 litres (5.297 cubic feet), at 30 mm. (1.18 inches) pressure, consumed under the same pressure only 110 litres (3.885 cubic feet) of gas. The ratio between the density of the Paris gas ( $\delta = 0.40$ ), and that of Guayaquil was, therefore,  $\sqrt{\frac{110}{150}} = 0.857$ ; and the actual density  $\frac{0.40}{0.857} = 0.461$ .

I have verified this theoretical result by an apparatus for measuring densities, which was roughly made on the spot, with a glass chimney, a tap, and a nickel cap, pierced by a fine needle point. I found at the same temperature of 26° C. (79° Fahr.), that the time of air-flow was 3 minutes 21 seconds; and of the gas, 2 minutes 18 seconds. If these are reduced to seconds, the density compared with the air becomes  $\delta = \left(\frac{138}{201}\right)^2 = 0.472$ . The difference between the actual result and the calculated one, which only comes about from the figure taken as that of the average density of Paris gas, shows the sufficiently practical correctness of similar experiments and calculations.

All the lighting, both public and private, was done by batwing burners. I have not found in the whole town a single argand burner; and, in fact, besides the batswings, there were only three regenerative—one "Industriel," and two "Cromartie" lamps of 150 litres (5.297 cubic feet). I therefore used a batwing burner to find out the lighting power of the gas—taking as a standard the stearine candle. I made a photometer according to Rumfort's method, and as a standard of comparison used two candles of six to the pound, placed in a plane parallel to the photometer, and spaced 5 centimetres (1.969 inches) from centre to centre of the wicks. Taking these candles as worth one-eighth of a carcel, I corrected their lighting power as their weight reached or passed 10 grammes per candle per hour. I ought to add that these tests were made with noted temperatures, varying from 28° to 35° C. (82° to 95° Fahr.); these being the local temperatures at which the gas is used. A No. 28 Bray burner, consuming 200 litres (7.063 cubic feet), gave a result of 23 candles, or 2.89 carcels, and the carcel-hour for  $\frac{200}{2.89} = 69.21$ .

The street burners with our gas correspond to those consuming 130 litres (4.591 cubic feet). The gas is sold at 20 centavos, or 1 fr. per cubic metre (22s. 7½d. per 1000 cubic feet).

Finally, I must certainly say a word or two about the manufacture and distribution of the gas, so as to complete the list of difficulties that may be met with in a similar situation. After leaving the hydraulic main, the gas is but inefficiently condensed. There is no mechanical tar extractor; and it will be understood that an ordinary pipe condenser, without a water spray, and with a temperature as high as 60° C. (140° Fahr.) in the sun, does not produce effective condensation. The real cooling takes place in the scrubbers. The adequacy of such condensation may well be doubted, when it is stated that I have found fairly liquid tar in the pipes and syphons, 2 kilometres (1¼ miles) away from the works. That naphthalene, however, is not met with, and indeed is unknown in the country, may be explained by remembering the average temperature is 29.6° C. (85° Fahr.).

The distributing main is in the form of a girdle—the pipes being 500 mm. (19.69 inches) in diameter; and the street mains are fed from trunk-mains of suitable size. Unfortunately, the ground is so bad—water being found at 70 or 80 centimetres (27.56 or 31.5 inches) underneath the roadway—that the pipes are laid almost on the ground level. They were put down without sloping, and with an insufficient number of syphons; so that in the course of our work of equalizing the pressure, we found 6-inch pipes half full of tar. In other places, 4-inch Chameroy pipes were completely eaten away, and the gas passed along the channel made in the hard clay by the pipe, the comparative tightness of which was due to the tar covering its sides. I may add that, on an average, six or seven times every year the mains are shaken by earthquakes, lasting about 20 seconds, which gave one an opportunity of seeing how the anti-vibrators on the burners acted. The earthquakes are an undulation of the earth, which may be well compared to the shuddering of the skin of a horse or an ox, when it wants to get rid of annoying insects. Of course, all the houses are of wood or iron; but it is very surprising that these earthquakes affect the mains, comparatively speaking, so little. After three which occurred during the months of December, January, and February, we had only to open one trench to repair a cracked pipe.

The gas always leaves the works under 25 mm. (1.378 inches)

pressure, which cannot be increased because of the state of the mains. Owing to some alterations, we have been able, however, to give the public burners and private consumers in the town a pressure varying from 25 to 15 mm. (0.984 to 0.591 inch). This pressure is more than sufficient for the batwing burners; but it will be understood that the American Auer burners, which have been tried with it, have not been so successful. Not only was the pressure lower than would have been necessary to satisfactorily work burners in France, but the gas was also almost twice as rich as that of Paris. Being heavier, it would have required greater pressure to drive it out; and being richer also, it would have needed more pressure so as to bring into play a sufficient quantity of air. The apparatus which we have put up, and which is to-day used by the Alumbrado Company of Guayaquil, is the Lecomte burner No. 3 R, with bunsen, anti-vibrator, and lighting tap—type D B C.

I shall not describe the principle of the Lecomte bunsen,\* for which its inventor was awarded a prize at the meeting of the Société Technique du Gaz in 1898, but will say a word as to the burner, which is a special one. The problem for solution was to obtain a lighting effect at least equal to that of the best burners with mantles, but without using a chimney, so as to avoid breakage, cleaning, and maintenance. It has been solved by changing the form of the cap, and by adding to it a sort of notched washer, the working of which I will now explain. Fig. 1 shows this burner. A is the gas-inlet, B the first cone for regulating the primary air at C; D, the spring of the anti-vibrator; E, the second cone; F, the mixing chamber of the air and gas; and G, the thick top of the burner, cut with notches. The air and gas mixed in the chamber F have not all the carburetting qualities required to obtain a short and very hot flame; but it is very easy to add them. Most people will have noticed that if a

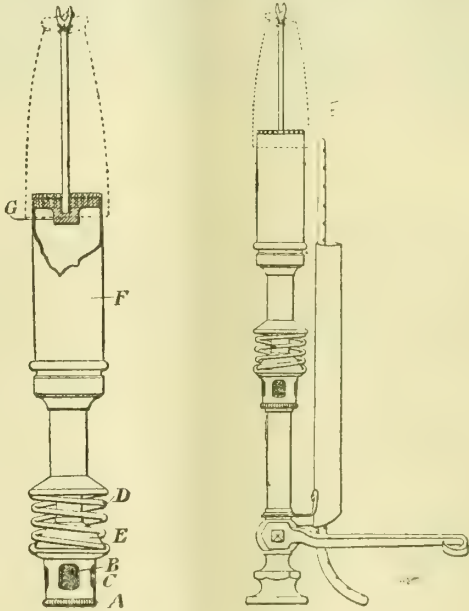


FIG. 1.

FIG. 2.

burner heats itself after a certain time of lighting, the flame is shortened, the burner hums, and then finally fires-back, which proves that the combustion mixture is very active. Well, it is this that M. Lecomte has taken advantage of in his burner. The mixture of air and gas heats itself in passing through the slots in the metal top; and, in issuing, it burns with rapidity, without requiring supplementary air, and consequently without the need of a glass chimney.

The installation at Guayaquil numbered 1900 single burners, as shown complete in fig. 2, and 100 triple burners on the same system for the street lighting. I have recorded the consumption and power of the Lecomte burner (No. 3 R) by means of the Rumfort photometer, previously described, and have obtained the results shown in the following table:—

Pressure in Millimetres.	Consumption in Litres.	Candles.	Carcels.	Consumption per Carcel-Hour.
10	65	28.8	3.6	18.0
15	80	56.0	7.0	11.4
20	92	75.0	9.4	9.8
25	103	88.7	11.1	9.3
30	112	101.0	12.6	8.9

It will be noticed that the best results start from the pressure of 20 mm. (0.787 inch). The mantles used were made by the Alumbrado of Guayaquil, who manufactured everything complete. These conclusive results agree with those which were given by our colleagues of the Primitiva Gas-Works of Buenos Ayres, where the following figures have been obtained with the

\* See "JOURNAL," Vol. LXXII. pp. 368, 535, 1472.



same Lecomte burner (No. 3 R). The gas at Buenos Ayres is rather lighter and less rich than ours.

Pressure in Millimetres.	Consumption in Litres.	Distances in Metres.	Carrels.	Consumption per Carcel-Hour.
11½	80	1'020	4'25	18'0
15	98	1'285	7'75	12'6
19	110	1'600	10'25	10'7
23	122	1'750	12'25	9'9
26	128	1'920	14'75	8'7

The tests are typical ones, because they have been carried out by the French photometrical method, with the Foucault photometer and the carcel lamp. One of the requirements (which was especially important to the Alumbrado of Guayaquil) was the power to place the burners directly in the lamps without altering them in any way. These lamps are shown in fig. 3, and are for the most part made of cast iron, with panes of glass both top and bottom. Acting on the advice of the inventor of the burner, I thought that it would be sufficient to close the lamp all but completely, so as to let the air required for combustion pass through, but not the wind. He, however, failed to take into account a much more serious inconvenience—namely, that of the nocturnal insects, which grow in these parts to quite formidable sizes. The day after putting up the first 60 lamps, 50 mantles were broken; and we picked out of the lamps fairly large insects—such as beetles, moths, locusts, &c. The beetle weighs about 60 grammes, and flies very swiftly, easily covering when fully on the wing 10 metres (32 ft. 10 in.) a second. I may

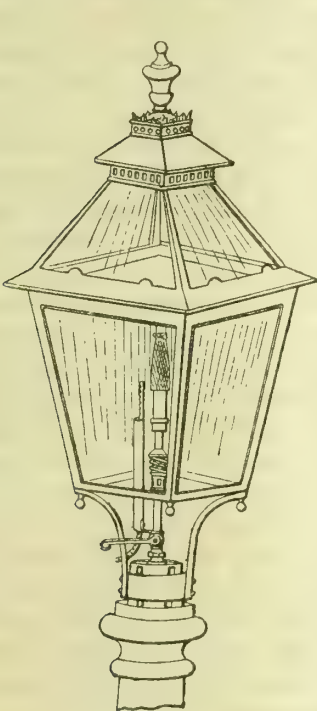


FIG. 3.

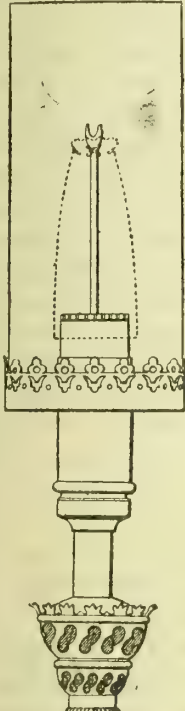


FIG. 4.

be excused from making the calculation of the net force of a coleopter; but it may be interesting to know that the practical result is, in many cases, sufficient to break the glass of the lamps. Other insects get in by the outlet-holes for the hot air. In fact, one-tenth of a litre of gnats is sometimes found in the lamps, but how they get in nobody knows.

In the design of the lamp shown in fig. 3 there is a detail introduced for the first time. The forged cross-bar which supports the lamp is formed of four branches, the upper ends of which are riveted to the lower part of the lamp-frame. At the bottom end, these four branches are joined together by two riveted rings. With this arrangement, all that is required is to drive down the cross-bar of the lamp on to the wooden top of the lamp-post, and the whole is then held firmly by iron or wooden wedges placed inside the rings. I do not quote this arrangement as a model of elegance, but as being very practical in a country where one cannot have everything instantly at hand, and where the fitting-up is done by natives, chiefly Indians.

To protect the burners in the houses, we have to provide them with a tulip-shaped glass or (preferably) with a globe, firmly held by claws, owing to the earthquakes, which are indeed, as I have said, so frequent that the inhabitants of these volcanic countries do not trouble themselves much about them. The chimney shown in fig. 4, which is 7 centimetres (2.756 inches) diameter and 16 centimetres (6.3 inches) high, is not intended to increase the draught of the burner, of which there is no need, but to provide the mantle with some protection from the direct attacks of insects and moths. The street-lamps have to be hermetically shut at top, because of "aguacerres"—a kind of diluvial rain of great violence, which always comes at nightfall for an hour or

two continuously. To light the burners, the lamplighters use a rod on which is a petroleum spirit lamp with a wick 10 mm. (0.394 inch) diameter. This system is an excellent one for the country, as whatever be the wind, there is no failure in lighting. The Lecomte burners are as quickly lighted as the old batswings—for example, one man lights 150 lamps on the Malécom in 40 minutes, a total distance of 3 kilometres (1.7 miles). Speed in lighting up is a necessity in these Equatorial countries, where there is hardly any twilight, and where night closes in within fifteen minutes.

The training of squads of lamplighters and lamp-cleaners was soon accomplished, though there were at first some faults to be overcome. For instance, there was the unfortunate habit which the Indians charged with cleaning the lamps had, of bodily grasping the mantles, and thus destroying them. The greatest praise that I can give the Lecomte burner, however, is to say that our staff, which is all but entirely made up of Indians ("Cañaris"), fix the burners, look after them, and light them, and that, in spite of all the elements of destruction that have been enumerated, the breakage seems to stop at 18 mantles per burner per year, everything included—wind, insects, moths, torrential rains, and earthquakes.

The lighting of the town has increased tenfold, and a like increase in private lighting has taken place. The distance between the lamp-posts on the Malécom (the quay of the Rio Guayas) is 40 metres (131 ft. 3 in.), the height of the light above the ground is 3 metres (9 ft. 10 in.), and the burners have the power of 10 carrels. The formula given by M. Ed. Servier, in his paper of 1882, on "Different Methods of Street Lighting," enables a calculation to be made of the amount of light received by a point at a given distance from the focus. Inversely, the lighting power of this point may be considered as a source of light. Taking—

$m$  as the lighting power of the burner = 10 carrels.  
 $y$  as the height of the lamp . . . = 3 metres.  
 $x$  as the horizontal distance from the point  $m$  to the foot of the lamp-post . . . = 20 "

and  $P$  as the amount of the light received by the point  $m$ .

Then—

$$P = \frac{2my}{(x^2 + y^2)\sqrt{x^2 + y^2}} = \frac{2 \times 10 \times 3}{(20^2 + 3^2) \times \sqrt{20^2 + 3^2}} = 0.0072 \text{ carcel.}$$

M. Servier quotes in his paper 0.006 carcel as the maximum type of street lighting. It is further to be noted that this figure of 0.0072 carcel corresponds to the light normally received by an object placed at 1 metre (3 ft. 3.4 in.) from a focus of half-a-candle, or one-twentieth of a carcel. The lamp-posts being very far apart, the street lighting could be cheaply increased by heightening the posts and adding reflectors to the lamps. In the Séminario Park, the lamp-posts are placed 10 metres (32 ft. 10 in.) from one another; and the height of the burner is 3.50 metres (11 ft. 5.69 in.) above the ground. The lights are in triplet, burning 270 litres (9.535 cubic feet) for the three burners, and producing a light of 30 carrels. The light received between the two lamps at the minimum point is 0.290 carcel, which is also the amount of light in the Place Rocafuerte. Throughout the rest of the town, the lighting varies between the two figures of 0.0072 and 0.290 carcel, according to the situation and the number of the lamps.

As regards the wear and tear of the mantles, taking as a basis the three worst months of the year, December, January, and February, it may be reckoned that 18 are used per burner per year. As already stated, the mantles are made at the gas-works. The net cost of the 18 is 9 frs. The burners, in 4015 working hours per year, consume 361 cubic metres (12,743 cubic feet) of gas, which at 50 c. amounts to 180.50 frs. The expense of the mantles, therefore, comes out at 5 per cent. of the cost of the gas. It will be seen that the maintenance of the mantles, in spite of the large number used, represents an insignificant figure compared with the cost of the gas. It would not be altogether the same here in France, as the gas is sold at a much lower price to the Municipalities.

In conclusion, the Lecomte burner that we have adopted, as well as the system of lighting up, gives full satisfaction as regards public lighting, and that notwithstanding the altogether unfavourable circumstances above described. It acts well with a very rich gas, and at a very low pressure; it is strong, easily regulated, and is the only one that has been able to work at Guayaquil.

I thought that the absolutely new conditions under which this installation of public lighting had been carried out would interest my colleagues, and would indicate a good solution in similar cases.

The Kitson High-Power Incandescent Oil Lamp.—In the article on this subject in the last issue of the "JOURNAL," it is stated that in tests made at the laboratory of the Paris Municipality, with a consumption of 400 grammes of oil per hour, each burner gave 10.36 carrels. This was an error; the illuminating power, with a consumption of 400 grammes, being 96.4 carrels. A more recent test gives 100 carrels, with a consumption of 398 grammes of oil. The mistake, it is only fair to mention, occurred in the type-written figures supplied to us.



## NOTES.

## Artificial Daylight.

At the recent British Association meeting in Bradford, Messrs. A. Dufton and Walter Gardner submitted a paper, and offered a demonstration, upon the production of artificial light of the same character as daylight. The object of the authors was to produce a light by means of which colourists and matchers of tinted materials may work by night as well as by day. They exhibited a collection of dyed cloths illustrating the extent to which the appearance of some colours varies with the kind of light in which they are seen. Among these patterns, one which is green by daylight became red-brown by gaslight; a violet became purple; a grey became heliotrope; a shade of tan turned a brick-red. Particularly striking was a pattern woven from specially dyed yarns, which appeared a uniform green by daylight, but was figured in gaslight. Generally speaking, the colours became uglier by ordinary artificial light, including that of the electric arc. Colours that alter at all become redder under artificial light, which is due, not merely to the redder tone of the light itself, but also to the peculiar transparency of colouring matters for red light. This transparency is of primary importance in colour matching. The whitest artificial light contains too much red. It can, however, be corrected by means of a screen of cupric salts. For practical purposes, the correction is made by means of pale blue glasses coloured with copper, and answering the purpose of the ordinary glass globe.

## The Preservative Virtue of Creosote.

Mr. Hall has reported, in the "Analyst," on some instructive and simple experiments designed to test the preservative action of creosote and coal tar, and to ascertain to what constituents of the compounds this virtue is due. Lengths of good hemp string of known breaking stress were soaked in various extracts from creosote, and other pure materials, at water-bath temperature. The string was then partly buried for two months in garden mould, dug up, and its strength redetermined. The results obtained gave a low value to the phenoloid constituents, and not much more to the naphthalene; but the less volatile fractions of the creosote, the basic constituents, and bone oil which is rich in similar bases, all preserved the string fairly well. Small deal rods, 8 inches long by  $\frac{3}{8}$  inch square, were also soaked in the various tar oils for  $1\frac{1}{2}$  hours, at a temperature of  $90^{\circ}\text{C}$ ., then buried to about three-quarters of their length in garden soil, taken up after about ten months, washed, slowly dried, and the transverse breaking strength measured. The results showed that the creosote itself, and especially the less volatile fractions, had considerable preservative power; the phenoloid and basic constituents had a real but smaller preservative power; but pure cresol had little or none. The general indication seems to be that the preservative action of coal-tar creosote lies in its property of filling the cells of the wood with a fixed moisture-resisting substance, rather than in any chemical antiseptic action. It is regarded as desirable, in the commercial valuation of creosote, to estimate the pyridine "tar bases," and to rate them as of equal preservative value to the "tar acids." This explanation of the nature of the preservative action of creosote on wood is not altogether a surprise.

## The Selection of Fire Hose.

One of the minor, but still important, cares of works managers is the provision and preservation of fire hoses. Some useful hints on this subject recently given in the "Engineer" may therefore be repeated here. As regards the material of which hose pipe is to-day manufactured, it is evident that flax or canvas is most in favour; although the London Fire Brigade prefer rubber-lined hose. This is supposed to be on account of the superior delivering capacity of hose of this description. For works and offices, however, a good flaxen, hand-woven hose will be found to answer every purpose to which it can be legitimately put. Such hose, however, is not particularly cheap. Hose should not be specified to be too strong, or it will be heavy and clumsy. A bursting strain of 300 lbs. is enough; and for this pressure the hose need not be very tightly woven, which is a further advantage. Such a hose gets thoroughly wet and swells perfectly water-tight after the first few minutes' use. The Admiralty are large buyers of hose, and they insist upon its being oak-tanned. Where a hose is not often used, as in the case of offices and public buildings, what is wanted is something that will not quickly perish when folded up. This consideration debars anything in which india-rubber is used. It can hardly be insisted on too strongly that in regard to this matter of selecting and keeping fire-hose, every care should be shown to get a good and suitable article in the first place, and to keep it in effective condition. In connection with the latter requirement, it may sometimes be a question how often the neatly-coiled hose pipe stowed away in its glass case on the landing of a public building, is laid out, connected up, and tested as in actual use. Yet unless this is done, it is impossible to make sure of the condition of such perishable fittings.

## The "Thermit" Process of Metal Welding.

During the meeting of the Iron and Steel Institute in Paris, a display was made by Mr. E. D. Lange, of Manchester, of Goldschmidt's method of producing intense local heat for certain

metallurgical purposes. The principle underlying the process is not new, being the intense chemical action between aluminium and certain metallic oxides; but the novelty of Dr. Goldschmidt's invention consists in the manner in which the action is developed and applied to practical purposes. It has been discovered that it is not necessary to heat the whole mass of aluminium and metallic oxides to the ignition temperature, as it is sufficient to start ignition at any one point, when the reaction will proceed throughout the mass. Further, it was found that the reaction in the case of some oxides can be started with an ordinary match. The combination here suggested is obvious; and in this way Dr. Goldschmidt succeeds in melting pure iron at such a temperature that it will cut into solid steel like a stream of boiling water into ice. In this manner welds can be produced in railway metals, fly-wheels, and other massive iron scantlings *in situ*, by merely melting iron oxide and aluminium together in a crucible and pouring the fluid metal into the proper place. The Chemische Thermo-Industrie at Essen makes a preparation expressly for this purpose, called "thermit." It is considered that extensive use will in future be made of this process, with the object of increasing the conductivity of electric tramways and so reducing the risk of the electrolysis of gas and water pipes. Tube welding is done in the same way. No flange joints for piping will henceforward be required. All repairs are easily effected by cutting out the defective piece of pipe and welding another piece in its place. Hard soldering can be done in the same way. One of the greatest triumphs of the process is the making good in place of broken teeth of cog wheels of any size.

## Incandescent Gas-Burners for Lighthouses.

In a report published by the "Engineer" on the lighthouse engineering exhibits at the Paris Exhibition, it is remarked that the introduction of the incandescent gaslight marked an important development in connection with lighthouse burners. In the French lighthouse service incandescent gaslight is used in many places. Several of the specimen lanterns shown at Paris are lit in this way. As the fruit of a long series of experiments, carried out by the Engineers of the Service des Phares, two distinct forms of incandescent gaslight have been adopted for use in the service. In one, the burners are supplied with compressed oil gas, on Pintsch's system; and in the other, the combustible is vaporized petroleum used with the incandescent mantle in a similar way. Examples of both are shown in the museum of the Dépôt des Phares. Of the two systems, the oil gas is preferred, and is used wherever a gas-works can be installed or a supply of compressed gas provided in cylinders in the usual way. Petroleum vapour burners, however, give excellent results, and require little plant. The necessary arrangements are limited to a couple of small containers with connecting pipes, which can be mounted on the lens-table of almost any lighthouse apparatus. Experiments are now being made with acetylene, both as a luminous flame and in connection with incandescent mantles. The results so far obtained are regarded as promising well. With compressed oil gas, the mantles are worked at a pressure of  $2\frac{1}{2}$  lbs. per square inch; and about eight volumes of air to one of gas are thus burnt. With Welsbach mantles of 45 millimetres diameter, the illuminating power per burner is 600 candles; and 350 candles for the smaller type, 30-millimetre mantle. This is now the standard unit of power adopted for the incandescent gas-burners in the French lighthouse service, both for compressed oil gas and vaporized petroleum burners. The latter are a sort of lucigen light apparatus. It is not so reliable as the oil-gas system.

**Denaturalized Alcohol for Incandescent Lighting.**—At the recent International Congress of Applied Chemistry in Paris, M. Arachequesne read a paper on the use of denaturalized alcohol, in the course of which he remarked that the discovery of Dr. Auer von Welsbach had made incandescent illumination by alcohol possible. To obtain incandescence, the mantle must be heated to a temperature of  $2550^{\circ}$  or  $3000^{\circ}$  Fahr.; and there must be adequate pressure of vapour. Bunsen burners are employed, each containing a small spirit volatilizer; so that the burner really represents a gas-works. To ensure good working, care must be taken that the gas-supply pipe does not become obstructed by dissociation, which would occur with alcohol at temperatures above  $572^{\circ}$  Fahr.

**The "Transactions" of the Institution of Gas Engineers** for the past year have just been issued in the customary form. The volume contains the papers read at the meetings held on the 2nd and 3rd of May, 1899, under the presidency of Mr. F. D. Marshall, of Copenhagen, with the discussions thereon; and an account of the interesting visit paid by the Institution to Berlin and Copenhagen in September. The Appendix contains a short description of the Gitschinerstrasse and Schmargendorf Gas-Works in the former city, accompanied by two plates; and the President furnishes particulars of the new Frederiksberg works of the Danish Gas Company, of which he is the Engineer, as well as of the Eastern Gas-Works in Copenhagen, which are under the supervision of Herr Irminger. A plan of each works is given, together with a plan and elevation of the holder constructed on the Intze principle at the Strandvej works of the Company. The Appendix also contains, as usual, abstracts of a few papers dealing with subjects connected with the gas industry which have appeared in various technical publications.



## TECHNICAL RECORD.

## SELF-LIGHTING MANTLES.

In a previous issue (*ante*, p. 959) we gave an indication of the scope of two articles by M. Pierron, in the "Revue de Physique et de Chimie," in which he described some of the types of self-lighting burners now before the public. In a later article, he dealt with the application to mantles of the principle of automatic ignition—that is to say, the addition to the mantle of an appliance whereby light can be obtained on merely turning the tap. These devices all comprise a mantle of the rare oxides (thorium-cerium); an igniting substance, having a basis of platinum black, or of blacks of the same group, which lights under the action of the gas; and a part intended to effect lighting. The first two features are practically the same in all the appliances; it is the igniting agents only which differ. They may be grouped in three classes, according as ignition is produced by platinum wire, by divided platinum and rare oxides raised to a state of incandescence, or by rare oxides only.

Dealing with these groups in the order named, M. Pierron points out that, in the case of lighting by platinum, the igniting substance, as in the arrangement of Rosenfeld, alluded to in the previous article, kindles under the influence of the gas and heats the platinum wire, which, becoming active in its turn, causes a combination of the gas and oxygen, attains a white heat, and lights. The first attempt in this direction was that made by MM. Deselle-Gillet, whose French patent is dated July 7, 1894. These inventors adapt to the mantle a mixture of platinum and palladium blacks enclosed in a bag of platinum gauze, or of artificial gauze made in accordance with the English patent of Stockes (dated Jan. 16, 1882), by calcining cambric saturated with platinic chloride. Killing, whose patent is dated Sept. 24, 1897, makes a tissue by intertwining very fine platinum wire with the igniting wire (a mixture of thorium and platinum black), and fixes the whole to the top of the incandescent substance.

Passing on to consider the mixed system of lighting, M. Pierron states at the outset that it is based on a different principle. It is well known that the mixture of air and gas only raises platinum black to a dull red heat, which will not cause ignition; whereas a mixture of refractory porous materials containing a small quantity of platinum will, under similar conditions, become incandescent and cause ignition. Sulzbach, according to his patent of Sept. 22, 1895, applies this idea by saturating the mantle with a platinic solution, and placing an igniting body against this part. Duke, whose American patent is dated July 27, 1897, selected as the source of heat a small piece of meerschaum charged with black, which he placed at the upper part of the mantle. His arrangement is shown in the accompanying illustration (fig. 1).

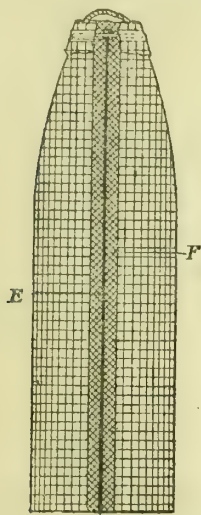


FIG. 1.

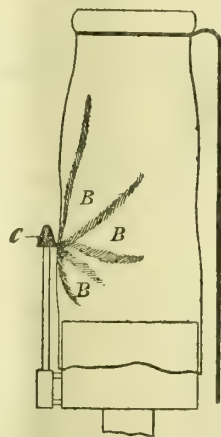


FIG. 2.

A line of platinum E, obtained by the calcination of very concentrated chloride, transmits heat to a broad band F (composed either of the same material as the mantle or of carbonate of lime mixed with a very small proportion of platinum chloride) painted upon the line E. Unfortunately, the igniting substances known at that time could not stand the prolonged action of heat; and consequently they soon lost their properties. In order to make them last longer, MM. Perl et Cie. constructed, under their patent of July 7, 1897, a mantle provided with a platinum spot, against which the lighting ball, located at the end of a spiral, was placed. When exposed to the stream of gas, the ball became red, and lighted the spot; but as soon as the burner was started, the spiral expanded and brought the ball into the cold part of the appliance. More recently, Herr Schultz has devised a special burner, in which a current of cold air is produced in the centre of the mantle. The igniting pastille is placed in the stream of gas so as to be constantly cooled. The arrangement is described in the inventor's German patent of June 19, 1899.

It may happen that the defective portion of the appliance is not the igniting substance, but the part intended to complete the lighting. It is well known that when one or several lines of platinum chloride are traced upon an incandescent mantle, the spots obtained gradually grow pale under the action of heat, and finally disappear; the parts subjected to the highest temperature being the first to go. MM. Butzke et Cie. endeavoured to remove this defect by taking a Killing self-lighting mantle, and adding two lines of iridium chloride from the top to the bottom. After calcination, there remained a deposit of iridium, which was much less fusible than platinum. The impossibility of obtaining a salt of constant quality and sufficient purity, however, prevented the arrangement from working with regularity. Various inventors have sought in other directions means of remedying the defects indicated. Franke and Hurwitz, whose French patent is dated Feb. 5, 1897, tried to prevent the formation of a continuous metallic deposit by mixing with volatilizable substances a dissolved platinum salt, and saturating rare oxides therewith. Early in the following month the above-named gentlemen, in association with M. Mengers, took out a patent for saturating the incandescent substances with a solution prepared with metals of the platinum series and a metallic oxide (silver or copper oxide). Herr Stoecklin, according to his English patent of March 21, 1898, subjected incandescent oxides to treatment by an alkaline liquor, having a base of potash, soda, or ammonia. In September of the same year, M. Pierron took out a Swiss patent in which he described the arrangement shown in fig. 2. Taking a solution of acid oxides, he traced upon the mantle several lines B starting from one centre, deposited divided platinum thereon, and applied the igniting substance C at the point from which the lines diverged.

M. Pierron next deals with ignition by the oxides which are constituent elements of the mantle itself. He remarks that this is the application of a phenomenon which may be observed every day. When a badly-regulated burner is started, the gas very frequently lights back—the flame being produced at the base, where the gas enters. By turning out the gas and immediately reopening the burner, the material of the mantle will have obtained sufficient heat to effect a combination of the gas with the oxygen of the air. It will then begin to glow, and eventually ignite the gaseous mixture. This result is achieved by Mr. Simonini, whose American patent is dated April 19, 1898, by employing textile fabrics. One of these, which acts as the igniter, contains a mixture of about 60 per cent. of platinum black, or analogous substance, and 40 per cent. of thorium or cerium oxide. The other contains about 92 per cent. of thorium oxide, 4 per cent. of cerium oxide, and a like quantity of oxide of neodymium. The inventor provides in certain cases for the addition of 0.1 to 0.2 per cent. of ruthenium. When once the second fabric has been heated by the first, ignition is effected.

As self-lighting mantles are sold collodionized, like ordinary mantles, they possess the advantages of ease in fitting and great convenience in use. At the same time their simplicity of action, theoretically—ignition of the gas being obtained by simply turning the tap—presents certain delicate points which M. Pierron thinks should be indicated. As previously remarked, the two constituents—the igniting substance and the thread, streak, or spot of platinum—have very distinct functions, which it is absolutely essential should be perfectly performed. The object of the igniting body being to condense the oxygen of the air and oxidize the gas, its pores must be in a condition to stimulate this action. Its composition should be such as to allow of its remaining in the flame unaltered; but even when fulfilling this condition it is liable to fail if the gas-tap is not perfectly tight. In fact, the quantity of gas which escapes being too small to cause a rise of temperature, the pores gradually become filled with gas which takes the place of the oxygen; thus preventing oxidation when it is desired to bring the burner into use. In order to remedy this defect, it is sufficient to expel the absorbed gas by hermetically closing the tap for some minutes, or by heating the body, or merely blowing upon it.

To ensure regular working and the efficient combustion of the gas, the igniting thread or spot should have a sufficient supply of oxygen. The best position is attained when the mantle is placed just between the zone of gas and the air. If, for any reason, such as the displacement of the mantle, excess of pressure, &c., the jet of gas completely surrounds the igniting substances, the quantity of oxygen is inadequate, they do not increase in temperature above dull red heat, and there is no ignition. In this case the mantle must be more favourably placed; and if the pressure is too high, the tap must be closed so as to decrease it progressively. At a given moment, the thread or spot is in a suitable position, and ignition results.

Attempts have been made on several occasions to utilize mantles composed of platinum, or of alloys of this group; but various difficulties—such as the use of gas under pressure, the diminution of illuminating power after a certain period of working, and so forth—which have not yet been overcome, have rendered their practical application impossible. By the addition of durable igniting pastilles, however, they might be converted into very reliable self-lighting mantles.

M. Pierron concludes by pointing out that self-lighting mantles, as is the case with automatic illuminating devices in general, always act best when they have just been lighted, and have acquired a certain amount of heat. They should therefore, he says, not be subjected to the action of gas except after being out



of use for at least ten hours. In practice, self-lighters should fulfil the following conditions. They should: (1) Glow and light almost instantaneously when subjected to the action of gas. (2) Preserve their catalytic properties for a considerable length of time. (3) Be arranged in such a manner that, when once the tap is opened, the gas flows directly on to the pastille, because the portion which is not brought into contact is unburnt, and vitiates the atmosphere. These conditions fulfilled, automatic igniters possess great advantages. In the first place, by their adoption the use of matches, spirit, &c., is rendered unnecessary; next, explosions are impossible, inasmuch as escapes from the burner, if at all appreciable, cause ignition; and, finally, they are very inexpensive. It may therefore be regarded as highly probable that the development of automatic gas lighting, which was slow at first, owing to certain slight difficulties already referred to, will be much more marked in the near future.

## REGISTER OF PATENTS.

**Prepayment Gas-Meters.**—Cowan, W., of Edinburgh. No. 18,727; Sept. 16, 1899.

This invention relates mainly to devices for actuating the prepayment or measuring-out mechanisms of various forms of coin-freed gas-meters, where a pointer-and-scale price-varying mechanism is used. The improvements are more particularly applicable to mechanism in which the prepayment device is always moved in one direction—as is described, for example, in patent No. 21,108 of 1894. The pointer-and-scale device is a modification of that described in patent No. 11,537 of 1890.

One part of the invention consists broadly in applying a pointer-and-scale price-varying mechanism to a prepayment mechanism in which the coin-pocket shaft is turned continuously in one direction to set the prepayment or measuring-out device for delivery of gas (no setting back of the operating handle to the original position being required), and in devices enabling this application to be carried into effect. Another part consists in providing a device which allows the spring holding the measuring-out wheel driving pawl in gear to be tensioned only when it is actually driving the wheel, and therefore to be free from tension except when the prepayment mechanism is being operated by means of a coin. A still further part consists in a new construction of prepayment mechanism of the type in which the coin-pocket is in two parts, which are joined by the coin itself; and in adapting to this mechanism a price-varying device of the pointer-and-scale type. In this mechanism, the driving handle makes a partial rotation in acting on each coin, and is brought back by a reverse rotation to the starting position.

In carrying the first part of the invention into effect according to one modification—see figs. 1 to 4, an elevation of the prepayment mechanism and price-varying device, looking on the back of the meter-dial, a plan of same, an elevation of the side cheek and operating handle, but looking on the opposite side of the device, and an elevation of one form of price-varying pointer and scale—a shaft is provided having a handle adapted to be operated from the outside of the meter. In this shaft is formed a coin-pocket, with its plane at right angles to the axis of the shaft. The coin-pocket has a through passage adapted to let a smaller coin than that to be used pass freely through. The coin-pocket or coin-wheel has formed on one side a ratchet-wheel, from which two or more teeth are omitted; and at this point a deep notch is provided. An arm is fixed to the back of the ratchet-wheel; and on the end of the arm is supported a driving pawl, which projects over the measuring-out wheel geared up to the measuring-out mechanism. A double-armed ratchet-pawl is provided, pivoted on the frame in which the coin-pocket wheel is supported. This

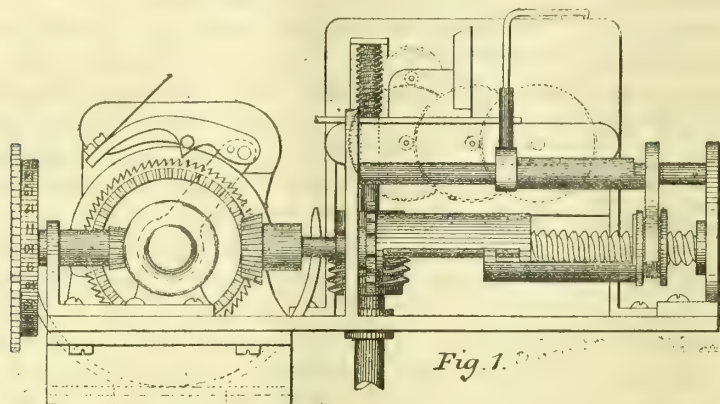


Fig. 1.

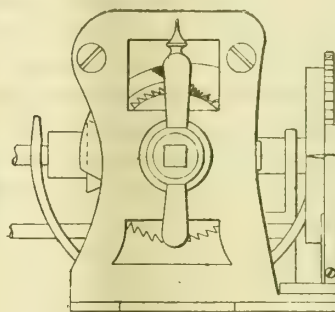


Fig. 3.

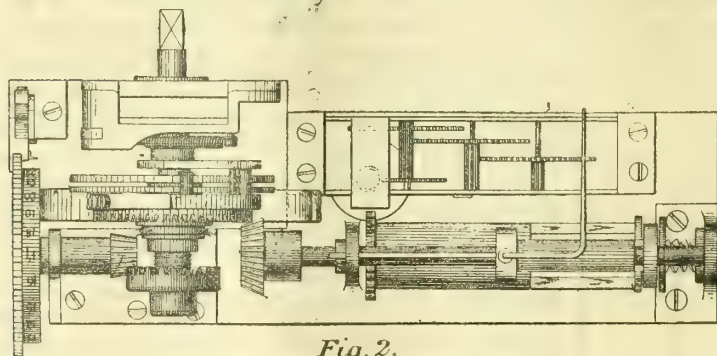


Fig. 2.

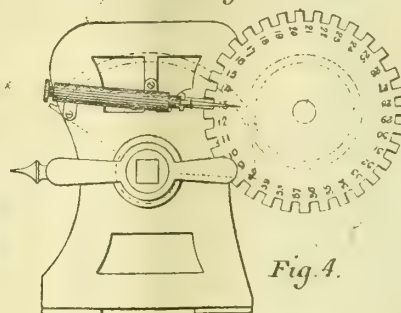


Fig. 4.

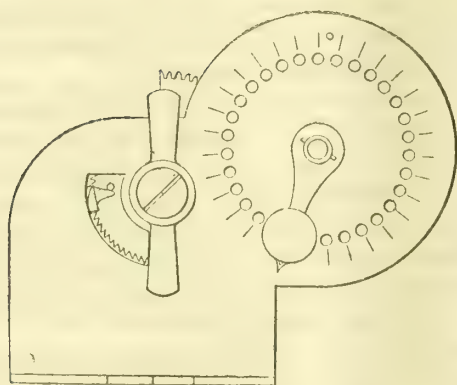


Fig. 5.

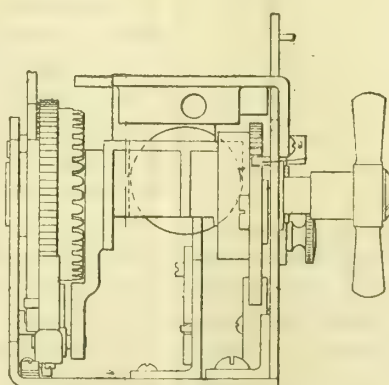


Fig. 6.

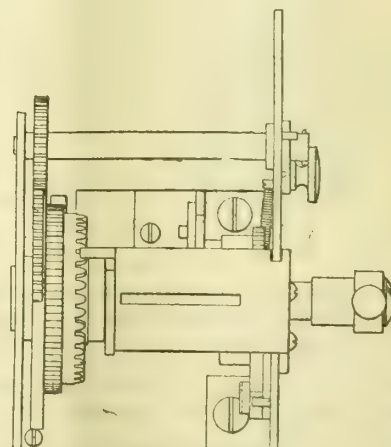


Fig. 7.

pawl is held forward against the wheel by a spring. A pin on the wheel is provided, which catches on one arm of the pawl when the wheel is attempted to be turned by hand before the penny is placed in the coin-pocket. The other arm of the pawl lies in the deep notch on the ratchet-wheel; and this arm of the pawl is adapted to engage with the teeth of the ratchet-wheel to prevent it being turned backwards, after a penny has been placed in the slot, and turning forward has become possible. The non-return ratchet may be provided on any other suitable part of the coin-pocket shaft.

When a penny (where a penny is the proper operating coin) is placed in the coin-slot, it falls into the coin-pocket, and is supported by the ends of the pocket in such a position as to be projecting out of the pocket; and this part of the penny, when the outside handle is turned, presses against the long arm of the two-armed pawl, and forces it clear of the pin on the coin-pocket wheel—thus enabling forward rotation to take place. During this forward rotation, the spring presses against the two-armed pawl, the short arm of which is now engaging with the teeth of the ratchet-wheel; and this prevents the handle being turned backwards.



When about half a rotation has taken place, the operating coin drops freely out of the coin-slot into a suitable receptacle. When nearly a complete rotation of the coin-pocket shaft has taken place, the short arm of the double pawl drops into the deep notch in the ratchet-wheel; and this permits the long arm of the pawl to pass into a position to again catch the pin on the coin-pocket wheel, and prevent a second turn being given to the latter until another penny has been placed in the slot.

The measuring-out or prepayment wheel is placed on a journal whose axis is in line with the coin-pocket wheel-shaft, but which is placed somewhat to the rear of the shaft. The journal, which is hollow and is rigidly fixed to the supporting frame, carries firmly attached a semi-circular disc, whose radius is somewhat greater than that of the ratchet toothed measuring-out wheel. The pawl which is carried by the arm fixed to the coin-pocket wheel is provided with a pin, against which bears the spring holding the pawl into gear with the measuring-out wheel. This pin also rides on the edge of the semi-circular disc, which acts as a platform holding the pawl clear of the teeth in the ratchet measuring-out wheel. A second semi-circular disc is provided, fixed to a spindle, which passes through the hollow journal on which the measuring-out wheel rides; and this spindle is geared up to a notched wheel provided with a locking pawl adapted to indicate by its setting the quantity of gas which the mechanism is set to deliver for a penny. The disc is of exactly the same radius as the fixed semi-circular disc; and it also acts as a platform to keep the driving pawl out of gear with the measuring-out wheel. When the moveable disc is set to exactly correspond with the position of the fixed disc, the meter is set for supplying the maximum quantity of gas for a penny. As the notched wheel is turned round, so as to make the semi-circular disc overlap less and less, the latter will hold the driving pawl off the measuring-out wheel for more than half a revolution; so that a less quantity of gas will be supplied for each coin. The measuring-out ratchet-wheel has a crown-wheel formed on its face, which lies opposite to the fixed semi-circular disc, and gears with a pinion-wheel, driving the screw of the meter mechanism which sets the meter free to deliver any given quantity of gas, as described in patent No. 21,108 of 1894. The notched wheel and spring pawl in gear with the moving semi-circular disc form a pointer and scale—the pawl being the pointer, and the scale being arranged around the outer circumference of the notched wheel.

In carrying the second part of the invention into effect, according to one modification, the driving pawl just described is adapted to operate the measuring-out wheel with a spring, which is so formed as not to be in tension when the mechanism is at the starting-point; and a curved segmental plate is provided, which acts as a kind of roof. When the coin-pocket wheel and the arm carrying the driving pawl are turned, the pawl-operating spring (which may be fixed to the pawl) is tensioned by passing under this roof, so that, through the whole arc in which the driving pawl could be in gear with the ratchet-wheel, the pawl spring is under tension.

In carrying the third part of the invention into effect—see figs. 5, 6, and 7, a side elevation, front elevation, and a plan—according to one modification, a suitably arranged frame is provided; and mounted thereon in suitable journals is the operating shaft carrying the coin-pocket. The shaft and the pocket are preferably divided into two separate parts; and it requires the presence of a coin before the portion connected with the handle will operate the other portion which acts on the prepayment mechanism. The coin-pocket (a coin being present in it) has on each occasion a definite movement which may amount to one-half of a revolution on the axis, or more, as may be arranged. A segmental band prevents the escape of the appropriate coin while the pocket is being moved round to the terminal point where the band ends, and so allows the coin to drop out. But, in order to prevent the possibility of the coin being brought back in the pocket in the event of its failure to leave it readily at the terminus, there is a poised detent lever at the end of the segmental band, which has to be pushed aside as the coin passes, but immediately resumes its normal position when the coin has passed. The lever then acts as a barrier against the coin's return. It is equally necessary to prevent the coin and pocket from being turned back at any intermediate stage of the journey; and for this purpose ratchet-teeth are formed on the handle portion of the pocket. Into these ratchet-teeth a pawl (which is pivoted on the frame) gears whenever the movement of the pocket is reversed at any point short of the terminus; but, when this has been reached, a pin on the ratchet (coming in contact with a projection on the pawl, close to the fulcrum) instantaneously draws back the pawl, and places it under the control of a poised detent lever, or a spring, so that the pocket can now be returned to its starting point. The attainment of this position brings about the release of the pawl by means of a pin on the ratchet, which, acting on the other side of the projection on the pawl above mentioned, replaces the pawl in gear with the non-return ratchet.

One end of the pocket is barred against the escape of the proper coin—for example, a penny—but not against the escape of a smaller coin, such as a halfpenny. And in certain cases, for the purpose of preventing the segmental band which is employed to retain the right coin in the pocket from also retaining the smaller coin which ought to escape, the band may either be placed at one end of the pocket, so as to leave space for the smaller coin to drop out, or if the band be placed round the middle of the pocket, a sufficient portion of it may be cut away to allow a smaller coin to pass out, though the appropriate larger coin is retained, at this point, by an end projection in the pocket.

The two portions of the shaft and pocket are only united when a coin is present. The part which receives its motion from the handle portion, in consequence of a coin being present in the pocket, has an arm rigidly attached to it, and on its outer end a pawl (with or without a spring), capable of gearing into the ratchet-teeth of a measuring-out wheel mounted loose on the shaft; and it only moves when driven onwards by the pawl above referred to, but does not return when the pawl returns.

In order to enable the quantity of gas supplied by each coin to be varied according to the price of gas, the extent of the measuring-out wheel's advance is limited by means of the moveable semi-circular disc before mentioned, part of whose edge forms a platform which keeps the pawl out of gear with the ratchet on the measuring-out wheel, for a greater or less part of the pawl's movement, as operated by the handle. This movement of the pawl-arm under the action of the handle is a movement through a fixed arc, so that a greater or less portion of the pawl's movement is rendered idle by the platform. Only that part of the movement which

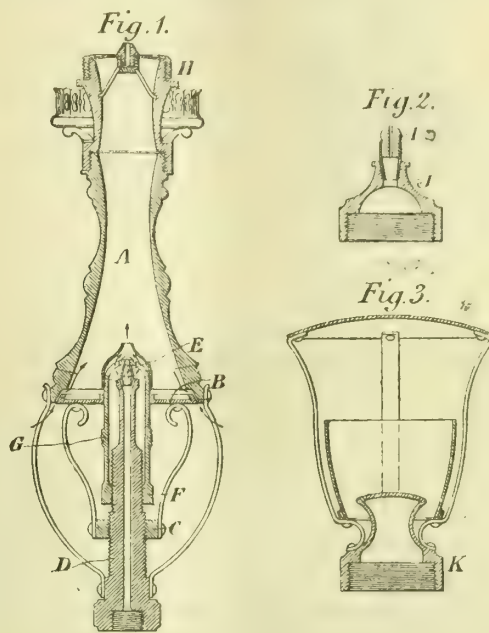
takes place after the pawl has left the platform operates the measuring-out wheel and mechanism. The disc whose edge acts as a platform as just described, is carried loose on a shaft; and in another part of its circumference teeth are cut gearing with a wheel on a shaft carrying a pointer which moves over a scale. The setting of this pointer in relation to the scale controls the position of the platform in relation to the moving pawl. The pointer may be fixed at any position, as desired, corresponding to the quantity of gas to be supplied for the coin.

The coin-pocket described above is provided with a circular ridge or guard, to prevent coins being inserted in the coin-pocket except at the starting position of the coin-pocket. A shutter closes the coin-slot when the maximum number of coins for which the meter is intended at one time have been inserted.

**Atmospheric Gas-Burners.**—Sinnberg, T. E., of Camberwell, S.E. No. 18,827; Sept. 18, 1899.

This invention in atmospheric gas-burners used for incandescent lighting, has for its object to enable the gas supply and air supply to be independently regulated by valves capable of being adjusted independently of each other, "so as to enable the variations of pressure to which the gas may be subject to be readily compensated, and the best possible result in illumination to be always attained."

Fig. 1 is a vertical section of a burner provided with independent air and gas regulating valves; while figs. 2 and 3 show two forms of burner attachment adapted to be fitted on the head of an incandescent burner for burning gas without previous admixture of air.



The tube A, wherein the streams of gas and air mingle on their way to the ignition orifice, is supported on the gas-supply tube D; and the lower end of the tube is adapted to form the seat for a disc-valve B, connected to a nut C, fitted to screw upon a threaded part of the gas-supply tube, so as to enable the valve to be thereby raised or lowered at will for the purpose of regulating the admission of air through the annular opening between the valve and its seat. The upper end of the gas-supply tube is not closed, as usual, by a perforated diaphragm (usually called an "injector"), but is adapted to form the seat for a conical valve E, whereby the area of the gas-emission aperture may be varied at will, without, however, thereby altering the area of the air-admission orifice, or necessitating any re-adjustment of the air-admission valve. The valve E is for this purpose carried by spider arms at the upper end of a tube G, passing freely through the disc valve B, and provided with a nut F screwing upon the upper part of the gas-supply tube. The arrangement is such that the nuts C and F are both readily accessible from below for independently adjusting the valves B and E "without disturbing the burner, or causing any oscillation of the mantle which would lead to its speedy destruction."

The gas issues beneath an upwardly convergent nozzle fitted over the upper end of the tube G, for the purpose of directing the issuing gas (in the form of a jet) upwardly and axially through the mixing-tube. The tube G is cylindrical; and the disc valve B makes a working fit about it, so that, while each is capable of adjustment independently of the other, no air can pass between the valve B and the tube G.

In order to enable an ordinary luminous flame to be temporarily obtained from the gas without previous admixture of air, should the mantle become unserviceable and another not be available, the patentee proposes to provide burner attachments (as shown in figs. 2 and 3) adapted to be fitted on the head of the atmospheric burner, from which the air supply is then entirely shut off by closing the valve B. The burner shown in fig. 2 is an ordinary batwing or fish-tail nipple I, carried by a cap J adapted to screw on to the head H of the mixing-tube A; while the burner shown in fig. 3 is also a cap K adapted to be screwed on to the head H, and provided with an annular series of minute orifices, whence the gas issues, and is burnt as in an ordinary ring burner.

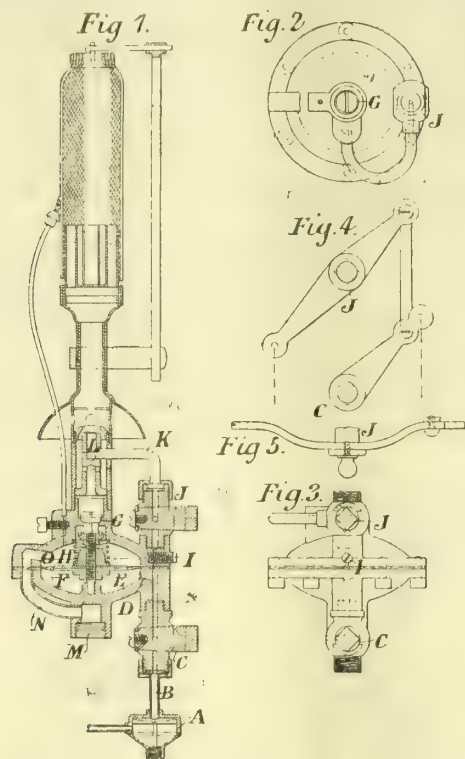
**Incandescent Gas-Lamps.**—Winkler, H., of Berlin. No. 23,229; Nov. 21, 1899.

The patentee remarks that in the employment of "intense incandescent gas-burners," which are fed with air under pressure, the necessity frequently arises that the burners should be employed for obtaining a less intense light, with a less gas consumption, and without the employment of air under pressure; and his invention has for its object to provide means whereby this can be effected. Furthermore, he points out that the jet of highly compressed air which streams out from the nozzle



possesses peculiar properties, the employment of which also forms the subject of the invention.

Fig. 1 is a vertical section of an incandescent gas-lamp having a controlling device fitted to the igniter; fig. 2 is a plan view of the lower portion, showing the parts necessary for illustrating the arrangement for



supplying the gas from the gas-chamber to the air-nozzle; fig. 3 is a side view corresponding to the plan view; and figs. 4 and 5 show, in side elevation and plan respectively, the link and lever mechanism of the controlling device.

The compressed air flows through the purifier A, the small tube B, and the cock C. After it has passed the latter, it flows through the lateral passage D into the air-chamber E, where, by pressure upon the diaphragm F, it raises the gas-valve G as it overcomes the tension of the spring H. The compressed air cannot pass out of the chamber, but merely holds the gas-valve open. The air also passes by the regulating screw I, and through the cock J and the tube K, and flows to the nozzle L, when the parts are in the normal position. The gas in this case flows through the supply-pipe M and the passage N into the gas-chamber O, and thence passes to the burner-nozzle. The gas is sucked up by the stream of compressed air, and "a quite peculiar mixture of air and gas is obtained, which, when burned in connection with the incandescent mantle, gives rise to a very intense light."

In the arrangement shown (as distinguished from nozzles heretofore usually made), the gas-nozzles are arranged concentrically. Through the inner nozzle, which is provided with very small perforations, there flows a relatively small quantity of air, highly compressed, and having a high velocity, so that the powerful jets of air issuing from its small perforations not only draw up the gas supplied from the space around the nozzle L, but also the air which passes into the burner-tube through the openings above. "This result has never before been obtained in incandescent gas-lamps."

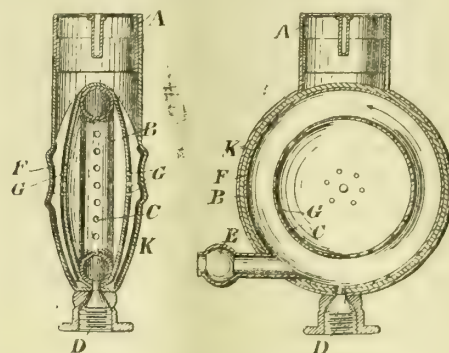
When now, for any reason, a less powerful illumination, "instead of the full intense light," is desired, the burner is supplied with gas only—the gas itself drawing in the air which it requires for combustion. This gas, however, does not pass through the valve G to the nozzle in the manner above described, as the nozzle has too large an opening, and would not produce the necessary jet of gas. For this reason, therefore, the gas is caused to flow from the gas-chamber O to the nozzle L. The connection is effected through a pipe, one end of which is fitted to a nipple upon the cover of the gas-chamber, and the other end of which opens into the three-way cock J, which, according to its position, cuts off the gas coming from the chamber O, or allows it to flow through so that in the latter case the gas can pass to the pipe K and nozzle L. In order, however, to prevent compressed air and gas simultaneously flowing through the pipe K and nozzle L, the cocks C and J are so connected that the air-cock C is closed when the cock J opens communication between the gas-chamber O and the tube K, and *vice versa*—that is to say, the connection is broken when compressed air is passed through the cock C. This control of the cocks is effected by levers fitted to the plugs of the cocks; while a link connects the two levers in such a manner that one cock cannot be moved independently of the other.

**Burners of the Bunsen Type.**—Tresenreuter, G., of Berlin. No. 13,162; July 20, 1900.

This invention relates to a burner for use with incandescent mantles, the object of which is "to produce an illuminating power of exceedingly great intensity, by means of an exceptionally thorough mixture of the gas with air, introduced under pressure, and by means of which the noise arising in the case of other burners of the kind—working with air under pressure—and other disadvantages are obviated."

Between the actual burner A and the gas-supply pipe, the apparatus which forms the main part of the invention is inserted. It consists substantially of a tubular ring B, furnished with openings C running inwardly. To this ring, the gas-supply pipe is connected and screwed by means of the nipple D; and the air-supply pipe is connected by means of the junction-piece E. The ring is seated in a casing F, provided on

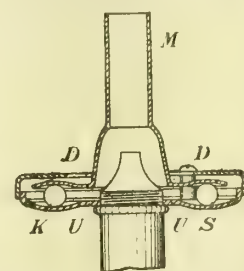
both sides with outlet-openings G. This casing has a felt lining on the outside, having openings corresponding with the openings in the casing. The main part of the apparatus is enclosed by an external casing K, furnished on the inside with a layer of felt; while in the upper part it assumes a cylindrical form. This cylindrical part carries the actual burner; and at its junction with the casing, openings are cut.



The action of the apparatus is as follows: If illuminating gas enters through the nipple D, and air through the junction-piece E, into the interior of the apparatus, the current of air, which, like the gas, is under strong pressure, carries the gas entering the ring at D along with it, and moves it forward through the ring B up to the point at which air enters at E. In this way, the two are very thoroughly mixed. The portion of the mixture which has not passed in a stream-like form through the small openings C is always seized again by the current of air constantly entering at E; and in this way, the mixing is carried on without interruption and in a vigorous manner. The mixture passing out through the openings C is, of course, freshly and completely mixed again by the meeting together of the different streams, and then passes through the openings G into the space between the inner and outer casing, and thence to the burner.

**Incandescent Gas-Light Burners.**—Hudler, J., of Glauchau, Germany. No. 13,545; July 27, 1900.

The patentee points out that, in his view, of the shocks which injuriously effect the mantles used in incandescent gas lighting those caused by horizontal oscillations of the burner are the most serious, and in street-lamps the most frequent. While a spring laid around the mixing-tube, and on



which the crown of the burner rests, forms a good means of protection against the vertical shocks, as soon as the shock takes a direction deviating from the vertical, and is broken up into a vertical and a horizontal element, the spring becomes ineffectual. The object of the invention, therefore, is to provide means for counteracting these shocks; and the arrangement is intended to be used in combination with any known means for preventing vertical shocks.

A saucer or ring U is firmly connected to the ordinary jet of the incandescent burner, and formed with three or more smooth cup-shaped recesses S, in which an equal number of balls K lie. On these balls rests a flange or rim formed on the lower part of the mixing-tube M, and having cups or indents corresponding with the cups in which the balls are arranged. The mixing-tube is held in position by a ring or cover D secured to the ring. The crown of the burner is put on the mixing-tube, as hitherto, after a spring support has been supplied to the latter.

The working of the apparatus is as follows: When the gas pipe is affected by horizontal oscillations, they are transmitted to the ring U, and the balls effect slight rolling motions, and then return to a position of rest. Any transmission of the horizontal shock to the incandescent body is thus impossible. The cover D prevents any falling away of the parts lying on both sides of the balls, without impairing the mobility.

#### APPLICATIONS FOR LETTERS PATENT.

- 17,800.—DELUCCE, S. A. N., "Gas-engine." Oct. 8.
- 17,883.—BARRY, HENRY, AND CO., LTD., and JACKSON, R., "Feeding appliances for elevators." Oct. 9.
- 17,920.—JACOBI, L. W. A., "Carbonization or heating of solid bodies." Oct. 9.
- 17,921.—SNELL, C. S., "Compressing gas, air, or the like." Oct. 9.
- 17,945.—DESHLER, C., and M'ALLISTER, E. J., "Photometers." Oct. 9.
- 17,950.—ROBINSON, O., "Gas-engines." Oct. 9.
- 17,976.—THOMAS, W. F., and TALBOT, G. W., "Internal combustion engines." Oct. 10.
- 17,993.—CROSSLEY, W. J., and ATKINSON, J., "Purifying heating gas." Oct. 10.
- 17,999.—COGHLAN, J. M., "Acetylene generating apparatus." Oct. 10.
- 18,078.—BOND, F. T., "Burning coal gas in combination with coal or coke in domestic fireplaces." Oct. 11.
- 18,112.—TAPIN, L., "Self-generating gas-lamps." Oct. 11.
- 18,156.—MILES, W. P., "Automatically regulating the flow of liquids, gases, and electricity." Oct. 12.
- 18,188.—NAEF, P., "Treatment of solid material with gas, especially applicable for catalytical reactions." Oct. 12.
- 18,191.—NAEF, P., "Treatment of solid material with gas, especially applicable to catalytical reactions." Oct. 12.
- 18,208.—THEOBALD, W. & G., "Increasing the illuminating power of gas-burners." Oct. 12.
- 18,211.—CHANDLER, D. & S. B., "Revolving gas scrubbers and washers." Oct. 13.
- 18,271.—GILBERT, W. S., "Incandescent gas lighting." Oct. 13.
- 18,279.—NAEF, P., "Treatment of fuel and the recovery of bye-products." Oct. 13.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## The Cost of Gas and Electricity for Public Lighting.

SIR,—Following the observations in your leader last week, I think you will be interested to see the enclosed report of the speech of the Chairman of the Bow Vestry. The entire lighting of Bow parish, including a good many streets which will still remain lighted with gas, cost only £1512 2s. 6d. for the year ending Midsummer, 1900; so that the addition of nearly £3000 a year is incurred by substituting are lights on a comparatively limited length of roads. The extravagance is even more remarkable than the statement of the Chairman would lead you to expect.

Commercial Gas Company, Stepney, E., Oct. 19, 1900. H. E. JONES.

[ENCLOSURE.]

At a recent meeting of the Bow Vestry, the Chairman (Mr. Dalton), speaking on a motion for the adoption of the report of the General Purposes Committee, recommending rates for the quarter ending Christmas next amounting to 2s. 6d. in the pound, with still a deficit on the sewers rate—the highest rate ever made in Bow—said the electric light would cost £750 more than the gas did in the corresponding quarter of last year. "But who," he asked, "would say that, because £750 would have to be laid out, the people should not have the benefit of the electric light? They had to keep up with the times."

## The British Gas Engineering Profession.

SIR,—The final "Editorial Note" in your last issue, under the title of "The Problem of the British Gas Engineering Profession," referred to the increasing difficulty of obtaining competent men for the higher posts in the gas industry, and lamented the fact that the younger generation of gas engineers is not formed from the best and most suitable material. The problem is undeniably one of considerable importance; and many must have been glad to find that it had received notice at the hands of the "JOURNAL," and that its treatment was of so sympathetic, and withal of so practical a nature.

But after all, is it surprising that the quality of gas recruits should fall behind that of those to other branches of civil engineering or to the sister professions? How can it well be otherwise? Is the general remuneration offered to gas engineers of such a satisfactory character that their calling is likely to attract the attention and draw the abilities of the most desirable class? Your "Wanted" advertisements give the answer. Even if such were not the case, when influence and inexperience are frequently found strong enough to capture positions from the industrious and capable, is it not natural that prospective gas engineers should hesitate a little before finally determining their lot? When ignorant shop-keeping Chairmen of Municipal Gas Committees, or *dilettanti* Directors of Companies have to be knuckled under to, how can the industry expect to gather to itself the best bred and most educated? "It is monstrous that men . . . should depend for their bread on their powers of 'carneying' to a Chairman of Committee, and judiciously keeping on the 'blind side' of some mountebank of a Town Councillor," recently said the "JOURNAL" in an "Editorial Note" on a similar subject.

How can the Urban District Council, or Company's Board, best be shown the false economy of knocking its chief gas appointment down to the lowest bidder? How can the prestige of the gas engineer be most worthily upheld? By what means may the general tone of the gas profession be raised? Must not the initiative come from its members themselves? And, indirectly, would not the representation of our industry by one solid and successful Society, with energetic and well-paid officials, gathering round it a trained body of students, be calculated to further the best interests of all? May it not, therefore, be hoped that the near future will witness a thorough change, not only in the form but in the spirit of our organizations, and that both the scientific and temporal conditions of the British Gas Engineering Profession will be improved in consequence?

Oct. 17, 1900.

"MIHI CURA FUTURUM."

SIR,—Your article in the "JOURNAL" for the 16th inst. touches a very sore point in the minds of many gas engineers, and raises a question the free discussion of which ought to bear good fruit. Why do not more of the best of our young men push to the front of the gas engineering profession?

The blame is not all with the young men. There are doubtless plenty of well-educated, energetic, "stick at nothing" young fellows with the training and instincts of gentlemen who would be only too glad to enter the profession and would become shining lights in the van of its progressive development if—but "there's the rub!" While other professions offer equal or greater opportunities of developing their latent talent, and obtaining a respectable social position, they do not present in equal degree the uncertainties and discouragements which throng the way to eminence in the gas profession.

The Gas Committees of Local Authorities have much to answer for in the state of things you deplore. The miserly salaries offered by many Gas Committees for services the efficient discharge of which demands a high standard of education and business ability, and a thorough practical training, present no inducement to young men who can obtain better things in more attractive walks of life; and the shameful practice of bestowing responsible appointments upon those who are willing to undertake them for the lowest remuneration is at once degrading to the profession and subversive of that commercial morality which should be found in a public official. How many well-educated and thoroughly competent young men have had to stand aside during recent years while this mischievous policy has given preference to those who were ready to accept a salary upon which no self-respecting educated man can possibly live honestly.

Again, it is degrading to a man of intelligence and refinement to occupy a position in which he is at the mercy of the local small tradesman, who seizes position on the Council dresses him "in a little brief authority," and d

enables him to bully officials, and interfere with them in their management of technical matters of which he is utterly ignorant. There is not a man in the profession to-day, outside the larger gas-works, who—if he honestly speaks his mind—would not prefer to serve a Company rather than a Local Authority. Until gas engineers under Local Authorities are given a standing which will render their position secure, and their dismissal (save for proved incompetency or some other proper reason) out of the power of the truculent Councillor with a grievance, the best men will not be found anxious to tempt fortune in that field—at any rate in works of small and medium size.

Another reason which may account for the dearth of really suitable young fellows is to be found in the lack of facilities for obtaining the special training required, outside the works with which they are connected. If it is desirable in the interests of the gas engineering profession that young men of the kind indicated should make choice of that profession for their career, it is surely consistent with the object of the Gas Engineering Societies that they should assist such young men in their efforts to obtain technical training and information. But beyond opening the door to them as "Students" and "Associates," the great representative Societies have done nothing; and there is no set standard of proficiency, the attainment of which would entitle a young man to a full certificate from either of the two representative bodies of the profession, such as would be a guarantee to Companies or Local Authorities that the candidate before them was genuinely qualified for their selection.

When small Gas Companies and Local Authorities learn to estimate at their real worth, moral character, education, business capacity, and thorough professional ability, and the organized resources of the gas engineering profession are utilized to assist and guarantee the technical equipment of otherwise suitable young men, there will be no lack of recruits of the right stamp eager to enter the profession.

A PROVINCIAL GAS ENGINEER.

Oct. 19, 1900.

**The Beckton Compensation Case: A Correction.**—Messrs. Bedford, Monier-Williams, and Robinson, the Solicitors to the Gaslight and Coke Company, write to correct the report which appeared in the "JOURNAL" last week of the above-named case. They say that "in the action under the Employers' Liability Act, judgment was given in favour of the Company, with costs against the plaintiff. It was in the subsequent application by the plaintiff's Counsel, under the Workmen's Compensation Act, for a weekly payment during his incapacity, that judgment was given for payment of 10s. 6d. a week during such incapacity." The name of the Counsel who appeared for the Company should have been given as Mr. H. W. Loebnis.

**Ignorant Plumbers Make Bad Meter-Fixers.**—At the Whitechapel County Court, last Tuesday, Mr. Alexander, a tailor in the district, was summoned by a plumber for £6 for work done. The plaintiff had fixed a meter at defendant's house, but had done it so badly that it was impossible to get a light. A gas inspector having proved that the meter had been improperly connected, and that all the fittings leaked, judgment was given against the plaintiff.

**Committal for Stealing Gas.**—At the Ashford (Kent) Police Court recently, a cycle manufacturer named Hayward appeared to answer a charge, on the information of Mr. John Morton, the Manager of the Urban District Council gas-works, of feloniously stealing 129,000 cubic feet of gas, value £20, on Sept. 22, and other dates. The allegation was that, by means of a bye-pass, defendant had taken the gas from the service pipe without its passing through the meter. He was committed for trial at the East Kent Quarter Sessions, where he appeared last Tuesday. Mr. Glyn addressed the Court in mitigation of the penalty, and called Dr. Claude Vernon, who gave defendant an excellent character. The Court were asked to deal with the accused under the First Offenders' Act; but the Judge (Sir L. Selge) said they could not do this. Under the circumstances, however, the prisoner would be sentenced to three calendar months' imprisonment in the second class.

**Assessment of Reservoirs and Filter-Beds.**—At the last meeting of the Hampton District Council, the rate collector (Mr. Roberts) called the attention of the Council to the temporary division of the Grand Junction Water Company's assessments to the general district rate, as regarded reservoirs and filter-beds. After correspondence with the Company, the matter was referred to the Union Assessment Committee; and he arranged for an interview with the Company. In the correspondence which took place, the Company asked that £5000 of their rateable value should be regarded as being for filter-beds and reservoirs. He felt this was too much; and the Secretary (Mr. Goodwin) consented to reduce the sum to £4000, which figure had been agreed to by the Company. Mr. Roberts said the difference of £1000 meant £200 on the year's rates in favour of the Council. It was to represent temporarily only the proportion of rateable value on which the Company would pay one-fourth of the rate; and he asked the Council to pass a resolution confirming the arrangement, without prejudice to what might be done in future, as the whole of this class of property in the Union was being re-assessed. The request was granted.

**Sales of Shares.**—A sale of £10,000 of new ordinary stock of the Tynemouth Gas Company took place yesterday week at the Company's offices, North Shields. The prices ran between £115 10s. and £119 10s. per cent.; the average being £116 10s. 4½d. When paid up, the stock will be entitled to a maximum dividend of 5 per cent. per annum, and will rank for dividend with the existing consolidated and new ordinary stock. Under the powers of the Borough of Portsmouth Water Order, 1898, the fifth batch of 1500 new ordinary £5 shares in the Portsmouth Water Company was submitted to public competition on Tuesday evening by Messrs. Penney and Clark, of Southsea. Of the total number, 1085 shares were sold at £6 15s. per share, and 415 at £6 17s. 6d. each. The gross return was £10,176 17s. 6d.—a premium of £2676 17s. 6d. The shares are to carry a dividend of 5 per cent. per annum. On the same day, 800 £5 shares in the Tonbridge Water Company (last dividend 6½ per cent.) were disposed of at prices ranging from £8 2s. to £7 10s. per share. Mr. W. E. R. Randall last week offered for sale by auction 500 ordinary 7 per cent. shares (new issue) of £5 each in the Brompton, Chatham, Gillingham, and Rochester Water Company. They were sold at £10 and £10 2s. 6d. each.



## MISCELLANEOUS NEWS.

### LONDON LOCAL AUTHORITIES AND THE PRICE OF GAS.

Conference at the County Hall, Spring Gardens.

A conference between the Parliamentary Committee of the London County Council and representatives of the City Corporation and the Vestries and District Boards of the Metropolis was held in the hall of the Council, Spring Gardens, last Wednesday. It was convened, in pursuance of a resolution passed on the 17th of July, to consider "the charges for gas made by the London Gas Companies, the quality of the gas supplied, the quantity supplied through slot meters, and the action which should be taken in the interests of the gas consumers." Mr. E. A. CORNWALL, the Chairman of the Parliamentary Committee of the Council, occupied the chair; and there were present Mr. G. H. Radford, the Vice-Chairman of the Committee, and eight other members of the Council, as well as about sixty delegates.

The CHAIRMAN, after a few words of welcome to the representatives, said the gas question in London had always been a matter which had created a good deal of controversy; and if they went back for a moment to its early history, they found that it was as long ago as 1810 when the Gaslight and Coke Company—the same Company, strangely enough, that they really found so much fault with to-day—obtained their first Act of Parliament enabling them to supply gas in the Metropolis. One of the features of the Act was that it contained a clause in reference to the powers which the Company should have as regards the price to be charged for gas for public lighting. The clause in the Act was: "That every contract in every parish should be null and void if the price charged for lighting with inflammable air should be greater than that paid for lighting any part of London with oil." So that it was no new doctrine that any powers granted by Parliament to the Gas Companies should prevent them from charging more for public lighting than they were charging their other customers. From 1810 to 1847, the Gaslight and Coke and other Companies sprang up, each of them supplying the Metropolis with gas. Several Companies between those years were in existence, competing against each other; and in several instances there were several mains in one street, and consumers were able to buy from whichever Company they pleased at the lowest price, and make the best bargain they could. Consequently, between those dates there was competition, and some protection for the consumers. In 1847, Parliament fixed the maximum dividend of the Gas Companies at 10 per cent. This not only applied to the Metropolitan Gas Companies, but to those in existence throughout the country. From 1847 to 1860, the Metropolitan Gas Companies carried on a process of amalgamation and distriking; dividing certain districts of London between themselves, and thereby converting into a huge monopoly what had hitherto been a matter of competition between them. This monopoly and this distriking-out of various parts of London was legalized by Parliament in 1860; and it might be said that the action of Parliament in sanctioning the withdrawal of competition in that year established a state of affairs which was very detrimental to the consumers, but which at the same time raised the Companies to great prosperity and affluence. On looking back, they found that it had been since 1860 that very large dividends had been payable, whereas prior to that time the Companies were more like struggling trading concerns. Since Parliament legalized the monopoly, under conditions which were then imposed, great discontent had reigned in London in reference to the charges made by the Companies; and they found to-day that they were still in an unsatisfactory position, even if they might not say in a more unsatisfactory position. One of the principal periods in the history of the gas question in London was that of the time of Mr. Cardwell's Committee in 1867, which placed on the parliamentary records for the first time the unfortunate position of the consumer. The Comptroller of the Council said on this subject in his report: "The general conclusion at which the Committee of 1867 arrived was 'that the Act of 1860 and the arrangements which it sanctions have been eminently favourable to the Companies, while the interests of the consumer have been very inadequately protected.'" Mr. Cardwell's Committee recommended that there should be an amalgamation, under proper conditions, of some of the Companies then supplying the Metropolis, with a view of reducing expenditure and benefiting the consumers. The benefit to the consumers had been very slow in coming—in fact, it did not follow the report of that Committee, and had not arrived yet. But, having received the report, the consumers expected some benefit; and this not arriving it created again a great deal of dissatisfaction, which had been prevailing ever since. It prevailed to such an extent after the report of Mr. Cardwell's Committee, that in 1874 the Metropolitan Board of Works resolved to introduce three Bills—one for the purchase of the Companies, another for establishing an independent supply, and the third to subject the Companies to uniform and improved regulations. The prospect of these Bills was somewhat interfered with by the attitude of the Government with respect to the third Bill, subjecting the Companies to uniform and improved regulations. A letter from the Board of Trade rather ruined the prospects of that Bill passing. The Board of Trade said in their letter, speaking of the provisions contained in the Bill: "Such a provision appears to Her Majesty's Government to be a breach of the existing arrangements with the Companies, to which, as stated by the Chancellor of the Exchequer on the second reading of the Bill, they could not agree." Members would appreciate, when a public body had a Private Bill before a Committee in Parliament, what it meant when the Board of Trade sent a communication of that kind to the Committee. The result was that none of the Bills promoted by the Metropolitan Board in 1874 were passed. But the Bills seemed to have been made the basis of the sliding-scale arrangement. He supposed that to-day they were face to face with the situation which had arisen out of the sliding-scale arrangement which was made the following session to that in which the Metropolitan Board of Works had introduced their Bill. All the information they had in reference to the sliding-scale arrangement clearly indicated that it was the intention of Parliament to make the consumers of

gas in London partners with the Gas Companies, and to protect and benefit them; whereas they had gone on now for 25 years, and instead of the consumers of gas in London being in any sense beneficial partners with the Gas Companies, or in any way protected or benefited, the consumer had had no benefit whatever, and he was still discontented, and justly so. On the other hand, the Companies had pocketed £3,500,000 in dividends over and above the 10 per cent. maximum which they were entitled to prior to the sliding-scale arrangement enacted in 1875; so that he thought they stood there that day justly discontented with the result of the introduction of the sliding-scale arrangement. It would thus be seen that the legislation of 1875-6 completely failed in its object, and they were face to face with the old difficulties in an aggravated form. This rather brought them down to the current events; and in dealing with the current events of this question, they might take their minds for the moment to the proceedings in Parliament in 1898. In that year, the Gaslight and Coke Company introduced a very important Bill into Parliament—a Bill for consolidating and converting their capital. The consumers of London, the Council, the local authorities, and the City Corporation felt that that was a time when the grievance under which London suffered should be brought forward, and that the Gaslight and Coke Company's Bill should be opposed until those grievances had been remedied. The proposal of the Company seemed very harmless at first sight; but yet at the same time it was very shrewd, because, whereas they were receiving a dividend of 10 per cent., the object of altering their capital was that it should appear in the newspapers and before the public that they were only receiving 4 per cent. This was rather a shrewd proceeding on their part. However, the Council petitioned against the Bill. They said—

The Gaslight and Coke Company have been until lately charging 2s. 10d. per 1000 cubic feet for gas supplied throughout the greater part of their district—viz., all that part of London which is north of the River Thames—as against 2s. 3d. charged by the South Metropolitan Gas Company, and have recently increased their charge to 3s. per 1000 cubic feet; while they charge 2s. 3d. only (the same as the South Metropolitan Company) on the south side of the river. The "standard price" of the South Metropolitan Gas Company is 3s. 6d., and that of the Gaslight and Coke Company is 3s. 9d.

This inequality of charge has always been considered unfair to the northern districts of London; and this unfairness has come recently into greater prominence in consequence of the rise which the Gaslight and Coke Company have made in their charge for gas.

Your Petitioners humbly submit that the whole circumstances relating to the charge made for the supply of gas in London by this Company, as compared with the South Metropolitan Gas Company, require consideration, and they submit that the powers and concessions now sought by the Company should not be granted; or that, if granted, they should be subject to a condition that the Company should make an adequate reduction in the price charged by them for gas on the north side of the River Thames.

In the Council's opposition to the Bill, they had the support of the local authorities, and unanimity existed throughout the Metropolis. There was a conference held in the Holborn Town Hall, at which it was resolved to support the petition of the Council. However, the Bill passed. Parliament was not persuaded by the opposition of the gas consumers of London or by the Council, and the Bill became law. As a result of the Bill going through, Mr. Cohen, a member of the Council and a member of Parliament, moved and secured the appointment of a Select Committee to deal with the London Gas Question. The Council, with the assistance of the local authorities, presented the case against the Gas Companies on behalf of the consumers; and he thought they all felt that the report of the Select Committee, dated the 24th of July, 1899, was a very important document, and a very important report in assisting them in dealing with the question at the present time. That it was a grave indictment against the Gaslight and Coke Company, he thought they must all admit; and they must all feel that there was a great deal of force in the indictment which had been made against the Gaslight and Coke Company by the Select Committee. They reported principally that the high price charged by the Gaslight and Coke Company was due to mismanagement. In reference to this particular charge against the Gaslight and Coke Company, it was far more serious than it seemed on the face of it, when they remembered that the whole of the powers were granted to the Company on the clear and distinct understanding that they should have those powers providing they exercised due care and management in the undertaking. And now to be told, in July, 1899, by a responsible Committee of Parliament, that the high charges and the position which the Gaslight and Coke Company found themselves in were due to mismanagement was a very serious matter—indeed, so serious that it was evident someone must, and would have to, suffer as the result of the mismanagement. It seemed to him a very important question for them to consider—for London and Parliament to consider—that if someone had to suffer in consequence of this management, who was it that should suffer? It was perfectly evident that in the past, although there had been this mismanagement, it had not been the Companies who had suffered, because they had continued to receive 10 per cent., and in some cases more; and it would be only fair of Parliament to consider whether some of the responsibility at all events, and some of the consequences of this mismanagement, should not fall upon the shoulders of those who were responsible for the present state of affairs. It was rather unfortunate for London that the standard price regulating the sliding-scale was fixed at a time when the price of coal in London was almost at famine prices. In 1873, the price of coal was very similar to what it had been recently, and to what it was now. In 1875-6, it had not reached a normal state; and at that particular period the standard price was fixed. Since then, the Gas Companies had had the great advantage of cheap coal, and they had had the great advantage of receiving a much larger income from their bye-products; and though it was the intention of Parliament that the consumers should benefit, yet the consumers had had no benefit whatever. He thought they would feel that the time had arrived for a revision of the sliding-scale and dividend arrangement. It was quite clear that, since 1847 down to the present time, when Bills had been before Parliament dealing with this matter, the consumers had been out-manoeuvred on each occasion. The Companies had succeeded in getting their Bills in reference to the consolidation and conversion of their capital, and in having their monopoly legalized. But in the sessions of 1899 and 1900, the Gas Companies had not been so fortunate; and he thought therein lay their hope, because it was indicated at the last half-

\* The report referred to was noticed in the "JOURNAL" for July 17 last (p. 169).



yearly meeting of the Gaslight and Coke Company that they would in all probability have to come to Parliament in the ensuing session. As Parliament began to realize the true position of affairs, and refused to pass the Gaslight and Coke Company's Bill in the sessions of 1899 and 1900, there was hope that, by formulating their proposals and by acting unitedly in the matter, they might be able to obtain some redress from Parliament when the Company again came for fresh concessions. They should be able to emphasize, at a conference of this kind, that they had a right to expect from Parliament a redress of the grievances of the consumers—at all events, on the north of the Thames. He did not know that he need refer to the Bills which did pass last session—the Bill of the South Metropolitan Gas Company and the Bill of the London County Council—but he might make one reference to the Bill of the South Metropolitan Company, which he thought was a very important one, wherein they asked to be empowered to take over the works of the Gaslight Company south of the Thames. He took it that they had no objection in principle to the transfer to the South Metropolitan Gas Company of these particular works; but there were two questions of great importance connected with the transfer: First, there was the question of new capital. It was evident that the Gaslight and Coke Company could not get on without more capital; and the Council's object was to make them come to Parliament for capital, so that they could lay their case before Parliament. But if the Gaslight and Coke Company sold their works south of the Thames to the South Metropolitan Gas Company, and got nearly £1,000,000 for them, it might keep them out of Parliament for several years to come, and prevent the case of the consumers being brought before Parliament. He thought this was a very important matter which they should resist, while they did not object to the principle of the transfer. Then there was the other point, and that was the question of the price of public lighting north of the Thames. The Gaslight and Coke Company were compelled to supply gas for public lighting at the same price as they charged their lowest customer; and as on the south of the Thames they only charged the same price as the South Metropolitan Gas Company, the local authorities north of the Thames only paid this for their street lighting, and there would be the danger of losing the advantage unless some protection were secured. This brought him to another point where there was a new danger—a new danger arising out of the South Metropolitan Gas Company's Act of last session. By it, the Company obtained the sanction of Parliament to lower their candle power for their quality of gas from 16 to 15; so that next year they could reduce their candle power to 15, and a little later on further reduce it to 14. This was very important, because the provision which compelled the Gaslight and Coke Company to supply gas for public lighting at the same price as they charged their lowest customers said that it should be for a similar quality of gas; and if they could make out that they were not supplying a similar quality of gas—because the South Metropolitan Gas Company would be making gas in the future of only 15 or 14 candle power—they might lose the benefit of the provision which the people north of the Thames had had, by the Bill of last session, carried by the South Metropolitan Gas Company. This he hoped the conference would not lose sight of in any decisions they might come to. It was very unfortunate, he thought, for London that the Council's Portable Photometer Bill was rejected by Parliament. He was quite sure that anyone who followed the matter before the House would agree that the officers of the Council placed a very strong case before Parliament; and, for his part, he could not quite appreciate the grounds upon which Parliament rejected the Bill, because it did seem strange that they should be unable to test the quality of gas as it was supplied to the various consumers in the Metropolis, and only be enabled to test the gas by giving many hours' notice to the Gas Company and at special points—particularly as the Council had found out by experience, and by testing, that the quality of gas was very inferior when it arrived at the houses of the consumers. It was clear that they had ample material for discussion. He could only express the hope that the conference would propound a policy on which all London could unite, and that the result might be that Parliament would afford the consumers that statutory protection to which they were entitled.

Mr. R. MELVILL BEACHCROFT (London County Council) asked, as a matter of information, whether the Corporation of London were holding a conference of a similar kind.

The CHAIRMAN said he believed that there was a conference going to be held by the City Corporation on Oct. 31; but he understood from Mr. Haward, who had seen the City people, that it was only with the object of strengthening the hands of this conference, or any other steps which might be taken with this object.

Mr. TRENNER (Holborn), with the view of giving effect, if possible, to one of the recommendations of the Select Committee, had prepared the following resolution: "With the view of giving effect to one of the recommendations of the Select Committee, a sinking fund shall be provided to redeem the obsolete or unremunerative capital of the Gas Companies by a reduction of dividend set aside for that purpose." Former conferences had been held, and the grievances under which the consumers were labouring were quite manifest at the present stage. They had got beyond airing a grievance; and the question now was how far this grievance could be remedied. One of the reasons given by the Gaslight and Coke Company why the price of gas north of the Thames was dearer was because of the large amount of capital which was in their undertaking. Of course, they were entitled to pay 10 per cent. at the standard rate; and if 10 per cent. had been paid also upon a large amount of obsolete and unremunerative capital, that seemed to him to be nothing short of a scandal, and a matter that ought to be at once dealt with with the view of remedying it. It did seem to him at the present day that 10 per cent. on the ordinary or productive capital was in itself a very high rate of interest; but when they had to pay this percentage on obsolete capital, then he said that it was a matter which might well be looked into with a view of remedying the evil. It transpired that there was a considerable amount of obsolete capital in this case. In the large amount of capital of something like £25,000,000, there was a very considerable amount which was obsolete capital. This was proved by the evidence. In fact, they had the report of the Select Committee to the effect that some steps should be taken to redeem this unproductive capital. Now he thought they might very well have arranged some plan by which, instead of this £3,500,000 which they had taken over and above the statutory 10 per cent.—this quarter per cent. extra, to be paid on every

reduction of a penny in the price—going into the pockets of the shareholders, it should have been set aside as a sinking fund for the redemption of obsolete capital; then at the present day both the shareholders and the gas consumers would have been deriving the benefit of it. It must be obvious that if they could reduce the capital by such an amount, they were taking a step towards the reduction of the price of gas.

Mr. COLLEY (Hampstead) asked what was this unproductive capital.

Mr. TRENNER replied that there was a very considerable amount of money invested during past years in machinery which later on was superseded by new machinery, and on works erected in certain localities which were afterwards superseded when the Companies found they could manufacture more economically in other localities. Consequently the expenses of machinery and works which were erected in various parts necessarily became obsolete when the works were transferred to other localities. This amount of money still figured in the capital, and was obsolete capital. It amounted to some millions of pounds.

Mr. BEACHCROFT suggested that it would be more convenient if they took the recommendations of the Select Committee and treated them *seriatim*, and saw whether they could not follow them out by some resolutions of the conference.

The CHAIRMAN remarked that it was a very difficult matter to give a lead to a conference of this kind; but the Comptroller of the Council had suggested one resolution which might meet the views of the conference: "That, in the opinion of this conference, the time has arrived when the sliding-scale of price and dividend as applied to the Metropolitan Gas Companies in 1875-76 needs revision in the interests of the gas consumers." It would be rather useful if they could have some expression of opinion from a representative conference such as this, which would strengthen the hands of anyone who had in the ensuing session of Parliament to combat any of the Bills promoted by the Companies, or to lay this question before Parliament.

Earl RUSSELL (London County Council) inquired the reason why Parliament reduced the standard of illuminating power. He understood the enrichment of gas was not done nowadays by the use of cannel coal as it used to be, but by the use of oil, and that the process was very much cheaper than it was.

The CHAIRMAN replied that the Companies claimed that it cost more than it was worth to the consumer to add the extra candle power; and that if they were in future enabled by statute to reduce it, they would be able to supply the gas very much cheaper. Of course, on the other hand, it was contended that this was only a clever move on the part of the Gas Companies, and the Chemist of the Council disputed the contention. This was the contention that prevailed, he thought, before Parliament.

Mr. HALE (Kensington) moved the following resolution: "That in the opinion of this conference the time has arrived when the sliding-scale of price and dividend as applied to the Metropolitan Gas Companies in 1875-76 needs revision in the interests of the gas consumers." There was not the least doubt that they were in rather an awkward predicament. The interests of the gas consumers had been neglected right away from the year 1860. This being the case, he supposed first one Government and then another had passed Bills that had enabled the Companies to obtain the position which they had that day, and, of course, which they believed, living north of the Thames, worked greatly to their disadvantage, inasmuch as they had to pay considerably more for their gas in the north than they did in the south, and he did not think this ought to be. Therefore they had a very strong feeling in regard to the matter. He quite agreed that they would have very great difficulty in getting justice from the Gas Companies.

Mr. BRUCE JOHNSTON (Kensington) seconded the resolution.

Mr. TRENNER remarked that, while no one could possibly object to a resolution of the kind, yet it did not seem to give them any practical step forward. It was simply a resolution that the time had arrived when the sliding-scale should be revised. But Parliament, or the Select Committee, had already recommended this; and therefore they were simply endorsing what had been said by the Select Committee, but taking no practical step in order to bring it about. He failed to see that by passing a resolution to say "the time has arrived," in face of the recommendation of the Select Committee, "that it is desirable" that it should be done, that they were getting any more forward on practical ground. Therefore they should discuss that, and possibly pass it as a pious resolution. But what then? Having passed the resolution, they ought to take some step to give practical effect to it; and that was the reason why he should like to see the resolution, to serve perhaps as the basis of discussion with a little more practical effect with it than this resolution would have on the face of it.

Mr. WALLACE (Camberwell) was not in opposition to the motion at all; but he thought the time had arrived when they ought to understand the difficulty of the consumers in the north, and the advantages which the consumers in the south possessed. To practical men, it seemed that the difference was between a well-managed business and a badly-managed business. They would like to hear those gentlemen who understood all about gas tell them how this difficulty was to be surmounted in dealing with the Companies. He yielded to no one in the desire to see the public protected; but they could not rush against the Companies, if they passed a resolution like this, unless they knew what they meant and they meant what they said. The South Metropolitan Gas Company, who supplied his parish, were under the able management—and he said "able" with confidence—of Mr. George Livesey, and they were doing marvellous things in the way of management; and if there was bad management, as the Chairman suggested, in the north of London, he could not see how they were going to deal with it until they dealt with the management. He did not know whether they would say that the time for making gas might cease—that the time had arrived when they ought probably to consider the larger question as to whether the County Council should not establish some very large generating stations throughout London, and let them out to local parishes for the purpose of electric lighting.

Sir ALBERT ROLLIT, M.P., said that upon the resolution which had just been proposed to the conference there would be no real division of opinion. But it seemed to him that they should do the best service to the case they had in hand, if they availed themselves of the formulated report of the Committee as a basis, confirmed as it was by the opportunity which the Committee had had of hearing practical evidence



upon the subject. It seemed to him that if they did this, they would arrive at a point ultimately in which they would place themselves in the best position for doing what they could in Parliament; because, of course, the House of Commons would have regard to the report of the Committee who had been appointed by the House, and he did not hesitate to say also that Parliament would have regard to the conclusions of this representative conference, especially in so far as they reinforced the report of the Committee. After they had affirmed, as he hoped they would, the main findings of the Select Committee, they might add supplementary resolutions upon possible points of difference from them, and with the view of modifying perhaps in some respects, in detail at any rate, the conclusions of the Committee. They should take No. 1 first, dealing with the question of revision, and incidentally with the question of the differential treatment of North and South London; and possibly at the same time they might consider whether they quite agreed with the introductory words of the paragraph inserted by the Committee—namely, that they should necessarily await the time when circumstances forced the Companies to come to Parliament. (Hear, hear.) He was not disposed to think that this was a necessary provision. Certainly, if it were true that by means of a sale and purchase the Gaslight and Coke Company, who were the chief offenders, and under the report of the Committee the principal convicts, might escape the consequences of conviction by an arrangement under which they obtained money *alibi* instead of having to resort to Parliament, these words became of material consequence in deciding whether they should necessarily await any such application.

Mr. HALE said it was more with the object of starting business that his resolution was moved; and he should withdraw it.

On the motion of Mr. COLLEY seconded by Mr. Cox (Strand Board) it was agreed that the recommendations of the Select Committee should be taken as the basis of the conference.

Mr. TRENNER said he felt all along that "Why should London wait?" applied with very great force to Recommendation No. 1; and in fact in Holborn they had considered the question of memorializing Parliament on the very lines that Sir Albert Rolit had referred to—namely, that those lines in the beginning of Recommendation No. 1 should be deleted: "That whenever any of the Metropolitan Gas Companies again come to Parliament for an extension or alteration of their capital powers." It seemed to him that if a grievance did exist—and it was admitted by everyone that it did exist—there was really not any fair or proper reason why they should have to wait until the Companies came before Parliament. If they knew that by coming before Parliament they would have, so to speak, to climb down from their pedestal, they would certainly, by hook or by crook, endeavour to avoid coming as long as they could. He moved to omit from Recommendation No. 1 the reference to waiting until the Companies went before Parliament, and further that  $\frac{1}{2}$  per cent. dividend over and above the 10 per cent. should be apportioned towards the reduction of obsolete capital.

Mr. RUMBALL (St. Luke's) seconded.

After some discussion, Mr. TRENNER withdrew the portion of his amendment dealing with the reduction of obsolete capital.

Mr. COLLEY thought it would very much strengthen the hands of the Committee of Parliament, or any Member of Parliament who might bring it forward, if the conference passed separate resolutions, and did not take those of the Select Committee, except as a basis to go upon.

Mr. HENRY MILLS (Islington) observed that, while they were unanimously of opinion that the words "whenever any of the Metropolitan Gas Companies again come to Parliament for an extension or alteration of their capital powers" should be deleted from any resolution they passed that afternoon, it occurred to him, as one of the consumers on the north of the Thames, that they were very interested to know what they proposed to put in instead of those words in order to bring this revision about. As far as he had been able to consider the question, it seemed to him that Parliament would not do anything until it was asked; and somebody must make application to Parliament, because, if a number of resolutions were passed there, they would go away perhaps with the gratifying feeling that something had been done, but after all not having left the thing in the practical shape that every representative of every local authority in London desired to see it placed in as speedily as possible. Therefore it occurred to him, and he made the suggestion with very great diffidence to the conference, that the more appropriate form of resolution would be that they should ask the London County Council, and if needs be the City Corporation as well, to immediately take such steps as they thought necessary to bring about the revision of the sliding-scale, and then the other words of the resolution would sum up the matter appropriately.

Mr. A. C. MORTON (City Corporation) saw great difficulty in voting for either the amendment or the motion, because, after they had done it, they would have tied their hands. They would probably get nothing. What they really wanted in North London was to get rid of the extra 8 $\frac{1}{2}$ d. which was charged by the Gaslight and Coke Company. If there was no other way of getting relief, they must ask Parliament, through the proper authorities, to give them relief. There was no doubt at all they had been saddled in London with a very great monopoly, an all-powerful monopoly. They could dictate, under the sliding-scale, what they should pay for gas, to a very large extent. No doubt it was the result of bad management on the part of the Gaslight and Coke Company that gas was dearer on the north side of London; but it ought also to be borne in mind that it was partly owing to the extra good management of the South Metropolitan Gas Company that they were enabled to sell gas cheaper. He was not going to be any party to carrying the resolution before them, because that would merely tie them up to going for a revision of the sliding-scale, which might possibly reduce it 1d. or 2d. on the north side, but would not reduce it 8 $\frac{1}{2}$ d.

Mr. THOMAS LOUGH, M.P., remarked that there was a difficulty in following the suggestions which had just been thrown out by the representatives of the Corporation. It sounded very simple to say that they ought to pass a resolution that the price of gas should be the same on the north side of the Thames as in other parts of London; but it was extremely difficult to do so, because the body who supplied the south had got statutory powers and a different standard price from the parallel body in the north, and there were other divergences in the Metropolis. Passing to the main resolution before them, it seemed to him that the conference was in a little difficulty. In order to get rid of the first words of the first recommendation of the Committee, they were asked to swallow

the whole of the first recommendation. That was a tall order; they ought to draw a line. What the mover of the present motion wanted to do was to get rid of the words that they were to wait until some of the Gas Companies came before Parliament. To get rid of these words would be a very proper first step for them to take. If in order to get rid of the first words, they swallowed the whole of the resolution, they were tied to expressing the opinion that 3s. 3d. would be a desirable standard price to fix. He did not think this would be a desirable resolution to come to at all. Although he was a member of the Select Committee, he had on those Select Committees to accept compromises. And 3s. 3d. was not a low standard price, it was rather a high standard price; and if a big dividend like 10 per cent. was to be paid, they might fix a lower price than that. But he only said this suggestively, in order to point out the difficulty of their swallowing the whole of the first recommendation hastily without studying every part of it, as the conference was now very rightly studying the two first lines. He would suggest that they should deal with the two first lines only, and declare that the time had come when a reduction of the standard price, and an alteration in the sliding-scale, should take place throughout London. If they started with that, and if the conference were able to agree with that, he was sure it would strengthen the hands of Parliament in dealing with the subject hereafter; and then they might consider afterwards what ought to be the standard price, and they might also consider whether the important recommendations in the last four lines of Paragraph 1 were necessary or not. He would be glad to move as an amendment: "That, in the opinion of this conference, the time has come when a revision of the sliding-scale should take place, and the standard price of gas throughout the Metropolis should be reduced."

Mr. BEACHCROFT suggested that the following words might be almost better: "That, in the opinion of this conference, the consumers should not be required to wait until the Metropolitan Gas Companies come to Parliament for further powers before obtaining revision of the sliding-scale, and accordingly express the hope that the London County Council and the Corporation of London will take steps to bring the matter before Parliament."

Mr. LOUGH said he preferred his own words.

Mr. MATTHEWS (St. Pancras) said the question before them, if he understood it rightly, was the deleting of these two lines. If they did so, he took it they should call upon the London County Council and the Corporation of the City of London to lodge a Bill in Parliament next year for the revision of the sliding-scale, with the object of lowering the standard of the different Companies. In his opening address, the Chairman told them that the price of coal when the standard of 3s. 9d. was fixed was almost the same as it was now. If the Committee of the House of Commons, guided by experts, found that, with the price of coal as it was now, 3s. 9d. was a proper standard to fix, was this the moment to choose when they should ask Parliament to lower the sliding-scale? Unless they could have some knowledge that the price of coal would be lower next session, were they justified in asking the County Council to choose this time to ask for the scale to be revised?

Sir ALBERT ROLLIT asked what was the motion at present before the conference, and suggested that their clear course, if they meant to get to business, was to declare first what they wanted and afterwards how they wanted it—by what means, and when. He did not depart from what he suggested—that the recommendations of the Select Committee gave the proper line to take. They might be cut up. For instance, take the first. They did not want certain introductory words at all for the purpose of their discussion. It was sufficient to leave them out, and to move the other words of the recommendation, that a revision of the sliding-scale should take place, and that the standard price should be reduced. This was one step forward. Whether it should be 3s. 3d., or what else, was the next step; and, finally, they wanted to come back to the introductory words, which, he thought, were somewhat misplaced, and to say that at the first opportunity, whether afforded by the introduction of Bills by the Companies or upon the initiative of the County Council, if that was recommended, means be taken to carry forward what they had declared to be necessary. Therefore he suggested, with diffidence, that the proper resolution would be culled from the first recommendation, that a revision of the sliding-scale should take place and that the standard price should be reduced; and afterwards let them consider details of price, and ultimately come back to the first part of the recommendation by saying how and when they wanted it.

SEVERAL REPRESENTATIVES: Agreed.

Mr. GIBSON was quite prepared to second this as being a practical method of getting to the end.

Mr. LOUGH thought it would be better to proceed in the spirit of Sir Albert Rolit's suggestion, but adopt better words, the responsibility for which the conference would take upon their own shoulders. These words seemed to him more desirable: "That, in the opinion of this conference, the time has arrived when the sliding-scale of price and dividend as applied to the Metropolitan Gas Companies in 1875-6 needs revision in the interests of the gas consumers."

Mr. WALLACE seconded; and Sir A. ROLLIT accepted Mr. Lough's form.

Mr. MUNDEN (Paddington) wished to move an amendment, to take the feeling of the conference on the case of the London County Council proceeding to purchase the London Gas Companies. He thought they would get no permanent benefit, from a consumer's standpoint, until the London County Council or some other body proceeded to buy up the Gas Companies. His amendment was: "That it be recommended to the London County Council to take into consideration the advisability of proceeding with a Bill for purchase."

The amendment was not seconded.

Mr. HOWLETT (Lambeth) considered that they ought to differentiate a little. He came from the south side of the Thames; and there they had no fault to find with the Gas Company. But he wanted to see that they did not use a two-edged sword, or they would hurt the people, and certainly not benefit them to any extent. The history of the South Metropolitan Gas Company was that whenever possible they had reduced the price of gas by good management. And he differed from the Chairman in his remarks that the sliding-scale had not been a benefit. He thought it had distinctly been a benefit to the consumer. If the London County Council were to buy up the South Metropolitan Gas Company, and run it upon municipal lines, that would be all right; but he was afraid they would be losers in the south, for he did not think the concern would be



managed as well as it was being managed at present. The feeling he had in the matter was that they in the south had every reason to be thankful to the Gas Company for the honest way in which they had treated them all through. Whatever complaints they had on the north side, he did not want them to pass a resolution advising Parliament that, while they remedied their own defects, they should injure the Company who had really done their duty all the way through.

Mr. LOUGH's motion was carried unanimously.

Mr. KERSHAW moved, on Recommendation No. 2 of the Select Committee's recommendations: "That this conference approves of the transfer, under proper conditions, to the South Metropolitan Gas Company of that portion of the area of the Gaslight and Coke Company situated south of the Thames, as recommended by the Select Committee of the House of Commons last year; provided that the Gaslight and Coke Company shall be required to make some equitable rebate on the ordinary charge to local authorities in respect of gas supplied for public purposes, in lieu of the existing arrangement provided for in the Amalgamation Scheme of 1883." This seemed to him to meet the whole case as far as the amalgamation of the two areas was concerned. At first, he thought of suggesting that they should oppose amalgamation entirely; but this did not appeal to some members of the conference as being a wise course, inasmuch as it was desirable in many other respects that the amalgamation should take place. But it would be very unfair to the consumers north of the Thames—he did not speak particularly for Shoreditch, where they had an electric light installation which deprived the Gas Company of some £6000 or £7000 a year that they previously had from the funds of the borough—and also the local authorities, if this amalgamation took place, that they should then be in the position of ordinary consumers, and should have to pay the full rate for gas charged at the present time, whereas under the Amalgamation Scheme of 1883 it was well known that they had the privilege north of the Thames of having gas for public purposes at the same price as the lowest charge made by the South Metropolitan Company. Therefore if that Company absorbed the portion of the Gaslight and Coke Company's area south of the Thames, it would necessarily follow that the price of gas to the local authorities north of the river would be the current rate.

Mr. COX, in seconding, said that if the South Metropolitan Gas Company were allowed to acquire the interest of the Gaslight and Coke Company on the south side, to the Strand district alone it would mean an increase of £2100 a year.

Mr. TRENNER opposed the resolution as drafted, not because he was against the principle of the purchase—or rather the sale—from the one Company to the other, but because he thought the resolution said too much; and by saying so much it rather narrowed its scope and its usefulness. He therefore moved, as an amendment, to leave out all the details which had been specified in regard to conditions, and simply say that the sale should take place under proper safeguards of the public interest.

Mr. WALLACE said the desire of the conference, it seemed to him, was that the sale should not take place unless they had an opportunity of being heard by Parliament; and yet it had been suggested that they should allow it to be effected. They should not allow any private bargaining between the two Companies, and yet they were dropping into making a bargain which would not allow them to be heard. It was better to rely on their powers or any powers they got from Parliament to regulate the Bill when it came before the Legislature.

Mr. WILKINS (Islington) seconded Mr. Trenner's amendment.

Mr. MATTHEWS hoped the conference would not deal with Paragraph 2 in the manner provided by either the motion or the amendment. If they on the north of the Thames were in any way in a good position, it was because the Gaslight and Coke Company owned a district on the south side of the river; to this only did they owe any reduction in the charge for public lighting the Company might make. Therefore, for them to put a handle in the hands of the Company to go to Parliament and say, "Not only do the Select Committee recommend that this district should be transferred to us, but the conference called by the London County Council in the interests of the consumers also recommended that the district should be transferred to us," was the most suicidal proposition he had ever heard brought before any public body. The Parliamentary Committee were quite in order in making re-arrangements of London; but this re-arrangement was, in his opinion, detrimental to the consumer. The proper course for the conference, if they had the interests of the consumers on the north of the Thames in their mind, was certainly not to deal with the question of transferring the southern district to the South Metropolitan Gas Company.

Mr. MORRIS agreed with these remarks. He did not think they ought to pass any resolution in favour of allowing one Company to sell, and the other to buy, the portion of the area in question. He was quite satisfied that the House of Commons Committee, when they passed Paragraph 2, did not really understand the question—he said it deliberately—or the benefit the north side derived by the terms of the Amalgamation Scheme of 1883. As a matter of fact, the loss would be, at the present moment, about £30,000, without any equivalent. It would mean practically the loss of a halfpenny rate on the north side of London; and they ought to be exceedingly careful how they dealt with it. He was very glad to know that the Corporation of London, having got all the local authorities on the north side of the Thames to send Counsel to oppose the purchase, succeeded in getting the clause struck out altogether; and therefore it would be a most suicidal course for any conference of London local authorities to express any definite opinion about purchase. If they wanted to do so, let them say it ought not to be done except on conditions to be approved by the authorities. He did not want to move "the previous question" in the matter, because he thought it would be much better for them to be unanimous; and perhaps honourable gentlemen would withdraw all their resolutions with regard thereto, and really deal with what Sir Albert Rollit had suggested they were to deal with after passing the general resolution saying what they wanted.

Mr. LOUGH said that he was in favour of the original motion, and did not agree with the last two speakers. It had been stated that any advantage they derived on the north of the Thames they obtained because the Gaslight and Coke Company had the small area on the south. This was a very superficial way of looking at it. They derived no advantage whatever on the north side. As matter of fact, what took place was this: In the area belonging to the Gaslight and Coke Company on the south side of the river, gas was sold under cost price. He believed it was

sold at 3d., or at any rate at 2d., per 1000 cubic feet under cost price; and at whose expense? At the expense of the consumers on the north side. If this selling under cost price were stopped, it would be a great saving to all the people in North London. The consumers there enabled the Company to pay 12½ per cent., 12 per cent., or 13 per cent. on the capital they used unproductively south of the river; and therefore they had no advantage from the arrangement. As a matter of fact, the people on the north side subscribed £80,000 a year in order that certain persons in the south and some local authorities in the north might enjoy cheap gas.

Mr. MORTON: We do not admit that.

Mr. LOUGH said of course they did not. It would be very foolish to admit anything anybody said on the other side; but an impartial authority might accept it. Therefore when the mover stated that they had a great advantage in the north, he also mentioned what the advantage was. He said that in the reduction in the price of public lighting they saved £30,000 a year. And they did it at an expense of £80,000. This £30,000 represented about 0.33d. per 1000 cubic feet of gas all over the north; but the £80,000 represented 1d. per 1000 cubic feet. If, then, the £80,000 was too high, it was quite certain that they paid a great deal more for the price of their gas than they got back in the cheapness of public lighting. Therefore he recommended the conference not hastily to throw over or to accept the theory that the Committee did not examine this question. The more it was examined, the more it would be found that there was no relief to the consumers in the north from this area belonging to the Gaslight and Coke Company in the south, but rather an additional burden. The words at the end of the resolution surely protected every legitimate interest, and they might adopt it with the addition which had been made as the Chairman had suggested.

Mr. HOWLETT held that the facts were substantially as Mr. Lough had suggested. The Gaslight and Coke Company lost money to the tune of something like £80,000 by manufacturing gas on the south side of the Thames; and, owing to the position they were in, they could not reduce the price of gas. The South Metropolitan Company were not at all anxious to take these works; the initiative came from the Gaslight and Coke Company. It was the Parliamentary Committee who suggested it; and the South Metropolitan Company said: "Well, we will take it at a fair price between ourselves." The whole thing would have gone through, but the House of Lords refused to pass the proposal because the Gaslight and Coke Company would then have had £800,000 or £900,000, and probably would have been enabled to keep out of Parliament for three or four years before they applied for any more capital. This was the only reason why the proposal was not agreed to. It passed the Commons and went through; but the House of Lords took the view of it that the Company had not treated the public well, and therefore they would not put any handle in their hands, so that they should not need to come before Parliament soon. But as far as the loss on public lighting was concerned, Mr. Morton said they lost £30,000 a year. He could assure him they would gain a very great deal more by passing these works entirely over to the other Company. He had no doubt of it in his own mind that when Parliament discussed this matter again they would take pretty good care that the public were safeguarded in the matter by proper conditions being insisted on.

Mr. MORTON wanted to put this proposition: If this at the present moment was a loss to the Gaslight and Coke Company of £80,000 per annum, how was it that they were to get £900,000 for the loss? That was the selling price of a loss.

Mr. RAYNOR (Battersea) hoped they would leave No. 2 clause alone. They were rather narrowing the issue. It appeared to him that there was somewhat of a fight between North and South London. Whatever they did here as a conference, he hoped would be done for the good of the whole of London.

Sir A. ROLLIT said there was one clear reason why they should retain the South London jurisdiction, if he might so speak, and that was that it was the standard price for public lighting in North London, and so far effected a very considerable reduction. But, except for this reason, they really had nothing to do with the internal affairs of the Companies—the question of amalgamation; and he ventured to say this: That, as the matter appeared debatable, and as they were not very clear whether it would be an advantage generally or not that the transfer should take place, the form of the resolution should be this: "That if the second recommendation of the Select Committee is adopted—namely, 'That the area south of the River Thames, at present part of the district of the Gaslight and Coke Company, acquired by them from the absorption of the London Gas Company in 1883, should be transferred from the Gaslight and Coke Company to the South Metropolitan Gas Company, fair and reasonable price being paid by the latter to the former Company for their property in the southern area,' it should be on proper conditions, and subject to safeguards for the protection of the public."

Mr. KERSHAW withdrew his motion in favour of that of Sir Albert Rollit; and Mr. Trenner's amendment was negatived on a show of hands—only four supporting it.

Mr. RUMBALL remarked that London would have to buy all these monopolies. They might delay the purchase as long as they liked; but they would have to at the finish. The longer they delayed, the bigger the price they would have to pay. They allowed the Companies to amalgamate until there was no competition whatever. The only sale they were agreed upon was a sale to the London County Council, or that some other body should buy the works for London—the City. It was suggested in the Council some time ago, with regard to the water question, that there should be a Water Commission. He was not against a Gas Commission buying on behalf of London; and the whole of the interest and profit should go in relief of the rates of London. That was what he was in favour of, and he moved it as an amendment.

Mr. MUNDEN seconded.

Mr. TRENNER maintained that the transfer would benefit both South London and North London. The South London Company were certainly selling gas at a very good profit, although at a much lower rate; and if they had a much larger number of customers, did anyone imagine that they would not be able to make some profit working on the same lines as they had hitherto done?

Mr. MATTHEWS said the Gaslight and Coke Company resented very much the introduction of the electric light into the streets. Therefore it was quite evident the figures were misleading, and they were not losing by selling gas in South London.



The amendment was negatived; and there voted: For the resolution, 24; against, 10; majority for, 14.

Sir ALBERT ROLLIT then moved, and it was agreed: "That the practice of the Gaslight and Coke Company in treating North and South London differentially, by charging consumers in North London 8d. per 1000 cubic feet more than in South London, has no justification, and is a practice which ought to be redressed."

Mr. COLLEY moved, Mr. WATTS seconded, and it was resolved—"That capital powers should not be granted to any Gas Company for more than five years."

Mr. TRENNER suggested a resolution to endeavour to give some practical turn to Recommendation No. 5, because it simply said that an effort should be made by the Companies. If they did not make any effort, they stood where they were. They might have a resolution to the effect that a sinking fund should be provided out of dividends for this purpose. Altogether the obsolete capital was £1,500,000. If they were to pay 10 per cent. on the £1,500,000, they had at once the ratepayers saddled with £150,000, making up to the Company for paying dividend on obsolete capital. This represented 2d. per 1000 cubic feet. He did not commit himself to details as to where it was to come from, whether out of the surplus over and above the 10 per cent. dividend, or out of the 10 per cent.—9 per cent. going into their pockets, and 1 per cent. to the sinking fund; but he moved that a sinking fund be provided for the purpose of redeeming obsolete capital.

Mr. PHYSICK (Marylebone) seconded.

On a show of hands, the resolution, in the following terms, was adopted: "That, with a view to giving effect to Recommendation No. 5 of the Select Committee, a sinking fund shall be provided for the purpose of redeeming obsolete capital by setting aside dividends."

Mr. WILKINS moved, but subsequently withdrew, the following motion: "That this conference requests the London County Council to promote a Bill to carry out the recommendations of the Select Committee, as set out on page 7 of the 'Memorandum' of the Council, with the modifications approved by this conference."

Mr. KERSHAW moved, and Mr. RUMBALL seconded: "That this conference approves of the action of the London County Council in requesting the Board of Trade to institute an inquiry as to the cause of the persistent differences between the results of testing the illuminating power of gas supplied by the Metropolitan Gas Companies at prescribed testing-places, and of tests made with the portable photometer (of identical construction) of gas supplied to other buildings in the County of London."

Mr. MORTON submitted that it was not in order to bring this before the conference at all, however good it might be.

The CHAIRMAN said if there was a fight which the County Council had been engaged in, it was in trying to strengthen the position of London as regards the quality of the gas and the testings which were made from time to time; and the hands of the Council would be very much strengthened by the conference passing such a resolution as that moved by Mr. Kershaw.

Mr. HOWLETT did not think the County Council had had a mandate upon this portable photometer business at all. It was not in the interests of the public in the slightest degree. The Bill passed by the House of Commons in favour of the South Metropolitan Gas Company was a much more sensible view to take of public gas lighting. He did not think the County Council had been well advised in this matter at all. He had not heard great complaints of the quality of the gas; and it was entirely a question of good and bad fittings. As a man in the street, he had never asked the London County Council to bring in this portable photometer. They had their testing-stations; and he thought there should be a give-and-take policy on this question. It was an irritant, and the public would have to pay for it.

Colonel BLAIR supported the last speaker. When the Council went against their ideas of fairness, the public rose against them. The Council had the right to test the public water that was supplied; but they did not test it in the dirty cistern at the top of the house. They tested it from the flowing main. So they ought to treat fairly with the Gas Companies. Testing gas at the dead-end of the pipe was unfair; so the Bill was thrown out of Parliament, simply because there was a feeling as to the unfairness of the matter. By all means test it at the flowing mains, wherever they wanted; and as to the 24 hours' notice, he believed the Companies would dispense with that.

The CHAIRMAN desired to put the conference right on the point raised by the last two speakers about the Council and testing gas. The Council went very carefully into the Bill and into its proposals before Parliament, to make it quite clear that there was no wish to test the gas at any old dead-end of a service-pipe, or at what would be parallel to a dirty cistern, because the Council were very careful to make their case to be that they could test only in such places, and under such conditions, as should be decided upon by the Gas Referees. The resolution was not committing the conference to everything that the Council might put in a Bill. It was committing the conference to an inquiry to be held by the Board of Trade into this question.

On a show of hands, there voted for the resolution 27, on the contrary 3.

Mr. MORTON asked for a division, as he wanted it to appear that he did not vote at all.

The CHAIRMAN said they had not the machinery for a division; but the fact that Mr. Morton did not vote would be noted.

It was agreed that a copy of the resolutions passed be sent to the Corporation of the City of London, for their guidance at the conference that has been called by them. It was also agreed that copies be sent to the bodies represented at the conference.

A vote of thanks having been passed to the Chairman, the proceedings terminated.

In a paragraph which appeared in the "JOURNAL" for the 9th inst., it was stated that the Company which has been formed to acquire the undertaking of the Crawley Gas Company will also "carry on the business of an electric light supply company." We are asked to explain that the Company have no present intention of establishing electric light works; but, in the event of a demand for this illuminant arising, they will be prepared, having the power, to take steps to meet it, if thought desirable.

## DEVELOPING THE GAS INDUSTRY IN IRELAND.

Save in a few of the leading towns, the gas industry in Ireland appears to be in a dormant condition, and little notable progress is being made. For this state of things, want of capital is no doubt largely accountable; for without it economical methods of manufacture cannot be secured, and the efforts of managers to gain new business are necessarily cramped. A Company, which will be known as the Irish Provincial Gas Company, Limited (see p. 1046), has been formed for the purpose of taking over a number of concerns, and supplying to those which need it the means of development which they now lack. It is believed that, if raised to a good manufacturing status by the modernizing of the plant, and placed under a qualified, concentrated, and energetic management, these undertakings offer the substance upon which a sound, growing, and lucrative business may be cultivated. It is proposed to purchase twelve undertakings—the principal of which are Sligo, Mullingar, Newbridge, Longford, Ennis, Castlebar, and Naas; but in the case of Sligo, the Company have acquired, by letters of agreement from individual holders, sufficient shares in the concern to give them the full control of the business. In this town, the make of gas in 1898-9 was 27 million cubic feet. The new Company are taking over these various works at a price (£86,100) which, the Consulting Engineer (Mr. Percy Griffith, Assoc.M.Inst.C.E.) calculates, on the present profits, will yield 5½ per cent.; and by spending a comparatively small amount of capital in the improvement of the works and the extension of the distribution systems, and by reducing the price of gas and pushing the use of slot meters, stoves, and engines, he states that he is confident that the profits will rapidly advance up to 15 per cent. on the capital now being issued. It is intended, as soon as the present proposals have been consummated, to undertake the construction of new works at a number of places which Mr. Griffith has inspected, and found to be of a promising character—in fact, in his opinion, there is a large scope for the development of the gas industry in the small towns throughout Ireland. The promoters' profits are considered moderate, compared with what is usual in similar cases. The nominal capital of the Company is £160,000, of which £50,000 is 4½ per cent. first mortgage debenture stock. The present issue consists of this stock and 65,000 ordinary £1 shares—making together £115,000. The Trustees for the debenture holders are the Right Hon. Sir Thomas D. Pile, Bart., the Lord Mayor of Dublin, and Alderman W. F. Cotton, J.P., the Managing-Director of the Alliance and Dublin Consumers' Gas Company. The Directors are Messrs. W. R. Fenton, W. A. Wallis, J. W. Russell Wall, and C. B. Tully, the Engineer of the Sligo Gas Company, who will be Managing-Director of the new concern. The report of the Consulting Engineer on this enterprise has been fully endorsed by Mr. T. O. Paterson, M.Inst.C.E., of Birkenhead.

## CAPITAL REQUIREMENTS OF THE WELSBACH COMPANY.

A Meeting of the holders of preference stock in the Welsbach Incandescent Gas-Light Company was called for last Wednesday, at the Cannon Street Hotel, to consider, and, if approved, to ratify, an alteration in the Articles of Association, by striking out Articles 53 and 54, and substituting therefor one giving the Directors power to borrow and raise money in any manner and on any terms; mortgage or charge the whole or any part of the property of the Company, both present and future, including the uncalled capital for the time being; and create and issue debentures, debenture stock, bonds or other obligations, perpetual or otherwise, with or without any mortgage or charge on all or any part of such property and uncalled capital, provided that the Directors shall not, without the sanction of a general meeting, borrow or raise any sum of money which will make the amount of principal borrowed or raised, and then outstanding, exceed 25 per cent. of the issued capital for the time being, and that the amount of principal at any time secured by any mortgage or charge shall not exceed £250,000, unless with the sanction of an extraordinary resolution of the Company and the sanction of the holders of the issued preference stock.

The meeting was held in the Great Hall of the hotel. Long before the time appointed for the commencement of the proceedings, there was a constant stream of stock and share holders into the hall. But outside the entrance was a disconsolate group of Press men, who, contrary to all previous custom of the Company, were at first denied admission, on the ground that the preference shareholders' meeting, being a "class" one, would be private, but a subsequent extraordinary general meeting would be open for their attendance. However, by the kind offices of one or more shareholders, the prohibition was very soon withdrawn; and the reporters were admitted. The Chairman (Sir Henry Burdett, K.C.B.) wished it to be clearly understood that the question of the admission of the Press had never been considered in any definite sense. This being merely a "class" meeting, Press representatives were not invited to be present. But it was pointed out by a shareholder that there was an impression that the Board had vetoed the admission of the Press, as they were notified at the door that they would not be admitted. However, as it happened, nothing had been lost by the reporters, as, on then admission, they found that, although the hall was crowded, those present, with the proxies, only represented £900,000 of the million (two-thirds of the total) of preference stock required before the business could be proceeded with. At three o'clock, there still being about £50,000 short of the million, the Chairman declared the meeting adjourned for a week, and appealed to the stockholders to co-operate with the Board in then securing a quorum, present or by proxy. He explained that if there was not a quorum, the meeting would have to be dissolved; and the matter taken in hand *de novo*.

During the wait, the Chairman mentioned that he had received a telegram to the effect that the Auer electric lamp had been fixed in the Austrian pavilion at the Paris Exhibition. It had also been tested by the Emperor of Austria in his own private room; and His Majesty had expressed a wish, and given an order, that it should be installed in all his palaces throughout Austria. Sir Henry said he thought this was a fact that might interest the shareholders; and he gave it to them for what it was worth.



A little later an Extraordinary General Meeting of the Company was held to consider a resolution in precisely the same terms as that already summarized. Sir HENRY BURDETT again presided.

The SECRETARY (Mr. Few) read the notice convening the meeting.

The CHAIRMAN, before moving the adoption of the resolution, said that, at the meeting of the preference shareholders, he was asked, and was now in a position to reply, how much preference stock was held by the Board. He found that the holding of the Board was as follows: Preference stock £20,255, ordinary stock £22,655, and deferred shares £14,188. Proceeding to the business before the meeting, he remarked that the explanatory circular which had been sent to the shareholders gave them pretty full particulars of the reasons why the Board decided to call the meeting. The facts were that the Articles of Association, as originally drawn up, gave power to borrow on security. It was intended, under Article 54, that such power to borrow on security should be conferred on the Board; but, in view of a recent decision, they were advised that power was not conferred, as it was intended to be, under that Article. The Articles of the Company were very carefully drawn, with the special object of protecting the interests of the preference shareholders; and this was the point which, in the resolution that was going to be submitted, had been duly borne in mind, and upheld by the Board in proposing to limit to £250,000 the borrowing powers on security which they asked for. There were great difficulties in the way of getting an alteration of the Articles of Association, because a general meeting was unable to alter them without the consent of the preference shareholders. A "class" meeting of the preference shareholders was called for that afternoon; but they failed to fulfil the conditions rendered necessary by the Articles of Association of obtaining a quorum to the extent of two-thirds of the whole of the preference stock. Failing to get a quorum at that meeting did not affect the present one, because the Company had the power, subject to the consent of the preference shareholders, to pass a resolution altering the Articles of Association; and this was what the Board proposed to ask the shareholders to agree to. It might be asked what the Board required the money for. A portion was needed for the increased output due to increased business; and it had been shown that this increase in the business rendered their manufacturing capacity inadequate, and so they would require new factory accommodation. On the formation of the Company, the arrangements provided for £100,000 as extra working capital. This extra £100,000 could be accounted for by the sum paid on account of the Kern and anti-vibrator patents, £63,000; outlay on premises and plant, after deducting the amount written off, £17,000; and increased stock-in-trade estimated at £20,000—making the total of £100,000. It would thus be seen that, at this important stage in the Company's career, when it was necessary to increase their trade to the utmost, they had no extra working capital available; the £100,000 provided having been expended in fixed assets to the amount of £80,000, and in increased stock to the extent of £20,000. This expenditure had no doubt added to the stability of the property. But it should be mentioned that, though the agreements for the purchase of the Kern burner patents were entered into by the Welsbach Company after the date of incorporation, the arrangements for acquiring the inventions had already been completed by their predecessors, and were referred to in the prospectus. Under such circumstances, the shareholders must see that it was highly desirable in the interests of the business that the powers sought should be granted. The Company probably never had a better chance of securing an extended trade than they had now. The figures showing the increase in the number of burners sold in the four months during which the reduced prices had been in force plainly indicated that the popular demand for the Welsbach light, now that it had been brought within the reach of a larger number of users who formerly hesitated on account of its initial cost, would spread still further, and take the Company a long way on towards the commercial footing which it had been so long desired it should obtain. Shareholders would assume enormous responsibility if they declined to place working capital at the disposal of the Board to push the business forward. It was perhaps fair to the shareholders themselves that they should plainly understand that, although the increase in business was of a distinctly encouraging nature, the reduction made in the prices of the burners and mantles was so sweeping that the business must be increased still further before they could hope to derive the same income that was yielded at the old prices. The reason why shareholders should vote for the resolution now before them was plain, and might be said to be one of necessity, if they were desirous of getting the fullest benefits of the increased popularity secured by the bold policy of reduced prices. The Directors might have temporized, and not called the shareholders together to alter the Articles at the present time. They felt, however, it was only right the shareholders should be placed in possession of the facts without delay, and that the powers sought should be obtained immediately, so as to place the Company in a strong position to protect their business and effectually meet competition of every kind. In fixing the maximum amount of the powers sought at £250,000, regard was had to the possibility that some day or other in the future, the unsecured debentures given to the Sunlight Company in payment for their business might be paid off. If this were done, there would remain a maximum sum of £140,000 available for the development of the business. The Board intended, however, to raise such sums from time to time as might be actually necessary for the requirements of the Company. Should an issue of debentures be decided upon, it was the full intention of the Board to provide for their redemption. The Board did not regard this maximum sum as extravagant. They were of opinion, so far as they could estimate for the future, that at present it would be ample for the requirements of the business, and place it in a position of financial and trading security. It was, however, of course, clear that the discretion of the Board would be in no wise limited should it be found necessary to exercise, for the general purposes of the Company's increasing business, the whole of the powers that would be conferred by the amended Articles. He moved the adoption of the resolution.

Mr. JAMES HEAD seconded the motion.

A little information having been sought and given on one of the minor clauses of the resolution, it was put to the meeting, when 87 voted for it, and 41 against. The requisite majority in favour not having been obtained, a poll was demanded, and was immediately proceeded with—the Chairman stating that the result would be announced at the offices of the Company on Saturday.

This was done; the votes for the resolution (representing nearly two

millions of stock) being 393,232, and against (representing £11,000) 2158. The figures show that there is a very decided opinion on the part of a very large proportion of the shareholders in favour of the proposal to grant the Directors facilities for borrowing. The sanction of the preference stockholders to the scheme has still to be obtained at the adjourned meeting to-morrow. The best way for the shareholders to look after their interests is to attend, when the Board, who have pursued a straightforward course in the matter by facing the shareholders with the position at the earliest possible moment, can be asked for explanations in support of their policy.

#### GAS-WORKS EXTENSIONS AND THE COLLIERY QUESTION AT BRADFORD.

Last Thursday, a Special Meeting of the Bradford City Council was held to consider the provisions of the Bill which the Council are going to promote in the ensuing session of Parliament. The Gas Committee asked for powers to extend the Birkshall and Valley Road Gas-Works; to enable the Corporation to manufacture and store gas on lands belonging to them, and on which they are not now authorized to manufacture and store gas; and to borrow £150,000 for carrying out these extensions and other works in connection with the gas undertaking. The Committee's recommendation was approved. Another item on the agenda paper was the resolution passed by the Council on the 9th inst., that powers be sought to acquire and work a colliery or collieries for supplying the coal required by the Corporation for use in their various undertakings. Mr. Johnson inquired if the Council could get the Bill through Parliament with such a clause in. The Mayor (Mr. W. C. Lupton) said he was informed that the addition of the clause to the Bill would imperil the promoters' chances of success with regard to other clauses. In the present state of feeling, it was not at all likely that the clause would be passed; and it was felt, on the other hand, that its retention might have a tendency to prejudice the Bill in other respects. He did not express any opinion on the resolution; he was simply giving information which he had received. Mr. Williamson moved that the clause be omitted from the Bill; and the amendment was seconded by Mr. T. L. Atkinson. Mr. E. R. Hartley submitted that notice of motion would have to be given before the resolution could be rescinded. The Mayor agreed; and it was understood that the required notice would be given before the next Council meeting.

Commenting on the proposals in the Bill, a Bradford contemporary says: "On the whole, the Council are pledged to a very formidable Bill; but a good many will think it a pity if the Council do not press a clause as to a municipal colliery. *Prima facie*, it is a 'big order'; but some corporation has to be first in these matters. From the owning of the means of gas production to the owning of the coal is not a long step; and some intelligent persistence on the part of Counsel might work wonders."

#### LAUNCESTON CORPORATION AND THE GAS COMPANY.

##### The Breaking Up of the Streets.

Considerable discussion took place at the meeting of the Launceston Town Council yesterday week with reference to the new contract with the Gas Company respecting the lighting of the public lamps. It had been decided at the previous meeting to accept the terms of the Company, to light the lamps for one year at an additional cost of 5s. per lamp; but the Council decided that in future the Company should be required to give the Surveyor notice of their intention to break up roads, and that the Surveyor should do the work of opening and restoring the roads at the expense of the Company. The Company now wrote that this condition could not be carried out without extreme inconvenience, and even danger in the case of the breaking of pipes or sudden escape of gas; and the Directors could not possibly accept the arbitrary terms proposed to be attached to the contract. They added that the terms proposed by the Company were most liberal, and they failed to see why so much animus should be shown by the Council. The Company had only continued to light the streets in order that the town might not be inconvenienced; and it was now necessary to have a prompt and definite acceptance or refusal of the Company's terms. The Mayor (Mr. J. Treleaven), who is the Manager of the Gas Company, vacated the chair during the discussion of the subject.

Mr. TROOP suggested that if the Company could not accept the terms of the Council, tenders should be obtained for lighting the streets with oil for the present winter.

Mr. STEPHENS was opposed to their going back to oil lighting, but thought they might adopt the electric light. He was strongly of opinion that the Council should not alter their terms; for they were not only within their right in requiring that the Surveyor should alone interfere with the streets, but it was to the advantage of the Company.

Mr. SYMONS denied that there was anything arbitrary in the terms of the Council, and said he was astonished that the Company had not accepted them.

Mr. SHUKER said the Manager of the Company accepted the terms, and the Company ought to have felt bound by his action.

The SURVEYOR, in answer to questions, said he thought there was force enough in the River Kenney, or in their water supply, to generate sufficient electricity to light the town. Or they might adopt incandescent oil lighting, which was in use in Ripon and was to be adopted by two or three other Yorkshire towns.

It was finally decided to adhere to the terms offered to the Gas Company. The Surveyor was instructed to make inquiries as to the cost of electric lighting, and also as to the system of lighting in use at Ripon. In the event of the town being left in darkness by the discontinuance of the lighting of the lamps, the Deputy-Mayor was instructed to call a meeting of the inhabitants to discuss the matter with them.

The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the half year ending the 30th of June, free of tax.



## ELECTRIC LIGHTING NOTES.

In their electric lighting undertaking, the Heywood Town Council are providing for 4000 lights of 8-candle power; and they have already received applications for 2700 lights.

In preference to extending the present electricity works at Powick, the Worcester City Council have determined to acquire an extensive site, at a cost of £4450, for a supplemental station—principally for generating current for the tramways.

The Skipton District Council, having decided to apply for powers to enable them to lay down plant and supply electricity, recently sent out circulars to the larger consumers of gas; and the replies show that 93 consumers are prepared to use the electric light, 95 have refused to adopt it, and 95 have not answered.

A scheme for the supply of electric light and energy, conjointly with a tramway service, for a large area embracing Castleford, Featherstone, Pontefract, and Knottingley, is being promoted by the United Kingdom Tramway, Light Railway, and Electrical Syndicate, of Westminster, whose head is Major Tulloch, C.B., late Chief Engineering Inspector to the Local Government Board.

Says the "Coventry Herald": The well-to-do residents of the city do not favour the electric light as numerous as might be expected. Some of the sub-stations in the wealthy parts of the city have few customers. On the other hand, there have been considerable developments among the poorer class of property, where it was least expected. The number of customers is now 301, against 159 about a year ago; but the light must be taken much more freely than it has been if it is not to continue a burden upon the rates.

The Town Clerk of Limerick has received a letter from the Local Government Board in reply to the application of the Corporation for a loan of £22,000 to carry out a scheme of electric lighting for the city. The letter states that, having carefully considered all the circumstances, especially the high rating in the borough, and the present unsatisfactory condition of the Corporation finances, the Board are of opinion that a sufficiently strong case has not been established to warrant them in giving their sanction to the loan at present; but the matter may be revived if the position of the Corporation as owners of the gas-works be again threatened.

Considerable inconvenience was caused at Hull last Saturday week by the failure of the electric light over a considerable area in the busiest part of the city. In some of the large shops not provided with a gas supply business was practically suspended until nearly ten o'clock; and considering that Saturday night is the busiest one in the week, the tradesmen must have suffered a serious loss. All they had for illumination was a candle or two upon the counter. Their windows were dark, and this darkened the streets. At several hotels, and at the Constitutional Club, candles had to be used as the only means of obtaining light. The cause of the failure was a short circuit, and not a breakdown of the dynamos as was generally supposed.

The Eccles Corporation originally obtained the permission of the Local Government Board to borrow £12,114 for their electric lighting undertaking; and they have overspent that sum by £5308. Application to the Board for sanction to borrow this further amount resulted in an inquiry by Colonel J. T. Marsh last Thursday. It was stated by the Town Clerk that practically the whole of the money over expended was for extensions; but he was promptly told by Colonel Marsh that the proper time to have applied to the Board for the money was when the extensions were taken in hand. It was also mentioned by the Town Clerk that the loss for the first year, including repayment of principal and interest, was £789. There was no opposition.

During the third year of the working of the Harrogate Corporation electric lighting undertaking 365,404 units of electricity have been sold, as against 201,363 in the second; bringing in a total revenue of £8400—an increase of £1732. The net profit for the year, after the payment of all charges, is £777. The previous year showed a deficit of £729, which has now been discharged. At the last meeting of the Council, the Town Clerk was instructed to apply to the Local Government Board for sanction to a further loan of £10,000 for a new boiler-house and generating plant equal to the supply of 10,000 additional lamps. Another trunk main from the works to the town has also been arranged for. This immediate extension, however, forms only a portion of what is contemplated. The remainder of the projected works will probably involve the outlay of about £40,000.

In a report presented at the meeting of the Newport County Council yesterday week, the Electricity Committee stated that £91,235 had been expended upon the electric light undertaking, of which £80,315 had been sanctioned, and that an additional sum of £30,000 would be required to cover the cost of further extensions and mains and transformers, and for the proposed changing over to the 250-volt system. In reply to Mr. Wilkinson, the Chairman of the Committee (Mr. G. H. Llewellyn) said he hoped the Council would be called upon to go on spending further sums, in order to secure to Newport the great advantages likely to arise from the electrical installation. Mr. Wilkinson thought it was not spending money, but "chucking" it away. At a subsequent stage, Alderman Parnall proposed that application be made to borrow the £30,000 needed, and this was agreed to; the Town Clerk explaining that £10,000 had been already expended.

The Bishop of Rochester had an unusual experience in St. James's Church, Bermondsey, on Monday evening last week. The church has been in the hands of the decorators for some time, and during the period it was closed the electric light was installed. At the re-opening service, the church, which accommodates 1500 worshippers, was crowded, and the Bishop had nearly reached the close of an impressive sermon when the electric light went out, leaving the congregation in darkness, save for a gas-jet or two at either end of the building. Dr. Talbot paused in his discourse to say that it would not hurt his hearers to be in the dark; and he then continued his sermon, the delivery of which was interrupted by the exit of a good many worshippers. It appears that the failure was not due to any defect in the installation at the church, as other buildings in the neighbourhood were similarly affected.

Free-wiring is the rage just now among the electricity committees of local authorities. For some time a week has not passed without our having seen that this or that electricity committee have been considering the question. In nearly all cases, we read that the initial cost of wiring

is a great hindrance to people introducing the electric light; and this gives the impression that, in such cases, new business is not coming in so fast as the committees would like to see, and hope for better things is found in free-wiring. But why call it "free" wiring, when, as a rule, the householder whose premises are so fitted is charged an extra penny per unit for the electricity used? There would be just as much sense in prefixing the word "free" to the fittings supplied under the prepayment gas-meter system. But, of course, it is a catch phrase, and intended to delude. The Cardiff Corporation Electricity Committee are among the latest to adopt the system. They consider the present time, when the price of gas is "high," opportune for striking out into this new branch; and no doubt they expect big results therefrom.

At last Tuesday's meeting of the London County Council, the Highways Committee reported on the result of the question of the alteration from 100 volts to 200 volts of the standard pressure given by the City of London Electric Lighting Company with respect to their Southwark Electric Lighting Order, 1891. The Council gave their permission subject to twelve conditions; but the Company were unwilling to accept them, and appealed to the Board of Trade. After holding an inquiry, the Board issued their award, in which only the first of the conditions was allowed. This was, shortly, that any necessary alterations to the wiring or fittings on a consumer's premises, and the repair of any damage incidental to such alterations, should be carried out by the Company at their own cost; and provision was made for reference to arbitration in case of dispute between the Company and a consumer. Our readers may remember that in April last the Magistrate at the Southwark Police Court dismissed six summonses taken out by the Council against the London Electric Supply Corporation for not maintaining a constant supply of electric energy. (See "JOURNAL" for May 1, p. 1135.) The Magistrate stated a case; but the Company had said it was very improbable that there would be any failure in the future, and had asked that further proceedings might be abandoned. The Highways Committee recommended this course; and it was agreed to.

Last Thursday, the first stone of the electricity and refuse destruction works which are in course of erection by the Hackney Vestry at Clapton was laid by Mr. W. H. Dickinson, Chairman of the London County Council. The site consists of five acres of land; and there is ample room for extensions. The mains are now being laid in the principal thoroughfares of Hackney. For public street lighting, 320 arc lamps will be erected on pillars 21 feet above the ground and from 50 to 60 yards apart. The refuse destructor will consist of 12 furnace cells capable of burning a maximum of 150 tons of refuse per 24 hours. Mr. G. A. Ogan, the Chairman of the Electric Lighting Committee, and Mr. Robert Hammond, the Consulting Engineer to the Vestry, having briefly addressed the gathering, Mr. Dickinson said he understood the question of electric lighting had been a subject of controversy in Hackney since 1893, and at one time there was a danger of the Provisional Order being handed over to a trading company. He was glad the privilege the Vestry had obtained had been kept for the benefit of the ratepayers. The cost of the present undertaking would be £250,000; and it was contemplated to supply the light at 4d. per unit for private houses, 3d. per unit for public lighting, and 2d. per unit for power. After four years' working, it was estimated that the electric lighting and the dust destructor would, combined, bring to the parish a profit of £18,000 a year. This meant 4d. in the pound off the rates in the district. He had gone carefully into the figures, and saw no reason to doubt their accuracy. If the ratepayers looked upon the concern as a co-operative enterprise, in which they were the shareholders and consumers and the new Council its board of directors, there was nothing to prevent its absolute success.

Our readers may remember that the Marylebone Electric Supply Company introduced a Bill last session to obtain power to supply electricity within the area of the Marylebone Vestry, in competition with the Metropolitan Electric Supply Company, who had previously been furnishing current in the district. The Bill was thrown out owing to the opposition of the Vestry, who had for some time been negotiating with the Metropolitan Company for the purchase of the portion of their undertaking within the Vestry's area. The negotiations terminated in August; and a provisional agreement was entered into by which the Company agreed to sell the part of the undertaking in question, including the two generating stations at Manchester Square and Rathbone Place, together with all the mains, &c., and the equivalent of some 300,000 8-candle power lamps connected thereto. The purchase-money was to be paid in 5½ per cent. bonds; the actual amount, at the market value of the bonds, being about £913,000. The agreement further stipulated that nothing was to prevent the Vestry from erecting and working other generating stations; but that in the event of their desiring, before such stations could be erected, to purchase current, it must be obtained from the Metropolitan Company only. According to the bye-laws of the Vestry, no agreement can become operative until after the minutes of the meeting at which it was passed have been read and confirmed. Since August, considerable opposition to the scheme has been manifested to the course the Vestry had taken; and at a special meeting of that body held last Tuesday, the subject was again considered on a motion by Mr. E. White that the minutes in regard thereto should not be confirmed. After a discussion lasting more than three hours, the motion was carried by 31 votes to 26; a subsequent division producing the same result. The provisional agreement consequently falls to the ground. The Vestry have now given notice of their intention to apply for a Provisional Order to establish a supply of their own.

It is human nature to feel a little gratification, when in a passing difficulty, to know that someone else is in the same boat; and it is easy to picture a smile of satisfaction on the faces of most readers to find another illustration this week of the effect that the price of coal is having on our electric competitor. The Lighting and Electricity Committee of the Croydon County Council have been considering the price charged for arc lighting. At the present time there are 135 arc lamps of various kinds and sizes in the borough, the average charge for which is £18 per lamp. When the charge for these lamps was fixed, it was based on the then price of coal, and practically at cost price. At the present price of coal, the Committee reported at the last meeting of the Council, the arc lighting is being produced at a loss. The Committee therefore recommended the Council to sanction an average price of £21 per arc lamp being charged to the expiration of the coal contract on June 30 next. Another recommendation will give satisfaction; and it was that an addi-



tional fifty street-lamps in the district should be fitted with incandescent gas-lights. Alderman Miller, who moved the adoption of the report, seemed to regard with contempt such an increase as £3 per lamp, and referred to it as a very small matter. Perhaps Alderman Miller is an exceptionally wealthy man, to whom a few hundreds extra expenditure per year is a "small matter." If so, he is not the most economical administrator for the ratepayers of Croydon. But to proceed. Following Alderman Miller, Alderman Taylor hoped the Committee would see their way to give a better light than they had done for weeks past. Then Alderman Foss pointed out that the "small matter" was an increase of 13 per cent. [Should it not be about 16½ per cent. ?] And he did not think any of the members would like to be called upon to pay an increase of 13 per cent. on their rating, or 13 per cent. interest. In his reply, Alderman Miller made the admission that, even with the increase, the charge would only be cost price, and up to last year it was less than cost price.

A report has just been issued by the Lighting Committee of the Leeds City Council, giving a review of the work done during the year ended the 25th of March last. It is pointed out that, the period under review being the first complete year of the Corporation's ownership of the electric light undertaking, materials are not available for a tabulated comparison of results with those of previous years; but it is shown that the business has undergone considerable expansion since its acquisition by the Corporation. The number of consumers and the lamps, &c., installed, expressed in the equivalent of 35-watt (8-candle power) lamps, were respectively as follows: On March 25, 1899, the number of consumers was 980; on March 25, 1900, it was 1393—increase, 413 (42·1 per cent.). Lamps installed on March 25, 1899, 78,380; on March 25, 1900, 106,263—increase, 27,883 (35·5 per cent.). The units sold were 2,005,840; the revenue from this source, after provision for discounts and bad debts, being £34,156—an average price of 4·09d. per unit. The average consumption of current per 35-watt lamp was 21 units; yielding a revenue of 7s. 1·8d. per lamp. The capacity of the works had been increased during the year by the addition of a combined engine and alternator of 640 kilowatts (1000 indicated horse power) with the necessary boilers, pipes, &c., bringing the total capacity up to 3040 kilowatts (5300 indicated horse power); and two similar sets remained on order at the close of the year. A report had been obtained from Messrs. Hopkinson and Talbot, the Consulting Engineers; and, in accordance with their advice, it had been decided that in future extensions of plant the two-phase alternating system should be adopted. The capital expenditure during the year was £75,006; and the total capital outlay to March 25 was £307,520, including £217,420 paid to the Yorkshire House-to-House Electricity Company, Limited, as purchase-money for the undertaking as on Aug. 31, 1898. The total receipts on revenue account were £36,220; and the working expenses, £9929 (1·19d. per unit sold)—leaving a gross profit of £26,291. After deducting interest (£12,473) and sinking-fund charges (£5316), a net profit remained of £8502. The total surplus on the 25th of March was: On capital suspense account, £3785; on revenue account, £8502—a total of £12,287. Of this amount, £4000 had since been applied in relief of the rates. The working expenses per unit sold are the lowest recorded in the history of the undertaking for a complete year.

It was scarcely to be expected that the figures quoted in the "JOURNAL" last week from the "Surrey Comet," in regard to the financial results of the electric light undertaking of the Kingston Corporation, would be allowed to pass unnoticed by some supporter of the scheme; and consequently Mr. G. Eaton Hart has come forward to disprove the assertions of Mr. Bolton, the previous correspondent. Mr. Hart explains that it has been the custom for the borough accounts to run up to the end of March; and until this year the Electrical Engineer's accounts have been made up to the previous December. The result has been that while the former accounts take in all the expenditure, they only show the actual cash received—not reckoning the large sums owing by consumers for current during the three months from December to March, amounting to between £1000 and £2000. As to depreciation, Mr. Hart asks Mr. Bolton if he has not overlooked the fact that the Corporation, like other municipal bodies, return the whole of the capital, with interest, within 25 years. Is it reasonable, he asks, to expect that they should establish a business necessitating a large capital outlay, pay interest on the borrowed money, pay profits, allow depreciation which would practically purchase the whole plant in 16 years, and then repay the capital outlay? Moreover, is not the goodwill of any value? Mr. Hart gives the following figures as furnishing a correct statement of the accounts of the electricity supply works up to March last:—

Revenue Account.				
Dec.	Receipts.	Expenditure.	Deficit.	
1895 . . . . .	£2441 19 3	£3824 9 1	£1382 9 10	
1896 . . . . .	3012 19 1	4339 4 8	1326 5 7	
1897 . . . . .	3929 0 6	4722 19 4	791 18 10	
1898 . . . . .	4700 18 10	5812 19 7	1112 0 9	
Jan. 1, 1899, to March, 1900 . . . . .	7511 18 9	7559 17 8	47 18 11	
Total deficit . . . . .			£4,660 13 11	
Capital Account.				
The total spent on buildings up to March, 1900, was . . . . .			£7,975 16 4	
On electrical and other plant . . . . .			40,484 8 11	
Total outlay . . . . .			£48,460 5 3	
Less repaid . . . . .			4,713 4 11	
Balance . . . . .			£43,757 0 4	

Mr. Hart says these figures show that, after providing for interest and the repayment of the loans (included in the expenditure), the actual loss on the undertaking for the 15 months ending in March was only about £47. He advises the burgesses to possess their souls in patience, as there is going to be "a great boom" in electricity supply at Kingston within a very short time. It is to be hoped that they may not be eventually disappointed.

Colonel Sadler, M.P., is to be entertained at a banquet early in December, in celebration of his victory at Middlesbrough, and of his being the first Conservative or Unionist representative returned since the enfranchisement of the town.

## GROWTH OF LIVERPOOL'S WATER CONSUMPTION.

Responding to a vote of thanks for his services during the past year, Alderman W. J. Burgess last Tuesday gave his colleagues on the Liverpool Corporation Water Committee an interesting account of the manner in which the demand for water is advancing in the city. He said the past twelve months had been marked by steady progress in the consumption. The new tenants within the compulsory limits had been 3544; and it was estimated that they had supplied an additional population of about 11,000. The total number of water tenants in Liverpool and the suburbs was now 171,392; and the population supplied was estimated at 833,000. The department had distributed during the year 10,084,579,000 gallons, which was an increase of 520,065,000 gallons over the quantity supplied in the previous year, and represented a daily average of above 27½ million gallons. He was glad to say that the supply for trade and manufacturing purposes and for shipping showed a large increase—a circumstance which was, of course, indicative of the progress and prosperity of the city and port. There had been an increase of 63,260,000 gallons for trade purposes, and of 21,236,400 gallons in the quantity supplied to shipping. The amount of water sold in bulk by meter along the lines of the Rivington and Vyrnwy aqueducts was 475,045,000 gallons, or 28,075,000 gallons more than in the previous year. They had laid down in and around the city about ten miles of new mains during the twelve months. The chemical and bacteriological analyses, which had as usual been regularly made, had given highly satisfactory results, showing that the high standard of purity attained by the Liverpool water was fully upheld. They were deeply impressed with the importance of protecting the purity of the sources of supply, and had recently purchased land on their watershed at Rivington principally for that purpose. To make the supply thoroughly effective, various new works had been entered upon. Considerable progress had been already made with the tunnel connecting the Cowny watershed with Lake Vyrnwy, and new filter-beds were in the course of construction at Oswestry and Chorley. A very important extension decided upon during the year was the construction of a new reservoir at Prescot, capable of storing 100 million gallons of water. A tender for this work would be recommended for acceptance, and, he hoped, sanctioned, at the next meeting of the Council. He reminded them that such a reservoir was contemplated originally as part of the Vyrnwy scheme; and in view of the increased and increasing demand for water, its construction had now become an imperative necessity. During the year the negotiations with the District Council of Wallasey had been brought to a successful issue—an agreement to supply water from the Vyrnwy aqueduct having been signed; and the laying of pipes to Wallasey would be commenced as soon as the consent of the Local Government Board was obtained. He was sure he was only expressing the feeling of every member of the Committee in acknowledging the efficient manner in which the work of the department has been performed by the Engineer and by every member of his staff; and in this connection it was only right that special mention should be made of the most interesting historical and engineering description of the works contained in the recently published report of the Engineer. The rapid increase in the consumption of water indicated clearly that the construction of a second line of pipes from Vyrnwy could not safely be postponed very much longer; and while the Committee would, of course, be wishful not to enter upon the large expenditure which that work would involve before it was really necessary, he was sure that, when fully convinced of the necessity for undertaking the work, there would be no hesitation in fulfilling to the utmost the obligation which rested upon them to secure for those who relied upon the Liverpool water undertaking that ample and sufficient supply which was so desirable and necessary for the health of the population.

## FALMOUTH CORPORATION AND THE WATER-WORKS.

### Rejection of the Purchase Scheme.

In accordance with the decision of the Town Council (*ante*, p. 970), a meeting of the ratepayers of Falmouth was held yesterday week, to consider the expediency of promoting a Bill in Parliament for the purchase of the undertaking of the Falmouth Water Company. So large was the attendance, that it was necessary to adjourn the meeting from the Town Hall to the Drill Hall.

The Mayor (Mr. F. J. Bowles), who presided, proposed a resolution in favour of promoting the Bill. He expressed the opinion that the dissatisfaction which existed with regard to the water supply hindered the growth of the town as a health resort. Since the subject last came before the ratepayers a year ago, the Corporation had obtained the information which was then lacking; and it was now before them. They had approached the Company with a view to purchase by agreement, but had not met with much encouragement. They had pressed the Company to carry out improvements; and although some had been attempted, the best advice the Corporation could obtain showed that what had been done was insufficient in quantity and inefficient in quality. The filter-beds were condemned by every engineer who had seen them. The complaints with reference to the gathering-ground, the high-level service, and the treatment of the water after filtration had not been remedied; the supply generally continued intermittent; and the water was very dirty. He did not put the blame altogether on the Company, whose income was insufficient to carry out the improvements. An expenditure was necessary from which there could be no immediate return, besides which the Company did not possess the power to safeguard the sources of supply. They were advised that Parliament would probably grant them power to acquire the works; and there was some hope that the Company would, if they proceeded, be not unwilling to part with an undertaking which had no prospect of ultimate success. Mr. Phillips advised them that there would be little difficulty in obtaining powers to collect the same gross revenue as the Company now received; so that there would not be the loss they had been led to anticipate through the water-rate being charged on the net instead of the gross rateable value. The cost of acquiring the works, and carrying out the improvements and extensions which were absolutely and immediately necessary, was estimated at £74,500. In several recent cases, 60 years was allowed by Parliament



for the repayment of money raised for water-works purposes; but if they took the period at 50 years, and the interest at 3 per cent., the annual sum required would be £2880. The net revenue from the water-works last year was £2376, so that £500 would have to be raised from the rates; and on the present assessment, a rate of 3½d. in the pound would cover it. If 60 years were allowed, the annual cost would be less; but in any case a rate of 4d. to 5d. should cover every contingency. Was it worth while paying this sum for the increased benefit of the town? They must bear in mind that, once purchased, the property would become of increasing value, and ultimately would be a splendid asset to the town.

Alderman BANKS seconded the resolution; and said that, while there was no justification for the suspicions aroused as to the water supply, the reputation of the town must be above suspicion. There was quite enough sense in the town to manage the water-works; while a loss to the town as a health and holiday resort would be a great deal more than the amount which would have to be paid out of the rates towards the purchase of the undertaking.

Mr. R. N. ROGERS contended that the sewage scheme was of more importance than the water supply. If the latter was not satisfactory, the Corporation should insist upon the Company improving it.

Mr. H. L. OWEN twitted members of the Corporation who talked of having an "open mind" with sitting on the fence.

Mr. J. W. BUCKLEY was of opinion that it would be to their advantage to have the water supply under the control of the Town Council.

Mr. W. P. DUNNING said samples of the water had been analyzed and not condemned. The only fault was that it contained a little peaty matter, and was discoloured.

Mr. R. FOX said that, although the condition of the water-works was far from ideal, a lot had been done towards improvement. The Council must do their utmost to induce the Company to effect further improvements. A great deal depended on the renewal of the pipes; and pressure must be put on the sanitary authorities to make sure that the gathering-ground was not subject to pollution.

On a vote being taken, a large majority was found to be against the scheme. A poll was demanded.

### THE WATER SUPPLY OF NEW YORK.

The needs of New York, as regards water, and the best methods of meeting them, have been the subject of a thorough investigation by the Merchants' Association of the city. The "Engineering Record" states, as evidence of the importance of the inquiry, that it was conducted by a General Committee of 33 men well representing the engineering, legal, and commercial interests. This Committee was sub-divided into an Executive Committee of nine (including Messrs. Thomas C. Clarke, D. Le Roy Dresser, Rudolph Hering, and Edward P. North) and four Special Sub-Committees. The Engineering Committee included the above-named gentlemen. There was also a Committee on Municipal Finance and Public Policy, who worked with the Comptroller (the Hon. B. S. Coler) and his staff in obtaining a record of the financial history of the city water-works; a Legislation Committee, who furnished a report of particular interest with regard to inter-state rights to water; and a Fire Protection and Insurance Committee. We learn from our American contemporary that in many respects the most important fact decided by the report of the General Committee is the inexpediency of attempting to develop for New York the supplies of the Housatonic and Ten Mile Rivers Basins, which would unquestionably yield an abundant amount of water of excellent quality if the boundaries staked out by man conformed with those of Nature. Unfortunately, however, this is not the case; and the legal uncertainties will force New York to pay several times as much for its water in consequence, even if the least expensive of the projects is adopted. There is absolutely no question as to the necessity of taking steps at once to obtain a new supply. Mr. Freeman discussed the subject very thoroughly in his report already noticed; and the Engineering Committee, in the latest investigation, reach practically the same result—that is to say, the supply in Manhattan and the Bronx will be exhausted by the consumption in 1903 if some means of checking waste are not introduced, while if an attempt is made to prevent waste the present supply may be rendered sufficient for the demands up to 1910. The latter date is a little farther off than Mr. Freeman's limit.

There being thus no question of the need of immediately building new works, our contemporary says it is interesting to notice the substantial agreement between the Engineering Committee and Mr. Freeman with regard to the source to be used for this additional supply. Mr. Freeman was an advocate, first, of the Housatonic and Ten Mile Rivers supply; but, this being thrown out on legal grounds, his apparent second choice would be the Hudson River—the source recommended by the Committee. The plan advocated by the latter is the construction of pumping-stations and filter-beds on the east side of the river, and an aqueduct to the northern limits of the city, where a new reservoir is to be built; or the construction of a great aqueduct to the city from the North Hudson near Hadley. It is proposed, in the case of the first project, to make the original installation of 100 million gallons daily capacity, but capable of extensions to any necessary amount. In order to prevent the river above Poughkeepsie from becoming brackish from the tide, because of the withdrawal of large amounts of fresh water, it is proposed to build compensating reservoirs in the Adirondacks, in which flood waters may be stored for delivery into the river during the dry season. Such reservoirs have frequently been recommended for the improvement of navigation, the prevention of floods, and the regulation of flow for power purposes. A supply of 250 million gallons daily of filtered water can be delivered in this manner at the city line, at the level of Jerome Park reservoir, at a cost of \$28.33 per million gallons. The cost of an equal supply from the Adirondacks will be \$30.

Having thus established the need for new works, and the possibility of obtaining a supply at a very low cost, it is interesting to notice that up to the present time the New York Water-Works Department has yielded a handsome revenue, and it can well afford to incur heavy expenses for new plant. From 1832, when the city began to develop the Croton watershed, down to 1884, the total expense for construction was \$37,382,521; while the profit on working was \$3,060,938. From 1884, when a new

supply was found necessary, to the close of 1889, when the new aqueduct was finished, a sum of \$24,571,264 was spent on construction. The profit—that is, the difference between the revenue and the total expense for maintenance, interest, &c., during this time was \$4,510,543. The third period, beginning in 1890, when the water was first delivered through the new aqueduct, and ending in 1898, the latest date at which statistics are available, showed a total expense for construction of \$24,405,776, and a profit of \$13,901,602. In other words, during this term of 67 years, the city of New York made a capital investment of \$86,359,562 for the construction of its water-works. It expended during that period for interest charges, maintenance, and operation, \$66,544,245; the aggregate earnings were \$88,017,329; and the total net profits were \$21,473,084. The maximum cost of water per million gallons, obtained by dividing the total annual charge by the quantity delivered, was \$54.20 in 1849; while from 1866 to 1898 inclusive it was \$35.06. The annual cost of distributing the water is not less than \$10 per million gallons at present; while the approximate cost at the city line is \$29.07. The average revenue since 1865 from the Croton system has been \$52.87 per million.

It is now possible to understand the utter foolishness of the proposed contract with the Ramapo Water Company. By the terms of that agreement, the Company were to build and maintain at their own expense works equal to deliver 200 million gallons of water daily at the city line under a head of 300 feet. The Municipality were to pay \$70 per million gallons for the water; the first delivery to begin in 1902, and the supply to continue for 40 years. At the end of that time, the works were to remain the property of the Company.

It is unnecessary to follow all the calculations in the report in analyzing the proposed contract. Figures vouched for by such a Committee as that which produced it may be accepted as correct. The method of the computation is the only correct one, in that it assumes that the works are first built for a capacity of 100 million gallons and are enlarged in 1911, 1914, and 1917 by 50 million gallons at each addition. An allowance of 3 per cent. has been made for interest, 4 per cent. for sinking fund, and suitable amounts for depreciation and operation. The payments to the Ramapo Company are assumed to be for the same quantity of water as is delivered under the municipal works. The conclusions drawn are as follows:—

1.—By 1937 the city would own its plant under the municipal system free from all debt, and would own nothing under the Ramapo system.

2.—Between 1906 and 1917 the city, under municipal ownership, would have an annual deficit beginning with about \$1,800,000 in 1906 and ending with about \$104,000 in 1917; but that thereafter, beginning in 1918, it would commence to make a profit which in that year would be about \$133,000, and would constantly increase year by year until 1945 (a date chosen because it is the termination of the proposed Ramapo contract), in which year it would be about \$3,100,000. The excess of this profit over the deficit in the 40 years of operation from 1906 to 1945 would be about \$48,000,000—a sum which represents the cash profit to the city during that period under municipal ownership.

3.—Under the proposed contract, the payment to the Ramapo Company of \$70 per million gallons, less the revenue from consumers at \$50.29 per million gallons, would result in a deficit to the city of more than \$60,000,000.

4.—If, therefore, the city should fail to build and operate its own water supply, and should make a contract with the Ramapo Company, it would suffer a loss of \$108,000,000 in the forty years of operation.

5.—But this sum of \$108,000,000 does not represent the total loss to the city, for it would own no plant under the Ramapo system, while under the municipal ownership plan it would have paid for its plant by 1937, and own it free of indebtedness thereafter. The total cash and property loss, therefore, would be \$145,000,000 on a system supplying only 250 million gallons daily.

6.—Furthermore, by 1920 another system, to meet the increasing needs of the city, and to supply an additional 250 million gallons daily, must be constructed. During the 25 years of the operation of this new system a further loss of at least \$50,000,000 to the city would result, compared with a contract with the Ramapo Company for such additional supply at the proposed price. This makes the total loss to the city during 40 years over \$195,000,000.

7.—The operation of increasing the supply from the Hudson every 15 or 20 years by an additional supply of 250 million gallons daily is a perfectly feasible plan, not only from an engineering, but most of all from a financial standpoint. The supplying of water to its citizens becomes an increasingly profitable enterprise; while, on the other hand, contracting with the Ramapo Company would probably result in giving that Company the monopoly of future additional supplies for the city.

The situation in which the city finds itself, in the matter of contracting with the Ramapo Water Company, is particularly interesting, owing to the manner in which the Legislature has granted extraordinary privileges to the Company, and curtailed those of the city in as remarkable a manner. The Company have full power to supply water to any municipality and public or private corporation, without the usual requirement for filing an amended certificate or obtaining the consent of local authorities. Such powers require special legislation, and are possessed in New York State by this Company only. There have also been given broad powers of condemnation, which make it practically impossible for anyone objecting to a line selected for an aqueduct to comply, within the time allowed, with the legal provisions for opposing the proceeding. As an additional safeguard to the Company, the expense of such opposition is very high.

In comparison with this showing of legislative favours to the Company, it is only necessary to refer to an Act cutting Brooklyn off from its natural source of supply for years to come, and another requiring it to pay enormous damages where fresh water has been appropriated which originally found its way into tide water. Even the Charter of the city had inserted in it a clause prohibiting the city from taking water from a supply devoted wholly or partly to the use of any other municipality. This was an entirely new idea in prohibitive legislation. This subject of legal restriction is the most important of all in its general influence on the citizens of the city. Fortunately for them, the legal advisers of the Merchants' Association state that legislation removing all these difficulties, and also the bugbear introduced by the constitutional limitation concerning the indebtedness of cities in the matter of water supply, ought







impossible to use it. What really troubled communities was the insisting on so high an illuminating power. Just now gas in Dundee must be of about 22-candle power, and there was a struggle to keep it at that; owing to the difficulty of getting cannel coal. Some places used carburetted water gas for enriching; but when he asked the Council some years ago to consider this matter he was told it was poisonous, although it was used in London, and he never heard of anyone being poisoned by it. In Belfast it was also largely employed. The position in Dundee was that the capital on the works was about £370,000; and by the time the reconstruction was carried out, it would probably be £500,000. Mechanical stoking was being adopted in Dundee; and the saving was expected to be about 2s. per ton of coal, which meant something like £6200 a year. But to bring about this method required £80,000; so that they needed to provide £4000 for interest and sinking fund, which would have to be deducted from the £6200. If the Council insisted in carrying out their present policy—putting aside out of revenue £4000 for extensions—this would make £8000 a year, or a loss of about £2000. There was not very much economy in this. His contention was that they were not called upon to put aside the £4000. If this generation were to pay for all the reconstruction out of revenue, it would be paying for futurity, which it should not do. As to how to cheapen the price of gas, he would adopt the incandescent method, which required heat to give light, and not gas with a high illuminating power. Fourteen-candle power gas would be sufficient. Then they would be able to use gas for cooking purposes at a great deal less cost than coal. The public incandescent lamps burned 3 cubic feet of gas per hour, while the others consumed 2 feet. But the illuminating power of the former was 80 candles, and of the latter 12 candles. Where would the hardship be, if the Council were to say that in May next they would reduce the quality of the gas to 15 or 16-candle power? This would give the consumers plenty time to get the new lights ready. Most of them would do it; but the others could maintain the present power by adding a third to the size of their present burners. This was where the relief was to come from. Mr. Brownlee's view, it will be seen, is much the same as is expressed in the special article to which I have referred. The underlying idea of both is that the Gas Commissioners should have regard for the present, and let futurity look after itself. This is not a wise policy; and if the Dundee Gas Commissioners adopt it, they will do a lasting injury to the cause of gas lighting in the city.

At a meeting of the Gas and Water Committee of the Dundee Town Council, on Thursday, a letter from the Dundee Trades Council was submitted, which asked that an investigation be made into the reason why gas is dearer in Dundee than it is in other towns. The Committee requested the Engineer and Manager (Mr. M'Crae) to bring up a report on the subject.

In Greenock there is more reason for complaint than there is in Dundee, because there has been a real, palpable deficit, which, to all appearances, might have been prevented. The situation was explained at a meeting of electors last night. Mr. Hugh Shearer said that the past year closed with a deficit of £2606, which was accounted for by the increase in the price of coal, the increased rate of wages, and sums

expended for the purchase of gas-meters and for main and service pipes. The increase of 5d. in the price of gas would be temporary, as to all appearance coal had reached its highest point. Treasurer Swan did not seek to defend anything that had been done; but, as Treasurer, he thought it his duty to submit one or two favourable features in connection with the department, pretty much because of the fact that it had got into what he might call disfavour. Referring to the indebtedness of the Trust, he mentioned that in 1874, when the Inchgreen works were started, the total indebtedness was £147,447; to-day the total indebtedness was £69,398. Something like £80,000 had been paid by the Trust during past years to the Police Board, to prevent the increase of taxation. The Trust had not only reduced by more than half its original indebtedness, but had handed over a larger sum than would have fully relieved it of all debt to the Police Board towards the reduction of general taxation. One other favourable feature was the fact that, notwithstanding what had been done, they had continued to reduce the price of gas. Regarding last year's unfortunate deficit, he thought one-half of it might be accounted for by extra meters and service-pipes. Treasurer Swan proceeded to explain how these items had been charged in a different manner from that of previous years; and he also mentioned that unfulfilled coal contracts had helped to create the deficiency. In reply to a question, Mr. Shearer said that the discrepancy in the late Collector's department had been found to be £609, and that he could not tell when the irregularities commenced. It is highly probable that not much more will be heard of this "regrettable incident" at Greenock; but a good deal will depend upon the extent to which the Police Board give their Manager a free hand in his working.

In connection with this subject, a Greenock ratepayer puts some questions to Messrs. Mitchell and Anderson, members of the Corporation, who seem to have agreed to give little or no information on the important question of the gas accounts. In the first place, he asks if it is true that the Committee who were appointed to inquire into the accounts, reported that more than £600 was lost to the town because the coal contracted for had not been delivered. And, further, did the Convener not receive a report from the officials, giving particulars of the amount of unfulfilled contracts, before he purchased the large quantity of coal he tried to get credit for? Again, what action did he take to compel the fulfilment of the contracts? Secondly, on the 18th of September, Mr. Mitchell moved that the correct position of the gas accounts "shall be disclosed." Since that date the Yellow Book has been issued, and in the ratepayer's opinion, the true state of the accounts is not disclosed. As proof, he refers Mr. Mitchell to the place where open accounts are put down at £2561; and included therein is more than £600 said to have been paid to the collector, and not placed to the credit of the town. He asks where this sum went, and if it is fair to charge to an open account money received. Plying his questions further, he asks if it is an honest system of keeping accounts to say that an item "shall be disclosed," and afterwards issue a printed statement signed by the Treasurer, the Auditor, the Convener of the Gas Committee, and the Provost, wherein a large sum is not so disclosed. Lastly, he inquires what steps have been taken to get the parties responsible to pay the sum still due.

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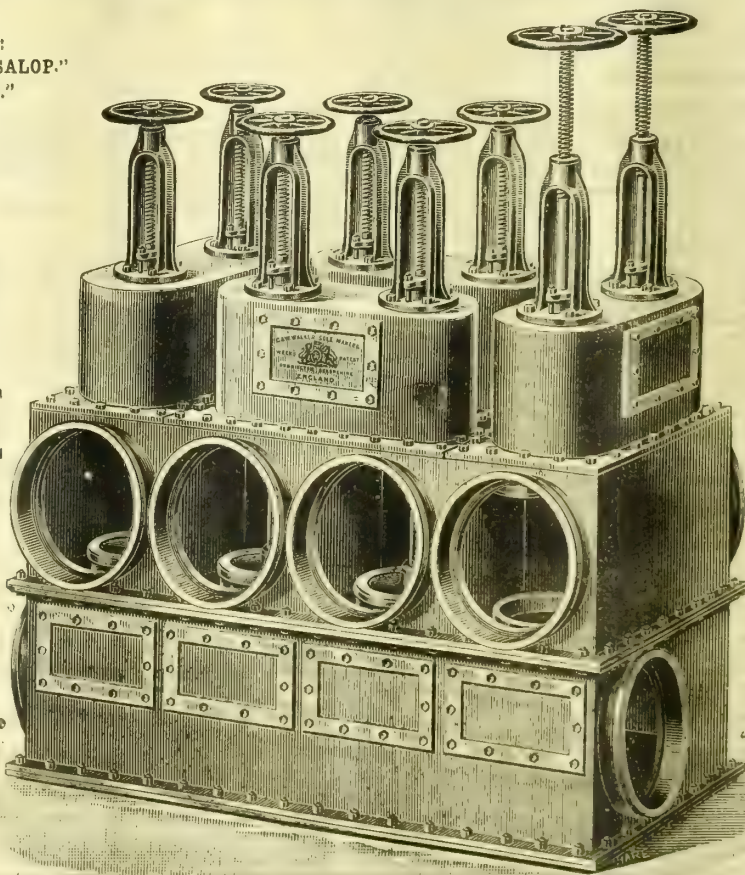
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Mr. R. Hamilton, Inspector of Lighting for the City of Glasgow, knows more about public lighting than any other man in Scotland. He is very favourable to lighting by incandescent gas—being in this respect unlike some who look upon the extra trouble of the system, as compared with ordinary gas lighting, as an insuperable obstacle to its adoption. At a meeting of the Town Council this week, a report by Mr. Hamilton was submitted, upon the lighting of Great Western Road. Dealing with the portion of the thoroughfare between Kelvin Bridge and Hyndland Road, he reported that the present annual cost for gas, labour, and repairs on account of 138 lamps is about £367; that to alter the lamps to the incandescent system would cost about £200, and the annual charge would be about £450; and that to light with electricity would cost £1050, and the annual charge would be about £900. The recommendation of the Watching and Lighting Committee was that part of the distance—from Hyndland Road to Horselethill Road—be lighted by incandescent gas-lamps as an experiment. In the Council meeting, Mr. Primrose explained that the Committee were adopting this experiment with a view to showing the relative values of electric lighting and incandescent gas lighting. The Committee felt perfectly satisfied from experience, that incandescent gas would play a very important part in the lighting of the city. The Council adopted the recommendation of the Committee.

At the Edinburgh Town Council this week, it was reported by the City Analyst (Dr. J. Falconer King) that the illuminating power of the gas supplied to the city from the Edinburgh works on the 9th inst. was 26·90 candles, and from the Leith works 21·70 candles. Mr. Balfour, who lives in a district which is served from the Leith works, asked what was the explanation of the low illuminating power of the gas made in Leith. Mr. Purves explained that in Leith the plant was very much worn out, and required to be pressed rather more than it should be. They were, however, using the best coal, and doing everything they could to keep up the quality of the gas made there. I daresay the Gas Commissioners are anxious not to expend more money upon the Leith works than they can help, because of their intention to close them as soon as the new works at Granton are ready for use. There is no plant in the Leith works for enriching; and therefore, unless dearer coal is used than in Edinburgh, the gas must be of lower illuminating power.

Cambuslang is a growing suburb of Glasgow. Its gas supply is in the hands of a limited liability Company, which is managed by Mr. Robert Simpson. So rapid has been the growth of the place, that the Gas Company have found it necessary to expend about £8000 upon extensions at the works—chiefly in laying down new plant which will make the undertaking capable of a yearly output of 80 million cubic feet, or double the capacity of a year ago. Among the extensions are a gasholder of 250,000 cubic feet capacity, and a new exhaustor to pass 28,000 cubic feet per hour.

**Accident to a Gasholder at Barking.**—Barking was deprived of a supply of gas for some time last Thursday evening owing to an accident to a holder at the gas-works. The holder became jammed and tilted, with the result that one side was torn, and the holder seriously damaged.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 20.

**Sulphate of Ammonia.**—The activity disclosed last week has been sustained; and not only has a good business again been transacted, both for prompt and forward delivery, but a further advance in values has been established. Quotations for prompt delivery are now about £10 15s. f.o.b. Leith, £10 13s. 9d. f.o.b. Hull, and £10 15s. to £10 17s. 6d. f.o.b. Liverpool. Some increase is quoted for delivery up to the end of the year; and, in this position, sales are reported to have been made in London at £10 17s. 6d., Beckton terms—quotations being now raised to £11. For delivery over the early months of next year, £11 to £11 2s. 6d. per ton f.o.b. at the ports, on ordinary terms, has been realized. The satisfactory feature in the situation remains that buyers have been willing to accord a premium for forward delivery; thus showing confidence in the future of the market.

**Nitrate of Soda** is firm on spot and dearer for shipment, owing to the combination being now regarded as a *fait accompli*. Spot quotations are 8s. 1½d. to 8s. 3d. per cwt. for ordinary, and 8s. 6d. for refined, quality. October-December shipment is quoted at about 8s. 9d.

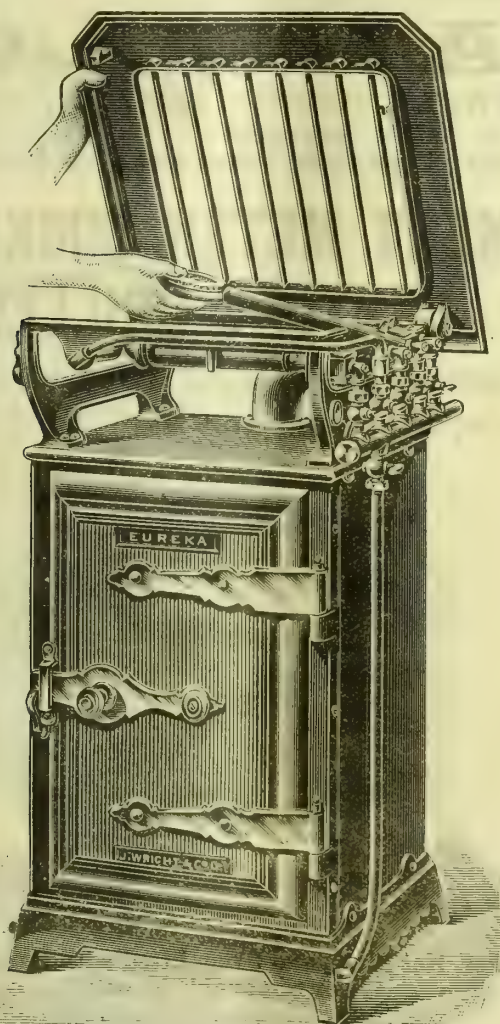
LONDON, Oct. 20.

**Tar Products.**—There is no improvement in this market; and although a fairly active business is being done as regards deliveries, prices generally have a drooping tendency—benzol being the exception, the surplus production of which is now being absorbed in other directions than aniline making. Curiously, 90's are stronger than 50's, which is a reversal of the conditions which have prevailed for some time. Carbolic acid is in a wavering state. Some English dealers will have it weaker. On the other hand, foreign buyers are disposed to pay more money. Most producers, however, are well contracted; and the present see-saw position of the article does not interest them much. Naphthalene is moving off readily; and there are more forward inquiries. Much lower prices are being paid for tar, while anthracene still continues neglected.

The average values during the week are: Tar, 14s. 6d. to 21s. 6d. Pitch, east coast, 36s.; west coast, 33s. Benzol, 90's, 10½d.; 50's, 1s. Toluol, 1s. 2½d. Solvent naphtha, 1s. 2d. Crude naphtha, 4½d. Heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 3d. Carbolic acid, 60's, 2s. 9d. Naphthalene, 75s.; Salts, 45s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** has taken a turn for the better. In all positions, higher prices are being asked. A large business is reported to have been done at £10 12s. 6d. per ton; but to-day's value may be taken at £10 15s., less 3½ per cent., with an advancing market.

In reference to the proposed purchase of the Newtown Gas-Works, the District Council last Friday passed a resolution that notice to treat be served at once on the Company.



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### COAL TRADE REPORTS.

#### From Our Own Correspondents.

**Lancashire Coal Trade.**—The position generally throughout the coal trade of this district remains without any very material change. All descriptions of round coal are still moving away steadily. The better qualities of engine fuel also meet with a fairly good demand; and there is still comparatively very little accumulating in stock at the Lancashire collieries. In some quarters, a strong inclination is expressed in favour of a further advance in prices at the earliest possible moment; but for the present at least this is not likely to receive sufficient support on the part of the leading collieries in the Manchester district, and unless they were prepared to act in co-operation with the West Lancashire Coal Sales Association it is scarcely likely that any independent move with regard to prices would be made. The position in some of the neighbouring large mining districts is also such as scarcely to favour any upward move in prices just now. Although Lancashire collieries have not much surplus output hanging on their hands, there are evidently fairly large quantities, both of round coal and engine fuel, that are not meeting with at all a ready sale in Yorkshire, Staffordshire, and Derbyshire; and these are being offered here at considerably below local quotations. Very much will depend upon the character of the ensuing winter season, as to the future course of prices. Judging, however, from surrounding districts, and the undoubted slackening off in many of the large coal-using industries, the position, taking it all through, is scarcely so strong as it has been. The absence of stocks, however, is in itself a matter of serious concern for the immediate future, and for the next two or three months at least is likely to operate against any appreciable easing in prices; while there is the not at all improbable contingency that an exceptionally severe winter might temporarily bring forward a further upward move in round coals. Pit prices for the present remain very firm at 16s. 6d. to 17s. 6d. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, 12s. 6d. to 13s. for steam and forge coals, and 8s. 6d. and 9s. for inferior to 10s. 6d. and 11s. for the best sorts of engine fuel. The shipping trade continues fairly active; and good prices are still being obtained for round coals delivered at the ports on the Mersey—ranging from 16s. to 16s. 6d. per ton for ordinary steam coal, up to 17s. 6d. and 18s. for house-fire qualities, delivered at the Garston Docks or the High Level, Liverpool. Foundry qualities of coke continue in active demand, and are well maintained at late rates. Furnace descriptions, however, are only in moderate request for iron-making purposes, and the tendency of these is undoubtedly in a downward direction; some qualities having dropped fully 5s. to 6s. per ton below recent maximum rates.

**Northern Coal Trade.**—Lower prices have been quoted of late for coal, as the result of the lessened demand from the north, and also of some scarcity of steamers for shipping the fuel. In the steam coal trade, this is rather marked. Best Northumbrian steam coals are now obtainable at from 17s. 6d. to 17s. 9d. per ton f.o.b., second-class steams are about 17s., and steam smalls are 10s. 3d. to 10s. 6d.; but there is some fluctuation, according as cargoes are needed. For occasional sales of gas

coals, the great companies of Durham now ask about 17s. 6d. per ton f.o.b., which is about 1s. 6d. per ton above the average price paid for supplies under contract. The production of the collieries seems rather better than it was a month or two ago. The coke trade is generally rather quieter; and best Durham coke for export is from 27s. 6d. to 30s. per ton f.o.b. Blast furnace coke is about 26s. per ton on Teesside. There is an increased production of gas coke; but it seems to be well taken up. The price quoted is still from 24s. to 25s. per ton f.o.b. At the time of writing, there are rumours that some contracts have been entered into for gas coals for the Continent for three years, at about 13s. 6d. per ton f.o.b.

**Scotch Coal Trade.**—There is a general expectation among buyers that prices are about to come down. Sellers, on the other hand, anticipate an advance. Meantime, the quotations which are given show no change in prices; but it is believed that better terms can be had than they disclose. There is a large output, which, however, could be nearly doubled if the men would work full time. The demand is such that there is hardly any coal in stock anywhere. Prices quoted are: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 15s. 6d. to 16s. 6d., splint 16s. 6d. to 17s. The shipments for the week were 240,567 tons—an increase of 24,509 tons upon the previous week, and of 44,526 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,707,948 tons—an increase of 1,712,121 tons over the same period of last year.

**Hythe Town Council and the Gas-Works.**—The Hythe Town Council consider the present time opportune to purchase the undertaking of the Gas Company; and they have given the Town Clerk instructions to enter into negotiations with the Company, to ascertain if they will meet the Corporation with a view to purchase by private treaty.

**The Issue of Gas Stock to Consumers.**—The Crystal Palace District Gas Company are offering an issue of £20,000 of ordinary stock to their consumers, under the authority conferred by the Company's Act of 1893. In 1896, £20,000 of stock was successfully placed among the Company's customers. The new issue may be taken by them in amounts of not less than £5, or multiples thereof, at the low price of £112 per cent., at which rate it will yield the investor about £4 9s. 3d. per cent. The continuous increase in the Company's business renders necessary this further issue.

**Keighley Corporation Gas Supply.**—The Gas Committee of the Keighley Corporation, on making up their accounts for the year ending June 30, find the consumption to have increased so largely—by about 13 million cubic feet—that, instead of £1000 which it was proposed to hand over out of the profits for the relief of rates, they are in a position to recommend £3000. But in the current year the cost of coal will be about £8800 more than usual; while the 3d. per 1000 cubic feet increase to the consumer only represents a return of one-fourth that amount. The better prices realized for tar and other residuals will still leave a large difference.

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**The Lighting of Ascot.**—The cost of lighting the village of Ascot by gas is paid out of a fund raised entirely by voluntary subscriptions. The Lighting Committee have just issued a balance-sheet, which shows the amount collected for the first year to be £37 1s. 6d.; and there is a balance in hand of £19 12s. It is proposed this year to have the lamps lighted during the six winter months, instead of only three months as was done last year, and to increase the number of lamps.

**New Capital for the Redhill Gas Company.**—The Directors of the Redhill Gas Company have been authorized by the shareholders to raise additional capital by the creation and issue of £7500 of ordinary stock under the provisions of their Act of this year, and to exercise the borrowing powers possessed under the Act. The latter will be effected by the creation and issue of 4 per cent. debenture stock. The Company have been spending a good deal of capital lately, and are putting the concern into a thoroughly sound and efficient state. According to the Chairman (Mr. H. Stenning), some of the money which they are going to expend now ought to have been spent several years ago.

**Mansfield Gas Supply.**—At the last monthly meeting of the Mansfield Town Council, a letter was read from the Local Government Board enclosing sanction to the borrowing of £6100 for gas-works purposes, and inquiring under what statutory authority the Town Council proposed to purchase the undertaking of the Mansfield Woodhouse Gas Company and to borrow the purchase-money. It was resolved to refer the Board to the provisions of the Mansfield Commissioners' Gas Act, 1878. It was also decided that in the Bill proposed to be promoted by the Corporation next session, that Act should be amended so that modern provisions as to the repayment of loans should be substituted for those existing, and that amendments should also be inserted with a view to the provisions as to borrowing and repayment of all further loans for gas purposes being governed by the proposed Act only.

**Provision of Artisans' Dwellings by the Southampton Gas Company.**—Last Tuesday, Lieut. Col. A. C. Smith, R.E., one of the Inspectors of the Local Government Board, held an inquiry relative to the Southampton Gas Company's scheme for providing a number of artisans' dwellings in connection with the widening of one of the streets. Among those present were Mr. C. Crowther-Smith, the Secretary, and Mr. S. W. Durkin, the Manager. Mr. Crowther-Smith explained that in 1898 the Company went to Parliament for the purpose, among other things, of obtaining compulsory power to acquire certain houses for their business. The freeholds of the houses having been obtained, it was proposed to demolish them in order to extend the works. The number of tenements was 21, and the number of residents 81; but only 75 could be designated as of the labouring class, for whom it was intended to provide under the Company's scheme. The land upon which it was proposed to build the substituted houses was within a mile of the present dwellings; and, as far as could be found, within the same distance of several occupations of the residents, most of whom were employees of the Company. The scheme would provide palaces for persons who were now practically in hovels. The Inspector put a number of questions regarding the plans, and other details, and the inquiry then terminated.

**A Joint Water Board for Ilkeston and Heanor.**—The water supply of the Heanor district has for many years been a troublesome question; and several trials and schemes have proved worthless. The Smalley scheme was the last venture; and now, after an expenditure of (it is stated) some £6000, failure has had to be acknowledged. Messrs. Hodson have brought forward a project for the supply of the district from Meerbrook Lough; and they suggest that the authorities of Ilkeston and Heanor should form a Joint Board. Both authorities appear to have jumped at the idea, and members have already been selected to serve on the Board. Steps are to be taken forthwith to promote a Bill in Parliament.

**The Wages of Newcastle Lamplighters.**—The lamplighters employed by the Newcastle and Gateshead Gas Company are agitating for an advance in wages and improved working conditions. On Oct. 10 last, Mr. T. Waddom, the Secretary of the Company, sent a letter to the men's Union, stating that the Company were unable to entertain the request for an advance, and remarking that the Newcastle men were better paid than those in some provincial towns. The men, at a meeting on Monday last week, decided that, unless the Company meet a deputation of them within fourteen days, a week's notice to terminate their engagements would be tendered. The gas stokers, it is stated, have agreed to support the action of the lamplighters. It is only about three years since that the lamplighters employed by the Company obtained an advance of wages.

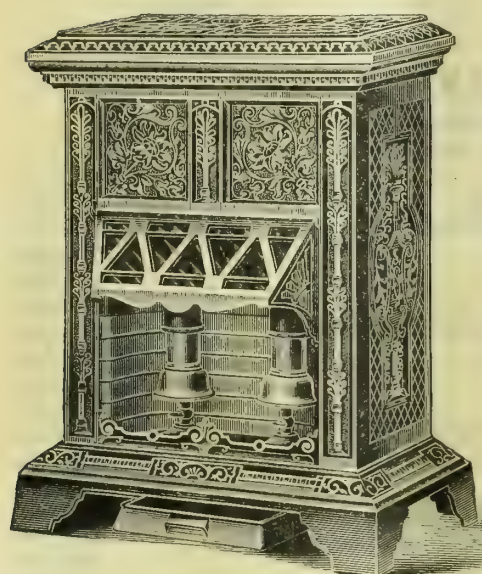
**Combating the Electric Light in Canterbury.**—Readers of the "JOURNAL" are aware that the Canterbury Corporation have an installation of electric lighting for which they are endeavouring to secure the support of the citizens. Those of them who do not mind paying for the luxury will possibly be led to adopt the new illuminant; but the Directors of the Gas and Water Company are determined that none of their customers shall do so without being fully informed as to the economy and utility of gas. Their new Engineer (Mr. H. C. Page) is sending to all the consumers using ordinary meters a circular setting forth the advantages obtainable from the usual as well as from the incandescent system of lighting. They point out that gas is very much cheaper than any other illuminant; that by it the maximum lighting effect is obtained at the minimum cost; and that it can be used for heating and cooking purposes. In order that the class of consumers specially addressed may derive the fullest advantage from the incandescent system, the Company will fix incandescent burners according to a scale of prices submitted, without any charge for labour. They urge upon the consumers the importance of keeping the burners free from dust, and the chimneys and globes clean, and of having the mantles renewed when requisite. With the view of relieving the consumers of trouble in this respect, the Directors are prepared to enter into contracts to keep in repair all their incandescent burners for one year at extremely low quarterly rates. With the facilities thus afforded for installing the incandescent gas system, and using it under the most favourable conditions, the citizens of Canterbury will do well to carefully contrast its advantages with those put forward for the electric light.

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**Winding Up the Brigg Gas Company.**—The final meeting of the Brigg Gas Company has been held. The Liquidators appointed on the works being taken over by the District Council presented a statement showing how they had dealt with the cash in their hands. About £24,000 has been divided among the shareholders for their capital of £10,000; and the Directors and some of the workmen have been given an honorarium. Formal resolutions terminating the existence of the Company were passed.

**Prestatyn Water-Works.**—The District Council of Prestatyn have decided to proceed for parliamentary powers to acquire, by compulsion or otherwise, the water-works owned by Mrs. M'Laren, wife of Mr. C. B. M'Laren, M.P. The works were established a few years ago at a cost of more than £3000; but, during the past two years, the supply of water has become inadequate, as Prestatyn has almost doubled its population, and is rapidly becoming, with its hilly background and spacious sea front, an attractive watering place.

**Burslem Corporation Gas Supply.**—At the last monthly meeting of the Burslem Town Council, the minutes presented by the Gas Committee contained a recommendation that application should be made to the Local Government Board for sanction to borrow £31,000 for 30 years for the purposes of the gas undertaking. Mr. Owen, in moving the adoption of the minutes, said, with regard to a paragraph stating that 960 new cooking-ranges and 37 grills had been fixed since the 31st of March, that this was a tremendous increase. There had been an increase in the consumption of gas every month as compared with the corresponding months of previous years; and this had been going on for a long time. The policy of the Committee had redounded to the prosperity of the undertaking. They were now going to apply for a loan of £31,000 in order to complete the extensions at the gas-works. He remarked that some people had occasionally been able to obtain gas from the automatic meters without previously putting a penny in the slot. The Committee had thought it their duty to give notice that they should demand payment for gas consumed in such cases. The minutes were passed.

**New Joint-Stock Companies.**—A Company has been registered with a capital of £15,000, in £10 shares (600 preference), to acquire the undertaking carried on at Brettell Lane, Staffordshire, as Trotter, Haines, and Corbett, and to carry on the business of brick, tile, and pipe manufacturers and merchants, clay merchants, and dealers in building materials of every description. The Standard Acetylene Gas Company, Limited, has been formed with a capital of £20,000, in £1 shares, to acquire certain patents for improvements in acetylene gas generators; to adopt an agreement with the London and Northern Syndicate; to manufacture and supply generators, lamps, and installations for acetylene gas; and to deal in carbide of calcium, oxides, &c. The Spanish Kern Burner Company, Limited, has been registered with a capital of £15,000, in £1 shares, "to acquire the benefit of certain patents relating to the manufacture of incandescent gas-burners for Spain, Cuba, Porto Rico, and Portugal, and to carry on the business of manufacturers and suppliers of gas-burners, incandescent lights, and other apparatus for increasing the illuminating or heating power of gas."

**A New Reservoir for the Weardale and Shildon Water Company.**—In consequence of the constantly growing demand for water in the district supplied by the Weardale and Shildon District Water Company, the Directors have deemed it expedient to take the preliminary steps towards the construction of a large impounding reservoir in Upper Weardale. Steps are being taken to obtain in the next session of Parliament powers for this purpose.

**The Wigton Rural District Council and the Overwater Scheme.**—The members of the Wigton Rural District Council were specially summoned to a meeting last Tuesday for the purpose of reconsidering the Overwater and Head of Ellen scheme, to which reference has been already made in the "JOURNAL." At a meeting held a month ago, the Council failed to secure a majority in favour of participating in the scheme; but it was subsequently decided to look further into the matter. After some discussion, the scheme was adopted by 19 votes to 8. It now awaits the sanction of the ratepayers.

**Fire at the Bognor Water-Works.**—A serious fire occurred last Wednesday afternoon at the Bognor Water-Works, resulting in the complete destruction of the engine-shed at the pumping-station, which is situated about five miles from the town. Shortly after one o'clock, a workman noticed that a mat near the oil-engine was on fire. The flames spread rapidly; and the oil becoming ignited, the building was ablaze in a very short time. Fortunately, at the time of the conflagration the reservoir contained a considerable quantity of water, and this, with the possibility of securing almost immediately a supply by means of an auxiliary pump, removed any danger of interruption of the service.

**Ripon and the Laver Water Scheme.**—At a special meeting of the Ripon City Council, held in Committee last Thursday—the Mayor (Mr. Wilkinson) in the chair—the question was discussed as to the advisability of seeking parliamentary powers to secure a supply of water from the River Laver above the present Lumley Moor works; this action being necessary in view of the Leeds Corporation resorting to the same source, though from a different tributary of the river. The Council resolved to promote a Bill with a view to extending the Lumley Moor scheme to the Laver; Mr. Charles Hawksley being engaged to prepare plans and report. It may be mentioned that as far back as 1893 Mr. Hawksley suggested that any extension of the Ripon works would have to be in the direction indicated.

**Kingsbridge Water Supply.**—By a majority of eleven votes to one, the Kingsbridge District Council decided on Tuesday last to proceed with the scheme formulated by Messrs. Taylor, Sons, and Santo Crimp for obtaining a supply of water from Place Moor, to which reference was made in the "JOURNAL" for the 9th inst. (p. 914). Mr. G. Saunders, the only opponent of the scheme, was in favour of further steps being taken to procure water from the Borough Estate, and contended that in the Capton Valley, from which it was now proposed to derive a supply, the conditions as to the cultivation of the land were similar to those which led to the rejection of the Borough scheme by the Local Government Board. The Chairman (Mr. J. S. Hurrell) said he believed the scheme alluded to was impracticable, and would cost more than that now before them.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHDE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETTFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

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**Expenditure on Public Lighting in London.**—According to a return just issued, showing, among other things, the amount of the expenses incurred during the year ending the 31st of March last by certain Metropolitan and Suburban Sanitary Authorities, under the Public Health (London) Act, 1891, the total amount expended in this way, out of the £253,815 received from the London County Council, under the Equalization of Rates Act, 1894, was £214,894. The largest share of this sum—£25,159—was spent by Islington; the next highest amounts being as follows: St. Pancras, £18,168; City of London, £17,681; Wandsworth, £16,561; Camberwell, £15,808; Lambeth, £14,663; Shoreditch, £10,525; and Hackney, £10,292.

**Professor Lewes's Evidence before Mr. Oldroyd's Committee.**—Readers of our report of the proceedings of the Committee of the House of Commons to whom were referred the Gas Bill of the London County Council and the Bills of the Gaslight and Coke and South Metropolitan Gas Companies will recollect that some important evidence for the last-named Company was given by Professor Lewes, the Gas Examiner to the Corporation of London. Though, as stated in the "JOURNAL" at the time, Professor Lewes attended before the Committee on a Speaker's order, his conduct in so doing, without the consent of the Corporation, was questioned by Mr. Alpheus C. Morton, a member of that body, who moved for an inquiry into the matter. It was accordingly referred to a Committee, who reported at the meeting of the Common Council last Thursday. They stated that they had heard a statement from Professor Lewes, seen a copy of the Speaker's order, and had before them Mr. Morton; and, after considering the whole question, they had come to the conclusion not to take any action in the matter. Mr. Morton expressed his dissatisfaction; but the report was adopted.

**The Wolverhampton Gas Company's Stokers and Inclined Retorts.**—The members of the Wolverhampton branch of the Gas Workers' Union employed at the Stafford Road Gas-Works held a meeting last Tuesday, when two important questions were brought under discussion—the first being an advance of wages for the men employed at those works. The men think they are entitled to more money to compensate them for the extra cost of living and firing. The other question was an alteration in the work of the men at the inclined retorts. They have given the new plant twelve months' trial, and find that the amount of work allotted to each is far too much for one man to perform for any length of time and do his duty to his employer and himself. It appears that there has been a grievance in connection with this branch of work since November last year; but some of the men asked the others to give the work a fair trial, and they are ready and willing to show they are doing more work on the inclined retorts than are men at other places. At a meeting some time ago, they applied to their General Secretary from Birmingham, to ask the Directors of the Gas Company to meet a deputation of the men to discuss the two questions; and the application was sent in some nine or ten weeks ago, but has not yet been replied to. The men are dissatisfied at this silence, and at the meeting last Tuesday it found expression in very strong remarks; and the General Secretary was instructed to take what action he thinks best to enforce their fair and just demands.

**Public Lighting Difficulty at a Lancashire Pleasure Resort.**—The Directors of the St. Anne's-on-the-Sea Gas Company have offered for sale the lamps at present used for the lighting of the public streets; and if a customer is found, they will be taken down. As the electric lighting scheme of the District Council is not likely to be completed until next summer, there is every prospect of the town being without light in the streets during the winter nights. The present difficulty has arisen through the St. Anne's Council refusing to buy the lamps from the Company for use in the electric light installation.

**Proposed Improvement of the Tiverton Water Supply.**—The scheme for the improvement of the water supply was further considered at a meeting of the Tiverton Town Council on Wednesday last. Owing to conditions imposed by the owner of the land through which the leat passes, it was decided not to proceed with this part of the scheme. The Surveyor (Mr. J. Siddalls) submitted an alternative proposal for piping certain springs into the leat, so as to increase the supply in summer; but he pointed out that this would do nothing to ensure the purity of the water, which was the primary object of the original scheme. The Council rejected the proposal, and decided not to make one of the suggested storage reservoirs, because in this case also conditions were put forward which were regarded as too onerous. All that remains of the original scheme, therefore, is a covered reservoir which is to be built at a cost of £1600.

**"Science" in the Daily Press.**—The East, as we know on good authority, is the quarter from which wisdom emanates; and therefore we reproduce from the "East Anglian Daily Times" the following description of the installation of compressed gas lighting which Messrs. William Sugg and Co. have recently completed at the point in the Strand where this crowded thoroughfare is crossed by Wellington Street, to which reference was made in our editorial columns last week. As an example of lucidity, scientific accuracy, and poetic afflatus combined, it is worthy of preservation: "An interesting demonstration of new lighting was made in the Strand this evening [Oct. 15], where four empores of traffic meet at Wellington Street. It is a development of Suggs' patent, and the result is produced by a combination with the sunlight incandescent mantle. The gross result is a luminant from the four lamps equal to 6000-candle power. The pure gas in the Sugg apparatus is precipitated by hydraulic pressure up to nine inches, against four inches in the previous highest possible. The firm have orders extending the lighting up to the City and down to Parliament Square. It is claimed for this combination that it is superior to electric lighting, because it is more solid and better distributed. Mr. Sugg claims to equal the sun, while the electric light is sister to the moon." We were immensely impressed with the word "empores," in the first sentence of the above paragraph—it is so uncommon, and withal so expressive. Others have been equally struck with it, for it has been faithfully reproduced by several of the papers in which the paragraph has appeared. Others, however—the "Liverpool Courier" among the number—have spoilt the beauty of the opening lines by substituting the word "course." The "Pall Mall Gazette" described the new light as a "blowpipe applied to an incandescent burner;" the result being "an improved gas."

THE  
"TRIUMPH"

"Let us enquire in a spirit of love, what is 'Triumph'?"

"BLEAK HOUSE."—Adapted by RICHMOND'S.



**The Cumberland Water Scheme.**—At a meeting of the Wigton Rural District Council last Tuesday, a second attempt was made to pass the Overwater and Head of Ellen water scheme. After a lively discussion, a resolution in favour of joining the Aspatria and Holme Cultram authorities in the promotion of a Water Bill was carried by a majority of one.

**Harrogate Water Scheme and the Ripon Rural District Council.**—The Ripon Rural District Council have decided to co-operate with the Harrogate Corporation in their project to take water from the River Burn—the pipe-track being through the Ripon rural district. On behalf of the Corporation, representatives promised the District Council that, if they would support the scheme, water should be supplied in bulk at 6d. per 1000 gallons to any hamlet, village, or township in their area.

**The Price of Coal and French Finance.**—A Reuter telegram from Paris, published in the "Financial News" last Tuesday, said: "The rise in the price of coal, attributed here partly to the British armaments for the war in South Africa and partly to the mining strikes in America, will have a direct and considerable effect on the French Budget for 1901. The Minister of Finance has informed the Budget Committee that he has found himself compelled by this cause to modify his estimates, both of revenue and expenditure. While the railways whose minimum rate of interest is guaranteed by the Government want 1,000,000 frs. more, the revenue from railways which share their profits with the Government shows a falling off of 1,200,000 frs. Besides this, the Minister of Marine has had to raise the amount required for coal for the Navy by 1,300,000 frs. The Budget is thus called upon, on account of the coal crisis, to bear a temporary surcharge of 3,500,000 frs."

Mr. J. A. Purves, D.Sc., of Edinburgh, last week exhibited aëro-gas fountains, which have already been described in the "JOURNAL," in the Music Hall Buildings, Aberdeen.

The Bridlington Gas Company have placed an order with Messrs. Jonas Drake and Son, of Halifax, for the erection of a retort-bench of seven arches with regenerator furnaces on their patent tube principle.

Since taking up his duties as Engineer of the Canterbury Gas and Water Company, Mr. H. C. Page has introduced the Deacon waste-water meter system—fixing nine meters of various sizes, which have just been brought into use.

The "Daily Express" says "the correctly lighted apartment of to-day is not a glare of brilliancy, but has a harmonious arrangement of subdued tones, with a studied artistic effect, produced by an endless variety of tinted and decorated shades and globes. There is practically no limit to the range of such effects. The colour scheme in lighting forms an important art in house decoration."

Messrs. W. J. Jenkins and Co., Limited, of Retford, have just received a second order for a De Brouwer patent coke conveyor for the Gaslight and Coke Company, as well as for a large coke storage hopper from which carts and railway waggons can load without heavy labour.

An exhibition of Messrs. Fletcher, Russell, and Co.'s gas cooking and heating stoves and other appliances has been held at the West-End Assembly rooms, Newcastle-upon-Tyne, under the auspices of the Newcastle and Gateshead Gas Company. Free cookery lectures, with practical demonstrations, were given by Mrs. H. M. Young.

The Campbell Gas-Engine Company, Limited, have issued a revised catalogue and price list of their gas-engines, for which, together with their oil-engines, they have been awarded a gold medal at the Paris Exhibition. The ordinary horizontal engines range from 1½ to 130 brake-horse-power working load with coal gas, and from 1 to 110 with Dowson gas; the number of revolutions being 250 per minute for the smaller, and 160 for the larger sizes. The Company's horizontal engines suitable for electric light installations range from 2 to 100 brake-horse-power with coal gas, and from 5½ to 85 with Dowson gas; the number of revolutions being 280 for the smaller, and 160 for the largest size. All the engines above 5-horse power constructed for electric lighting purposes are fitted with an extra heavy fly-wheel and outer bearing. The engines are shown in combination with the Company's pumps; and the latter are also illustrated separately.

Price 6s., Bound in Cloth.

## THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

Price 7s. 6d. per 100; £3 per 1000 (Carriage Free), Demy 4to.,

A LEAFLET ON

### SULPHATE OF AMMONIA: ITS SOURCE—RELATIONSHIP TO SOIL—EFFECT ON PLANTS.

BY

H. H. COUSINS, M.A., South-Eastern Agricultural College, Wye.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

#### GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

##### OXIDE OF IRON.

**O'NEILL'S** Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,  
160, 161, & 162, PALMERSTON BUILDINGS,  
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ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

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#### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,  
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"Volcanism, London."

#### BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

#### ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At today's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE. Apply to SADLER AND CO., MIDDLESBROUGH.

#### AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

#### SADLER & CO., Ltd., Middlesbrough.

Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

#### SULPHATE OF AMMONIA SATURATORS.

#### JOSEPH TAYLOR & CO., Chemical

Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate. Telegraphic Address: "SATURATORS, BOLTON."

#### J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET and DRY GAS-METERS, STATION METERS, and GOVERNORS, PRESSURE-GAUGES, STREET LAMPS and PILLARS, &c.

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##### SULPHURIC ACID.

#### JOHN NICHOLSON & SONS, Limited,

Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and good colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

#### GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

#### PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

##### SPECIAL PAINT FOR GAS-WORKS.

#### JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS, MANCHESTER.

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facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

#### SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

#### PORTER & CO., Gowts Bridge Works,

LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."

[For Illustrated Advertisement, see Oct. 2, p. 864.]

#### GAS PURIFICATION.

##### OXIDE OF IRON BOG ORE.

#### BALE & CO.'S Oxide of uniform quality.

SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

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##### CANNEL, COAL, ETC.

#### JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved SCOTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application.

No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.  
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

##### HYDRATED OXIDE OF IRON.

#### PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no Back Pressure.

The Cheapest in the Market.

Can be Lent on Hire.

Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

##### TO GAS AND WATER OFFICIALS.

#### HIGH-CLASS Cycles at reasonable and

low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free. MELROSE CYCLE COMPANY, COVENTRY.

#### DRAWINGS, Tracings, and Specifica-

tions PREPARED and NEATLY EXECUTED, for Apparatus, Structures, or Extensions to Gas-Works, either designed or drawn to Engineer's Sketches by Draughtsmen of experience.

For Terms, apply, by letter, to No. 3568, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### WANTED, a Situation to take charge

of Small Gas-Works, or as WORKING FOREMAN. Understands Engine and Exhauster, and can do small Fitting. Age 30. Good Reference. Address A. HANCOCK, Gas-Works, Radstock, BATH.

##### CITY AND GUILDS EXAMINATIONS.

#### MANAGER of a Gas-Works (First-class

Honours and Metallist) willing to HELP, BY CORRESPONDENCE, intending Students for next Exam.

Apply, by letter, to No. 3585, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.



**APPOINTMENT** desired by Traveller, SHIPPING AGENT, and FOREIGN CORRESPONDENT, accustomed to call on Gas and Water-Works Managers; or as SECRETARY or GAS-RENTAL ACCOUNTANT. Ex-Manager of Gas-Works.  
Address No. 3577, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a good Gas-Fitter.** Used to Iron and Compo.  
State Age and Wages required to the SECRETARY, Sheppy Gas Company, SHEERNESS-ON-SEA.

**WANTED, a Gas-Fitter, one used to** Iron and Compo. Wages 90s. per week. None but competent Men need apply.  
Applications to Mr. L. G. HALL, Gas Engineer, RHYL.

**WANTED, Two Gas Stokers, used to** Shovel Charging. Permanency to steady, active Men. Wages 34s. per week.  
Apply E. ONIONS, Engineer, Gas Offices, LOUGH-BOROUGH.

#### FITTERS WANTED.

**TWELVE additional Fitters required,** used to Compo. and Barrel work. Must be quick and neat. Only good Men need apply.  
Give References and Wages required to RICHMOND & CO., LIMITED, DUBLIN.

**FITTER wanted at once. Steady,** married Man, with good References (Abstainer preferred), used to Iron and Compo. Fitting and Main and Service Laying. Good Dwelling-House.  
Only really capable Men need apply to the SECRETARY, Gas Company, Glastonbury, SOMERSET.

**WANTED, a good Stoker, used to** Shovel Charging, and Engine and Exhauster. Also a YARDMAN, to assist in Stoking when required, and to make himself generally useful. Must be steady and reliable Men.  
Apply, stating Age, Wages required, and Particulars, to G. MOAT, Gas-Works, Purston, PONTEFRAC.

**WANTED, at once, in a South-Coast** Town Gas-Works, a thoroughly competent GAS-FITTER, well up in Iron and Compo. work, and able to do light Smithing. Permanency to a suitable and reliable Man.  
Apply, by letter, stating Age, Experience, and Wages required, to No. 3582, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a good Smith and Main** LAYER, accustomed to Gas-Works. Also good GAS-FITTER for Prepayment Meter Installation work, with Compo. Permanent employment to suitable Men.  
Apply, by letter, giving References and stating Wages required, to No. 3582, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, at a Country Gas-Works,** two steady FOREMAN STOKERS, used to Shovel Charging, Generator Furnaces, and to Engine and Exhauster. Wages 36s. 2d. for Seven days. Twelve-hour Shifts, Day and Night alternately.  
Apply, by letter, addressed to No. 3578, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating the Weight of Coal the applicant will undertake to Carbonize, and the number of feet of Gas to make per Shift, including Furnace Work, the Wheeling in of Coal, and the Wheeling out of Coke.

**WANTED, for Gas-Works in Brazil, an** ASSISTANT MANAGER. Applicants must be well acquainted with the routine of management, and especially of Carbonization.  
Preference will be given to Applicants having Experience of Electric and Incandescent Street Lighting and Generator Furnaces.  
Salary £30 per month, with Apartments, Fuel, and Gas. Three Years' Engagement. First-class Passage out and home.  
Apply, by letter, to No. 3576, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### CITY OF BIRMINGHAM.

**THE Secretaryship of the Gas Department** will shortly be VACANT. Salary £1000 per annum.  
Preliminary inquiries as to the duties of the Office should be addressed to the Secretary of the Gas Committee, Council House, Birmingham. Experience in the Financial and Commercial Management of a Gas Undertaking or of a large Manufacturing Business is desirable.  
Copies of Applications for the appointment may be forwarded to members of the Gas Committee; but Candidates are earnestly requested to abstain from canvassing the members of the Council or of the Gas Committee.

#### TO BE LET on Hire—

**FACING MACHINE**, for facing *in situ* Self-Sealing Retort Mouthpieces any shape or size,  $\square$ , Oval, or Circular.  
**PULSOMETER**, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe  $\frac{3}{4}$  in. diameter. Discharge 10,000 Gallons per hour.  
Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

**WANTED, a good second-hand Gas-** HOLDER TANK, either Cast-Iron or Steel. Not less than 43 ft. 6 in. inside diameter, and 18 feet deep. Must be in good condition.  
Apply, by letter, to Mr. PERCY GRIFFITH, Assoc.M. Inst.C.E., 54, PARLIAMENT STREET, S.W.

**"CUTLER'S" Condenser,  $\frac{1}{2}$  million day,** equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.  
J. F. BLAKELEY, Thornhill, DEWSBURY.

**OIL-TAR. Purchaser wanted for this** Residual of Carburetted Water Gas. Delivery in the North of England; about 20 Casks at a time.  
Address No. 3584, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE, Cheap—One, Two, or Three** PURIFIERS, 8 ft. square by 4 ft. deep, in good condition, with Valves, Connections, and Lifting Gear.  
Apply to SAM. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

**OFFERS wanted for Second-hand** CYLINDRICAL STATION METER to pass 12,000 cubic feet per hour.  
Address GENERAL MANAGER, Enfield Gas Company, Enfield, MIDDLESEX.

#### HIGH-PRICED COAL.

**SMALL Gas-Works Authorities should** immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets in stock, both New and Second-hand.  
Address J. FIRTH BLAKELEY AND Co., Thornhill, DEWSBURY.

**FOR SALE—260 22 in. by 15 in. and** 135 20 in. by 14 in. second-hand  $\Delta$ -shaped Retort Mouthpieces, fitted complete with Tangies Patent Lids, 18 inches diameter.  
Can be inspected on application to Mr. T. Hardie, Manager, Gas-Works, Redheugh, Gateshead-on-Tyne.  
Offers to be addressed to the SECRETARY, 35, Grainger Street West, NEWCASTLE-ON-TYNE.

**GAS PLANT for Sale—I can always offer** NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gas-holders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.  
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

**FOR SALE—Exhauster and Connections,** Capacity 30,000 cubic feet per hour, and HORIZONTAL STEAM-ENGINE, 7-Horse Power, at the Gas-Works, Forfar.  
Sealed Tenders to be lodged with William Gordon, Solicitor, Forfar, not later than the 27th of October, 1900.  
The Corporation do not bind themselves to accept the highest or any offer.  
Mr. James Baxter, the Manager, will show the Plant.

#### SCARBOROUGH GAS COMPANY.

##### FOR SALE.

**TWO 16 ft. by 6 ft. Lancashire Boilers.** Shell  $\frac{7}{8}$ -inch B Staffordshire, Double Riveted, Longitudinal Seams. Front and Back-End Plates  $\frac{1}{2}$ -inch Staffordshire B.B. complete, with all necessary Fittings and Connecting Piping. Insurance report 50.  
The above Boilers are in first-class condition, and may be seen in position at the Gas-Works, Seamer Road, Scarborough.  
For further Particulars, apply to J. HOLLIDAY, Engineer and Secretary.  
82, Westborough, Scarborough.

#### PURIFIERS FOR SALE.

**THE Directors of the Clayton, Allerton,** and Thornton Gas Company are prepared to receive OFFERS for Four 12-feet square old PURIFIERS, with CENTRE-VALVE and 12-inch CONNECTIONS, LIFTING and TRAVELLING APPARATUS, and Two 12-inch RACK and PINION VALVES.  
Also Two old PURIFIERS, 22 ft. by 8 ft., with 10-inch CONNECTIONS and Two Anderson 10-inch FOUR-WAY VALVES and Four 10-inch RACK and PINION VALVES and LIFTING APPARATUS.  
The whole can be seen at the Company's Works in position, and to be pulled down and removed by the purchaser.

By order,  
JOHN NIVEN,  
Secretary and Manager.

Clayton, near Bradford,  
Sept. 18, 1900.

**J. FIRTH BLAKELEY & CO., Thornhill,**

Dewsbury, have FOR SALE:—  
One Set of Three 6-ft. PURIFIERS.  
One " Two 8-ft. "  
One " Four 8-ft. "  
One " Four 16-ft. by 12-ft. PURIFIERS,  
Four 5-inch ANNULAR CONDENSERS,  
Four 10-inch " "  
Six 16-inch " "  
"Cutler"  $\frac{1}{2}$  million WATER CONDENSER.  
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.  
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.  
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.  
"Holmes" & "Clapham" WASHER-SCRUBBERS.  
"Livesey" & "Cripps" WASHERS.  
4-in., 6-in., 8-in., and 10-in. STATION METERS.  
Splendid GAS HOLDER, 50 ft. by 20 ft.  
RETORT IRONWORK, MODERN HYDRAULICS.  
Telegrams: "BLAKELEY, THORNHILL LEES."

**FOR SALE—Nine old Cast-Iron Gas-** HOLDER COLUMNS.  
For Particulars, apply to W. J. DOUGALL, Engineer and Manager, Gas-Works, SEVENOAKS.

#### COUNTY BOROUGH OF SALFORD. (GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for** the purchase of about 900 Tons of SPENT OXIDE.

Further Particulars and Form of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Spent Oxide," to be sent to me not later than Three p.m., on Wednesday, Oct. 24, 1900, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,  
L. C. EVANS,  
Town Clerk.

Town Hall, Salford,  
Oct. 16, 1900.

#### ALDRESHOT GAS AND WATER COMPANY.

##### PURCHASE OF SURPLUS TAR.

**THE Directors are prepared to consider** OFFERS for the purchase of surplus TAR (about 1000 Tons), produced at their Gas-Works, Ash Road, Aldershot, S.W. Rly., and North Camp, Farnborough, S.E. Rly., for a Year from the 1st of January, 1901, to the 31st of December, 1901.

Specification and Conditions can be obtained on application post.

Tenders to be sent in to the undersigned, endorsed "Purchase of Surplus Tar," to arrive not later than Wednesday, Nine a.m., the 21st of November, 1900.

The highest or any Tender not necessarily accepted.  
By order,  
R. W. EDWARDS,  
Secretary.

Oct. 12, 1900.

#### FIRE-CLAY GOODS.

**THE Directors of the Sheffield United** Gaslight Company invite TENDERS for the supply of SILICA and FIRE-CLAY GOODS, required at their Neepsand, Effingham Street, and Grimesthorpe Stations during the next Twelve Months.

Specifications and Forms of Tender may be obtained on application to the Company's Engineer, Mr. J. W. Morrison.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Tender for Fire-Clay Goods," must be delivered by post to the undersigned not later than the first post on Saturday, Nov. 3.

HANBURY THOMAS,  
General Manager and Secretary.  
Commercial Street, Sheffield,  
Oct. 15, 1900.

#### CORPORATION OF LEICESTER.

##### RETORTS AND FIRE-BRICKS.

**THE Gas and Electric Lighting Com-** mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specifications, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Tuesday, the 30th of October, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E. & M.Inst.E.E.,  
Engineer and Manager,  
Offices: Millstone Lane,  
Leicester, Oct. 12, 1900.

#### GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 6th day of November, 1900, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th day of June last, and to transact the General Business of the Company.

THE TRANSFER BOOKS WILL BE CLOSED from the 24th of October to the 6th of November, both inclusive.

By order of the Board,  
SAMUEL WOOD,  
Secretary.

Offices: 30, Gracechurch Street,  
London, Oct. 23, 1900.

#### NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

##### SALE OF ORDINARY STOCK.

**THE Directors have instructed Mr.** ROBERT MACK to SELL BY AUCTION, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 7th day of November, 1900, at Twelve o'clock at noon,

TWENTY-FIVE THOUSAND POUNDS  
ORDINARY STOCK

of the Company, to be issued under the Powers of the Company's Act of 1896.

For Conditions of Sale and further Particulars, apply to the undersigned.

THOMAS WALDOM,  
Secretary.  
Offices: 35, Grainger Street West,  
Newcastle-upon-Tyne.



The List will open on Monday, the 22nd day of October, 1900, and close on or before the Wednesday following.

# IRISH PROVINCIAL GAS COMPANY, LTD.

(Incorporated under the Companies Acts, 1862 to 1898.)

Formed to acquire, by purchase or by the acquisition of Shares, the Gas-Works and Allied Undertakings at

Carrick-on-Shannon

Mullingar

Roscrea

Castlebar

Mallow

Sligo

Ennis

Newbridge

Tuam

Longford

Naas

Westport

In the case of the Sligo Gaslight and Coke Company, this Company has acquired, by Letters of Agreement from individual holders, sufficient shares in the Sligo Gaslight and Coke Company to give this Company the full control of the business of the said Sligo Gaslight and Coke Company.

SHARE CAPITAL	-	-	-	-	-	-	£110,000
4½ % FIRST MORTGAGE DEBENTURE STOCK							50,000
							£160,000

The Share Capital is divided into 110,000 Ordinary Shares of £1 each.

## PRESENT ISSUE.

£50,000 4½ per cent. First Mortgage Debenture Stock	.	.	.	.	.	.	£50,000
65,000 Ordinary Shares of £1 each	.	.	.	.	.	.	65,000
							£115,000

The Debenture Stock will be redeemable at £108 per £100, at the option of the Company, on or after the 1st January, 1915, on six months' previous notice; any partial redemption being by purchase or drawings.

The Debenture Stock will be registered in the Books of the Company, and the Interest will be payable half yearly on the 1st day of April and the 1st day of October in each Year.

The Debenture Stock and the Interest thereon will be secured by a First Mortgage to the Trustees for the Debenture Stockholders of the properties now to be acquired by the Company, and by a first floating charge (subject to a power reserved to charge further issues on hereditaments which may be subsequently acquired) on all the other assets (but not including unissued or uncalled capital) of the Company.

The Debenture Stock will be transferable in multiples of £5.

The under-mentioned Banks are authorized to receive subscriptions for the First Mortgage Debenture Stock, and Ordinary Shares, payable as follows:—

### DEBENTURE STOCK.

£10 per cent. on application.
£40 " " " allotment.
£50 " " " two months after allotment.

£100

### ORDINARY SHARES.

1/- per share on application.
6/6 " " " allotment.
5/- " " " one month after allotment.
7/6 " " " two months after allotment.

£1

### Trustees for the Debenture Stockholders.

THE RIGHT HON. SIR THOMAS D. PILE, Bart., Lord Mayor of Dublin.

ALDERMAN W. F. COTTON, J.P., Managing-Director, Alliance and Dublin Consumers' Gas Company.

### Solicitor for the Trustees.

D. O'C. MILEY, 16, Dame Street, Dublin.

### Directors.

W. R. FENTON, Crown Solicitor, Sligo.

WILLIAM A. WALLIS, J.P., Fairy Hill, Blackrock, Co. Dublin.

J. W. RUSSELL WALL (Biggs, Wall, and Co., Gas and Water Engineers), 13, Cross Street, London, E.C.

CORNELIUS B. TULLY, Past-President Irish Association of Gas Managers; Engineer, Sligo Gas Company (MANAGING-DIRECTOR).

### Bankers.

THE NATIONAL BANK, Limited, College Green, Dublin; the Head Office—13, Old Broad Street, London, E.C., and all Branches.

THE PROVINCIAL BANK OF IRELAND, Limited, College Street, Dublin; the Head Office—8, Throgmorton Avenue, London, E.C., and all Branches.

ULSTER BANK, Limited, College Green, Dublin; the Head Office—Belfast, and all Branches.

### Solicitors for the Company.

CASEY AND CLAY, 21, St. Andrew Street, Dublin.

### Consulting Engineer.

PERCY GRIFFITH, Assoc.M.Inst.C.E., M.Inst.M.E., F.G.S. (Successor to the late Mr. Jabez Church), 54, Parliament Street, Westminster, London, S.W.

### Auditors.

SMYLIE, LYNAS, AND CO., Chartered Accountants, 13, Donegall Square North, Belfast.

### Registered Offices.

D'OLIER CHAMBERS, D'OLIER STREET, DUBLIN.

### Secretary.

W. MONDS GREENE.

Prospectuses can be obtained at the Company's Offices or Bankers.

**NOTE.**—The Directors, their Friends, and certain of the Shareholders of the above-mentioned concerns have applied for £30,000 of the Capital of the Company.



# HUMPHREYS—GLASGOW

## CARBURETTED WATER-GAS PLANT

These instances are all from the LONDON designs of Messrs. HUMPHREYS & GLASGOW.

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Copenhagen . . . . .	700,000	Coventry . . . . .	600,000	Lawrence, Mass. . . . .	400,000
Copenhagen (2nd) . . .	2,500,000	Coventry (2nd) . . . .	600,000	Commercial Gas Co.. . .	850,000
Belfast . . . . .	1,700,000	Bordentown, N.J. . . .	125,000	Commercial (2nd) . . . .	850,000
Belfast (2nd). . . . .	4,500,000	Winchester . . . . .	225,000	Commercial (3rd) . . . .	1,250,000
Brussels. . . . .	750,000	Shanghai . . . . .	225,000	Rotterdam . . . . .	850,000
Brussels (2nd) . . . .	750,000	Stockport . . . . .	600,000	Dorking . . . . .	150,000
Liverpool . . . . .	3,500,000	Norwich . . . . .	1,000,000	McKeesport, Pa. . . . .	500,000
Liverpool (2nd). . . .	4,500,000	Holyoke, Mass. . . . .	600,000	G.L.&C.Co., Bromley . .	3,750,000
Tottenham . . . . .	750,000	St. Joseph, Mo. . . . .	750,000	G.L.&C.Co., Nine Elms. .	2,750,000
Tottenham (2nd). . . .	750,000	Lea Bridge. . . . .	350,000	Durham . . . . .	200,000
Santiago de Cuba . . .	400,000	Lea Bridge (2nd). . . .	350,000	New York . . . . .	4,000,000
Swansea . . . . .	750,000	Stockton-on-Tees . . .	500,000	Scarborough. . . . .	800,000
Manchester . . . . .	3,500,000	Edinburgh. . . . .	2,000,000	Perth, W.A. . . . .	125,000
Brighton. . . . .	1,750,000	Guildford . . . . .	350,000	Bremen . . . . .	550,000
Preston . . . . .	1,400,000	Brentford . . . . .	1,200,000	Maidenhead . . . . .	225,000
New York . . . . .	1,200,000	Syracuse, N.Y. . . . .	850,000	Epsom . . . . .	225,000
Southport . . . . .	750,000	Bridlington . . . . .	150,000	North Middlesex. . . . .	150,000
Bath . . . . .	1,000,000	Middlesbrough . . . .	1,250,000	Wandsworth. . . . .	1,800,000
Newburg, N.Y.. . . .	350,000	Croydon . . . . .	1,250,000	Aarhus . . . . .	800,000
Newburg (2nd). . . . .	250,000	L. & N.W. Ry., Crewe .	700,000	Falmouth . . . . .	150,000
Hoylake . . . . .	125,000	Taunton. . . . .	225,000	Southampton . . . . .	800,000

### SINCE JANUARY 1st, 1899.

Hartlepool . . . . .	750,000	Stockport (2nd) . . . .	600,000	Faversham . . . . .	200,000
Utrecht . . . . .	1,000,000	Croydon (2nd) . . . . .	625,000	Birmingham (Swan V'ge)	1,500,000
Deventer . . . . .	150,000	Maidenhead (2nd) . . .	225,000	St. Gallen (Switz.) . . .	225,000
Portsmouth . . . . .	1,000,000	G.L.&C.Co., Beckton . .	2,250,000	Colney Hatch . . . . .	400,000
Bournemouth . . . . .	1,000,000	G.L.&C.Co., Fulham . .	1,750,000	Southampton (2nd) . . .	500,000
Aylesbury . . . . .	150,000	Tottenham (3rd) . . . .	350,000	Tunbridge Wells . . . . .	1,000,000
Hamburg . . . . .	1,750,000	Sydney (Harbour). . . .	500,000	Hebden Bridge . . . . .	200,000
Redhill . . . . .	275,000	Sydney (Mortlake) . . .	500,000	Chorley . . . . .	300,000
Dublin . . . . .	2,000,000	Manchester (2nd) . . . .	3,500,000	Liège . . . . .	1,000,000
Posen . . . . .	450,000	Hull . . . . .	1,500,000	Stafford . . . . .	500,000
Dunedin (N.Z.) . . . .	150,000	Longton. . . . .	600,000	Bridlington (2nd) . . . .	200,000
Lincoln . . . . .	500,000	Staines . . . . .	600,000	Gosport . . . . .	200,000
Antwerp. . . . .	1,500,000	Commercial (4th) . . . .	2,000,000	G.L.&C.C., Beckton(2nd)	10,750,000
Brussels. . . . .	1,000,000	Dublin (2nd). . . . .	2,000,000	Tottenham (4th). . . . .	1,000,000
Brighton (2nd) . . . .	1,850,000				

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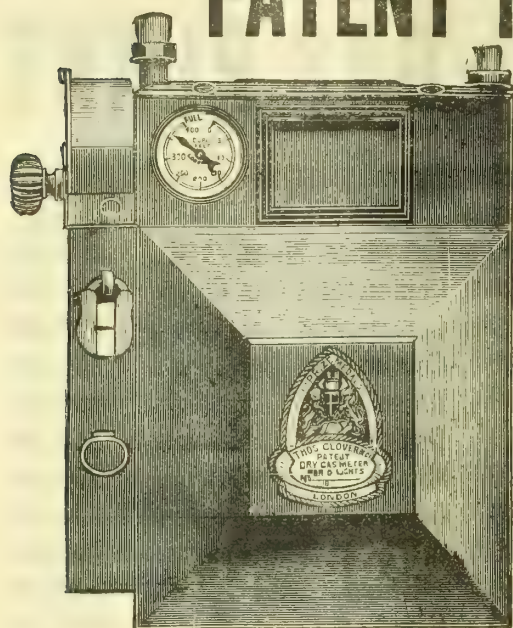
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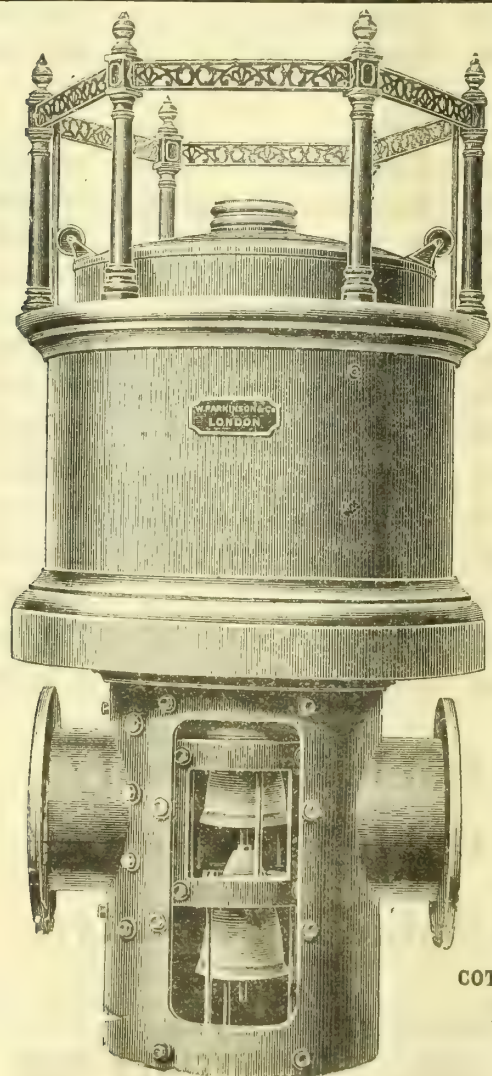
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## EDITORIAL NOTES.

## Some Three-Year Coal Contracts.

THE publication of the details of several considerable contracts for Durham gas coal that have been recently completed, has been hailed in some quarters as affording very hopeful signs for the future. We can only say that if the prices at which these contracts have been closed really represented the probabilities of the situation for the next three years (the term for which they run), the outlook would be very dark for the gas industry. The contracts in question, made by the Paris, Lisbon, and Catalonia Gas-Works, provide for the delivery of 310,000 tons of gas coal during each of the next three years at prices averaging 13s. 5d. per ton f.o.b. Tyne. Seeing that the f.o.b. price of Durham coal was not so long ago, and is, in all except abnormal times, something from 6s. 6d. to 7s. a ton, and that the price at which the London Gas Companies have been compelled to buy in this present year of little grace on the part of the coalowners did not go higher than about 16s. 6d.—a figure that has sufficed to send gas up 6d. to 7d. per 1000 cubic feet—the prospect of paying 13s. 5d. a ton for three years would not be hailed with delight by the English Gas Companies.

We have not the slightest hesitation in saying that no such prospect lies before the gas consumers of the country, and that the Durham colliery proprietors have been extremely fortunate in finding purchasers willing to commit themselves to such engagements as those instanced. The signs of the times are much more favourable to the gas-coal buyer than those afforded by the selling of 930,000 tons at over 13s. a ton. Everything points to a considerable quieting-down of the market and a steady sinking of prices towards their former level. The miners' strike in America is now practically over; and on every hand orders are heard of that formerly came from other countries to the English coal market going to the United States. As we have frequently pointed out, it is not to an influx of American coal into England that we can look for relief to the present state of the coal market in this country and in Europe, but to the competition of such coal with that from English ports in the markets we at present serve.

In the iron trade, too, the effects of the competition of American goods in both our home and foreign markets are being increasingly felt; and the longer coal prices are maintained at their prevailing level, the harder will it be for English manufacturers to successfully contend against that competition. A great hubbub is being raised in some quarters over South African firms sending their machinery orders to the States instead of to this country; but surely the blame does not lie with the South Africans. They want machinery, want it as cheaply as they can buy it, and want it quickly. The American manufacturer is ready to supply it more speedily and at a lower price than the English. Then it seems to us that the orders will naturally go to the States, and that what the English maker has to do is not to lift up his voice and cry aloud for favoured treatment, but to find out why his American competitor can beat him, and then set to work to get on an equality once more. A touch of competition is a splendid tonic for any industry. Before, however, the English factory can get on terms with the American, coal will be down to half the 1900 price. The descent has now begun. But, unfortunately, at present coke is descending with even greater rapidity.

## The City Conference on the London Gas Question.

TO-MORROW the Lord Mayor of London is to preside over a conference called by the Corporation to consider the London Gas Supply. This is the second gathering of the kind; and it remains to be seen whether the corporate wisdom of the old Common Council of the City will deal with this thorny subject more adeptly than the London County Council did, as reported in last week's "JOURNAL." On that occasion, when the Chairman had fired off his carefully prepared address, nobody knew what to do next. To-morrow things will not be left to chance and Sir Albert Rollet; an agenda of six Notices of Motion having been prepared and circulated in advance. The London County Council must feel slightly mortified over the reflection that they were not so businesslike. As we give the text of the notices elsewhere, it is unnecessary to repeat them here. The organic resolutions are the first and the second. The



first declares in general terms that "Parliament should intervene to protect gas consumers from the evil effects of the giant monopoly brought about by the Gas Acts of 1847 and 1860;" and the second suggests that the price of gas in London should be that charged for the cheapest supply furnished for the time being by any Company, "so that gas consumers should not be compelled, as under the present monopoly, to make good the loss incurred by bad management." These resolutions are very much to the point, and have the merit of registering what is unquestionably the sense of public opinion upon the matter. Their adoption by a representative congress of City and Metropolitan Local Authorities will constitute a serious aggravation of the long-standing difficulties of the higher-priced London Companies.

It is not the least serious and significant feature of this pronouncement that it goes away back behind the sliding-scale settlement of 1875-6, and fixes the root of the grievance complained of by the public in the legislation of 1847 and 1860. This is a "far cry;" but it is no small relief to get the controversy cut adrift from the sliding-scale settlement. Rightly or wrongly, this settlement is thereby made to appear an incident, and not a starting-point. Legally speaking, this is what the sliding-scale is; because it is no general enactment, like the Acts now in question. If the prices of gas in London had been open to reasonable explanation, on the merits, this resurrection of the organic statutes would never have occurred. As matters stand, however, some such arraignment of the Acts of Parliament under which the existing state of things has come to pass was to be expected. There is no denying the facts; the trouble is how to deal with them. We cannot but unaffectedly regret that circumstances have had this issue, while confessing that the effect is a natural and logical result of the cause. None but the wilfully or incurably blind could fail to see the peril to the whole statutory gas industry of the United Kingdom which lay in the unequal—the largely unequal—gas prices levied by the London Gas Companies on whom Parliament had conferred privileges and laid obligations as nearly identical as possible. Now the peril has become an emergency; and it is only too clearly to be feared that, before all is done and a new settlement arrived at, the innocent and the culpable will be made to suffer together. What parliamentary action has brought about, Parliament can be moved to remedy. In the question once more at issue, the Corporation of London are true to their traditions in looking to commercial competition as furnishing the key to efficient service. Actual competition in gas supply being out of the question, the Corporation seek to obtain its usual and ordinary result—the levelling-down of prices—by fresh statutory enactment.

#### The Prospects of Alcohol Lighting.

As an amusing illustration of how little substantial aid from facts is required to lift the "popular science" writer upon a comfortable hobby, which will forthwith amble away with him into the Unknown, we draw our readers' attention to something appearing in "Leisure Hour" on the subject of "Alcohol for Lighting Purposes." It is here observed that the illumination of the "Orangerie" in the Tuileries Gardens by means of the alcohol-burning lamps invented by M. Louis Denayrouze, "together with the results now obtained at the Pont de Jéna and elsewhere by the same "system of lighting," seem to indicate that alcohol will be one of the chief illuminating agencies of the near future. Without entering into details that would be too technical for the reader—and probably for the writer—the latter confesses himself unable to explain precisely how it is that M. Denayrouze has been able to render alcohol "a light-giving agency of extraordinary brilliancy;" but details, of course, are immaterial. It is far more interesting to picture the possible consequences to agricultural interests of the general adoption of this method of lighting—"all alcohol being of vegetable origin." In France, for example, where agriculture languishes "for reasons of an economic and fiscal order," a largely increased demand for crops which are suitable to the distillation of cheap alcohol would bring an important amelioration to the condition of the peasantry in many districts, "and go far to solve the perplexing question of protecting the French wheat-grower from foreign competition." This is racy of the soil. How the manufacture of cheap alcohol from potatoes is to help the wheat-grower is another detail; but let it pass. We are next bidden to ponder the possibility

that "one of the great changes of the new century may be that the vegetable kingdom will take the place now occupied by the mineral kingdom in the production of artificial light; in other words, that coal gas and petroleum will be both succeeded by alcohol." Even the electric light may be put out of fashion by the same competitor "on account of its costliness"—as if cost ever had anything to do with the waxing or waning of a fashion—and then, naturally, both metallurgists and mechanicians would suffer a diminution of their trade. All this is very pretty cobweb-spinning, out of the slenderest of structural materials. Unfortunately, or fortunately, as one may look at it, any kind of alcohol light will have a good deal of leeway to make up before it can get on level terms with the existing illuminants; and then it will not be the French agriculturist who will reap the benefit of it. Meanwhile, the gas industry can afford to wish well to the alcohol light, or to anything else which will take some of the pressure off the coalfields.

#### Gas from Sewage Sludge.

THE letter of Mr. Edward A. Harman, of Huddersfield, on the use of sewage sludge for the manufacture of illuminating gas, which appears in our "Correspondence" column to-day, is a reminder that it is at least as feasible to make gas out of this waste material as it is to drive dynamos by burning town's refuse. Beyond this, we fear there is not much to be said for the performance. Of course, if local authorities owning gas-works choose to require the gas manager to get rid of their sewage sludge by carbonizing it, that is their affair. It can be done, at a price; but it is not good business. Clean, dry gas coal is the best raw material for gas manufacture; and it is a very costly blunder to suppose that there is ordinarily any surplusage of heat in gas-retorts to be played with in the fashion described by Mr. Harman. On the contrary, the getting up of sufficient heat where it is wanted, and maintaining it at the lowest possible expense for fuel and repairs, is quite enough responsibility for most gas-works' managers and carbonizing foremen. A good retort-setting is too costly and delicate a piece of apparatus to use for burning or carbonizing sewage or any such worthless rubbish. Nothing of the kind should ever be permitted to enter a gas-works. It may be, as Mr. Harman says, that "the cost of destruction (of sludge), including labour, fuel, and capital charges, is in some towns enormous." That is no affair of the gas manager. He should allow his good colleague the cleansing superintendent, or his friend the electrical engineer, to see to all that. There is no reason whatever why he should upset his carbonizing plant, and ruin the aspect of his fuel account, to conceal the cost of the sewage system. Once let a disturbing element such as this get into carbonizing accounts, and the gas manager will never know where he is. Mr. Harman's affection for sewage sludge, and his amiability in trying to make gas with it, will not be shared by many of his brother professionals. Let us leave it to the electricians, by all means. If they can burn it, the relief to the coal-market will be as great as if it were carbonized; and nobody will begrudge them a full supply of this interesting preparation. They can have all the marsh gas to be had from "septic tanks" too, if they like it. The new-fashioned septic tank is only the old tight cesspool with a fine name; and it is no fresh discovery that this receptacle made gas. Many a man has been reminded of the circumstance disagreeably, on entering one with a naked light.

#### The Report on the City and Guilds of London Examinations.

THE report on the work of the Examinations Department of the City and Guilds of London Institute has been published. The Committee mention, with pardonable pride, the success of their exhibit at the Paris Exhibition, which received a "Grand Prix" at the hands of the International Jury. Various references in the body of the report testify to the consciousness of the Committee of the shortcomings of their methods, and their desire for improvement, especially as regards adapting instruction and examinations to the needs of the trades and the requirements of learners. The subject of gas manufacture is one of those which are under the consideration of the Committee. The time of the examination has been extended, to enable candidates to do their work less hurriedly. It does not appear from the remarks of Dr. H. G. Colman that he is particularly impressed with the quality of the candidates, more especially in the ordinary



grade. This seems to argue bad or insufficient instruction, or failure to get the right stamp of candidate. Through almost all the Examiners' reports there runs the same line of criticism, which points to the probability that the Institute is not getting at the right order of learners. Many candidates for all sorts of examinations are clearly certificate-hunters, whose object is to equip themselves with as many of these fallacious testimonials as they can obtain by "getting up the subject." They probably belong to the great *genus* "pupil teacher." Over and over again the Examiners complain that the real workmen entirely fail to show an intelligent appreciation of the science of their craft, other candidates who are good at the paper-work "are complete failures as workmen." It strikes one also, while reading these reports, that the elementary education of the candidates must be very poor. They supply one more proof of the miscarriage of the Board School system of the country. The sketching of the candidates is almost without exception condemned. Even in the somewhat elevated regions where telegraphy and telephony are cultivated, "the making of even the simplest sketches shows, generally, lamentable incompetency." After this, it is not surprising that the humble plumbers betrayed "a frequent failure to understand the meanings of views, elevations, plans, and sections." There is something rotten here.

So far as instruction in the elements of gas manufacture are concerned, the record does not compare favourably with the American work to this purpose inaugurated by Mr. Walton Clark, of Philadelphia. The City and Guilds of London must try and get rid of the text-book student, and endeavour to lay hold of the real workman. It is only necessary to read the report of the Examiner in such a fundamental handicraft as carpentry and joinery to perceive that the scheme of examinations is often out of focus. As might be expected, some trades are better fitted for this scheme than others. The prize paper in goldsmiths' work, for instance, is characterized as being of "signal excellence, and the practical work submitted with it is one of the best which has been presented." This is comforting, although the subject is not one in which we are specially interested. Generally speaking, however, the impression created by a perusal of the Examiners' reports is not very favourable to the system as a whole, nor encouraging of any hope that the great mass of workmen are being leavened or touched by it. How can one judge differently while the statistics remain what they are? Battersea Polytechnic—"Gas Manufacture"—ten students registered, seven examinees, one pass. Borough Polytechnic, one candidate—no pass. The Regent Street Polytechnic seems to be the greatest school of gas manufacture in London, with 35 students, 25 examinees, and 10 passes, whereof three are prizemen. This is not a bad record for one centre. At the same centre electric lighting claimed 62 students, of whom 25 became candidates, and 10 passed. Ninety-three plumbers turned out 24 passmen. Unhappily, in nearly all the Examiners' reports, the most searching questions, those which went to the heart of the practical or commercial part of the craft, were those which generally "floored" the candidates, and are responsible for the heavy proportion of failures.

#### The Barking Gasholder Disaster.

In our "Miscellaneous News" columns, is told the story of the serious misfortune which has overtaken the Barking Gas Company in the collapse of their cable-guided holder. Engineers will miss one important point from the narrative, and that is any mention of the actual cause of the accident. The information which we possess is not sufficiently precise to warrant even an expression of opinion in this regard; and, as there may be some question between the contractors for the holder and the Company, it is not prudent for anyone who might throw light on the matter to commit himself at this stage. But we shall no doubt learn the truth in due season. Meanwhile, we would ask readers to withhold their judgment, and not to condemn the cable system of guiding as a system until the matter has been fully investigated. The system itself has in several instances proved to be, according to engineers whose word is beyond question, all that could be desired; and some satisfactory explanation of the present occurrence may be forthcoming. A serious feature of this altogether unfortunate event is that the holder (excepting a small one with a capacity of only 14,000 cubic feet) constitutes the entire gas storage of the works, which have an output of from 130,000 to 140,000 cubic feet

per day; and consequently, had the Company not been able to obtain the friendly aid of the Ilford Gas Company, the position of the Manager (Mr. W. B. Reidie) would have been a desperate one. This brings to mind the old adage about "carrying all one's eggs in one basket;" and it is a question which should be gravely considered whether in a works having only one holder, when making an extension of storage, prudence should not outweigh the large saving which can admittedly be effected by telescoping. In a second holder, there is a great safety to compensate for the additional expenditure; it is an insurance against an interruption of constant supply, and loss and damage to business in the event of an accident. Telescoping may come after the second holder, when extended business demands it. This is a suggestion which presents itself in connection with the Barking *contrevtemps*. But many managers of limited sized works will count the cost; and some will shake their heads. For them we hope the future has not a rude awakening in store.

#### A Seamy Side of Municipal Trading.

It was certain to come out; and now it is out there can be no objection to rubbing the truth well in to those who have hitherto ignored the possibility. We refer to the exposure of a seamy side of London County Council Progressivism at last Tuesday's meeting of this body. "Mr. Beachcroft" referred to a letter sent to the Council by the Secretary "of the Municipal Tramways Officials' Association, in which it was stated that Mr. Benn (Chairman of the Highways Committee) had informed a deputation that 'the question of including employees in the superannuation scheme of the Council should be brought forward after the election. Electoral assistance was promised in the letter from members of the Association to those councillors who supported the Association in the matter of superannuation.' . . . Mr. H. P. Harris hoped the 'tramway question would not be made an electioneering one.' He held in his hand a bill issued during the recent General Election asking electors to 'Vote for Benn, who 'voted for and secured a ten-hours day, one day's rest 'in seven, and better wages.'" Thus runs the report of the debate. We hope Mr. Priestman, of Bradford, and other admirers of the theory of municipal trading, will pay heed to this disclosure of how the thing works in practical politics. Theories of government action are lovely to talk about, and possess an unfading attraction for some minds. Others prefer to see what is done, behind the backs of the talkers. It may not be easy to find plausible hypothetical objections to the principle of municipal trading so attractive as the pleas urged by well-meaning gentlemen like Mr. Priestman in its favour. But when it comes to the working, the force of argument is all the other way. One of the strongest points of the opposition case was very well put the other day at Leeds, by Mr. Whittaker, of Southampton. He asserted that if municipalities are to extend their trading enterprises, it will be impossible for them to get councillors to devote the necessary time and care to the work of administration without some remuneration. The right men simply cannot afford to give up their own interests in order to carry on commercial enterprises which do not belong to them. Another objection is that so pointedly brought out at the London County Council meeting. It will be impossible to prevent municipal busybodies from attempting to make political capital for themselves out of everything which appears to be popular in the working of the authorities to which they belong. They may be only as flies on the wheel; the advertisement will be sought all the same. And this influence will become a canker, fretting through the whole texture of municipal and political affairs. If municipal trading is to be carried further, it will become necessary to put the administration of the various enterprises into commission, if only in the best interests of the councillors themselves.

#### Lord Rosebery on the London Borough Elections.

A ROOTED disinclination to look facts in the face, coupled naturally with a fixed determination to take words for things, appears to be the dominant "Note," to use a current term, of that otherwise unintelligible chorus of conflicting election cries which is called the profession of Progressive opinions. Lord Rosebery spoke on Friday last on the subject of the London borough elections; and, as usual, he uttered some counsels of sound common sense.



He bade a not very mournful farewell to the departing Vestries, and hailed the advent of the new authorities without much enthusiasm. On the all-important question of whom to elect to membership of the new borough councils, Lord Rosebery urged that selection should be made not of those men who desired to serve themselves, but of those who were willing to serve the public. He went on to advise that choice should be made, wherever possible, of business men, not men who would simply use the Council as a debating society, with a view to practising for Parliament. Uncorrupt men—men with a single eye to the public service—are the men for placing upon a local authority. This declaration, of course, was pounced upon by certain newspapers next morning as meaning that the electors should vote Progressive; for where else is virtue to be found? This reminds us of what we remarked last week about the haloes that are now being furbished up for these worthy gentlemen by their journalistic supporters. Some new ones will be wanted, to replace others lost during the General Election. Lord Rosebery suggested that the question of the housing of the people should be put to candidates in the most personal fashion possible, by asking every man if he is a builder, or owner of any house property in London; and, if so, where it is situated, and what it is like. This is getting to the facts, indeed; but Lord Rosebery did not stop here. He actually ventured to remind his hearers that large powers for dealing with housing questions already exist, but are not exercised in the vast majority of cases.

Obviously, his Lordship is no Progressive. He has too much regard for facts to be a Socialist; and too great respect for the work of Parliament to patiently abide the ascription to the Legislature of all the blame properly due to local apathy and conflicting interests. And, once more, everything that Lord Rosebery said ought to be done was promptly appropriated for the advertisement of a party in local politics. Nobody else is allowed to have a spark of public spirit. For instance, the question of the equalization of rates over the Metropolitan area is being discussed somewhat acutely in the richer boroughs; and this is held up as a matter of objecting to the help of the poor out of the pockets of the wealthy. But from what has lately been stated in these columns, the most extravagant of all the Metropolitan Local Authorities are those of the poorest districts. What chance is there of reforming them if they are able to draw upon their richer and more prudent neighbours? This idea of the equalization of rates is precisely one of those things that will not bear examination below the surface. Imagine Birmingham, Leicester, Nottingham, and Norwich clustered together with conterminous borders. How would the ratepayers of any one of these places like to be made liable for the mistakes and wastefulness of the others? Yet that is no more than the condition sought to be set up for the regulation of the finances of 28 Metropolitan Borough Councils. Unless the operation is conducted with the nicest care, the equalization of the rates for any group of local authorities is calculated to destroy the very soul of local self-government, which is financial responsibility. In London, at any rate, it is only too probable that the owners of heavily-rated property would fare worse under the supposed improved system of local government than under the Vestries, if these bigger bodies could rely upon being subsidized by one another to an unlimited extent.

Mr. Alexander Young, Manager of the works in Edinburgh of Messrs. R. Laidlaw and Son, has been presented by the employees of the firm with a handsome dining-room clock and hall barometer, on the occasion of his marriage.

At the meeting of the London Section of the Society of Chemical Industry on Monday, Dec. 3, Mr. W. J. Dibdin, F.I.C., F.C.S., formerly Chemist and Superintending Gas Examiner to the London County Council, will read a paper on "The Effect of Quality on the Consumption of Coal Gas."

The coal-tar derivative fuchsine is generally supposed to owe its name to the fuchsia, as its tint certainly resembles the colour of that flower; but this, according to the "Engineer," is not the case. The inventor of fuchsine, whose death was lately recorded—M. Francisque Renard—and his brother desired to identify their name with the new product; but, not liking to adopt the appellation of renardine, they translated their family name Renard (fox) into the German Fuchs.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

SUBJECT to what we shall have to say later on regarding the special department of Gas and Water, business on the Stock Exchange last week showed in most of the markets a rather more active disposition than it had in the preceding week. But things never became absolutely brisk; and the preparations to receive the C.I.V. on Saturday practically truncated the week of a day. However, the tendency in values was on the whole favourable; and several quotations made a modest advance. But Consols and the War Loan are down, though the closing prices were better than the worst of the week. The settlement was not heavy, and revealed no particular feature. The Money Market was extremely easy, and short loans were negotiable at light rates; but discount terms closed tighter. In the Gas Market, there was almost a dead calm; and the week was one of the most barren it has ever been our lot to record. On Monday and Tuesday, transactions amounted to just about the average of an ordinarily quiet day; but thenceforward something like absolute stagnation set in, and lasted to the close. The quietude may be realized when we say that, on the last four days of the week, the aggregate of the bargains marked did not amount to a score. Only one change in quotation was effected—viz., in Gaslight ordinary, which opened rather weaker on Monday, and fell a point. Par was marked once on the opening day, but was not again touched; and the lowest figure was a "special" deal at 98. The secured issues, so far as one could judge, seemed inclined to be firm. South Metropolitan marked top price—132—on the opening day, but could not do it again. In Commercials, only one transaction in the debenture was marked. The tendency in the Suburban and Provincial group could not be gauged. The few dealings recorded in the Continental Companies were indicative of steadiness, at average middle figures. Among the remoter undertakings, there was perhaps almost as much business as elsewhere; River Plate being the most noticeable in this respect. In the Water Companies, business was much reduced, even below the normal point of quietude; and very few alterations were made in the old quotations. But the tendency was firm; and changes were all upward.

The daily operations (or the lack of them) call for no detailed report, nor the publication of the table. On Monday, Gaslight ordinary fell 1. On Wednesday, Southwark ordinary rose 2. On Thursday, Southwark "D" gained 3, and West Middlesex 2½.

### ELECTRIC LIGHTING MEMORANDA.

**Small Electricity Supply Undertakings—Mr. Vesey Brown's Views—Small Works a Bar to Progress—Duty of the Local Government Board.**

THE subject of small, isolated electricity supply undertakings, usually belonging to local authorities, is of perennial interest for the electrical engineering profession. Mr. C. S. Vesey Brown, the City Electrical Engineer of Lincoln, is in particular much exercised in mind by various aspects of this subject; and having already read a paper upon it in the summer, at Huddersfield, he has just written an article bearing the same title for our excellent contemporary the "Electrician." Mr. Brown has taken note of the circumstance that most of the later Electric Lighting Visional Orders issued relate to the supply of small places times with as low a population as 3500. He shakes over the prospect of the kind of electrical supply work to be done under such of these Orders as may be acted upon. He sees all these twopenny-halfpenny undertakings designed for their owners; or at least without any regard to the of standardizing generally, or of preserving some sort between neighbouring installations. He hints at that, under these conditions, the small independent supply installation is likely to prove a nuisance—un in itself, and a hindrance to the improvement of system by the establishment of central supply works in districts. So it has at length come to this, that the industrial electrical tout, who has been largely instrumental in persuading the small local authorities of the United Kingdom to go in for their own electric lighting for the sake of "Progress," is being cursed by his more reputable professional brethren for blocking the way to real progress in the direction of bringing the cheapest possible electricity into service of the community as a whole.

This is very solacious for us, who have denounced the proceedings of the electrical tout these many years, and have been regarded coldly by the electrical journals, to say the least of it, on this account. We have never been able to see any "Progress" in the saddling of local government districts with isolated electric lighting schemes that could never do anything else than sell a wretched article at a high price, nor ever make both ends meet at that. Of course, all this prudence has been ascribed to trade jealousy. But the truth is now beginning to make itself heard; and even electricians are fain to urge that this business of setting up insolvent electricity supply undertakings by ill-advised local authorities has been sadly overdone. This is how Mr. Brown now sees it. He says: "It would be interesting to know whether the Board of Trade and Local Government Board have sufficiently investigated the position of . . . local authorities to see whether, before granting statutory powers for electric lighting,



the systems for drainage and disposal of sewage are adequate to the needs of the town or district; if sufficient has been done to properly metal and pave the roads and footpaths under the local authorities' jurisdiction; if efficient accommodation is made for infectious diseases beyond that provided by the poor-law authorities; or, again, is the water supply all that it should be; and many points of far more importance to the welfare of the people than the question of being in possession of a monopoly for the supply of electricity." So Saul has joined the prophets once more; inasmuch as Mr. Brown, who very reasonably sets forth these objections to the fruition of electrical touting, will find the same thing advanced in these columns over and over again.

The humour of the matter lies in the discovery, somewhat belated, that this particular kind of electrical progress—for it will not be denied that the very number of applications for Provisional Orders has been so regarded, irrespective of the merits—constitutes a hindrance to the real thing. Mr. Brown believes that the promiscuous granting of Provisional Orders has been detrimental to the British electrical industry; and this result has been produced irrespective of whether the Orders have been carried out or allowed to rest in abeyance. This is undoubtedly true; but we like to have it acknowledged by an electrician. The parochializing of electricity supply was a mistake. Mr. Brown mourns over it, and thinks the evil irreparable, but nevertheless declares it to be his firm opinion that "if each town and district was originally made the owner of the right to supply electricity, and given (say) five years in which to make up its mind to supply under statutory powers, and if nothing was done to carry out these obligations to transfer the concession, either by auction or some equally convincing means, there is not a town or district in this country which would not be operating an electricity works to-day." This conclusion is a *non sequitur*. Like the "Electrician," moreover, which discusses the matter editorially, the lesson which experience of the dealings of local authorities with this matter teaches us is not that of the desirability of putting these bodies in the advantageous position proposed by Mr. Brown. Unlike our contemporary, however, we can claim to have foreseen long ago that the past and present tendency to force every little local authority to go into the electricity supply business was to be deprecated.

Of course, the question is a difficult and a complicated one. Now that electricity supply in bulk is looming upon the industrial horizon, the interests that are concentrated upon this new development naturally think the small statutory undertaking a block and a nuisance. Their opinion is not influenced by any consideration of what the undertaking may be in itself, as regards its proprietors and supporters. The more prosperous it is, indeed, the greater the hindrance it offers to would-be supplanters. On the other hand, it is not so long ago that there was no prospect of such a thing as cheap electricity supply in bulk; and districts had to face the alternative of a local undertaking or no electricity. Then, in addition, there is the personal business element to be considered. Is the "consulting electrician," with himself to look after in the first place, to sacrifice his chance of a job out of regard for considerations which, in his case, would amount to pure philanthropy? Our contemporary asserts that "it is the duty of the consultant to see that those he is advising are at the outset presented with a clear statement of the true character of the problem and its best solution." Alas! who in this case is to pay the consultant? For if he were to tell the truth as he knows it, nine jobs out of ten would never come off. All the same, the local authority could obtain their Provisional Order and play "dog in the manger." After all is said, therefore, it comes to this, that the Local Government Board ought to keep small local authorities from embroiling themselves with electricians, when their circumstances are such as to clearly indicate the advisability of husbanding their resources.

#### INCANDESCENT GAS MANTLE COMPETITION.

A JOURNALIST'S portion is not always a happy one, particularly if it lies in the channels in which run class or trade interests. It is his duty to chronicle, and if need be to comment upon, without fear or favour, everything he hears and everything he sees which, in his view, has any interest, from a professional, trading, or business standpoint, for the whole or any section of his readers. But in doing this—in carrying out his duties on broad lines, without favouritism, and with a singleness of purpose—he frequently, while giving pleasure on the one hand incites displeasure on the other; and occasionally he receives (sometimes directly, sometimes indirectly) evidence of petty jealousy and animosity, and even of obloquy. But the true journalist is not impressed, affected, or shaken by any such considerations. His duty is to be just, and to give the best he can command, and the fullest information he can obtain, to those who look upon him as a repository for, and collector of, intelligence of every kind touching their particular interests. The "JOURNAL" has always endeavoured to maintain a high standing in this respect. One and all who have had anything worth calling attention to have never been, and never will be, refused a hearing, or the publicity they desire; and the question of incurring the wrath of others has never, and never will, trouble our minds. And we are happy to acknowledge that we have been comparatively free from unwarranted aspersion, and that there have been few indications of our having incurred resentment

through our freedom of action. It can be well understood that among manufacturers and vendors of articles in the same line there would be a little latent jealousy when a competitor in business brings out something new, or a fresh aspirant enters the field, and the one or other succeeds, by proving the worthiness of his goods, in getting the helping editorial push. But that jealousy has, in most cases, remained latent so far as we are concerned. All that is new and meritorious, and all that will promote the welfare of the industry we serve, has entrance to these columns.

The question may be asked, "Why have you written thus in introducing a little information which you have to give on the subject mentioned in the title?" The reply is simply this: A few weeks since we heard in the City that competition in the sale of incandescent mantles was shortly to be seriously entered upon, and then the legal monopoly which the Welsbach-Sunlight combination possess, or have so far succeeded in holding, would again be strenuously disputed, if action by the Welsbach Company compelled. We made inquiry, and found there was some truth in what we had heard; but our information does not go far. In the course of the inquiries, it was apparent to us that there was a little feeling that the "JOURNAL" was somewhat favourably inclined towards the Welsbach Company; and the inference we are left to draw (so much, however, it is only fair to say, was not expressed in words) is that we should be reluctant to fairly and freely disseminate information about promising competitors. We can find nothing in our past action which can uphold that idea. It is not for us to do anything to discourage or to try to prevent competition in incandescent mantles; that is the business of the Welsbach Company. Our attitude towards the Company ought certainly to be clearly known by this time; and we can declare it in a few words: With their past financial arrangements we have little concern, excepting in so far as they have operated detrimentally on the price of their mantles, and have dragged upon the heels of progress; with the Directors' policy and business methods before (say) about the time of the advent of the Kern burner, we were not particularly struck; but the more enlightened methods and commercial principles upon which the business is now being conducted have our full sympathy. But even this sympathy will not hush our cry for the cheapest and best that can be obtained in incandescent mantles to benefit the gas industry of this country. We care not whether the cheap, serviceable mantle comes from the west or from the east so long as incandescent lighting obtains the same hold of the public in this country that it has obtained in Germany through the medium of the low-priced mantle. The Welsbach Company themselves tell us that, since their recent substantial reduction in the price of mantles and burners, the demand has increased by 50 per cent. This is satisfactory; and it points the direction in which they must, and sooner or later will have to, further tread. The question of the relation of profits to the heavy capital with which the present administration is encumbered is a serious one for them; but in it the public, the gas industry, or the "JOURNAL" have no concern whatever. The public want incandescent lighting; and the gas industry desires to push it. But when the public hear that in Germany mantles can be obtained for about half the price charged here, when they are offered at their own doors mantles for fourpence which give a satisfactory light, they ask why they cannot obtain the Welsbach goods at the same figure? It passes their understanding. The day is gone when we can talk of mantles being inferior at the price of 4d. or 4½d.; and from a remark made at last Wednesday's meeting of the Welsbach Company, the shareholders are not altogether ignorant on the point. They no doubt find, as we have done, that it is no use speaking of inferiority when our friends reply by pointing to brilliantly glowing mantles which have been purchased for about 4d. apiece, and yet have given a profit to the vendor. And our experience is that of gas managers; and they, like ourselves, cannot shut their eyes nor their ears. We could say more on the point, but it is no use labouring it. What we have written has not by any means been prompted by a spirit of hostility to the Welsbach Company. Nothing would be more pleasing to us than to see the successors of the Company who introduced incandescent lighting into this country the channel through which the gas industry obtained the means in the way of yet cheaper mantles of putting into the homes of rich and poor alike, and into every apartment of a house, the advantages to be derived from this method of illumination. In all the efforts of the Company to make progress towards this end, our pen and our columns shall be at their service, but others too will not knock at our door in vain.

To-day the Welsbach Company are the masters of the incandescent gas lighting field of this country; and, so far as we know, they may continue to be so for some years longer. But their right to the position will continue to be assailed. Upon the rumours in the City of which we have already spoken, we made inquiries; and we heard that a new Company was being promoted to exploit a mantle which, we believe, is to be known as the "Standard." But about this Company or about the mantle, we have nothing to say at present. We have also learnt that the "Voelker" Mantle Company intend almost immediately to commence business. This mantle is not a stranger to readers of the "JOURNAL"—an article describing it and reports by Professor Lewes having appeared in the numbers for Feb. 14 and 28, 1899. It may be remembered that one of the claims for this mantle is that its illuminating power starts at about 70 candles, and then in use it gradually increases in brilliancy—in fact



tests have been made which gave the mantle credit for an increased candle power of fully  $12\frac{1}{2}$  per cent. after about 2000 hours' use. The proposal of the Company is to put the burner and mantle, with side support for the latter, on the market for 2s. One advantage of the side support is that it can be raised or lowered by a small screw to suit the length of the mantle—for instance, if the mantle becomes frayed in use, the support can be readily lowered. The Directors of the Company have no intention—at all events at present—of touching glassware or fittings; they being of opinion that the cheapness of their burner and mantle “brings them within the reach of the million,” and that their best policy is to push them, and them alone.

Then we found that the “United Chemical Works”—a concern of which we had never heard before, with offices in the City—appeared to be doing a very good business in mantles known as the “Guaranty.” In fact, we are told (and we give the statement for what it is worth) that in England alone, something like 60,000 of these mantles a week are being distributed. On calling at the offices of the Company, our attention was directed to a large poster, on which it was announced that: “Recognizing the excellent quality of our mantles (known as the ‘Guaranty’ incandescent mantles), and the keen opposition they have encountered from us, the Welsbach Incandescent Gas-Light Company, Limited, by their Counsel (Mr. Thomas Terrell, Q.C.), applied on Tuesday, the 4th day of September, 1900, to Mr. Justice Farwell to stop the sale thereof, by us or our customers, by means of an interim injunction. After hearing our Counsel (Mr. Wm. Neill), the Judge declined to stop us, in spite of the Welsbach Company's offer to bring £25,000 into Court. If anything were wanting to convince the public of the superior quality of our goods, it is the jealousy of our competitors. But why should you pay the Welsbach Company 7s. 6d. per dozen, when you can buy from us for 4s. 6d. per dozen?” This style of advertising does not appeal to us; but it may net the public. What rather appeals to us is the fact that these mantles can be bought at 4s. 6d. per dozen, and that samples were freely offered to us from stock for trial purposes. In the few days during which one has been in use, it has given as much satisfaction as a more expensive article; and we have independent testimony, obtained direct from one who has had much experience with incandescent mantles, that on certain high-power lamps he has found them more durable and equal in illuminating value to other mantles. And our informant accompanied this expression of opinion with the remark “There is one”—pointing to a lamp from which came an exceedingly brilliant light. We have no interest in bolstering up this mantle any more than any other; but what are we to say to such testimony? We cannot deny the testimony of our own eyes, nor the testimony of a disinterested and practised user. And these are mantles, made in Germany, and sold here at  $4\frac{1}{2}$ d. each!—manufacture, transit, and profit all included. But how long they will be sold here is another question. Already the Welsbach Company, as we have shown, have tried to stop the trade in them; and writs have been served on some of the users. But the “United Chemical Works” emulate quondam competitors of the Welsbach Company by asking users to report to their Solicitor “any attempt on the part of the Welsbach Company to terrorize.” If we have correctly understood, the introducers of the “Guaranty” mantle do not deny that it is made on the same principle as the Welsbach; but they dispute the validity of the 1893 patent. Their point appears to be that the specification of the 1886 Welsbach patent describes and claims making mantles of pure thorium oxide or thorium oxide alone; and that in one of the Sunlight cases it was established (1) that pure thorium oxide gives practically no light, and (2) that what was known as “pure thorium” in 1886 was really thorium containing a small quantity of cerium. Therefore, they contend that the validity of the 1893 patent can be impeached on the ground that the alleged invention was merely the discovery of what were the real components of the mantles sold from 1886 to 1893, and of the best proportions in which to use them, and therefore was not proper subject-matter for a patent. Others who are making mantles hold the same view; and this looks like the point over which the next contest will rage. Further litigation there must be if the Welsbach Company are to retain their monopoly (if so it can at present be called); and we are assured that, if they force the fight, they will not find their opponents unprepared to meet it. Upon this point we can say nothing further.

For the present we leave the subject with these remarks: Our three objects in writing have been to declare (if that were necessary) our independence, to urge the argument for even cheaper mantles than are supplied from the recognized source, and to give information which may or may not result in meeting the demand.

Our readers are aware that the Sulphate of Ammonia Committee offer three prizes to the growers of barley raised with sulphate, at the malting barley competition in connection with the Brewers' Exhibition at the Agricultural Hall. The winner of the first prize (£25) this year is Mr. R. Seabrook, of Tolleshunt D'Arcy, Essex; the second prize (£15) being secured by Mr. L. Briggs, of Belmesthorpe, Rutlandshire. The sample of barley shown by Mr. A. Day, of Stratford-on-Avon (a portion of 43 quarters grown on a loam soil with a subsoil of gravel), was highly commended by the judges.

## VIOLLE ON CONTEMPORARY PHOTOMETRY.

THE most generally interesting of the reports presented to the International Electricity Congress at Paris was that by Professor J. Violle, on Photometry. A full abstract of the report has been published in the “Electrician;” and the following is a summary of its chief points of interest for gas photometrists. We depend upon our contemporary's translation of the text. Professor Violle started with a restatement of the resolutions adopted by the International Electrical Congress of 1896 with regard to photometric quantities and standards of light. These resolutions formulated a scheme of photometric data based on the conception of luminous intensity as referable to a point source, the value of which was styled the decimal candle, but for practical purposes was represented by the horizontal intensity of the Hefner lamp, corrected.

The present report deals with the later developments of photometry. First, it is stated that Professor Violle's own platinum standard of light, which has been so much criticized, has been reproduced by M. Petavel. The conditions of successful reproduction of the Violle standard are: (1) Chemically pure platinum; (2) a crucible made of pure lime—prepared by calcination of the carbonate—obtained by precipitating calcium nitrate by ammonium carbonate; (3) the hydrogen burnt must not contain hydrocarbons; (4) the gases must be in the proportion of four volumes of hydrogen to three of oxygen, mixed by passing the oxygen both through an inner tube and through an annular space outside the hydrogen tube. Under these conditions, the platinum is carried to a temperature little over the fusing point; and the luminosity of the metal is not altered by combined carbon. M. Petavel has constructed an apparatus by means of which a single operator can conduct the whole process. After the platinum is melted, gas turned off, and the perforated cover put over the crucible, the luminous intensity of the visible square centimetre of molten metal falls very rapidly at first, then rises with a flash, and varies very slowly for from 40 to 50 seconds. It is during this period that the readings are taken. Afterwards, the fall of intensity becomes rapid again. M. Petavel enters the readings for the period of slow variation on squared paper. The points so obtained are sensibly in a straight line; and this line is produced up to the abscissa corresponding to the flash. The value thus found is called the luminous intensity at the moment of solidification, which, it will be remembered, is the original Violle prescription. The experimental error is stated to be about 1 per cent. at the most.

Lummer and Kurlbaum have proposed to make a standard of light with platinum heated to less than the fusing point, and defined by the condition that nine-tenths of the energy radiated shall be absorbed by a layer of water 2 centimetres in thickness. This suggestion has been realized at the Reichsanstalt, at Charlottenburg; but it necessitates a complicated and uncertain train of apparatus, and the light is found to be too red for photometric use.

Another available source of constant and very high temperature is the electric arc. Electricians have known for some time that the area of the crater varies nearly as the current intensity, and that the luminosity follows nearly the same rule. Violle himself has shown that the brightness remains constant under variations of from 500 to 34,000 watts. Although the elements of a constant standard of light appear to be here, unfortunately the result of all attempts to produce such a standard by means of the carbon arc lamp have failed. A principal reason of this failure is the shifting of the most brilliant portion of the craft which periodically revolves in the hissing arc, and is not steady with the silent arc. The application of electric incandescent lamps to this object affords an interesting study. Numerous experiments have shown that an incandescent electric lamp can be standardized and used if the pressure at the terminals is carefully regulated. But the regulation has to be extremely exact, since the luminous intensity changes much more rapidly than the voltage (5.5 times, according to Liebhenthal).

This latter authority has made an extensive series of observations of the luminous effects of different patterns of incandescent electric lamps, and has found that the arrangement and looping of the filament makes a great difference in the distribution of the light. Where there are spirals or loops, the mean horizontal intensity may sink to 73 per cent. of the maximum ascertainable effect. Two determinations in mutually perpendicular directions do not as a rule give a satisfactory mean value. Three equidistant measurements are better; but even then the error may exceed 2 per cent. The Union of German Electricians have adopted the latter way of obtaining the mean horizontal intensity of an incandescent electric lamp. The photometer screen receives the rays emanating directly from the lamp, on the flat way of the standing part of the filament, and also the reflected rays from two mirrors suitably inclined. The mean error amounts to 1.9 per cent. The American method is to revolve the lamp at a speed of two revolutions per second. In order to arrive at the nearest actual intensity of such lamps, as used, it is sufficient to incline their axis, when under test,  $45^\circ$  from the vertical, as well as to revolve them.

On the subject of flame standards of light, Professor Violle enumerates as the modern representations of this kind of standard the French Carcel; the English Vernon Harcourt pentane (ten candles and one candle); and the Hefner amyl-acetate



lamp. The Carcel lamp continues to be used according to the prescriptions of Dumas and Regnault. The Hefner standard is certified by the Reichsanstalt. The whole of the height of the flame is used; and if this varies by one millimetre from the normal 60 millimetres, a difference of 3 per cent. of luminosity results. Liebethal's researches on the Hefner standard show that, on the whole, its winter intensity is several per cent. higher than its summer brilliancy. This effect is chiefly due to water vapour. The effect of barometric pressure changes on this standard is not great. Liebethal gives formulæ for correcting the Hefner standard for aqueous vapour and carbonic acid in the atmosphere. Deprivation of oxygen also affects it. The red colour of the Hefner standard and its feeble luminosity are its great drawbacks. Also, the mobility of the flame often necessitates an assistant operator. Otherwise the lamp gives very consistent values.

In 1891, Professor Violle himself determined the equivalent value of the Hefner lamp to be 1.026 "decimal" candles. Laporte has recently stated it at 0.885 "decimal" candle. This determination is based upon a Carcel lamp, taken at 9.6 "decimal" candles. With regard to the Vernon-Harcourt pentane standards, after repeating the claims of the author, dated 1898, Professor Violle remarks that Liebethal has subjected the pentane standard to a study similar to that carried out on the Hefner standard. He found that great exactitude of regulation of the height of the flame is required; and also that the flame (apparently in the case of the one-candle standard) does not reach its maximum intensity till half-an-hour after lighting. The pentane lamp, although having a much stiffer flame than the Hefner, requires more attention. The influence of moisture is sensibly the same in both lamps. Barometric pressure, however, affects the pentane much more, according to the formula  $\Delta y = 0.00049(b - 760)$ . This shows a variation of 2 per cent. for an alteration of 40 millimetres of the barometer scale. It is therefore necessary to allow for altitude, which is an objection. For all that, however, the superiority of the Hefner to the pentane standard is not regarded as clearly proved.

Professor Violle dismisses the Dibdin pentane lamp in a few words; saying that the proportion of air and pentane varies with the temperature and moisture in the room. On the other hand, he records that Methven's carburetted gas standard has given very good results. The Dutch Photometric Commission recommended the employment of a lamp of the Vernon-Harcourt type, modified to burn a mixture of 9 parts of benzene with 100 parts of ether. The intensity of this standard has to be 1.48 English standard candles; but Professor Violle does not criticize it. Acetylene standards come in for more detailed notice. Professor Violle himself uses a Carpenter burner, with a pressure of 30 centimetres of water. This flame is over 100-candle power for a consumption of 58 litres (2 cubic feet) per hour. The flame is of remarkable whiteness; its spectrum having the same range as that of fused platinum. Fery proposes to burn acetylene at the end of a thermometer tube about 0.5 millimetres in diameter. An American acetylene standard consists of a mixture of two parts of acetylene and one part of hydrogen burnt in pure oxygen. M. Blondel has constructed a chimney lamp burning a mixture of alcohol and crystallizable benzene; and M. Broca has proposed the use of an "albo-carbon" gas-burner as a standard. All this shows, according to Professor Violle, how difficult it is to obtain satisfactory results with flame standards. The greatest errors are due to variations in height of flames, which may amount to as much as 24 per cent. He thinks the old Carcel lamp the steadiest of all, since with careful handling the error may be kept below 0.8 per cent.

As to photometers, the instrument of Lummer and Brodhun is commended as an improvement on previous adaptations of the Bunsen principle, by reason of the sharpness of the dividing line between the two illuminated surfaces. Yet it is admitted that the instrument is not perfect, inasmuch as its action cannot be reversed—that is, the positions of the standard and test-light changed—without introducing risk of error. The photometers suggested by Blondel and Broca are also mentioned. But this division of the subject is not treated by the reporter in a very practical spirit; and it is not easy to tell whether he is discussing mere suggested appliances or apparatus actually obtainable for industrial or scientific purposes. This impression may be the fault of the abstract; but it is to be regretted that the learned reporter did not put upon record the types of photometers actually used by French, German, and English practitioners.

The next meeting of the Southern District Association of Gas Engineers and Managers will be held on Thursday, Nov. 15, at the Holborn Restaurant, under the presidency of Mr. D. Irving, of Bristol.

A description of the condition of gases, materials, and food in a mine which had been tightly closed for fifteen months was given by Mr. F. G. Meachem at the recent meeting of the Institution of Mining Engineers. When the mine was reopened, the air was analyzed, and was found to consist of 84 per cent. of nitrogen, 12 per cent. of fire-damp, and 4 per cent. of carbon dioxide. The gases were greatly compressed; and it is estimated that about 1½ million cubic feet escaped from the first borehole in 24 hours. When the mine was entered, it was found that the gases had not had any deleterious effect upon the food or the materials left in the mine.

## THE INVESTOR'S OPPORTUNITY.

THE great depreciation that has taken place in the market value of investment (as distinguished from speculative) securities in the past two or three years, has already been the subject of remark in the "JOURNAL;" gas stocks having been not the smallest sufferers in this respect. We have before pointed out that the present is an excellent opportunity for purchasing the best class of stocks, as there is as certain to be a reaction in the not distant future as that spring will follow winter, or day follow night. The causes of the present state of affairs, and the reasons for holding that this state cannot, in the nature of things, be permanent, are ably discussed in an article by Mr. W. R. Lawson in the current number of the "National Review," entitled "The Investor's Opportunity."

The writer first points to the great downfall of what are commonly known as "gilt-edged" securities—i.e., British Funds, Corporation and Colonial Stocks, Railway Debenture, Guaranteed, and Preference Stocks, and Indian Railways, which were at the zenith of an artificial appreciation in the summer of 1896, and are now at the depth of their depression. The depreciation that has taken place in those four years has been equal, on an average, to about 15 per cent. on the 1896 prices. Consols in 1896 touched 114; they have been bought this year at 97. Metropolitan Two-and-a-half per Cents. have fallen from 107 to 89; and Threes from 120 to 103. So with railway stocks, which, like gas stocks, stood at ridiculous figures four years ago. In that year, London and North-Western 3 per cent. debentures yielded 2.4 per cent. to the purchaser. At present prices they return over 3 per cent. Taking seventeen first-class securities, Mr. Lawson shows by a table that those stocks, which stood at an aggregate market price of £2222 10s. in July, 1896, were only quoted at £1908 10s. in the same month this year—an average fall of 14.1 per cent., while the yield to the purchaser rose from £2 15s. 5d. to £3 7s. The gas stock included in that table is the Commercial Company's Old Stock; the fall therein, according to the figures given by Mr. Lawson, being from £347 to £275 per cent. This, as the following comparison will show, is only a representative instance of the decline in the market value of gas stocks, and not by any means an exceptional case.

Stock.	Market Price, Oct., 1896.	Oct., 1900.	Yield upon Investment, Oct., 1896.	Oct., 1900.
Brentford 4 p.c. deb. . . . .	132	118	..	£2 19 9    £3 6 8
Bristol 5 p.c. max. . . . .	130	117	..	3 15 9    4 4 9
Commercial old . . . . .	343	267	..	3 18 0    4 12 8
Gaslight 10 p.c. ord. . . . .	307	250*	..	4 2 3    4 7 2
" 6 " deb. . . . .	210	190*	..	2 16 7    3 2 6
South Metropolitan ord. . . . .	145	130	..	3 10 3    4 0 10
" " deb. . . . .	172	159	..	2 17 9    3 1 10
Total . . . . .	1439	1231	average	£3 11 8    £3 16 8

\* Calculated from present price of converted stock.

The stocks quoted by Mr. Lawson, and those enumerated above, "are unimpeachable as to quality, and are as safe to-day at their low prices as they were at the high prices of 1896." Why then have they tumbled down so heavily? Because we have passed in the four years from a period of trade stagnation into one of unexampled activity. That is the prime cause of the fact, though in the case of gas stocks to say this is not to say everything; for those securities depreciate under such circumstances in twofold manner. All good securities stand lower when there is a pressing demand for money to provide the capital essential to trade expansion—the Consol market and speculative stocks vary inversely in strength—but gas stocks are especially hit by times of abnormally good trade, because, coals and other materials being in demand, and consequently dear, profits tend to rule lower in the gas world. This is a fact only too well known to our readers. It is, therefore, a source of satisfaction, and a sign of the confidence of the public in the future of the gas industry, that the depreciation in the representative gas stocks that we have tabulated is only barely equal to the average depreciation of the seventeen first-class securities that are quoted by Mr. Lawson.

The tendency for the price of high-class investment to vary inversely with the price of money is agrowing, not lessening, one; for the volume of "gilt-edged" securities bears, not only a small, but an ever-diminishing proportion to the volume of money seeking investment. Not more than 20 per cent. of the quoted securities of the country can now be put in the category of high class; and the consequence naturally is that, so soon as ever commercial enterprise ceases to require, or to attract, the investor's savings, there is a scramble for the safe stocks, and an enhancement of their market value quite unwarranted by any change in their character or yield. At no time was this adventitious enhancement more marked than during the first six months of 1896. The "Bankers' Magazine" publishes every month the market value of 325 representative securities. At the end of 1895, that value was 3095 millions; by the end of June, 1896, it had risen to 3280 millions; and by August this year the figure had gone back below the level of December, 1895, standing at 3063 millions. But it would convey a false impression if one said that these stocks were worth 217 million pounds less now than four years ago. The difference is only a paper, not an actual, one. Indeed, as one would rather buy Consols at par



than at 114, they may be said to be worth more now to the purchaser than four years ago.

It is not without interest to glance at some of the groups making up the aforesaid 325 representative stocks. The shares of the four Gas Companies quoted have declined in market value since June, 1896, from £32,186,000 to £27,540,000—a drop of £4,646,000. On the other hand, the group of seven Coal, Iron, and Steel Companies show an appreciation of £5,346,000—a more than compensating rise; the two changes being by no means unconnected. The principal other groups to show increased values are American Railroads, Commercial and Industrial Companies, Shipping Companies, and Banks; all but the first being, in fact, the very concerns that would profit by a trade revival of a magnitude sufficient to account for the depreciation of other first-class stocks. The ten Water-Works whose shares are included show a fall from £22,012,000 to £19,248,000.

The obvious lesson to be drawn from the consideration of the causes of the great fall in gas and other first-class stocks is that the present is a splendid opportunity for the investor to buy them, as their recovery is absolutely assured. In fact, the man who bought coal shares in 1896 would do well if he sold them now and bought gas stock, as the pendulum has got to the end of its swing and is now falling back. Above all, the present is a time to invest, not to speculate.

#### THE WORK OF THE EXAMINATIONS DEPARTMENT OF THE CITY AND GUILDS OF LONDON INSTITUTE.

WE have received from Sir Philip Magnus, the Superintendent of Technological Examinations of the City and Guilds of London Institute, the report on the work of the Examinations Department for the session 1899-1900. This is the 21st annual report; and, in presenting it, the Committee direct particular attention to the large increase this year in the number of registered classes in technology and manual training; the figures rising from 2087 in the year 1898-9 to 2460 in the past twelve months. The progress of the work of the department is indicated by the augmentation in the number of candidates presented for examination. The number of papers worked was 15,557, as compared with 14,978 in the previous year; and while only a few years ago all the examinations were held on two days, they extended this year to twenty, during the months of April, May, and June. Examinations were again held in India and several of the Colonies; and the results are given in special tables in the report. Money prizes to the value of £477.10s., distributed over 59 subjects, were awarded in the names of the contributing Livery Companies; and 103 silver and 156 bronze medals were given by the Institute. There was an increase from 1764 to 2182 in the number of registered classes; but there was no corresponding augmentation in the number of students in attendance—the figures being 34,189, against 34,176 in the year 1898-9. It is pointed out, however, that the increase in the period covered by the report was really greater than these figures indicate, as it was found that many of the schools forwarded, at the beginning of the session, only the approximate, and not the actual, entries. The number of candidates examined this year was 14,551, and the number of passes was 8114, as compared with 14,004 and 7962 in 1898-9. Of the entire number of candidates, 2729 were examined in London, against 2662 last year; and they secured 69 of the 259 prizes awarded—59 being gained by students in attendance at the Institute's schools. The grants to London classes on results will be discontinued after this year.

With these introductory remarks on the general work of the department, we turn to the section of it which has a direct bearing upon the gas industry—viz., the examinations in "Gas Manufacture." These are conducted by Dr. Harold G. Colman. The papers set at the last examinations were published in the "JOURNAL" for the 8th of May (p. 1238); and an indication of the nature of those to be prepared for next year has already been given (*ante*, p. 532). In the session just closed, there were eight registered classes, against eleven in 1898-9; the number of students in attendance being 102, as compared with 160. There were 139 candidates at the examinations, and 64 of them passed; the previous figures being 168 and 81. Analyzing the results, in the Honours Grade, 8 candidates passed in the first class, 25 in the second class, and 23 failed; while in the Ordinary Grade, 7 passed in the first class, 24 in the second class, and 52 failed—the total passes being 64 and the failures 75, or 53.9 per cent. The names of the successful candidates were given in the "JOURNAL" for the 26th of June (p. 1734); and those of the prize winners, in the number for the 31st of July (p. 272). Reporting upon the results, Dr. Colman says the general character of the answers was relatively much better in the Honours papers than in those in the Ordinary Grade; many of the latter being "very weak." The faults to which attention has been called on previous occasions—viz., lack of knowledge of construction and weakness in drawing—are still very noticeable, "even after making every allowance in the latter case for the limited time at the disposal of the candidates, and the inevitable hurry of the examination-room." He remarks that "in many cases far too much time was spent over the first few answers, owing to the candidates entering into the discussion of matters outside the question, with the result that they were only able to give very hurried answers to the remaining questions." Though instructions were given that not more

than eight questions were to be answered, no notice was taken of them in a considerable number of cases. It has been suggested that the syllabus should be divided into two sections; and the Committee have the matter under consideration. Meanwhile, in order to prevent one of the causes of failure of candidates, referred to by the Examiner, the time has been extended to four hours. At the last examinations, there were two candidates from the Colonies—one from Sydney, and the other from Wanganui (N.Z.); and they both passed in the Ordinary Grade. With regard to the London candidates, 7 came from the Battersea Polytechnic, 1 each from the Borough and the South-West Polytechnics, and 25 from the Regent Street Polytechnic—three of the prizes being carried off by students at this institution.

#### WATER ACTS FOR 1900.

(Continued from p. 1011.)

The Airdrie, Coatbridge, and District Water Trust Act, 1900, constitutes and incorporates a Water Trust for the burghs of Coatbridge and Airdrie, and the districts adjacent thereto, in Lanarkshire; acquiring the undertaking of a Company incorporated in 1846. The Trust consists of twelve members; and after five years, the number may be altered by the Secretary for Scotland. No member of a constituent Local Authority can be an officer of the Trust. The Trustees are to give the Company, within six months of the passing of the Act, notice of their intention to purchase; and the purchase must be completed within six months of the issue of the arbitrators' award. In addition to the ascertained value of the property, the Company are to receive the reasonable costs of their Act of 1899, the reasonable winding-up costs, and "such reasonable compensation to the officials of the Company as, failing agreement, may be fixed by the arbiters or oversman." But in fixing such compensation, the offer of the Trustees to continue the officers in their employment is to be reckoned—provided that officials with twelve years' service may refuse to accept employment under the Trustees without losing his right to compensation. The Company must, within fourteen days before the commencement of the arbitration, deliver to the Trustees a statement of all debts and liabilities of the Company on capital account, and the amount thereof, including all continuing liabilities on existing contracts for works in process of construction; and the Trustees take over and pay all such debts and liabilities. The Directors are to prepare a scheme for the distribution of the purchase-money, to be submitted to the proprietors, any one of whom may insist on the project being referred to the arbitration of Counsel. The District Committee of the Lower Ward of the County of Lanark have power to purchase their portion of the undertaking. The Trustees may supply water by measure for other than domestic purposes, after the domestic demands are met, at a price to be settled, in case of disagreement, by the Sheriff of Lanarkshire. An additional water loan of £50,000 is sanctioned. The accounts are to be audited by a professional accountant appointed by the Secretary for Scotland. The Trustees can take parliamentary action by conser majority of their body, with the approval of the Secretary for Scotland.

The Bury and District Water (Transfer) Act constitutes and incorporates a Joint Water Board consisting of representatives from the Councils of the respective boroughs of Bury, Bolton, and Rawtenstall, and the Urban Districts of Bury, Ramsbottom, Little Lever, Whitefield and Tottington, and the rural district of Bury, all in Lancashire; and transfers to the Board the water undertaking of the Bury Corporation, with the exception of the Chesham reservoir. The composition of the Board is described. The Chairman for the first five years is to be a representative of Bury; and the Vice-Chairman for the same period is to be a representative from elsewhere. Members of the Board must not be interested in the Board's contracts, nor derive any profit or emolument whatsoever from the funds. This provision does not extend to shareholders of companies. Differences arising out of the working of the Board are to be settled by arbitration under the Local Government Board. The financial relations of the Board and the Corporation are adjusted. Any surplus profits of the undertaking are to be applied to the reduction of the price of domestic supplies. Within six months, the Board are to settle a uniform price for water used for fire and other public purposes throughout the district. All the statutory financial powers of the Bury Corporation relating to water supply are transferred to the Board.

The Exmouth Urban District Water Act authorizes the District Council to purchase the undertaking of the Exmouth and District Water-Works Company, incorporated in 1864. In addition to the ascertained value of the property, the Council are to pay the Company £2000 towards their parliamentary and winding-up expenses. The officers and servants of the Company are to be compensated for loss of employment. Unclaimed shares of the purchase money not exceeding £500 may be paid into the County Court. Rates for domestic supply range from 7½ to 6 per cent. Shipping rates are 1s. for the first 100 gallons or less, and 6d. per 100 gallons after.

The Hemel Hempstead Corporation Water Act makes further provision for the purchase of the Hemel Hempstead Water-



Works by the Corporation. The inclusion of part of the borough in the area of the Great Berkhamstead Water Order, 1885, is altered. The purchase is to be completed, and the money paid by the end of the year. Officers and servants of the Company are to be taken over by the Corporation on the same terms as they enjoy under the Company, and are not to be arbitrarily or summarily dismissed by the Corporation. For the protection of the Hertfordshire County Council, records of pumping levels are to be kept. The maximum price of metered supplies is 1s. per 1000 gallons. An additional water loan of £15,000 is sanctioned. Surplus profits are to be divided rateably between the borough and the outside area. In the latter, they are to be applied to reducing the cost of water; but in the borough, they may be applied either to this purpose or to the district fund.

The Menstone Water-Works (Transfer) Act authorizes the Rural District Council of Wharfedale to purchase the undertaking of the Menstone Water-Works Company. The promotion of this Act was provided for by the Company's Act of 1899. The notice to treat must be given within three months. In addition to the value of the property, the Council pay the costs of the Company's Act of last year, with 4 per cent. interest from Jan. 1 last; the taxed expenses of winding up; and two years' salary to any officer (other than a Director) and servant (other than a weekly servant) of ten years' standing, who is not willing to continue, or is not continued, in the Council's service. The sum of £5000 is to be borrowed for water-works extensions, authorized by the Company's Act. Surplus profits are to be carried to the credit of the special expenses account of the contributing place of Menstone.

The Mountain Ash Water and Gas Act authorizes the Urban District Council to construct additional water-works, comprising an impounding reservoir in the parish of Llanwanno, Glamorgan-shire, called the Perth-gelyn reservoir. The waters of the River Clydach and its tributaries are to be taken, subject to the conditions imposed by the Act of 1886. The works are to be completed within seven years. Rates for domestic supplies vary from 8 to 7 per cent. The sum of £60,000 is to be raised for this purpose; and £5000 for the future extension and improvement of the undertaking, both repayable in 60 years.

The Otley Urban District Council (Water-Works) Act sanctions the construction of a reservoir in the parish of Middleton, for impounding the water of a stream called the March Gill, subject to the obligation to discharge compensation water at the rate of 140,000 gallons per day. The works are to be completed within seven years. The water supplied by the Council is to be effectually treated for the prevention of plumbism. The Council are not to supply water within the limits of the Ilkley Urban District Council, but are to supply the Council in bulk at the price of 6d. per 1000 gallons. The rates for domestic supplies are altered, and range from 7 to 5 per cent. The sum of £55,000 is required for the purposes of the Act, repayable in 60 years.

The Paignton Urban District Water Act authorizes the construction of additional water-works, including a reservoir for collecting the water of the Venford Brook, in the parish of Holne, and other works in Marlton parish. The waters taken are those of the Venford Brook and its effluents, all tributaries of the River Dart; and compensation water is to be discharged as provided. The works are to be completed partly in ten and fully in twenty years. The water-rate for domestic supplies is 12 per cent.; and the price of metered supplies, which can be demanded by any person for any purpose, is 1s. 6d. per 1000 gallons. There is a clause in the Act for the prevention of plumbism. The amount of the additional water-works loan is £70,000, repayable in 60 years.

The Spalding Water Act authorizes the Urban District Council to purchase the undertaking of the Water Company as from Oct. 11, 1900. The mortgage debt of the Company, and the interest thereon, are to be paid off by the Company prior to this date. Officers and servants of the Company are to be compensated for any loss of emolument. The South Lincolnshire Water Acts, 1888 and 1890, are repealed. Rates for domestic supplies are 8 and 7 per cent. Supplies for all purposes may be by meter. A water-works improvement loan of £10,000 is sanctioned.

#### OBITUARY.

Mr. WILLIAM PORTEOUS, formerly Manager of the North Middlesex Gas Company, has just died at the advanced age of 96. For some time past, the deceased had been living in retirement; but he was well known and respected by all employed by the Company.

#### PERSONAL.

Mr. J. W. TURNER, of Torrington, Devon, has been appointed Manager of the new gas-works at Scunthorpe. There were about ninety applicants.

Referring to the appointment of Mr. SYDNEY E. STEVENSON as Engineer and Manager of the Devonport Gas-Works, the "Devon and Exeter Gazette" recalls the fact that when the Exeter Gas-Works were removed from Exe Island to their present site, they were remodelled and enlarged under the sole supervision of Mr. Stevenson, who succeeded the late Mr. T. Dand as Manager; an important feature being a large gasholder and tank designed

by him, and inaugurated by the Mayor and Corporation in 1878. During his residence in Exeter, Mr. Stevenson made many friends; and the "Gazette" thinks the members of the gas industry in the West are to be congratulated upon his return to this part of England.

Mr. P. M'DOUGAL, Assistant-Superintendent of the Gas Mains and Distribution Department of the Leeds Corporation, has been selected to fill the position rendered vacant by the death of Mr. S. H. Bradshaw, the Superintendent of Mains of the Sheffield Gas Company, announced in the "JOURNAL" for the 11th ult., in which issue applications for the appointment were invited by advertisement.

A pleasant gathering of the employees at the Rotherham Gas-Works took place on the 20th inst., for the purpose of testifying their respect for their foreman, Mr. J. O. WHITAKER (who has left the Company's service to take the management of the Portland Gas-Works, which have just been acquired by the District Council), by asking his acceptance of a solid gold pendant, suitably inscribed, and a case of drawing instruments. The presentation was made by Mr. F. Winstanley, the Engineer and Manager of the works, who wished the recipient every success in his new sphere. Mr. Whitaker expressed his thanks for the kindness shown towards him.

The recent completion of 25 years' service by Mr. J. A. COOMBS as Sub-Manager of the Cheltenham Gas-Works was chosen by the workmen and staff as a fitting occasion for testifying in a tangible manner the good feeling and mutual regard which have characterized the dealings one with another during this long period. This they did by subscribing for a silver tea service, with oak tray, which was presented to Mr. Coombs by Mr. R. O. Paterson, the Engineer, at a pleasant gathering of the employees, numbering more than a hundred. In offering the gift, Mr. Paterson alluded to the cordial relationship which had always existed between himself and his lieutenant; and he heartily endorsed the good wishes of the men for Mr. Coombs's future welfare. Ringing cheers accompanied the presentation. Mr. Coombs heartily thanked the donors, and emphasized the advantage of cultivating good feeling between the workmen and officers by the latter manifesting constant regard for the welfare of every employee.

**Composition of the Air of Paris.**—M. Armand Gauthier has been studying the air of Paris, and has given in the "Comptes Rendus" the results of his investigations. He found the combustible portion of the atmosphere of the streets to have the following mean composition, calculated as parts per 100 litres: Free hydrogen, 19.5 c.c.; marsh gas, 12.1 c.c.; gases very rich in carbon (benzene and its analogues), 1.7 c.c.; carbon monoxide (with traces of hydrocarbons of the acetylene series), 0.2 c.c.

**An Iron and Cement Reservoir.**—Particulars have lately been given in the "Revue Technique" of a reservoir, constructed entirely of cement and expanded metal, for storing the filtered water from the works at Waalhem, near Malines, of the Antwerp Water Company. It was erected by M. Chassin, who built the large covered reservoir at Châtillon-sous-Bagneux, the capacity of which is 880,000 gallons. The Waalhem reservoir, which will hold 660,000 gallons, may be described as an immense box, the roof of which is supported by cement pillars with an iron core capable of resisting a pressure of 6,600,000 lbs. The floor, sides, and roof have a coating an inch thick. The quantities of materials used were: Concrete and cement mortar, 2200 cubic feet; cement, 250 metric tons; expanded metal, 6000 square yards; and the heavy iron for the framework of the reservoir, 30 metric tons.

**Natural Gas in America.**—According to the annual report which was recently issued by the United States Geological Survey Department, the total value of the natural gas produced and marketed in the United States during last year was \$20,026,864, while the corresponding amount for 1898 was \$15,296,813; showing a gain of \$4,730,051. This gain is due in part to the slight increase in the prices charged to customers, and to the securing of more complete returns, but mainly to the increased bulk of natural gas produced and marketed. This has been accomplished against a declining pressure in all the old fields, as there was little new territory developed during the year, except in the extreme south-western portion of Pennsylvania and a part of West Virginia, in which some virgin territory, which has not felt the drain of adjacent wells, was developed. The increased delivery was due principally to the enlargement and multiplication of the pipe-lines of the old companies, the application of the gas compressor on a large scale, and more careful manipulation of the wells and lines so as to anticipate the requirements of customers. West Virginia made the largest increase of all the gas-producing States. The total number of wells producing gas operated at the close of 1898 was 8453; whereas at the close of 1899 it was 9333. This was an increase of 880 wells, or more than 10 per cent. of the number at the close of the preceding year. The increase in the value of gas sold during 1899 was 31 per cent. Of the total value of natural gas produced in 1899, the Appalachian fields supplied 60 per cent., and the Lima fields 37 per cent.; leaving only 3 per cent. for the production of all the other fields in the United States. Natural gas was used last year in 13 iron-mills, 63 steel-works, 196 glass-works, and 13947 manufacturing establishments of other kinds than those specifically mentioned.



# THE INTERNATIONAL GAS CONGRESS.

## THERMIC REACTIONS IN THE DISTILLATION OF COAL.

By M. EUCHENE.

[A Communication to the International Gas Congress in Paris.]

The valuable communication on the "Thermic Reactions which occur during the Distillation of Coal," which was presented by M. Eucène, on behalf of the Paris Gas Company, to the International Gas Congress, forms, with appendices, a volume of upwards of 200 pages. No useful purpose would be served by the reproduction in our columns of the full text of this memoir; and we shall therefore in the sequel give only its more salient points, and the conclusions drawn from the investigation. The original memoir, however, presents an excellent example of the experimental aptitude and lucidity of reasoning and exposition which is characteristic of the bulk of the research work by M. Eucène's countrymen. It may be commended to any who may be about to undertake similar exhaustive investigations, not so much for the intrinsic value of the results recorded—though this is considerable—as for the indirect benefit which a study of the train of reasoning and methods of research adopted will certainly impart. It will, unfortunately, not be possible to do more than present a bare account of the researches in the following abstract of M. Eucène's communication.

The first of the two parts of the memoir treats of the thermic reactions; the second of matters which incidentally had to be investigated in connection with the ground covered by the first part. The latter opens with a general survey of the thermic reactions which occur in the distillation of coal. It is remarked that hitherto the thermic reactions of gas manufacture, and especially the determination of the heat needed for the distillation of coal, have not been treated in an exhaustive and conclusive manner, owing chiefly to the complexity of the questions involved in their study. Coal is a body of variable composition; and the chemical analysis of gas and tar, which are the chief products of its distillation, has not yet been brought to perfection. The heat supplied and consumed has to be determined; but the determination rests on more or less reliable thermometric readings. Previous attempts to investigate the subject have failed for want of practical data. The interpretation of the results of the inquiry will differ according to the position taken. The practical gas maker desires primarily to know what is the minimum consumption of fuel per ton of coal distilled. Consequently he regards the amount of heat needed for the distillation of the coal as that afforded by the fuel consumed in the furnace. That amount of heat, however, will clearly vary with the type of furnace and apparatus employed, and will be quite distinct from the heat of decomposition of the coal, as scientifically defined. The heat of decomposition is invariable for a particular variety of coal. The coal is transformed from a solid into gas, coke, tar, ammoniacal liquor, &c.; and the transformation is attended with the absorption or liberation of a certain quantity of heat, which it is desirable to determine. The complication of apparatus used for the distillation, and the numerous losses of heat, render the determination very laborious and uncertain, if the industrial transformation of the coal is taken as the starting-point for the study. Nevertheless, the present investigation follows this plan: A heat balance is drawn up, showing on the one side the heat generated and on the other side the heat expended; the difference found between the quantities on the two sides ought then to represent the heat of decomposition of the coal.

From these introductory comments, M. Eucène proceeds to the "Investigation of the Heat of Distillation of Coal." For every 100 parts by weight of coal carbonized, a certain quantity of fuel, which develops a certain number of heat units, has to be consumed. Let the heat developed by the fuel be represented by A calories per 100 parts by weight of coal carbonized. Some of these A calories are to be traced: (1) As heat carried away by the volatile matters—*e.g.*, gas, water, tar, &c. Let this portion be represented by D. (2) As heat carried away by the smoke in the flue = C. (3) As heat retained by the coke = E. (4) As heat lost by radiation = F. (5) As heat carried away by the ashes and clinker = H. Then the difference  $A - [C + D + E + F + H]$  will represent the heat needed for the decomposition of the coal. Let this quantity of heat be termed  $x$ . Thence we get the equation (1):—

$$x = A - [C + D + E + F + H],$$

which represents evident facts, though analysis of the operation of coal distillation shows that it involves reactions which afford a very interesting study. These internal reactions must be considered in the light of thermo-chemical data.

Coal, consisting of a mass of ternary compounds, containing carbon, hydrogen, and oxygen principally, with a little nitrogen and sulphur, is ordinarily associated with some water and earthy matter. All the constituents (except the moisture) are in the solid state; and they undergo transformation into solid and volatile products when the coal is distilled. The solid products consist of carbon, sulphur, and ash, with traces of nitrogen, hydrogen, and oxygen. The volatile products comprise carbonic acid, carbonic oxide, marsh gas, hydrogen, benzene, and ethylene and its homologues, which bodies form the chief constituents of the gas; sulphuretted hydrogen, carbon bisulphide, hydrocyanic

acid, thiocyanic acid, and hydrochloric acid, all of which occur only in small quantity and are extracted; water, with some ammonia; and tar consisting of various compounds of carbon, among which naphthalene is conspicuous. In the coal they were in the solid state; and distillation has, in the first place, decomposed the ternary compound and volatilized a number of bodies. A part of the carbon has been converted into carbonic acid and carbonic oxide, by combination with oxygen; and into marsh gas, benzene, ethylene, and tar by combination with hydrogen. A part of the hydrogen has combined with oxygen to form water; and minor changes have produced ammonia, sulphuretted hydrogen, &c. The formation of these bodies has, however, been attended by liberation or absorption of heat; and hence it affects the heat produced or the heat expended. The following table gives the heats of formation of the chief constituents of gas:—

### I.—Substances Formed with Liberation of Heat.

	Calories per Kilogramme.
Carbonic acid, CO <sub>2</sub> . . . . .	liberates 8,080 of amorphous carbon.
Carbonic oxide, CO . . . . .	" 2,473 " " "
Marsh gas, CH <sub>4</sub> . . . . .	" 1,791 " " "
	or 1,343 " marsh gas.
Water (liquid), H <sub>2</sub> O . . . . .	" 34,462 " hydrogen.
Sulphuretted hydrogen, H <sub>2</sub> S . . . . .	" 135 " sulphuretted hydrogen.
Ammonia, NH <sub>3</sub> . . . . .	" 717 " ammonia.

### II.—Substances Formed with Absorption of Heat.

	Calories per Kilogramme.
Benzene, C <sub>6</sub> H <sub>6</sub> . . . . .	absorbs 125 of amorphous carbon.
	or 115 " benzene vapour.
Ethylene, C <sub>2</sub> H <sub>4</sub> . . . . .	" 517 " amorphous carbon.
	or 443 " ethylene.
Carbon bisulphide, CS <sub>2</sub> . . . . .	" 411 " carbon bisulphide.
Cyanogen, CN . . . . .	" 1,319 " cyanogen.
Tar (mean composition) . . . . .	" 300 " tar.

Tar may be regarded, without great error, as having a mean heat of formation equal to that of naphthalene—*i.e.*, 300 calories.

As all coals do not behave similarly, it is necessary to determine what coal is to be used in making the gas before a heat balance can be drawn up. Wood, peat, lignite, and gas coal, when distilled under similar conditions, yield gas and secondary products similar in character, but showing, on close examination, remarkable differences. Regnault first made a methodical classification of fuels; and his results and scheme have been confirmed by recent researches by Mahler. M. Eucène gives a table, based on the work of Regnault and Mahler, showing the elementary composition of typical fuels, and then prepares the following table showing St. Claire Deville's classification of gas coals. The figures refer to the substance of the coal after ash and moisture have been deducted.

Coal.	Volatile Matter.	ELEMENTARY COMPOSITION.			
		Carbon.	Hydrogen.	Oxygen.	Nitrogen.
No. 1	29.48	88.38	5.06	5.56	1
" 2	33.88	86.97	5.37	6.66	1
" 3	36.42	85.89	5.40	7.71	1
" 4	40.66	83.37	5.53	10.10	1
" 5	43.99	81.66	5.64	11.70	1

The percentage of nitrogen does not change progressively varies with conditions which are not material for the purpose. It has therefore been taken as constant. The volatile matter increases from Type No. 1 to No. 5; and we should the quantities of heat liberated and absorbed through matation of volatile matter to increase with the proportion latter. Calculation will confirm this anticipation. The as employed in gas making, would contain ash and r and M. Eucène next gives tables showing the product tillation, with the quantities of heat liberated and absce these five types of coal and for peat. We reproduce significant portions of one of these tables—*viz.*, that r coal of Type No. 3, which is the one on which the mosi tive experiments were subsequently made.

### COAL OF TYPE No. 3.

#### Products of Distillation, with Heat Absorbed and Liberated.

100 parts (by weight) of the coal.			
Consist of—	Forming on Distillation—	Parts.	
3.31 parts moisture . . . . .	Ammoniacal liquor . . . . .	3.310	
7.21 " ash . . . . .	Ash . . . . .	7.210	
	Solid { Coke . . . . .	61.611	
	Retort carbon . . . . .	0.100	
	Liquid { Tar . . . . .	4.687	
76.00 " carbon	Gaseous { Carbonic acid . . . . .	0.284	
		Carbonic oxide . . . . .	1.352
		Marsh gas . . . . .	5.001
		Benzene . . . . .	1.016
		Ethylene . . . . .	1.311
		Cyanogen . . . . .	0.036
		Carb. bisulphide . . . . .	0.002
	Solid { Coke . . . . .	0.469	
	Liquid { Ammoniacal liquor . . . . .	0.388	
	Tar . . . . .	0.327	
4.78 " hydrogen	Gaseous { Hydrogen . . . . .	1.366	
		Marsh gas . . . . .	1.867
		Benzene . . . . .	0.086
		Ethylene . . . . .	0.218
		Sul. hydrogen . . . . .	0.019
		Ammonia . . . . .	0.040
			3.537
			0.059
			3.596



6.82	,,	oxygen	Liquid	Tar	0.436	
				Ammoniacal liquor	3.107	
			Gaseous	Carbonic acid	0.758	
				Carbonic oxide	1.802	2.560
0.88	,,	nitrogen	Solid	Other products (?)		0.717
				Coke		0.270
			Gaseous	Gas	0.385	
				Am. liquor	0.183	0.610
1.00	,,	sulphur	Solid	Cyanogen	0.042	
				Coke		0.683
			Gaseous	Sul. hydrogen	0.306	
				Carb. bisulphide	0.011	0.317

100.00 parts. 100.000

Or grouping the products in the usual manner, the 100 parts (by weight) of the coal yielded—

	Parts by Weight.
Coke—	
Ash	7.210
Carbon	61.611
Hydrogen	0.469
Sulphur	0.683
Nitrogen	0.270
	70.243
Gas—	
Carbonic acid	1.042
Carbonic oxide	3.154
Hydrogen	1.366
Marsh gas	7.468
Nitrogen	0.385
Benzene	1.102
Ethylene	1.529
	16.046
Ammoniacal liquor—	
Moisture in coal	3.310
Formed	3.495
	6.805
Tar—	
Carbon	4.687
Hydrogen	0.327
Oxygen	0.436
	5.450
Sulphuretted hydrogen	0.325
Ammonia	0.223
Retort carbon	0.100
Cyanogen	0.078
Carbon bisulphide	0.013
Other products, or unaccounted for	0.717
Total	100.000

The yield of gas was equal to 30.64 cubic metres per 100 kilos. of the coal (= 10,995 cubic feet per ton). The composition of the gas in volumes per cent. was as follows:—

Hydrogen	50.10
Marsh gas	34.03
Carbonic oxide	8.21
Ethylene	3.98
Carbonic acid	1.72
Nitrogen	1.00
Benzene	0.96
	100.00

The heat liberated in the formation of compounds would be as follows per 100 kilos. of coal distilled:—

Compound.	Amount, Kilos.	Kilos.	Heat of Formation.	Heat Liberated, Calories.
Carbonic acid	1.042 containing carbon	0.284	× 8,080	= 2,295
Carbonic oxide	3.154	1.352	× 2,473	= 3,343
Marsh gas	7.468		× 1,343	= 10,030
Sulphuretted hydrogen	0.325		× 135	= 44
Ammonia	0.223		× 717	= 160
Water	3.495 containing hydrogen	0.388	× 34,462	= 13,371
Total				29,243

And similarly the heat absorbed would be—

Benzene	1.102	× 115	= 127
Ethylene	1.529	× 433	= 677
Cyanogen	0.078	× 1,319	= 103
Carbon bisulphide	0.013	× 411	= 5
Tar	5.450	× 300	= 1,635
Total			2,517

Equally full data are given by M. Euchène for the remaining four types of coal and for peat; and then follow two tables summarizing the whole. The more important figures from these summaries are tabulated below.

These tables suggest the following remarks: (1) That there is very close agreement between the results of the elementary analyses and the practical results. A slight excess of oxygen is found; but this is doubtless due to the fact that the oxygen is estimated by difference. (2) That the heat liberated during distillation ranges from 76,564 calories for peat to 23,718 calories for coal containing little oxygen; and the heat absorbed varies

Type of Coal, &c.	ELEMENTARY COMPOSITION.							VOLATILE MATTER OBTAINED ON DISTILLATION. PERCENTAGE BY WEIGHT.				HEAT LIBERATED DURING DISTILLATION.		HEAT ABSORBED DURING DISTILLATION.		Per- centage of Coke Obtained from the Coal.*	Carbon Volati- lized. Per Cent. of Total Carbon.	Fuel (Coke) Consumed Per Cent. of Coal Distilled.
	Moisture.	Ash.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Gas.	Tar.	Water.	Total.	Calories per 100 Kilos.		Calories per 100 Kilos.				
												Of the Coal as Distilled.	Of the Coal minus Moisture and Ash.	Of the Coal as Distilled.	Of the Coal minus Moisture and Ash.			
No 1	2.17	9.040	77.790	4.460	4.890	0.880	0.770	14.283	4.500	4.584	23.367	23,718	26,712	1,976	2,225	75.661	15.50	..
„ 2	2.70	7.060	77.560	4.790	5.940	0.890	1.060	15.361	5.070	5.567	25.998	26,228	29,064	2,282	2,529	72.567	17.40	22.40
„ 3	3.31	7.210	76.000	4.780	6.820	0.880	1.000	16.046	5.450	6.805	28.301	29,243	32,681	2,547	2,846	70.243	18.80	21.00
„ 4	4.34	8.180	72.080	4.780	8.730	0.870	1.020	17.258	6.300	8.616	32.174	34,213	39,109	2,865	3,275	65.962	21.70	20.20
„ 5	6.17	10.730	67.010	4.630	9.600	0.820	1.040	16.797	6.400	9.861	33.058	32,017	38,528	2,832	3,408	64.016	22.80	..
Peat	17.50	5.342	47.475	5.207	22.975	0.825	0.676	36.250	8.300	26.500	71.050	76,564	99,230	4,333	5,615	27.304	55.00	..

\* The nature of the coke was: No. 1, caked, dense, large; No. 2, caked, dense; No. 3, caked, medium size; No. 4, caked, friable, small; No. 5, caked, very friable, small; peat, not caked.

Remarks.—Distillation proceeded slowly in the cases of Nos. 1 and 2; rather quickly with No. 3; quickly with Nos. 4 and 5; and rapidly with peat.

from 333 calories for peat to 1976 calories for coal containing little oxygen. The heat liberated, therefore, is greatly in excess of the heat absorbed. These facts, however, do not make it possible to draw any conclusion as to the amount of heat required for the distillation of the coal, because they give no idea of the value of the term which represents the heat of decomposition of the coal. This value will be found last, by difference. One piece of information, however, is afforded by the practical results—viz., that the consumption of fuel varies in inverse proportion to the amount of heat liberated by the volatile products. (3) That the fixed residue or coke increases progressively from peat to the coal containing least oxygen; and that the nature of the residue changes from a non-caking wood charcoal (from peat) to a well caked large coke (from the coal containing least oxygen). Also, that the rapidity of the distillation falls off from peat to the coal containing least oxygen.

A general and complete equation may now be set out for the heat exchanges. The first member will comprise two terms—viz., A = the heat furnished by the fuel, and B = the heat of formation of the volatile products which are formed with liberation of heat. The foregoing table gives the value of B. The second member will comprise seven terms—viz., C = the heat carried away by the smoke, D = the heat carried away by the volatile products of the distillation, E = the heat retained by the red-hot coke, F = the heat lost by radiation from the brick-work and mouthpieces, G = the heat of formation of the compounds of carbon which are formed with absorption of heat (the

foregoing table gives the value of G), H = the heat carried away by the ash-pit refuse, and X = the heat of decomposition of the coal. The value of X has to be found by difference. The equation (2), therefore, is

$$A + B = C + D + E + F + G + H + X.$$

As already stated, the values of B and G are known from the table; and the values of the other terms have now to be ascertained in order to give us the value of X.

On comparing this equation (2) with equation (1) given earlier, it will be seen that  $x = X - B + G$ ; or  $x$  (equation (1)) is the actual heat of decomposition, and X (equation (2)) is a value comprised in  $x$ . Regarding the coal as a ternary compound consisting of carbon, hydrogen, and oxygen, the decomposition may be supposed to occur in two stages—viz.: (1) The decomposition of this ternary substance into its elements, solid carbon, gaseous hydrogen, and gaseous oxygen. X will be the heat expended in this first stage. (2) The formation of volatile products. — (B - G) will be the heat of formation; the negative sign indicating liberation of heat. Then the actual heat  $x = X - (B - G) = X - B + G$ . Consequently, X is only a portion of  $x$ .

M. Euchène then proceeds to the determination of the values of the terms of the foregoing equation (2); starting with the first member of the equation, comprising A and B. The determination of A, or the heat furnished by the fuel, is first of all



considered. Coke, the fuel employed, was found to have the following mean composition in percentages by weight : Moisture 6, ash 10, carbon 81·5, hydrogen 0·5, sulphur 1·0, and nitrogen 1·0. A hectolitre of the coke weighed 40 kilos.—i.e., a bushel weighed 32 lbs. The heat liberated when 1 kilo. of carbon is converted into carbonic acid = 8080 calories, when 1 kilo. of hydrogen is consumed to water, liquid at 0° C. = 34,462 calories, and when 1 kilo. of sulphur is burnt = 2000 calories. The latent heat of vaporization of the water formed will be included in the loss under the head of smoke, &c. The term A will be simple for ordinary direct-fired furnaces; but for generator furnaces, where the combustion is effected in two stages, there must be kept distinct: (1) The incomplete combustion of the coke in the producer, resulting in the formation of combustible gases, and (2) the combustion of these gases, having essential heat, with hot air from the recuperator. Whence it follows that the heat furnished in the furnace is made up of (a) the heat supplied by the combustible gases, (b) the heat of combustion of these gases, and (c) the heat supplied by the hot air. The term B, or the heat of formation of the volatile products, is given in the table; and for coal of Type No. 3, is = 29,243 calories.

The first term of the second member of equation C is the heat lost in the smoke or chimney gases. Now the heat held by a gas at a given temperature equals the product of the volume of gas and the heat needed to bring the unit volume of the gas to a given temperature. When the heat required to raise the temperature of a gas varies in proportion to the temperature reached, it is merely the product of the constant specific heat of the gas and the temperature. But when it does not so vary proportionately, the specific heat is no longer constant, but for any given temperature it may be found by an expression embodying the results of three observations at different temperatures. The specific heat rarely remains constant at high temperatures. In the sequel, only the heat (= Q) required to heat a gas to the temperature *t*, or the heat possessed by the gas at that temperature, need be considered; and this will have been determined directly. Only two determinations will have been needed—viz., (1) that of the temperature of the smoke or flue-gases, and (2) that of the heat needed to raise the smoke to that temperature. The temperatures were determined by the Le Chatelier pyrometer; and the results are shown below. A description of the calorimetric apparatus which was used to determine the heats corresponding to the temperatures is given in an Appendix to M. Euchène's communication. But the heat needed to raise gases to given temperatures is not proportional to the temperature. It varies according to the nature of the gas, and also according to the temperature. Mallard and Le Chatelier, in 1881, ascertained these amounts of heat for certain gases at different temperatures; and Le Chatelier has communicated the formulæ for the principal gases. They are given in another Appendix. The results afforded by them, and the observations referred to above, are appended.

Heat which Raises to the Temperatures Stated One Cubic Metre [or, in parentheses, One Cubic Foot] of the named Gases :—

Temperature	1050° C.	975° C.	800° C.	650° C.	600° C.
Where observed	Tempera- ture of the Chimney Gases at the Outlet of a Siemens Furnace.	Smoke or Chimney Gases issuing from an Ordinary Furnace.	The (Combustible) Producer Gas.	Volatile Products issuing from the Retort.	Outlet of a Siemens Recuperator.
	Calories.	Calories.	Calories.	Calories.	Calories.
Nitrogen, oxy- gen, hydrogen, and carbonic oxide . . .	343 ( 9·7)	317 ( 9·0)	257 ( 7·3)	207 ( 5·9)	190 ( 5·4)
Steam (total heat) . . .	1005 (28·4)	956 (27·1)	851 (24·1)	767 (21·7)	741 (21·0)
Carbonic acid. Marsh gas . .	606 (17·2)	550 (15·6)	426 (12·1)	329 ( 9·3)	298 ( 8·4)
Sulphur di- oxide . . .	908 (25·7)	863 (24·4)	758 (21·5)	..	638 (18·1)
Benzene . . .	..	..	..	1287 (36·4)	..
Cyanogen, carbon bisulphide, sulphuretted hydrogen, and ammonia . . . . .	..	..	..	390 (11·0)	..

Tar [650° C.] 423 calories per kilo. [= 192 calories per pound].

The second term of the second member of the equation, D, is the heat lost through the volatile products of the distillation. These products are gas, tar, and water, &c., as given in the general table above for coal No. 3. Their temperature has to be determined. It was observed on top of the charge at a distance of 1 foot from the mouth of the retort, and was found to be 630° C. at the beginning and 735° C. at the close of the distillation. But as the bulk of the volatile products is given off in the first two hours, their mean temperature as they leave the retort may be taken to be 650° C. Mr. Foulis, of Glasgow, some time ago estimated their temperature at 600° C. In the ascension-pipe, at 8 inches from the mouthpiece, their temperature has dropped to between 420° and 440° C.; and at the hydraulic main the maximum is 80° C. Taking the composition of the volatile products, as already given, and the heat needed to raise

them (as given in the last table) to 650°, calculation gives the following values for the heat removed by the volatile products in the distillation of 100 kilos. of coal, Type No. 3 :—

	Calories.
Carbonic acid . . . . .	173·7
Carbonic oxide . . . . .	519·8
Hydrogen . . . . .	3,151·2
Marsh gas . . . . .	4,149·2
Nitrogen . . . . .	63·4
Benzene . . . . .	380·2
Ethylene . . . . .	556·8
Sulphuretted hydrogen, ammonia, &c. . .	207·7
Gas, total . . . . .	9,202·0
Water . . . . .	6,492·0
Tar . . . . .	2,305·4
Total . . . . .	17,999·4

For the other four types of coal, the total heat removed by the volatile products from 100 kilos. of coal was similarly—

	No. 1.	No. 2.	No. 4.	No. 5.
Gas. . . . .	8,839·5	9,224·2	9,131·9	8,447·6
Water . . . . .	4,373·1	5,310·9	8,220·6	9,407·4
Tar. . . . .	1,903·5	2,144·6	2,664·9	2,707·2
Totals . . . . .	15,116·1	16,679·7	20,017·4	20,562·2

It will be observed from these figures that (1) the hydrogen and marsh gas are responsible for the bulk of the heat carried off by the gas; and (2) that the heat carried off by the gas is nearly constant for all the types of coal, but that removed by the tar and water—the latter especially—increases from Type No. 1 to Type No. 5. As the heat liberated and absorbed by the formation of the volatile products varies appreciably for the several types, it is clearly necessary, in drawing up an equation of the heats, to distinguish between these different types.

The next term, E, is the heat lost through the red-hot coke. When the couple of a Le Chatelier pyrometer is inserted in the charge in the middle of a retort, the temperature half-an-hour after charging will be found to be 500° C., and it will rise to 950° C. at the end of the period of distillation. Thus the coke must leave the retort at an average temperature of about 950° C.—in some retorts, and in some parts of each retort, rather less or rather more; but that will be a fair average. As the capacity for heat of carbon at high temperatures is given differently by different authorities, it was determined afresh for the purpose of this investigation; and the method used is described in the third Appendix to M. Euchène's communication. It was found that the heat removed by 1 kilo. of coke at 950° C. was 350 calories (by 1 lb., 159 calories). Hence it followed that the heat removed by the amounts of coke obtained from each of the five types of coal was as follows :—

	Type No. 1	2	3	4	5
Calories . . . . .	26,481	25,573	24,585	23,087	22,406

The next term, F, comprises the loss of heat through the brickwork, retort mouthpieces, grate, opening the retorts, &c. These losses vary with the season, time of day, and state of the atmosphere, and are not readily estimated. Existing data for the conductivity and radiating powers of brickwork at high temperatures were found to be unreliable; and the coefficient of conductivity was determined afresh by a method which is described in the fourth Appendix to the communication. The losses by radiation, &c., were thus found to amount, per sett<sup>1</sup> per hour, to 54,824 calories with the ordinary setting of 9 retorts, to 80,174 calories with a Siemens setting of eight<sup>1</sup> and to 89,251 calories with a Siemens setting of nine.

The last term, H, is the loss of heat through the and it may be taken from a metallurgists' observat calories per kilo. This figure is perhaps rather high; but the e. introduced would be of no moment.

The several terms of the equation having now been mined, they have been applied in the cases of coals, Types 3, and 4, distilled in an ordinary setting of seven retort in the case of coal No. 3, distilled in a Siemens setting c retorts. The ordinary setting is shown in longitudinal and c section in figs. 1 and 2; the Siemens setting in figs. 3 and 4.

The following is a summary of the data and calculations the case of coal No. 3 distilled in the ordinary setting. The calculations are shown in full in the fifth Appendix to the communication.

#### COAL TYPE NO. 3

##### Heat Produced and Expended during Distillation in an Ordinary Setting.

Coke consumed . . . . .	= 21·20	parts per 100 parts (by weight) of coal distilled.
Water evaporated from ash-pan = 6·05	do.	do.
The composition of the coke was—		

	Per Cent.
Moisture . . . . .	6·0
Ash . . . . .	10·0
Carbon . . . . .	81·5
Hydrogen . . . . .	0·5
Sulphur . . . . .	1·0
Nitrogen . . . . .	1·0
	100·0

The smoke or chimney gases consisted of 16 per cent. by volume of carbonic acid (containing 8·582 per cent. of carbon),



4.5 per cent. of oxygen, and 79.5 per cent. of nitrogen; and their temperature was 975° C.

M. Euchène discusses the results of the observations made on the distillation of coals, Nos. 2, 3, and 4, in the ordinary setting. In the first place, he makes some comparisons of the three types of coals, with reference to the heat of decomposition and the thermic reactions which occur in the retort. He recapitulates the following data for the three coals (the figures are calories per 100 kilos.) :—

Type.	Heat Liberated by the Volatile Products.	Heat of Formation of the Carbon Compounds.	Heat Carried Off by the Volatile Products.	Heat of the Red-Hot Coke.	X.	Heat of Decomposition.
No. 2	26,228	2282	16,680	25,573	22,707	— 1239
" 3	29,243	2547	17,999	24,585	23,098	— 3598
" 4	34,216	2865	20,017	23,087	25,000	— 6351

The negative sign before the values of  $x$  indicates that heat is liberated by the distillation of the coal. As the amount thus liberated is not large, it might be considered as falling within the limits of the probable errors in the observations. But it should be noted that the liberation of heat is supported by M. Mahler's results obtained in 1893 by a totally different method of research.

M. Mahler determined the calorific value of 100 kilos. of coal

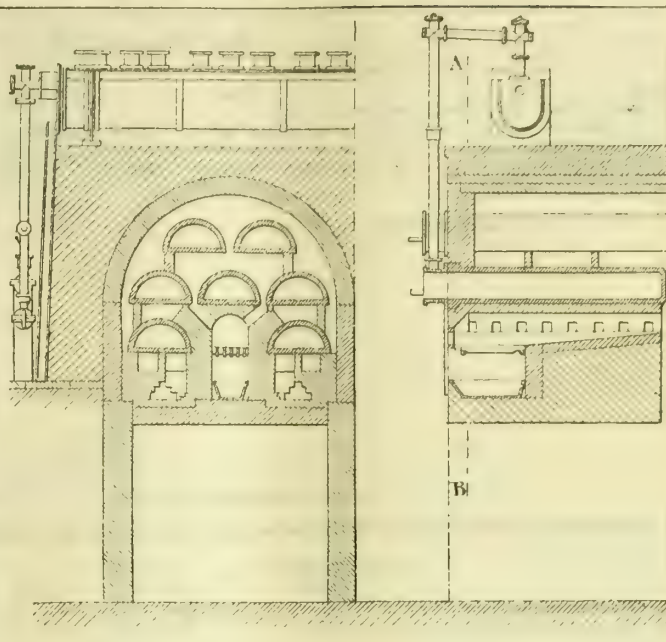


FIG. 1.

FIG. 2.

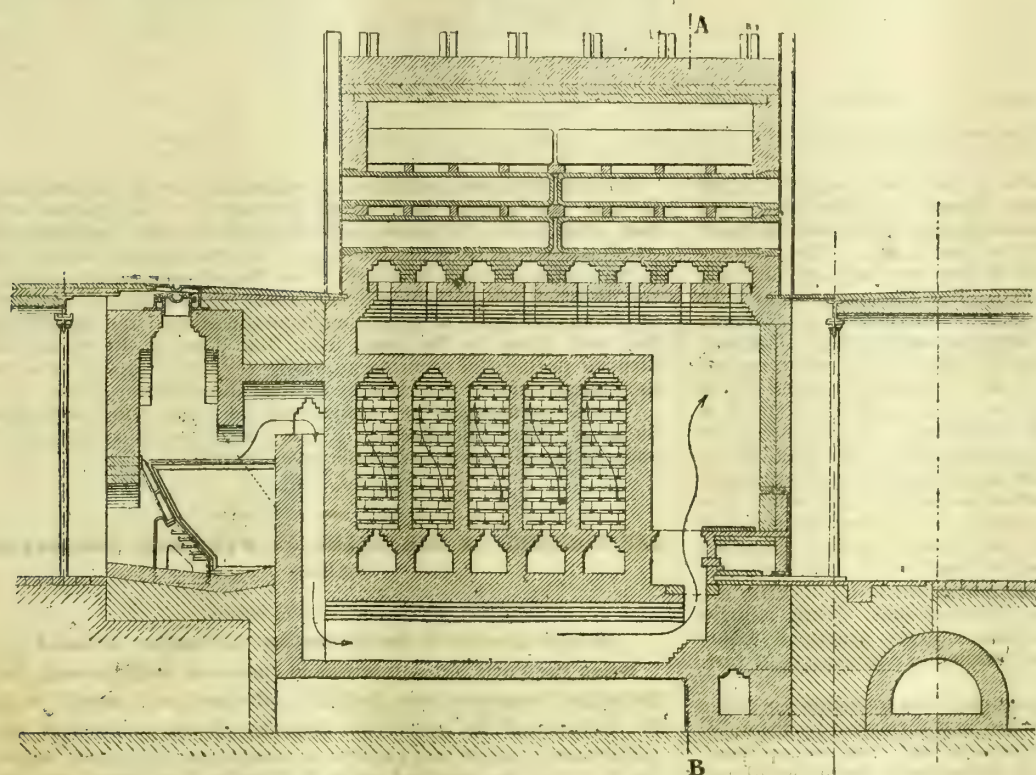


FIG. 3.

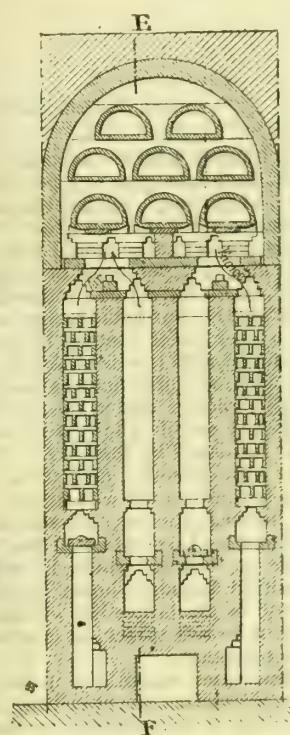


FIG. 4.

of Type No. 4, and the calorific value of all the products obtained on carbonizing it. The calorific value of the coal exceeded that of the products by 25,483 calories, which quantity of heat had therefore disappeared or been liberated during the carbonization. Consequently, the distillation or carbonization of the coal liberates heat. On comparing this figure with that found in the present researches for the same type of coal—viz., 6351 calories—it will be observed that the values both indicate liberation of heat. The difference of 19,000 calories, though apparently great, may be accounted for by the inevitable sources of error, especially as the errors would be in opposite senses in the two cases. For instance, in the present research, the heat of decomposition ( $x$ ) has been computed by taking the difference between the heat produced ( $m$ ) and the heat consumed ( $M$ ), thus  $x = M - m$ . Here  $x$  has a negative value; and sources of error would make  $M$  low in the same manner as  $x$ . But in M. Mahler's method,  $x = C - c$ , where  $C$  is the heat of combustion of the coal, and  $c$  the heat of combustion of the products; and  $c$  is likely to be too low, and consequently  $x$  too great.

It is to be observed in the next place that the heat liberated by the volatile products increases from 26,228 calories for coal No. 2 to 34,216 calories for No. 4; while the heat of decomposition ranges from 1239 to 6351 calories. Further, the sum of the heat carried off by the volatile products and of the red-hot coke is nearly constant—viz., 42,253 calories for No. 2, 42,584 for No. 3, and 43,104 for No. 4. It follows that the heat of decomposition is characteristic of the different coals, just as is the proportion of volatile matter; but it is affected by the physical phenomena of the distillation. Fusion takes place to an extent which varies with the type of coal. It is more marked

with No. 2 than with No. 4; and it is likely that fusion absorbs a certain amount of heat.

In the third place, it is noticeable that the carbonization of coal liberates heat if it is assumed that there can be recovered (1) the heat carried off by the volatile products, (2) the heat of the hot coke, (3) the heat of the ashes, (4) the heat of the chimney gases, and that radiation can be completely prevented. Therefore, if heat is once applied to start the carbonization, it will proceed without expenditure of fuel. In other words, carbonization of coal can take place without expenditure of fuel. This observation elucidates the phenomenon of the heating up of coal, which is now admitted to be due to oxidation. It is not the sulphur of the coal which determines the liability to oxidize; as the coals which contain much sulphur, such as English coals, are less liable to spontaneous ignition than those which contain very little sulphur, such as Belgian coals. When the oxidation occurs in a small heap, the heat produced is dissipated, and heating does not occur. But when the heap of coal exceeds a certain height—13 to 18 feet—and especially when the lumps are large and the intervening air spaces considerable, the absorption of the enclosed air by the coal produces a little heat, which favours oxidation of the coal. Then, thanks to the feeble conductivity of the coal, distillation commences, and continues slowly until the volatile matter is completely separated. After a time, the conversion of the coal into coke may be almost as complete as in a retort.

Though complete recovery of heat, such as has been imagined in the case of the heap of coal, cannot be effected industrially, it is desirable to consider under what conditions an approach can be made to it. In the first place, the average composition of



HEAT-BALANCE FOR 100 KILOS. OF COAL.—No. 3.

Heat Produced.			Heat Consumed.		
Term.	Kilos.	Calories.	Term.	Cubic Metres.	Calories.
A.—Heat from 21·2 kilos. of coke—					
Carbon	17·278	× 8,080 = 139,606·240	C.—Loss of heat through the smoke		
Hydrogen	0·106	× 34,462 = 3,652·972	at 975° C.—		
Sulphur	0·212	× 2,000 = 424·000	Carbonic acid	32,213	× 549·700 = 17,707
			Oxygen	9,058	× 317·153 = 2,875
			Nitrogen	160,033	× 317·153 = 50,753
			Water of the coke	1,582	× 956·224 = 1,513
			" " ash pan	7,525	× 956·224 = 7,196
			" from the hydrogen	1,186	× 956·224 = 1,139
			Sulphur dioxide	148	× 863·000 = 128
B.—Heat of the volatile products					81,311
		29,243	D.—Volatile products at 650° C.		17,999
			E.—Red-hot coke at 950° C.	70·243	× 350 = 24,585
			F.—Losses by radiation	54,824	× 24 × 100 = 22,114
				5950	
			G.—Formation of carbon compounds		2,547
			H.—Ash, &c. (15 per cent. of the coke)	3·18	× 400 = 1,272
			X.—By difference		23,098
		172,926			172,926

The heat of decomposition  $x = X - B + G = 23,098 - 29,243 + 2547 = - 3598$  calories.

The following shows the heat-balance in percentages for the three types of coal, Nos. 2, 3, and 4, distilled in the ordinary setting:—

Heat Produced.				Heat Consumed.			
	No. 2.	No. 3.	No. 4.		No. 2.	No. 3.	No. 4.
A.—Heat from the coke	85·27	83·60	79·80	C.—Smoke, &c.	48·30	47·20	45·20
B.—Heat of the volatile products	14·73	16·40	20·20	X	12·70	14·20	14·70
				E.—Hot coke	14·40	13·20	13·60
				F.—Loss by radiation	13·20	12·80	12·30
				D.—Volatile products	9·40	10·40	11·80
				G.—Formation of carbon com- } pounds	1·30	1·50	1·70
				H.—Ashes, &c.	0·70	0·70	0·70
	100·00	100·00	100·00		100·00	100·00	100·00
Heat of decomposition per 100 kilos. of coal distilled $x = X - B + G = - 1239$					No. 2.	No. 3.	No. 4.
					- 1239	- 3598	- 6351
							calories.

the chimney gases—carbonic acid 16 per cent., oxygen 4·5 per cent., and nitrogen 79·5 per cent.—shows an excess of 4·5 per cent. of oxygen. Such is the normal state of affairs with ordinary furnaces. What is the effect of this excess of air? The chimney gases theoretically should consist of 20·5 per cent. of carbonic acid and 79·5 per cent. of nitrogen. For the quantity of coke used, there should be produced 32,206 cubic metres of carbonic acid and 124,895 cubic metres of nitrogen—making a total volume of 157,101 cubic metres, in place of the 201,304 cubic metres produced with the usual excess of air. The heat carried off by the 157,101 cubic metres would be 57,315 calories, instead of 71,335 calories under the usual conditions. The excess of air therefore entails a loss of 14,000 calories, or 9·7 per cent. of the heat furnished by the coke. This important loss can be avoided only with difficulty, just as in other ordinary grates where the supply of air is not well under control. It is, however, possible to diminish the loss by altering the draught until incomplete combustion takes place in the bed of fuel, and a little carbonic oxide is formed, which is subsequently burnt by a little air admitted through holes in the furnace door. Only a little excess of air is needed by this plan, which is practically combustion in two stages, as is more thoroughly carried out in producer furnaces.

The water evaporated in the ash-pan is responsible for a loss of 7196 calories, or 5 per cent. of the heat furnished by the coke. This loss is unavoidable, as the furnace bars must be kept cool. In producers, the greater part of this water is decomposed and produces hydrogen. The use of the red-hot coke for fuel would result in an economy of 8933 calories, or 6·2 per cent. of the heat furnished by the coke. This economy is appreciable; but the practical difficulties of charging the furnace with the hot coke, and the interference with the stokers' routine, would often make it impossible to secure even a part of the advantage.

The loss of heat by radiation is influenced by the quantity of coal carbonized in the setting. For instance, seven retorts carbonized 5600 kilos. of No. 2 coal in 24 hours, with a loss by radiation of 23,496 calories per 100 kilos.; or 5950 kilos. of No. 3 coal, with a loss of 22,114 calories; or 6300 kilos. of No. 4 coal, with a loss of 20,885 calories. Now, if eight retorts were placed in a setting of the same size and surface, and 7200 kilos. of coal were distilled per 24 hours in them, the loss by radiation would be reduced to 18,260 calories per 100 kilos., or an economy of 5000 calories as compared with the distillation of No. 2 coal quoted above. This is equivalent to a saving of 3·2 per cent. of the heat furnished by the coke. For No. 3 coal, the losses by radiation amounted to 12·52 per cent. of the total heat, and were distributed among the top and sides of the setting, the mouth-pieces, opening the retorts, &c. Economy at any one of these points would have little effect, as the loss at each is small. An appreciable effect on these losses can be made only by increasing the charge of coal per setting.

To sum up, the ordinary furnace and setting, as commonly used, appears susceptible of improvement being effected in the following directions:—

On the excess of air,	an economy of 9·50 per cent.
" " water in the ash-pan	" " " 4·90 " "
" " red-hot coke	" " " 6·16 " "
" " losses by radiation	" " " 3·20 " "
Total =	23·76 " "

But gas engineers actually are inclined to give up the ordinary furnace, and adopt the plan of dividing the combustion into two stages—viz., (1) incomplete combustion, with formation of combustible gas, in a producer, and (2) combustion of this gas in the setting. Such distribution has the advantages of avoiding the destructive combustion on the grate of the ordinary furnace; of placing the grate at a distance from the setting, and separating the work done by the grate from that done in the setting or furnace proper; of securing an easily regulated supply of air to the setting; and of utilizing the heat of the chimney gases.

These advantages are considered in connection with the Siemens setting, in which only the No. 3 type of coal was carbonized for the purposes of this investigation.

(To be continued.)

## GAS LIGHTING IN THE CHAMP-DE-MARS AND TROCADERO PARIS.

By M. AUGUSTE LÉVY.

[A Paper presented to the International Gas Congress at Paris.]

When the Paris Exhibition was in course of arrangement, the Paris Gas Company came to the conclusion that it would be to the interest of the whole gas industry if the portions of Exhibition grounds and gardens in which gas appliances (as in 1889) be installed were brilliantly illuminated. Such a course the Company considered would prove the best imaginable means of demonstrating the great improvement in gas technology—especially in connection with lighting appliances—made since the previous date. In addition, the thing would contribute to the prestige of the Exhibition.

With this object in view, it was decided two years ago to devote the greater part of the money laid aside for the Company's exhibit at the Exhibition to this purpose; and in 1898, an offer of the Company was approved of by the Minister responsible for the arrangements of the Exhibition. The parks and gardens of the Champ-de-Mars and of the Trocadéro, it was settled, should be lighted by gas only, under the control of the Paris Gas Company. The Company agreed to make use of the most perfect appliances existent; and the plans of the installations proposed by them were submitted to the Executive of the Exhibition for approval, and were passed by the General Commissioner on Jan. 23 last.

Before alluding to the arrangement adopted in the present instance, it will be well to review the history of the incandescent system of lighting in public places, and the principles on which the Gas Company's own efforts were based. Up to 1877, the public lighting of Paris was effected by means of 140-litre burners arranged separately or in clusters. When, however, M. Jablochhoff was authorized in 1877 to light the Avenue de l'Opéra with his "candles," the Paris Gas Company laid themselves out to develop the "high-power" system. The so-called "Quatre-Septembre" burner of 1400 litres, which was introduced at this time for the lighting of the street of that name, had the advantage of consuming a considerable volume of gas within a single small area, owing to the concentration of a number of bafswing burners. It gave the relatively great intensity (at that time) of 13 carcels, and consumed 105 litres of gas per carcel.



In 1889, experiments were made with regenerative gas-burners in the Avenue de l'Opéra and Rue de la Paix; and a few of these burners were used in the Exhibition of 1889. Some Guibout-Giroud burners were also tried. Each consisted of two to six jets, consuming up to 1200 litres of gas per hour. In the Rue de la Paix, the Schülke burner, consuming 350 litres per hour, and giving 7 carcel per burner, was likewise tried. The department of the Company entrusted with the superintendence of the experiments possessed at the time only one small photometric laboratory—in the basement of No. 6, Rue Condorcet. A complete installation was fitted up in 1890-91 alongside the Ateliers de Construction Mécanique, at Landy. In addition to an office and store, it includes three experimental rooms for the trial of heating apparatus, and a large photometer room, in which the most powerful lamps (of 550 carcel, or 5500 decimal candles) can be tested. It is nearly 30 feet in height, and well ventilated; so that the atmosphere of the lamps remains practically normal, despite the immense volumes of gas burnt. The photometer benches here are 23 feet in length.

About 1889, incandescent gas was still in the experimental stage. It was not until the end of 1891 that Welsbach mantles were made of uniform and sufficiently stout quality. At this time, the Company had only the No. 1 and No. 2 burners, using 80 and 120 litres of gas per hour respectively, and giving lights of 4 and 6 carcel. The question presented itself (in France and other countries) as to how it was possible to get incandescent burners of greater intensity than these. In 1893, we placed in the Landy laboratory a number of Welsbach burners using compressed gas. They consumed each 500 litres of gas per hour, were supplied with gas at a pressure of 1·3 to 2·5 metres of water, gave a lighting power of 25 to 40 carcel, and the mantles lasted from 80 to 100 hours. Not being made for this special purpose, the burners produced an unpleasant noise when in action; but the encouraging results, as regards intensity, obtained, led us to undertake the construction of suitable burners. The results obtained in the laboratory in May, 1894, enabled us to ascertain the best proportions of air and gas for maximum incandescence. In these trials, the gallery of an ordinary Welsbach burner, fitted with a mantle, was used. The burner was made from a copper tube without an injector, screwed into a copper globe fitted with two cocks. The gas, after passing through a meter, was led into the globe; while the air was supplied from a gasholder capable of giving a varying discharge. Lastly, the mantles were tried with and without a chimney. In these trials, efficiencies of 10 to 12 litres per carcel-hour were obtained. The maximum was with larger proportions of gas and air than in the Welsbach burners of that day.

The trials led to the construction of burners with an expansion chamber in the mixing-tube, whereby the minimum resistance was offered to the gas, and the maximum incandescence at the minimum of pressure was produced. Compression of the air in place of the gas was claimed at this time in a patent taken out by the Company, in which an efficiency of 42 carcel for a consumption of 450 litres of gas per hour was claimed for the burner.

In the meantime, the Denayrouze Company had worked in the direction of increasing the proportion of air by means of a forced draught, produced (among other ways) by a small electrically-actuated exhaustor placed at the inlet of the burner. The burners were publicly tried in the Place du Palais Royale, in July, 1896. M. Denayrouze afterwards devised a new burner working with uncompressed gas, which has been available for use since February, 1897.

The French Welsbach Company placed the No. 3 burner on sale in June, 1897. It had an hourly consumption of 155 litres, and an intensity of 12·5 carcel.

With these burners in existence, therefore, in 1898, the Paris Gas Company decided that on the whole it would be more beneficial to gas interests to make use of the various burners then existent than to pursue the experiments which had already been started. The Welsbach and Denayrouze Companies, as well as the Paris Municipality, lent their support to experiments made in this direction. Incandescent gas on the high pressure system was used in Paris in 1898-99 (when six thoroughfares were lighted with Denayrouze burners of 270 litres per hour), though Welsbach burners had previously been installed as long ago as 1894.

As a preliminary to the task of lighting the Exhibition, the Company sought to secure, with the appliances which were to be lent to them by the Exhibition Authorities, the greatest efficiency possible with each lamp. They were anxious to obtain the greatest yield of light per mantle and per cubic metre of gas consumed. At the commencement, it was seen that two types of burners might be employed: (A) with gas at a pressure of 200 mm., with an hourly consumption of 350 litres, and an intensity of about 35 carcel; (B) with gas at normal pressure.

It was intended that the burners should be all on the Denayrouze system; but during 1899 the French Welsbach Company placed on sale burners of the Bandsept type without glasses—viz., (B) 9 carcel for 100 litres per hour; (C) 12·5 carcel for 150 litres per hour; and (D) 35 carcel for 300 litres per hour. The "D" burner was adopted for the lighting of the Champ-de-Mars, and the Denayrouze for the Trocadéro.

I may now refer to the photometric methods employed in the examination of these burners. The standard of light used throughout was the Bengel burner consuming 105 litres of gas

per hour, and producing one carcel. As far as possible, the identical burner was used throughout. It was verified from time to time by the carcel oil-lamp. The Foucault photometer was the one used in cases where the lamp could be examined indoors. By making the benches of considerable length, lights of great intensity could be examined without change of standard; but, when necessary, the Bengel burner was replaced by other previously tested standards.

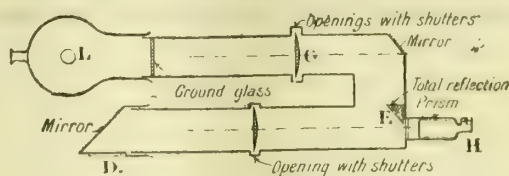


FIG. 1.

For outdoor work and for lamps in the interiors of buildings, &c., the Mascart photometer was used. (See fig. 1.) It is only 75 centimetres long, and is easily carried about in a case—being fixed for use on an ordinary photographic tripod. The two parts of the screen E are illuminated respectively by a portion of the light to be measured and of the standard light. The two fractions are adjusted to get uniform illumination of the screen. The standard L illuminates a piece of ground glass the image of which, produced by a lens A, is thrown, after two reflections at an angle of 45°, on to the disc E. The lenses producing these images are each fitted with a rectangular diaphragm, which can be made larger or smaller at will. The scale recording the sizes of these openings indicates the proportions in which the light of the standard and of the lamp being tested must be reduced in order to produce equal illumination of the disc E. The graduation of the apparatus is made in the laboratory by means of a carcel lamp. The receiving screen D can be inclined so as to measure the lighting effect at various angles; and glasses of various tints can be placed in it in order to aid in comparing illuminants differing in colour. In every case a large number of tests must be made, and the mean taken.

Since the height at which most lamps are placed prevents the eye from receiving the horizontal rays, an estimation of the total light (the "spherical intensity") becomes necessary. The arrangement of the laboratory photometer not permitting oblique rays to reach the screen, we used in the Landy tests the method of Ayrton and Perry, in which the rays are received on a plate of glass, and transmitted normally to the eye. The "coefficient of absorption" of this glass (by which is meant the ratio of total light received to light reflected) depends on the angle of incidence of the luminous beam. To avoid having to determine this coefficient at all angles, we arranged the apparatus so that the incident angle is always 45°.

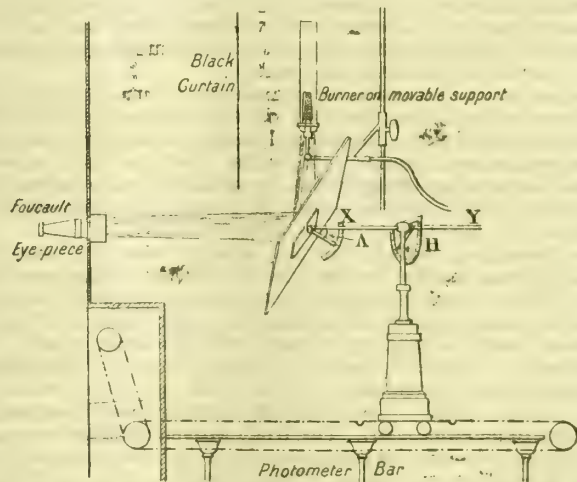


FIG. 2.

Fig. 2 shows how this method is applied. The glass is fixed to a foot standing on the photometer bench. It is inclined at an angle of 45° to the axis XY, which is parallel to the base, so that the angle of 45° (A) is constant. The glass can turn with XY; and the angles thus described are measured on the scale H. The photometer, being placed outside the apparatus (facing the glass), can be raised or lowered on a vertical pillar. In proportion as it is raised, it becomes necessary—in order to bring the reflected rays on the lens—to turn the glass. The angle of rotation indicated by H is that which the incident luminous ray makes with the vertical. A black screen prevents the direct rays of the lamp from reaching the lens. For every position of the burner, the quantity of light reflected is measured; and this, multiplied by the coefficient of absorption of the glass, represents the light emitted by the luminous source in that particular direction. This is done for various positions, and a curve of intensities of the illuminant above and below the horizontal is thus obtained.

The "mean spherical intensity" of an illuminant may be defined as the quotient of the sum of the illuminations on a sphere of



unit radius by the surface of the sphere—in other words, the intensity of a point of light which would give the same total of light when emitting luminous rays of equal intensity in all directions. Generally, the photometric surface may be considered as revolving around the geometric axis of the luminous source; and hence, in order to estimate the mean spherical intensity, it is sufficient to study the variations of the intensities in a single meridian plane. The method consists in determining, for inclinations differing by (say) 10°, the intensities of the illuminant, and tracing a curve of the results plotted on any convenient scale.

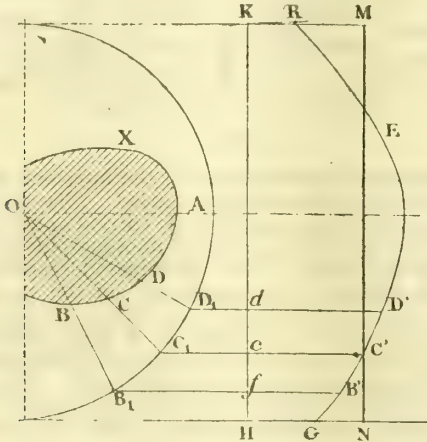


FIG. 3.

The "mean spherical intensity" is deduced graphically as follows. (See fig. 3.) Let O be a luminous source with the photometric curve shown opposite it. Let OAX be the circumference of any given ray. Dividing it into *n* equal parts by OB, &c., it is seen that by projecting the points DCB . . . on to *d c*, and producing the lines so that *d D' = o D* and *c C' = o C*, &c., we get a surface H G E R K proportional to the illumination of the focus in the half meridian under examination; and by drawing MN so that the surface K M N H equals the surface H G E R K, the value of the mean spherical intensity is represented by KM on the given scale.

A knowledge of the photometric curve of a luminous source enables one to calculate the illumination on the ground if the height, *h*, of the light is known. When an intensity, *I*, is produced by a luminous source making an angle *θ* with the horizontal, *h* distant from the ground, and *d* distant from the given point P, the intensity at P is

$$\frac{I \sin \theta}{OP} = \frac{I \sin \theta}{h^2 + d^2}$$

When *I* is expressed in carcels and *h* and *d* in metres, the result is in carcel-metres (i.e., such units of illumination that an illumination of *n* carcel-metres is equal to the illumination produced by *n* carcels at a distance of 1 metre).

In the case of incandescent mantles, the curves of equal lighting are circles having the foot of the standard as the centre. The plotting of these circles and their combinations, when two or more sources illuminate the same spot, permit of curves of equal illumination being drawn, by which the value of the lighting can be traced, just as curves of geographical altitude fix the contour of a district.

As previously stated, 200 mm. of water was the pressure at which it was decided to use the gas for the high-power lighting. After a study of various compressing methods, an experimental plant capable of treating 50 cubic metres of gas was installed and worked by a motor of half-horse power. This apparatus supplied a main on which were 80 incandescent burners, each consuming 350 litres of gas at a pressure of 200 mm. of water. We could thus study very precisely the burners to be employed. The trials proved satisfactory enough to induce us to use the pressure-raisers for the Champ-de-Mars and Trocadéro gas-lamps. The apparatus has, in fact, the advantage that the pressure depends only on the speed of the machine and the density of the gas which it transmits, and not on the quantity passed. In August, 1899, an order was given for two motors of 1·2 metres diameter, capable of running at a speed of 1050 revolutions per minute, and delivering from 700 to 800 cubic metres of gas, at 200 mm. pressure, per hour. They acted most satisfactorily.

Experiments on reduction of pressure have been carried out since May 1 last with all the burners in use. It has been ascertained that the maximum reduction at the furthest points of the mains has been 18 mm.; so that, by making the pressure at the exhaustor 220 mm., we have maintained the necessary maximum throughout the system. The following tables show the influence of pressure on the efficiency of the burner.

The first gives results with burners adapted for the supply of gas at ordinary pressure. Beyond 125 mm. pressure, the simple Welsbach burner gave rise to an unpleasant buzzing. The mantles, also, wear very badly when the consumption exceeds 400 litres of gas per hour.

The second table shows results with the same burners adjusted to 350 litres of gas under 200 mm. pressure. With the pressure approximately 200 mm., the efficiency is very satisfactory, and

Pressure.	CONSUMPTION.		INTENSITY.		CONSUMPTION PER CARCEL.	
	Welsbach.	Denayrouze.	Welsbach.	Denayrouze.	Welsbach.	Denayrouze.
Mm.	Litres.	Litres.	Carcels.	Carcels.	Litres.	Litres.
50	260'87	220'85	18'94	9'56	18'71	23'10
70	300'00	250'00	20'00	12'10	15'00	20'66
75	318'58	266'66	22'59	13'22	14'10	20'17
100	375'00	288'00	34'60	18'52	10'84	15'55
125	413'19	321'42	42'17	23'21	9'80	13'42
150	450'00	346'15	46'91	29'00	9'59	11'94

Pressure.	Hourly Consumption.	INTENSITY.		CONSUMPTION PER CARCEL.	
		Welsbach.	Denayrouze.	Welsbach.	Denayrouze.
Mm.	Litres.	Carcels.	Carcels.	Litres.	Litres.
50	188'48	9'00	7'21	20'94	25'14
100	248'27	15'50	15'00	16'01	16'55
150	288'00	27'50	27'70	10'47	10'40
175	321'42	33'87	33'80	9'48	9'51
200	349'51	37'24	37'20	9'38	9'39
225	367'35	39'62	39'07	9'28	9'40

the behaviour of the burners very regular. The admission of air must be regulated by using a copper disc, as in the Welsbach burners Nos. 1, 2, and 3.

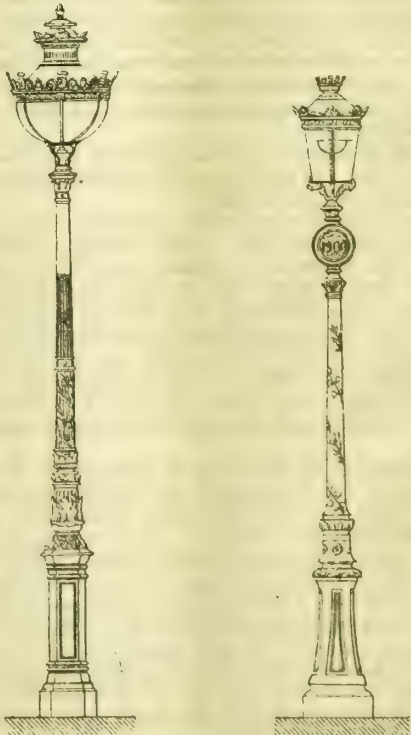
The heat of the burners sometimes oxidizes or burns away the metal gauze; so it is well to use a gauze of rather finer mesh than that in ordinary burners.

The municipal authorities placed at our disposal lamps of the latest pattern, particulars of which are given in the following table:—

Model.*	Consumption of Gas in Litres per Hour (a) Before and (b) After Alteration.		Diam. of Lower Part.	Diam. of Upper Part.	Height of Chimney.	Height of Lamp.
	(a)	(b)	Cm.	Cm.	Cm.	Cm.
No. 1	140	300	21	32	33	65
" 2	140	750	27	39	36	70
" 3	750	750	27	39	36	78
" 4	850	1250	35	45	38	80
" 5	1400	1750	38	49	46	90

\* No. 1.—Small refuge-lamp. No. 2.—Ordinary lamp. No. 3.—Ordinary lamp with raised dome. No. 4.—"Quatre-Septembre" lamp. No. 5.—Large refuge-lamp. Lamp No. 1 contained one burner, passing 300 litres of gas per hour; Nos. 2 and 3, three of 250 or two of 350 litres; No. 4, five of 250 or three of 350 litres; No. 5, five of 350 litres.

The lamps were altered by (1) removing the glass covering the base; (2) altering the reflector underneath the upper openings; and (3) making more space in the throat of the lamp, and introducing a cone inside and a cap on the summit of the lamp, in order to prevent water getting inside.



TYPES OF LANTERNS AND STANDARDS EMPLOYED FOR THE INTENSIFIED GAS LIGHTING.

Trials of all the different appliances were made at Landy for a year previous to their installation, with a view to obtaining absolute assurance that the burners worked regularly and that



the number of broken glasses was not too great. These tests were made by placing a thermometer along the windows inside the lamp. Usually the lamps that were not altered showed a rise of temperature of from 180° to 230° C. After alteration, the temperature varied from 70° to 110° C. An extra-large lamp—called the “Opéra”—was designed for centres of great illumination. It permits the introduction of fifteen mantles, each burning 350 litres—say, 5250 litres per hour.

Reviewing the enterprise we undertook, the preliminaries of which have been just described, I may briefly consider the general arrangements adopted.\* Compressed gas was used only in great thoroughfares and similar places. The two Farcot compressors were installed on the Quai d’Orsay, each being worked by an 8-horse power gas-engine. Only one was required at a time; the other being reserved in case of accidents. An arrangement of valves permitted the gas to be turned into the second compressor without any fear of the light being interrupted.

An installation on such a considerable scale demanded the co-operation of all interested. The officers of the Mechanical Department were responsible for its general organization; while those of the Mains and Lighting Departments supervised the laying of the supply-pipes and the fitting of the burners in the lamps. The firms of Lecarrière and Co., Mesureur, and Grandpierre also rendered most valuable assistance. The French Welsbach Company and the Denayrouze Lighting Company agreed to bear part of the expenses—viz.: (1) Bandsept burners in the Champ-de-Mars and Denayrouze burners in the Trocadéro. (2) Maintenance and repair of these burners. (3) Renewal of mantles within certain limits. The total help thus received enabled the Company to successfully carry out their scheme; and this lighting of the Parks, the Champ-de-Mars, and the Trocadéro has been in operation since April 3.

It will be interesting to quote the mean illumination afforded in different parts of the area assigned to the Company:—

	Metre-Candles.
Avenues under the Eiffel Tower . . . . .	28
Central avenue of the Champ-de-Mars . . . . .	23
Side avenues . . . . .	26
Château d’Eau . . . . .	24
Smaller side avenues . . . . .	12
Central avenue from the Trocadéro . . . . .	26
Boulevard Delessert . . . . .	15
Side avenue . . . . .	22
Bye-thoroughfares . . . . .	12

The total hourly consumption of gas has been 1,383,900 cubic metres; the total intensity, 91,000 carcels; and the efficiency per carcel, 15·2 litres. The number of lamp standards was 1076, of lamps 1618, of mantles 4619. The area illuminated was 195,000 square metres; 100,000 of which was in the Champ-de-Mars.

Comparing the results with those of 1889, I may here quote M. Fontaine’s monograph on the work of the “Syndicate International des Electriciens,” in which it is stated that the gardens of the Champ-de-Mars (with an area of 178,000 square metres) were lighted with 19,000 carcels, or a little more than one-tenth of a carcel per square metre. Calculation of the figures previously given shows that the illumination of the Champ-de-Mars has this year been 0·54 carcel per square metre, and of the Trocadéro, 0·39 carcel; or 4·7 times that produced in the Champ-de-Mars in 1889.

Following names must be mentioned among those connected with the carrying out of the installation: M. Léon Bertrand, M. Hart, M. de Mont-Serrat, MM. Vialay and Baron, and Gaudry, and M. Franceschini.

Some time ago we reproduced in the “JOURNAL,” from the “News,” some extracts from a letter received by Mr. Colson, of Leicester, from his son, Mr. Douglas F. Colson, who is serving in the Electrical Engineers (R.E.) Volunteer Battalion, South Africa. Mr. Colson, it may be remembered, was captured, but was subsequently liberated; and he gave in the “JOURNAL” a graphic account of his adventures. His capture was followed by the minor “regrettable incidents” of the war; but it was unfortunately followed by blood poisoning which incapacitated him for active service, and he had to go into hospital at Pietermaritzburg. He has since been invalided, and is now on his way home in the hospital ship *Nubia*, which is expected to reach Southampton early next month. As Mr. Colson showed himself to be quick at acquiring the native language and capable of handling gangs of men—qualities which were not unrecognized by his superior officers—it is a pity so promising an engineer was deprived by sickness of the opportunity of exercising them to the fullest extent, and denied the pleasure of returning with his company to receive the congratulations of their compatriots. However, he will be sure to have a hearty “welcome home” at Leicester; and we trust that a period of rest may effectually remove all traces of the mischief which he, like many another brave fellow, has sustained in the service of his country. The current number of the “Electrical Review” contains some snapshots of the Electrical Engineers at work and at play.

\* Particulars of the lighting installations at the Exhibition have already been given in the “JOURNAL” (see Vol. LXXV., pp. 1357, 1635, and ante, p. 636).—ED. J.G.L.

TECHNICAL RECORD.

THE ANNUAL MEETING OF THE AMERICAN GASLIGHT ASSOCIATION.

The President’s Address.

The Twenty-eighth Annual Meeting of the above-named Association was opened at Denver (Colorado) on the 17th inst., under the presidency of Mr. GEORGE G. RAMSDELL, of Philadelphia. Mr. Ramsdell has favoured us with a copy of his Inaugural Address; and we give it below.

We meet at this time, in twenty-eighth annual session, under somewhat peculiar circumstances. Although our Association is national in name and membership, it has never before held a meeting west of the Mississippi river; and it is peculiarly fitting that we have decided to gather here to-day in this thriving city, so thoroughly Western and typically characteristic.

We also meet at a peculiar time, being almost the end of the Nineteenth and on the threshold of the Twentieth Century—a future period, whose possibilities we can only conjecture. When we consider the marvellous advances made in our industry during the past decade, we are prepared to expect wonderful things. I believe the first contract for street lighting with gas in this country was made by the City of New York in 1823. But the gas business was small indeed at that distant period; and it was not until nearly half the century had passed that the business assumed any importance. From then until now, the business has steadily grown, until it has become one of the most stable and important. Its growth in volume, in improved appliances, in economy of manufacture, and in diversity of use, during the past ten years, has been indeed phenomenal; and it to-day survives, after numerous contests of the utmost severity with opponents who, in the gladiatorial arena, would have been classed as giants.

The gas business is a most excellent thermometer of trade, responding with equal promptness to adversity or prosperity; and it seems to me its recent history shows it is keeping pace with our rapid growth as a nation. It is also apparent, I think, that we have reached a point in our history when we must soon drop the idea that we are young in the gas business, and assume the responsibilities of a position in the gas world in keeping with our position as a nation. We already, in some respects, are leaders—conspicuously so in the matter of water gas; and we are very rapidly dissipating the divergence that was formerly so glaring in selling prices. Indeed, very recently, during an important legal action in the City of Boston, it was easily demonstrated that, when the costs of materials and labour were equalized, no appreciable difference existed.

Perhaps the most serious criticism of our business and profession is a lack of thoroughness and repose, largely the result of unavoidable conditions. The growth of the communities we serve has been large and rapid—requiring prompt action and often energetic measures to meet absolute necessities, in order to provide a satisfactory and unfailing supply. This condition is happily passing away. We are advancing in engineering ability quite as rapidly as in other directions; and no change in our business is more marked. The Gas Associations, the educational work conducted by this Association, the technical schools, &c., are responsible for this; and to-day the number of competent minds actively engaged in solving the intricacies of our business is far greater than ever before. I think this is readily apparent in the quality of our meetings—both in the character of papers read and in the subsequent discussion. It is to be regretted that to this cannot be added a statement that there is also a corresponding growth in the number of those who prepare papers or discuss them.

We have been passing through an era of high prices, both in the cost of materials for manufacture and in construction. A year ago the price of oil had increased to such an extent as to become a serious matter, resulting in a large increase in the manufacture of coal gas. Subsequently the price of coal was largely increased, tending to equalize matters. Fortunately for those depending upon coal, a better market had sprung up for residuals; so that, as far as holder costs were concerned, they still maintained about the same relative positions. Already a reaction has set in; and lower prices prevail for both oil and coal.

Undoubtedly, a vast amount of construction work has been postponed, by reason of the abnormal cost of material; and the fact that this character of material has also started downward in price, confirms the wisdom of delay. Indications now point to normal conditions being resumed. Prices will, probably, for some time to come remain higher than formerly; but the margin of difference will not be so great as at the present time. This condition of things will prove exceedingly welcome; for the increased prices of materials fell upon us at a time when reduction in the price of gas was conspicuous all over the country. In fact, there never was a time when the demand for lower rates was greater or more universal. Now that we are getting down to, and below, the “dollar mark” for gas, more attention will have to be paid to the cost of materials entering into its manufacture. The margin for dividends and profits is not elastic enough when gas is being sold at one dollar, or less, per thousand, to stand the strain of an increase in cost of material of from 50 to 100



per cent. It also becomes more and more apparent that, as prices decrease, greater care will have to be taken in our system of accounting; and I deem it of the greatest importance that this whole subject be taken up by the Association, and systematically treated, until a standard is reached. Several years ago the Western Gas Association made a start in this direction, but only carried it as far as the cost of gas in the holder, and the subject has progressed no farther. There seems an urgent demand for intelligent discussion on this particular and important subject; and your officers hoped to have a paper for this meeting, treating the matter, on broad lines, in such a manner as would invite succeeding papers upon detailed subjects. In 1897, I had the honour to prepare and read a paper before the Society of Gas Lighting on "Depreciation;" and I have since been surprised at the number of requests for copies of that paper, for use in legal cases. I mention this simply to call your attention to the urgency for standard rules covering this important field. I, therefore, earnestly recommend that this subject be taken up by us as an Association in a thorough manner, and treated exhaustively. There would be a special desirability, in that it could interest an almost new list of paper-writers—thus "giving labour to the unemployed."

Probably the most prolonged, bitter, and expensive gas war this country has known was ended early in the summer. Other gas wars have reached lower prices, but none where any such amounts were involved. The old prevailed over the new, and the end of the war corroborates the oft-repeated axiom, that "Competition is impossible where combination is possible," and the further fact is emphasized that lower rates in such cases are always temporary in character, and immediately resume normal conditions upon the cessation of hostilities. The war lasted over a year, was waged with unflinching bitterness, and undoubtedly swelled the gas consumption to enormous volume, at unremunerative prices. One of the most noticeable features of this critical period was the remarkable maintained strength of the stocks involved. The final outcome leaves the active lighting interests, both gas and electric, of one of the largest cities in the world in the supreme control of one Company. This is as it should be, although it is unfortunate that the consummation adds unnecessary capital to an already burdensome capitalization, very largely the result of former similar conditions.

For a good many years we have been using, after having formally adopted, the Society of Gas Lighting standard for specials, flanges, &c. This, at the time of its adoption, was the result of a careful investigation on the part of the Committee appointed by the Society of Gas Lighting, and seemed to be a *consensus* of opinion of pipe manufacturers as well as gas engineers. Since the formation of the Pipe Trust or Combination, the pipe manufacturers themselves have taken this matter up; resulting in the adoption by them of a new standard, the principal differences being somewhat heavier specials, and a larger number of bolts used in flange work. I understand they are making, or have made, a system of gang drills, so as to drill any sized flange at one operation; thus very greatly reducing time, labour, and cost. In order to have their flanges suitable for water requirements, the number of bolts must necessarily be sufficiently large for that class of work, which is an unnecessarily large number for gas requirements. The subject seems to me to be entitled to our careful consideration; and I advise its being referred to a Committee for investigation and report.

One of the vital questions of the day is that of public control; and it seems apparent that this important subject will not be satisfactorily settled until a solution is reached, based upon equitable lines, and satisfactory to both sides of the problem.

When the Gas Commission of the State of Massachusetts was established, it was supposed that a satisfactory and equitable solution had been found for gas interests; and it was launched under the most favourable opinion of the gas fraternity of Massachusetts, and, in a large measure, of the entire country. This Commission occupied the position of a judicial referee, to which appeal could be made by either the gas company or the public, with assurance of careful consideration and a fair decision, equitable alike to either party, and one that conserved the best interests of each. The humblest consumer stood on a parity with the largest; and the right of petition, in the hands of consumers, seemed an ever-present reminder both to directors and managers, that secured most respectful treatment and consideration. Starting out in this mutually agreeable way, everything was apparently entirely satisfactory. Many knotty problems were investigated, many equalities adjusted, competition was rendered practically impossible, and, under the control of the Commission, the ledgers of the companies showed prosperous conditions. Undoubtedly, the above conditions have been true for a long period; yet the past year seems to have been fruitful of trouble and vexation alike to the companies and the Commission; and the fact that troubles of an uncommon nature have arisen, after a continued experience, quite the contrary, seems to indicate a weakness in the system. In fact, it seems to show a culmination of conditions long existing, but dormant—the effects of causes possibly hidden, but inherent from the first. A Gas Commission, to be permanently successful, at all times equitable and just to both parties, must be founded upon lines of general policy, that, continuously maintained, will reach correct results. If the general policy be wrong, a gradual divergence will result.

I think the Massachusetts Commission has been composed of

fair-minded men, who have laboured to reach correct conclusions, and the fact that for many years no serious complaint has been heard would seem to bear this out. It is but reasonable to suppose, however, that some mistakes have been made, and that, as the entire fabric must be erected upon knowledge gained by experience, the experience of the past year will serve as a guide in formulating or changing any part of the present policy clearly shown to be wrong.

Public control of gas interests, through properly formed and wisely conducted State Commissions, is, to my mind, ideal; and we can well afford to wait for further investigation before arriving at a final verdict. The great value of control by a State Commission was never more apparent than during the period mentioned above; for, while apparently a decision of the Commission started the avalanche of legislation that for a time seriously menaced the vested interests of the Gas Companies of the State, yet it is a conspicuous fact that not one of the Bills succeeded.

The first International Gas Congress, after months of anticipation and preparation, has passed into history. It is probably too soon to fully estimate its results. That it was a success we can safely say; and in my judgment the measure of success surpassed the expectation of its warmest advocates. Being the first attempt at such a meeting, there were no precedents to guide its originators; and therefore the greatest credit is due to those whose foresight and wisdom brought such magnificent results. There was a large attendance, thoroughly representative in character, and intensely interested in the topics under consideration. Even the matter of language did not interfere as greatly as was anticipated. Most of the papers and discussions were in French; but any member was at liberty to express himself in his own tongue. The general arrangements were perfect; and the hospitality of the French Gas Society, under whose auspices the meetings were held, lavish. Under the skilful guidance of the President, M. Th. Vautier, the proceedings moved forward in a most expeditious and satisfactory manner; and the somewhat lengthy list of papers was allotted ample time for discussion. The attendance throughout was very large, drawn from all parts of the globe; the proportion being governed very largely by distance. This country was represented by seven, five of whom were members of this Association; and while a greater number would have been entirely appropriate, yet considering the serious journey involved, we felt proud of our contingent. This Association was complimented (as were all the others) in having your President occupy the chair for a part of one of the sessions.

Great credit is due the Technical Press for their enterprise in obtaining full reports of the proceedings—especially as, at least, three different languages were used during the meetings. Yet, notwithstanding this drawback, the proceedings began making their appearance in the regular channels with as much promptness as though no unusual difficulties were involved. A careful perusal of these reports will show that all the papers presented were of a very high order, and that they were ably discussed. Another feature worthy of notice was that each delegate was given a neatly bound paper pamphlet upon entering the Congress in the morning, giving a complete chronicle of the proceedings of the day before—an evidence that enterprise or "hustle" is not confined to one Continent. The papers presented by our own members were exceptionally well received, and were given the compliment of a liberal discussion.

It was peculiarly gratifying to witness the very great interest taken in Mr. Forstall's paper, giving the history and results of our educational work. That the widest publicity might be given to it, it was read in French; and the discussion was in English and French. I believe no subject presented to the Congress was quite so appropriate for international discussion as this, and none elicited more earnest or thoughtful consideration. The discussion brought out the systems that are in use for the same or similar work in Germany, England, and America, and eliminating the fact that local surroundings may make a wider difference. We have lost no confidence or faith in our system.

In addition to the literary feature, the hospitality of the French Society displayed itself in other ways. The officers of sister Associations, in attendance upon the Congress, were invited to attend the annual dinner of the *Société du Gaz*, which proved to be a delightful affair. The entire list of delegates were also entertained sumptuously on the opening evening of the convention. In addition to this, special attractions were given in the Exposition, particularly in the lighting exhibits, for the benefit of the members; and last, but not least, the entire convention were taken in steamers to visit the Paris Gas-Works.

In the matter of lighting, I think it is within bounds to say that the exhibition of lighting on the Champ-de-Mars is the finest ever given. The Champ-de-Mars is a vast esplanade in the centre of the grounds, and of such ample dimensions as to afford a magnificent opportunity. There were arc and incandescent electric lights, which were distinctly eclipsed by the magnificent display of incandescent gas lighting through the Denayrouze and Bandsept burners, part of them intensified by a pressure plant located on the grounds. There were 4676 mantles, burned under a pressure of 200 millimetres in Bandsept burners, giving 90,000 carrels of light. The average duration of the mantles was 42 days; those in the lamps burning under normal pressure (about equal in number) being about the same. The total light was 47 times greater than when the same space was lighted by electricity at the former Exposition, eleven years ago.



Taking the Gas Congress all in all, its connection with the Exposition, where such ample opportunities for exhibition of gas appliances offered, the fact that it was the first of its kind, and the further fact of the opportune time—the close of the Century, which very nearly compassed the lifetime of gas, covering practically the period from birth to its present commanding position—it was a magnificent success. It was the unanimous desire of the English-speaking contingent that a similar congress should some day be held in England or America; and I sincerely hope that when the time comes, circumstances may be such as will give us the honour of holding it in this country.

The three prominent topics of the day abroad are inclined retorts, prepayment meters, and incandescent lighting. In company with two others, I made quite a little study of the first and last of these. The inclined retort, particularly in Germany, has undoubtedly passed beyond the experimental stage, and is occupying a position earned by its merits. We visited fifteen different gas-works during our trip—with one exception, entirely unannounced; so that we visited them as they were running in every-day practice, and consequently saw them to the very best advantage. Of these works, four used only horizontal retorts, eight used inclined retorts exclusively, and three were using both systems. We were received most cordially, and given every facility for acquiring the information sought for; and we desire here to express our heartiest thanks for the many courtesies extended us by the various gas engineers on the Continent and in England, who assisted us in various ways.

Broadly speaking, there can be no question as to the success of the inclined system; the only qualification of the term lying in the adjustment of details. The proper length of retort seems a somewhat unsettled feature. England stands for a length of 20 feet—claiming that they experience no difficulty in heating the entire retort, and readily showing increased economy over retorts of shorter length. On the Continent, they use retorts of shorter length; but it is worthy of note that it is admitted that the earlier installations of 11 feet and 12 feet retorts are too short, and that 16 feet is now considered a more proper length. This fact is emphasized by one of the largest and most ably managed of the companies visited—now using retorts 12 feet long—who, in rebuilding their works, are adopting the 16 feet length. This we found the current opinion in Germany; and as this country has gone into the matter more extensively than any other, and is apparently giving much more study to the subject than any other, it is a criticism worthy of careful consideration. No question can arise as to the nearly automatic discharge of coke from the retort, and no serious difficulty seems to further exist in the preparation and charging of the coal; and as the manipulation of the gas after it leaves the retorts is the same, whether the retorts are horizontal or inclined, it would seem that the mechanical details at least are very nearly complete. At most of the works coal-breakers are used; but we visited one where the coal was charged as received, any very large lumps being cracked up with a hammer—the run of the coal apparently being of a size between our nut and lump. In any event, the engineer assured us that it was charged as received, and that he experienced no trouble whatever. The coal used in Germany is largely a mixture of German and English coals, and much of it of the nut size. We heard no complaint of the action of the coke after being deposited in the retort; and the charges we saw, at the first or last stage, seemed to lie very even.

and there is much more talk of the “creeping” of the coke, it should be borne in mind that our English friends are much hampered in coal matters, and can do very little work of coal selection at the present; and it seems that if they had as favourable an opportunity they might find that what would give as little trouble as the engineers of the Continent seem to have.

A factor worthy of note, it seems to me, lies in the circumstance that the change from the horizontal system to that of the inclined system is usually so great that it results in most cases in practically new works, doubling or trebling the capacity, and discarding the old for new apparatus of modern type. Hence the whole change is conspicuously an improvement upon the old; and unquestionably better results, and greater satisfaction, would be obtained were the retorts on either system. I think due weight should be given to this in considering the merits of the two systems. The cost for labour is approximately the same, using inclined retorts or horizontal retorts, with drawing and charging machines; but the labour troubles strongly recommend the inclined system to foreign engineers.

In our Continental trip we visited the works at Zurich (Switzerland), Dresden, Berlin, Altona, and Cassel (Germany), Copenhagen (Denmark), Rotterdam, The Hague, and Amsterdam (Holland). With two exceptions, all of these were municipally owned. In only one did we see any difficulty in the discharge of coke—arising clearly from local trouble, shown from the fact that we experienced no difficulty in any other of the works. Some little knack is required in charging the coal, but only such skill as an ordinary stoker easily acquires. In some of the works, the duration of charges was four hours; but most of them took six hours. In one works, they had used five benches of nines, 13 feet long, for a year in the same retort-house, with horizontals using drawing machines; and they have already contracted for a complete retort-house of inclines to be 16 feet long, with complete coal and coke handling machinery. This we considered a strong endorsement of the system.

I have purposely refrained from giving figures, for the reason that figures in foreign works would not apply here, and also for the reason that we shall have a paper at this meeting based entirely upon actual practice in our own country. But I give the following conclusions drawn from my observation.

1st. There seems to be nothing in the system of inclined retorts that need be feared as to their successful working.

2nd. The cost of labour is approximately the same per 1000 cubic feet for gas made in inclined retorts or gas made in horizontal retorts using charging and drawing machines.

3rd. There is a marked saving in using inclined retorts, when compared with horizontal retorts operated with manual labour.

4th. The lifetime of inclined retorts would probably be somewhat longer than the lifetime of horizontals.

5th. The first cost of an inclined installation—including all machinery for coal and coke complete—would be more than an installation of the horizontal type, equipped equally well with coal and coke handling machinery, and including charging and drawing machines (works in each case of equal capacity).

6th. Less skill is required to operate a works of inclined retorts than one of horizontals with machines. Hence the freedom from labour troubles is somewhat greater, using inclines, than with horizontals.

Nothing impresses a gasman more in a journey abroad than the well-nigh universal use of incandescent gas lighting. This is particularly true of Germany, where it is said that over 90 per cent. of all gas lighting is on the incandescent system; and I can very readily believe this statement, as it only confirms my own observation. Almost all street lighting, and nearly all indoor lighting, that one sees is of this type, and of very superior quality. The gas companies give far more attention to the burners than is our custom; and it evidently pays to do so. I have seen no streets better lighted, and few as well, as the general run of them in Germany; and this universal use of incandescent burners has produced a marked effect upon the entire gas industry. Candle power has become, or at least is fast becoming, a secondary consideration; and already, in many works, more importance is attached to the testing of gas for its heating qualities than for candle power. It was a matter of note that, in the works we visited, the candle power of the gas was an unimportant factor. It requires no stretch of the imagination to anticipate a time when the photometer will be second in importance, and the calorimeter first. This condition has led gas engineers, in the renewal of all public contracts, to secure the same upon such a basis as will enable them easily to obtain the necessary candle power direct from the coal most economical for them to use. It is therefore not uncommon (especially in Germany) to find street lighting contracts or contracts with cities specifying a power of 13 to 14 candles, measured by the Hefner unit, which, being only 0.877 of an English standard candle, is equivalent to less than 12-candle power, as measured in England.

One of the prime-factors in the liberal use of incandescent lights is undoubtedly their cheapness. There are no patents on incandescent lighting in Germany. Hence a customer can purchase over the counter the best burner in the market, complete with the best mantle, Jena chimney, reflector top, fixed for \$1 of our money, and other burners, similarly equipped, for as low as 50 c. After the first purchase, in most of the cities, the gas company thereafter maintains the light, sending out new mantles, with new chimneys, ready to slip on in place of the old one, at a charge of 12 c. in our money. This same outfit can be purchased over the counter for about 8 c. or 9 c.; but the difference is so small that few avail themselves of it, but allow the company's agent to make the renewal—thus securing at all times the greatest efficiency of their lights.

I am informed that the German Continental Gas Company, operating a large number of gas-works, which give abundant evidence of superb management, carry out this system, besides other extremely liberal plans. For example, they have obtained large numbers of new consumers by providing slot or prepayment meters, using the 10 pf. piece, equivalent to about 2½ c. of our money. The only requirement of the consumer is to sign a paper, acknowledging the installation to be the Gas Company's property, which is countersigned by the landlord, if in a rented building. The customer is then furnished free with five incandescent burners, ready for use; a large cooking apparatus, which includes a hot-water heater; a gas-heated ironing set, with two nickled flat-irons of any pattern desired; and burner renewals on the regular terms.

As 10 pf. worth of gas will keep an ordinary incandescent burner going for five hours, this plan has proved very popular—resulting in a large volume of new business. One feature of store-window lighting forcibly impressed me both for number in use and for quality. It consisted of a single or double row of incandescent gaslights on plain iron pipes stretched across the window quite well towards the top. On a single 1-inch pipe there would be placed six, eight, ten, or more of these lights, with a porcelain shade, with nickel trimmings, which not only gave a handsome appearance, but flooded the window with light, and, being located far above the sight line, gave a pleasing effect. I believe this is called the “Ramp” system; and it is not only effective but, judging from its large use, quite popular. It struck me that we were behind our friends on the other side in incandescent lighting, not so much in the quality of the burner itself as in the more effective



way the burners were operated through the better care given them, and consequent uniformity; and, while we are constantly extending their use, they are far in the lead as to numbers. But this state of affairs is most encouraging for us, as we can readily see that the same conditions will sooner or later prevail here. Already with us incandescent gas lighting for streets has become a factor of no mean proportions; and it is easily apparent that there will come a decided increase, and the arc lamp now so largely used, and which created a revolution in street lighting fifteen or twenty years ago, will find a deadly rival in its once vanquished enemy—gas. It seems to me that, as gas engineers and managers, it would be a satisfaction to us if we could express our sentiments on this subject in some tangible way.

If we were asked to-day to whom, as gas purveyors, we are most indebted for our present healthful business condition, I think that we would all, with one accord, answer: "The inventor of the Welsbach light." Launched at a time when gas investment was in its most uncertain period, when the advent of the electric light was proclaimed with such a blare of trumpets as to alarm the large majority of stockholders, and challenge the faith of the strongest friends of the gas business, the Welsbach light entered upon its battle for supremacy, comparatively unheralded, and with an utter lack of all theatrical features. Unfortunately, it did not spring into instant success; and fortunately, it did not sink into utter failure. Unlike the majority of inventions, this light was not the result of chance, but the outcome of the profound knowledge by the inventor of his subject, combined with that superior quality we call genius, which is the embodiment of thought, skill, and persevering labour. After comparative failure for several years, difficulties were gradually overcome, and increased efficiency slowly but surely attained, until to-day, at home or abroad, it undoubtedly stands as the greatest contributor to our present defensive strength, and the strongest weapon we have ever possessed for aggressive warfare. It seems to me an exceedingly appropriate thing to do, and I recommend that Dr. Auer von Welsbach be elected an honorary member of this Association.

In 1879, the writer imported into this country its first large gas-engine. Nothing larger than 7-horse power had been made here. The engine imported from Germany was of 17-horse power. From that day to this, steady progress has been made, until now 650-horse power is, I believe, the maximum manufactured in this country, although there was one on exhibition in Paris of 1000-horse power, which was built expressly to be operated with blast gas from a furnace, and was expected to develop 700-horse power with that poor fuel. We have never enjoyed so large a sale of gas-engines as their merits seemed to warrant; and it is probably to a great extent our own fault. We are at least open to the criticism that we do not entirely practice what we preach. We certainly do not use gas-engines in our works as liberally as we should, and we thereby lose a grand opportunity of advertising them. I believe all motive power about gas-works, except for exhausting machinery, can be furnished by gas-engines cheaper and more satisfactorily than with steam. They are used much more extensively in foreign works than with us—in fact, we visited one works where gas-engines were held in reserve in the exhauster room. However, the development in this country in recent years has been very gratifying; and I am of the opinion that more aggregate horse power of gas-engines has been sold within the last three years than in the ten years preceding. I have been told of one order recently placed for twelve engines of an aggregate horse power of 3000; and it seems entirely reasonable to assume that the number of gas-engines will multiply much more rapidly in the coming years than ever before.

The address concluded by giving some particulars of the life work of eight members of the Association who had died during the past year.

#### BOILER TRIALS AND ANALYSES OF FUEL AND CHIMNEY GASES.

The following is an abstract translation of a communication prepared by Dr. H. Bunte, of Carlsruhe, at the request of a Committee appointed by the Association of German Engineers, the International Bond of Boiler Inspectors' Associations, and the Association of German Mechanical Engineering Works, to compile a set of rules for carrying out efficiency trials of boilers and steam-engines. It has been published in recent numbers of the "Journal of the Association of German Engineers," and of the "Journal für Gasbeleuchtung."

The rules for trials of the efficiency of boilers and steam-engines compiled and recently published by the above-mentioned Committee showed one important advance in comparison with the rules issued in 1884, which is most significantly stated in Clause 39, which says: "The calorific power of the fuel is to be determined calorimetrically." When the rules were compiled sixteen years ago, opinions were divided on the question of the calorific power of the fuel. On the one hand, it was believed that the interdependence between the chemical composition and the heat of combustion of the fuel was very questionable; while, on the other hand, the methods for the direct determination of calorific power were so tedious and unreliable that a long time would have had to be spent in investigation of these

methods, and therefore it was only recommended that the calorific power should be calculated approximately, according to the so-called "Bond" formula. Since that time, however, thanks to the advances in physical chemistry, the methods of making calorimetric investigations have attained such a degree of simplicity, reliability, and precision, and consequently have become so extensively adopted, that a calorimetric determination of the calorific power of a fuel should generally be demanded.

Furthermore, the relation between the chemical composition and the heat of combustion of fossil combustibles has, during the last decade, been to a considerable extent elucidated, whereas opinions on it were formerly very confused. There can be no doubt, from exhaustive researches, that, given a correct ultimate analysis, the calorific power of coals can be determined with a very close approximation to the truth by means of the "Bond" formula, which was recommended sixteen years ago. Approximately correct determinations have been made in this manner for efficiency trials carried out since that date. Following, therefore, a practical suggestion, the "Bond's" formula might be embodied in the new rules, in addition to a calorimetric determination of the calorific power being required.

The greater the reliability and precision of the laboratory examination of the fuel, however, the more important is it that the small quantity of the material tested is truly an average sample of the fuel used in the efficiency trials. But the condition of a fuel such as coal or lignite is so liable to fluctuations, in respect of the amount of water and ash present, that it is by no means easy to secure such a representative sample. The new rules lay special stress on the proper sampling of the fuel. Careful sampling should make it possible to attain conformity between sample and bulk within 1 to 2 per cent. so far as the percentages of water and ash in coal are concerned; but much will depend on whether the conditions are favourable in regard to the size of the coal and the amount of moisture in it. When, however, coals of recent formation and lignites are used, special difficulties supervene, owing to their rapidly fluctuating water-content.

To indicate how great may be the effect on the analysis and the calorific power, tests made by the author some time ago at the suggestion of Herr Münster, of Halle a/S., may here be referred to. A portion of a sample of lignite, packed in a soldered tin, was found to contain 52.5 per cent. of water; other three portions—one similarly packed and kept several weeks, the second put in a well-stoppered glass vessel, and the third in a tin with tight-fitting lid—gave the same result (actually 52.8, 52.6, and 52.6 per cent. respectively). On the other hand, a portion kept for fourteen days in a well-closed wooden box showed only 48.4 per cent. of water; and one kept in a loosely-closed box after nine days 44.5 per cent., and after fourteen days 41.6 per cent. Hence it appears that samples of coal, &c., containing a large amount of water must be conveyed for analysis in soldered tins, or tightly-closed tins or glass vessels, as considerable loss of moisture may ensue if the samples are packed in wooden boxes. Samples on which the percentage of water is to be determined must be stored in glass or tin vessels. The calorific power of the coal would be increased by loss of moisture owing to careless packing of the sample. For instance, the last of the figures quoted would be equivalent to an increase of over 10 per cent. in calorific power.

Loss of water may also ensue in pulverizing and dividing the sample for analysis; and in order to avoid error on this account, it is a good plan to make a rough moisture determination by observing the loss which the sample undergoes when it is exposed to the air for two to eight days. This air-dried sample is then prepared for the subsequent analytical operations. In the cases cited above, the loss of weight in eight days amounted to 30 to 20 per cent., according to the amount of moisture originally present and the size of the lumps of coal. This example directs attention to points to which the greatest care must be paid in efficiency trials, in which it is assumed that a certain percentage of the value of the fuel is utilized in the boiler.

The details of the chemical and calorimetric tests of the fuel need not be discussed here; but it may be pointed out that, for the sake of simplicity in the calorimetric determination, corrections which are of quite minor importance compared with the points referred to above should be omitted in tests made for efficiency trials. For instance, correction for the formation of oxides of nitrogen or of sulphur by combustion in compressed oxygen, and determinations of the nitrogen in the coal, though of scientific interest, may be omitted in such trials.

Calorimetric determinations should be as simple, but as reliable, as possible, because they are coming more and more into use for the regular surveillance of deliveries of fuel in large works, where a chemical laboratory adapted for elaborate operations is not available. In such cases, it will often be necessary to forego the tedious and uncertain determination of the quantity of water produced on combustion, and to apply a constant correction—fixed according to the nature of the fuel—for the latent heat of the water condensed in the calorimetric bomb. The amount of hydrogen—on which this figure chiefly depends—varies only within small limits, so far as coal is concerned. In round figures, it is between 4 and 5 per cent. of the weight of the coal. The quantity of water produced on combustion, therefore, must range between  $4 \times 9 = 36$  per cent. and  $5 \times 9 = 45$  per cent. of the coal burnt. If the latent heat of the water vapour is taken as equivalent to 600 calories, then for every 1 per cent.



of hydrogen the correction is  $1 \times 9 \times 6 = 54$  calories; and consequently for 4 per cent. it is 216, and for 5 per cent. 270 calories per kilo. of coal burnt (98 and 122½ calories per pound).

The majority of ordinary coals used as boiler-fuel contain from 4.5 to 5.2 per cent. of hydrogen, and for such a mean value of 250 calories per kilo. (= 113½ calories per pound) can properly be deducted from the heat of combustion as found in the calorimetric bomb. Actually coal from the Ruhr district contains on the average 4.7 per cent. of hydrogen; while the more recent Saar and Saxony coals contain about 5 per cent., as do also the Silesian coals. The older coals contain also very little moisture—about 2 per cent.—and the more recent true coals seldom contain over 5 per cent. But as each 1 per cent. of water corresponds to 6 calories per kilo., the correction for the water present in coals lies between 12 and 30 calories per kilo. (or 5½ and 13½ calories per pound). But this correction becomes much greater for brown coals or lignites, which may contain as much as 30 to 50 per cent. of moisture. The correction will then be from 180 to 300 calories per kilo. (or 80 to 135 calories per pound). In such cases, it is necessary to determine the amount of moisture in the lignite, in order to arrive at results of value. But when approximate comparative values only are required, the water correction may be calculated in the same manner as for coal for other classes of fuels—e.g., anthracite, coke, &c. For the sake of the economical utilization of our fuels, it is highly desirable that their calorific value should be taken into consideration more than hitherto, and calorimetric determinations afford reliable criteria for the valuation of the fuels.

Only isolated communications have lately appeared on the calorific power and chemical composition of the fuels in common use in Germany. The author has therefore tabulated the results obtained for a large number of fuels, for the most part under his supervision at the Chemical-Technical Testing and Research Institute of the Grand-Duchy of Baden. The source of coal, however, is not of great significance, as it is well known that one group of mines will tap different descriptions of coal, while different mines, on the other hand, will raise the same description of coal. The chief value of the tabulated results (of which an epitome is annexed) lies in the fact that they present reliable values for the chemical composition, yield of coke, and

calorific power (determined by the calorimeter) of a large number of samples of coal. Such an exhaustive series of determinations must prove valuable in extending our knowledge of the chemical composition and calorific power of coal. Some general conclusions may, perhaps, be drawn from the results referred to.

Most of the samples examined were good coals, containing but little ash—such as would be selected for efficiency or contractors' trials. The majority of the true coals contain over 90 per cent. of combustible material, or the ash and the water present do not amount to more than 10 per cent. The ash, of course, may vary greatly, according to the quality of the coal; but the moisture in the older coals is very low. In the Ruhr coals, it seldom exceeds 2.5 per cent. In more recent coals from the Saar, Silesian, and Saxony districts, the moisture rises to 10 to 12 per cent., and in the lignites or brown coals to over 50 per cent., without the fuel appearing wet. The proportion of ash and moisture can, consequently, affect the calorific value of these fuels to a much greater extent than can variable quality of the actual combustible substance. For purely practical purposes, therefore, it is indispensable that the percentages of ash and water should be determined, as well as the calorific power by means of the calorimeter.

The true nature of the coal, however, first becomes apparent from the calorific power and chemical composition of the combustible substance in it. In the tabulated results (see Summary) referred to, the calorific power of the combustible substance, calculated from the experimental results, has been recorded for each fuel. This value, after the percentages of moisture and ash have been determined, affords a simple check on the quality of consignments of coal. For extensive works, to which the freight charges form a large proportion of the cost of fuel, this method of controlling the quality of the deliveries becomes invaluable. The author recalls one case in which the price to be paid for the coal supplied has to be calculated on the basis of a fixed price per unit of 100,000 calories. In such a case, both the moisture and ash in the fuel must be kept within narrow bounds, and either washed coal, or briquettes made from such coal, supplied; while there must also not be great variation in the calorific power of the combustible substance of the fuel.

The tabulated results for the true coals, in which carbon forms

#### COMPOSITION AND CALORIFIC POWER OF GERMAN FUELS.

DETERMINED BY HERREN BUNTE AND EITNER.

SUMMARY (i.e., the Maximum and Minimum Values in Each Column for the Several Types).

Type of Fuel.	COMPOSITION OF THE AIR-DRIED FUEL. (PERCENTAGES.)						Percentage of Combustible Substance in the Fuel.	COMPOSITION OF THE SUBSTANCE OF THE FUEL, AFTER DEDUCTING WATER AND ASH. (PERCENTAGES.)				YIELD OF 100 PARTS OF THE FUEL.			CALORIFIC POWER OF THE FUEL IN CALORIES PER POUND.*		
	C.	H.	O. & N.	S.	H <sub>2</sub> O.	Ash.		C.	H.	O. & N.	S.	Coke.	Solid Carbon.	Volatile Constituents.	Calculated by the Bond's Formula. (1)	Found by the Calorimeter.	Calorific Power of the Combustible Substance (Calorimeter Tests), in Calories per Pound.*
Coals from the Ruhr district, 24 varieties	(a) 89.27	5.13	10.52	1.99	2.50	17.87	97.67	91.40	5.43	10.95	2.13	86.16	83.55	28.38	3827	3829	3946
	(b) 66.20	3.68	2.74	0.41	0.57	1.63	79.63	82.24	4.12	2.81	0.42	70.08	53.96	13.04	2888	2914	3534
Coals from the Saar district, 11 varieties	(a) 81.49	5.20	11.30	2.10	4.05	12.46	95.44	85.38	5.65	12.81	2.28	68.59	65.63	37.72	3516	3537	3735
	(b) 68.67	4.21	7.90	0.65	1.21	2.83	84.84	80.79	4.93	8.62	0.68	60.21	50.93	29.17	2913	2938	3456
Silesian coals, 6 varieties	(a) 81.12	4.85	17.37	1.57	2.28	12.48	94.98	88.64	5.20	18.29	1.84	81.46	74.63	33.86	3467	3468	3883
	(b) 70.60	4.24	4.93	0.57	1.58	3.12	85.24	77.91	4.63	5.39	0.61	64.19	58.70	16.89	2965	3006	3169
Saxony coals, 3 varieties	(a) 75.95	5.35	11.17	1.80	8.91	5.50	93.10	82.00	5.74	12.00	1.99	(1) 59.75	56.23	31.34	3308	3311	3584
	(b) 71.45	4.76	9.60	0.63	3.50	3.22	87.57	81.58	5.44	10.55	0.68	56.50	43.19	36.13	3076	3062	3524
Upper Bavarian varieties	(a) 58.01	4.42	12.02	4.87	7.37	13.31	79.32	73.14	5.57	15.15	6.14	55.13	33.08	34.69	2551	2551	3240
	(b) 47.78	3.83	10.92	5.24	10.18	22.05	67.77	70.50	5.65	16.12	7.73	55.13	33.08	34.69	2111	2136	3193
Lower Bavarian varieties	(a) 45.40	3.73	17.54	3.87	47.45	15.89	66.09	73.08	6.54	26.54	8.20	38.51	27.61	38.64	1944	1959	3214
	(b) 28.80	2.54	9.42	0.99	22.85	1.99	43.76	65.62	4.86	16.89	1.88	24.98	18.11	25.65	1158	1169	2750
Prussian varieties	(a) 49.31	4.70	29.18	0.61	29.14	6.91	80.42	63.02	5.84	36.29	0.76	33.16	27.64	52.78	1965	1979	2587
	(b) 38.76	3.66	21.27	0.26	14.06	5.28	63.95	57.11	5.72	30.76	0.41	29.60	22.69	41.26	1479	1489	2300
Briquettes, 4 varieties	(a) 83.24	4.45	4.82	1.36	2.10	8.10	91.75	80.94	4.87	5.28	1.48	85.60	77.77	21.89	3551	3548	3933
	(b) 80.85	4.05	3.13	0.88	1.06	6.15	90.13	98.55	4.42	3.41	0.98	76.35	69.42	12.63	3476	3455	3789
Briquettes, 7 varieties	(a) 55.91	4.66	19.14	2.98	19.40	18.52	79.90	71.05	6.09	24.58	4.18	49.40	34.84	45.57	2343	2331	3098
	(b) 48.20	4.07	15.21	0.78	10.26	5.33	71.22	67.68	5.09	19.88	0.98	38.92	29.60	40.34	2069	2051	2819
Coke, 7 varieties	(a) 88.08	1.07	4.80	1.43	3.73	11.18	92.52	96.09	1.22	5.23	1.62	98.30	91.78	3.17	3298	3297	3601
	(b) 80.68	0.54	2.01	0.81	0.96	6.41	86.49	92.93	0.60	2.23	0.88	94.34	83.98	0.21	3028	3046	3500

(a) Maximum. (b) Minimum.

\* Calorific power is stated in "calories per kilogramme" in the original paper. The values have been converted into "calories per pound" for the above table. If "calories per pound" here given are multiplied by 3.968, the corresponding values in "British thermal units (B.T.U.) per pound" will be obtained.

(1) The "Bond's" formula is: Calorific power = 8100 carbon + 29,000 (hydrogen -  $\frac{\text{Oxygen}}{8}$ ) + 2500 sulphur - 600 moisture.

(2) Determined for only one of the three varieties.

from 75 to 90 per cent. of the combustible substance, show that the calorific power of the coal rises and falls commonly with the percentage of carbon. The percentages of hydrogen and oxygen certainly also affect it. But generally with coals such as are used for heating purposes they do not do so to an extent sufficient to do away with a regular increase of calorific power with the proportion of carbon. The table on next page, in which the calorific powers are arranged according to the percentage of carbon in the combustible substance, for each 1 per cent. variation in the proportion of carbon, illustrates this. The figures in brackets are the numbers of determinations of which the calorific power given is the mean result.

Though it may not be permissible to draw other conclusions from the tabulated results, at least it is clear that they indicate the relation of chemical composition to calorific power in coal, and the preponderating effect of the amount of carbon contained in the coal. For the more recent coals, lignites, &c., the results

collected at present do not afford sufficient material for general deductions. No opportunity must be lost of making the necessary chemical examination of such fuels when used in efficiency trials, as only thus will the results acquire a general scientific value, not confined to the case in point.

Chemical observations made during a trial relate to the amount of combustible material left in the residues from the grate, and to the temperature and composition of the furnace gases. The correct determination of the average proportion of carbonic acid in these gases is of the greatest importance, as on it depends the calculation of what is, as a rule, by far the greatest of all the losses of heat, as well as the estimation of the efficiency and economy of the firing. But little change has been made since 1884 in the directions for conducting these observations, except that they are now rather more precise. A simple calculation from the composition of the fuel, and the proportion of carbonic acid in the furnace gases, enables the total volume of



TABLE showing the Calorific Power of the Combustible Substance of Coals, in the Order of the Amount of Carbon Present.

Percentage of Carbon in the Combustible Substance.	CALORIFIC POWER IN CALORIES PER POUND.*				
	Ruhr Coals.	Saar Coals.	Silesian Coals.	Saxony Coals.	Briquettes.
91/90	3882 (4)	..	..	..	3892 (3)
89	3862 (8)	..	..	..	..
88	3823 (7)	..	3883 (1)	..	3789 (2)
87	3796 (5)	..	..	..	..
86	3761 (6)	..	..	..	..
85	3736 (3)	3717 (5)	..	..	..
84	3647 (2)	3687 (4)	..	..	..
83	3642 (2)	3689 (2)	3609 (2)	..	..
82	3534 (1)	3592 (2)	3555 (1)	3584 (1)	..
81	..	3513 (3)	..	3545 (2)	..
80	..	3491 (4)	..	..	..
78	..	3257 (1)	..	..	..
76	..	3290 (1)	..	..	..

\* See note to last table.

these gases resulting from a given weight of fuel to be found. The calculation, if made by volume instead of weight, is extremely simple, and affords a direct insight into the course of the combustion, showing the quantity of furnace gases traversing a boiler, their rate of flow, the time they remain in the boiler-flues, the quantity of gas escaping through the chimney, &c. If the carbonic acid is determined at several points in the boiler-flues—for instance, at the back of the fire-bridge, in front of the flue-damper, and at the mouth of the chimney—the quantity of air afterwards drawn in is found in the simplest manner. In this way, in particular cases, want of soundness, and also the causes of bad furnace-draught, are at once detected. Conclusions may be immediately drawn as to the efficiency of the firing, merely from a knowledge of the proportion of carbonic acid and the temperature of the flue-gases; and the relative loss of heat through the hot furnace gases may thus be directly determined. The author has noticed that those concerned make but little attempt to turn furnace gas observations to account in this fashion; and therefore the following particulars are added to illustrate their value.

The proportion of carbonic acid in the chimney gases is a direct measure of the heat produced by the formation of unit volume (1 cubic foot) of the furnace gases. When 1 cubic foot of carbonic acid is formed by the combustion of pure carbon in oxygen or air, 123 calories are evolved. If a furnace-gas contains 1 per cent. of carbonic acid, there have been developed by its formation, for every 1 cubic foot of chimney gases, 1.23 calories. Or, for 5 per cent. of carbonic acid,  $5 \times 1.23 = 6.15$  calories, and for 10 per cent. 12.3 calories, have been liberated. This quantity of heat has heated the gases to a certain temperature, which may be calculated in the following simple manner: The quantity of heat (= W), calculated from the percentage of carbonic acid, is divided by the capacity for heat (= C) of 1 cubic

foot of the chimney gases. The expression  $\frac{W}{C}$  gives the so-called initial temperature (= T). This temperature thus calculated, for several reasons is actually unattainable. But that fact is of no moment for the present purpose; for T merely serves to afford a simple relation between the quantity of heat produced, and the temperature of the gases at the exit of the furnace, and thus to show the proportion of the heat retained by them. The loss of heat is thus ascertained. If the temperature of the furnace gases issuing from the end of the boiler, and by how much (= t) it exceeds that of the entering air are known, then the fraction  $\frac{t}{T}$  directly expresses the ratio of the heat lost through the out-flowing furnace-gases to the heat developed. The expression  $\frac{T-t}{T}$  then gives the portion of the heat which is expended within the boiler, or the gross efficiency.

The net efficiency, which is given by the evaporation results, differs from the gross efficiency in that it takes into account all losses of heat in the plant through radiation and conduction. But as these latter losses do not fluctuate much for the same plant under similar conditions, the above calculation will serve, not merely as a control on the stoking, but to a certain extent as a control of the work done by the boiler. Thus the proportion of carbonic acid in, and the exit temperature of, the furnace-gases afford important starting-points for criticizing a boiler plant, just as indicator diagrams are of service with steam-engines. They enable surveillance to be exercised in the ordinary course of working, apart from more exhaustive efficiency trials.

The utility of the procedure just described is apparent with any carefully conducted efficiency trial, for which the proportion of carbonic acid and the exit temperature have been correctly determined. To facilitate the calculation, the annexed table has been compiled, in which, for furnace gases containing from 1 to 16 per cent. of carbonic acid, the capacity for heat (= C), as well as the initial temperature (= T), are given, for both pure carbon and for ordinary coal, each burnt in air. The products of the combustion of coal contain water as well as carbonic acid and atmospheric constituents; and the initial temperature is higher than with pure carbon. There is, however, but little difference in the

value T for all natural fuels; and the values given in the table for coal may be taken as applicable to all classes of coal. The calculation was actually made for coal of the following composition: Carbon 84.45, hydrogen 5.43, oxygen 8.18, sulphur 0.75, nitrogen 1.16 per cent.

Percentage of Carbonic Acid in the Furnace Gases.	Capacity for Heat of One Cubic Foot of the Gases = C.	Initial Temperature (Degrees Centigrade) for		Difference for 0.1 per Cent. of Carbonic Acid.
		Carbon (T).	Coal (T).	
1	0.00873	141	167	16
2	0.00877	280	331	16
3	0.00880	419	493	16
4	0.00883	557	652	15
5	0.00886	694	808	15
6	0.00889	830	961	15
7	0.00892	962	1112	15
8	0.00895	1096	1261	15
9	0.00899	1229	1407	14
10	0.00903	1360	1550	14
11	0.00907	1490	1692	14
12	0.00911	1620	1830	14
13	0.00914	1750	1968	13
14	0.00916	1880	2102	13
15	0.00918	2005	2237	13
16	0.00920	2130	2366	..

The utility of the above-described method of calculating the loss of heat may be shown by examples. Take, for instance, the carefully conducted boiler trials at the Electrotechnical Exhibition at Frankfurt-on-Main, to which Nos. I. to VI. in the annexed table refer; and trials made by the Prussian Smoke Abatement Commission, Nos. VII. to IX. In the Frankfurt trials, Ruhr coal was used, in Trials VII. and VIII. Silesian coal, and in Trial IX. Bohemian lignite.

Trial.	Excess of Temperature of the Furnace Gases t.	Percentage of Carbonic Acid in the Furnace Gases.	Initial Temperature (from the Percentage of Carbonic Acid by the foregoing Table) T.	Percentage Loss of Heat by the Furnace Gases.	
				Calculated $\frac{t}{T}$ .	Found in the Efficiency Trials.
	Deg. Cent.		Deg. Cent.		
I.	287	11.9	1830	15.6	16.07
II.	286	8.3	1306	22.0	22.62
III.	304	9.7	1512	20.1	20.82
IV.	261	9.8	1527	17.1	17.71
V.	286	10.7	1655	17.3	17.73
VI.	260	12.8	1940	13.9	13.52
VII.	216	8.9	1383	15.6	15.41
VIII.	213	10.5	1620	13.1	12.57
IX.	216	8.2	1291	16.7	15.96

The table shows that the abbreviated method gives good results, even with very different kinds of fuel. The relative loss of heat through the furnace gases and the gross efficiency can therefore be ascertained merely by determining the exit temperature of, and the proportion of carbonic acid in, the furnace gases, and without a knowledge of the chemical composition and calorific power of the fuel. This is a valuable practical advantage, as complete efficiency trials are costly and difficult.

The worst part of the chemical investigation consists of the determination of the unconsumed constituents—carbonic oxide, hydrocarbons, and soot—of the furnace gases. Our knowledge of the losses which happen through incomplete combustion is still extremely imperfect. In general, the type of fuel is of great importance—for instance, the amount of its constituents volatilized by heat. It is therefore rightly recommended that a coking trial should be made to determine the quantities of volatile matter, and of residual coke. But other points are of equal importance—viz., the type of grate, the stoking, and other local and temporary conditions. Therefore these losses can only be properly investigated in any case by an exact testing of the furnace gases. The usual gas-analysis appliances—such as burettes and Orsat's apparatus—only give sufficiently reliable results for the carbonic acid; and they do not serve for determining the unconsumed gases. As a rule, only carbonic oxide can be determined by such apparatus, and the other combustible constituents have to be ignored; while the errors are too great for so highly diluted gases.

A percentage of 0.2 by volume of carbonic oxide in furnace gases, which is as little as can be determined with any precision by such analytical apparatus, is equivalent to 0.17 calorie per cubic foot of the gases. The error, assuming that 1 lb. of coal produced (say) 250 cubic feet of furnace gases, would consequently amount to  $250 \times 0.17 = 42.5$  calories per pound of coal. The rules therefore require the composition of the gases to be determined by exact analytical methods, wherever loss by incomplete combustion is investigated. For such determinations, a very suitable method is the combustion of from 6 to 10 litres of the gas by means of cupric oxide, and estimating the carbonic acid and water produced as in elementary analyses, and then determining the soot separately. Up to the present, such tests have rarely been made; but they are the only ones suitable for trials of the efficiency of so-called smoke-consuming firing. The loss of heat by unconsumed gases and smoke can be very great



with smoky firing; and therefore it is most desirable that testing should be more generally adopted.

Very little satisfactory information is to be gleaned from published matter on the amount of such loss. The only extensive series of researches of which the author is aware, on loss by incomplete combustion of furnace gases, was made at the Munich Heat-Testing Station twenty years ago. It included 52 experiments with various descriptions of ordinary coal, on a horizontal grate. The unconsumed gases and smoke were determined, and the loss of heat therefrom calculated. In 25 cases the unconsumed gases caused the greater part of the loss of heat; in the remaining 27 the loss due to the smoke was the greater. Roughly, therefore, about half is due to visible and about half to invisible losses. The total loss of heat from these causes in 51 trials was as follows: In 11 cases 0 to 2 per cent. of the calorific power of the coal, in 9 cases 2 to 3 per cent., in 13 cases 3 to 4 per cent., in 6 cases 4 to 5 per cent., and in 12 cases over 5 per cent. Excluding instances in which the conditions were clearly unfavourable, on account of the great depth of fuel, insufficient draught, clinker on the grate, &c., it was found that in 40 cases with smokeless firing the loss of heat through the gases and smoke did not exceed 5 per cent. In most instances careful stoking afforded tolerably complete combustion, with 8 to 10 per cent. of carbonic acid present, with a comparatively small supply of air. Far greater losses, however, appeared when the bed of fuel was of great depth, or the draught insufficient. To show how great these losses may be, the following results of heating trials of six to ten hours' duration with Saar coal are given :—

Trial.	Composition of the Furnace Gases. (Percentages by Volume.)					Loss by Non-Combustion in Percentages of the Calorific Power.		
	CO <sub>2</sub> .	CO.	H.	O.	N.	By Gases.	By Soot.	By Gases and Soot (Total).
I. . .	14.62	2.07	1.00	2.07	80.25	10.7	6.7	17.4
II. . .	14.29	0.85	0.60	3.20	81.06	5.5	4.8	10.3
III. . .	14.01	0.62	0.19	3.92	81.26	3.2	2.5	5.7
IV. . .	10.22	0.22	0.07	8.57	80.92	1.6	1.8	3.4

Conditions of the Trials.

- I.—An 8-inch bed of fuel; indifferent draught; clinker on fire-bars.
- II.—A 6-inch bed of fuel; but in other respects as No. I.
- III.—A 5-inch bed of fuel; stronger draught.
- IV.—A 4-inch bed of fuel.

The loss in the first trial, with very smoky firing, amounted to 17.4 per cent. The broken coal was added and distributed uniformly over the grate every 15 minutes. Reduction of the depth of fuel reduced the loss to 10.3 per cent.; while in the third trial, more frequent stoking—the small coal being added at intervals of 7½ minutes, and spread over the front part of the grate—with the help of a stronger draught, resulted in a further reduction to 5.7 per cent. A somewhat greater excess of air brought down the loss to 3.4 per cent. Although the unfavourable conditions of the first two trials would scarcely ever occur in efficiency trials, yet they indicate how great the loss through unconsumed gases and smoke may be if the arrangements and firing are bad, and incidentally the great value of an exact determination of the furnace gases. It is highly desirable that examinations should be more frequently made, especially in cases where the performances of special grates or so-called coke-consuming furnaces are in question.

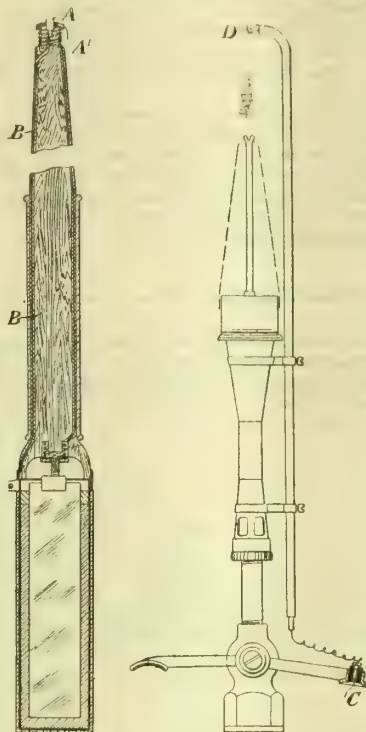
**Paris Gas Company.**—The revenue of the Paris Gas Company for the month of June last was 5,535,311 frs. (£221,412), as compared with 5,590 frs. (£198,383) in June, 1899; being an increase of 575,721 frs. (£22,938), or at the rate of 11.61 per cent. These figures brought up the revenue for the first half of the year to 43,886,362 frs. (£1,755,454), as compared with 40,454,427 frs. (£1,618,177) in the corresponding period of 1899; being an increase of 3,431,935 frs. (£137,277), or at the rate of 8 per cent.

**Fatality at the Beckton Gas Works.**—The Coroner for West Ham recently held an inquest on the body of Edward Page, aged 26, a labourer in the service of the Gaslight and Coke Company at Beckton. Alfred Arrowsmith said he was engaged with deceased in hoisting baskets of chalk to the top of a lime-tower, from which it descended to the pit. Page was at the top and witness at the bottom; and about half-past three, after Page had been nearly 1½ hours on the tower, witness heard a shout for someone to come and help a man up. Going round he found deceased at the bottom of the ladder of the tower bleeding from the head. There was a rail on the tower 3 feet above the top. He had felt a little sick once or twice when he was working at the top of the tower, and the fumes were blowing in his face. William Hammersley, the foreman, said flue gases were present when the top of the kiln was opened, but there had never been any complaint by a man who had worked on the top. Dr. W. G. Ross, of the Seamen's Hospital, said the deceased was admitted suffering from fracture of the skull, and in a dying condition. He succumbed in half-an-hour. There was no symptom of gassing. Mr. Ireland, one of the Inspectors of Factories, said that in almost every departmental report the fact that one rail was not sufficient was drawn attention to. He did not consider that a single rail was sufficient safeguard. The Jury returned a verdict of "Accidental death;" adding a rider that they considered there should be better protection at the top of the kiln.

REGISTER OF PATENTS.

**Electric Lighter for Incandescent Street-Lamps.**—Duncan, J. H. H., of Coleman Street, E.C., the New Sunlight Incandescent Company, Limited, of Shoe Lane, E.C., and Barnett, H. T., of Teddington. No. 19,193; Sept. 23, 1899.

This invention has for its object to enable gas-jets to be ignited by a single source of electricity of low potential. The electric generator and the tap by means of which gas is turned on to a burner, are provided with contacts so arranged that the electric generator contacts can be forced against the tap-contacts for the double purpose of turning the gas-tap and at the same time completing an electrical circuit including the electric generator and a portion of a kindling device, so arranged in relation to the burner as to be near to, or in, the jet of gas issuing from the burner, and adapted to be highly heated on the passage of an electric current through it.

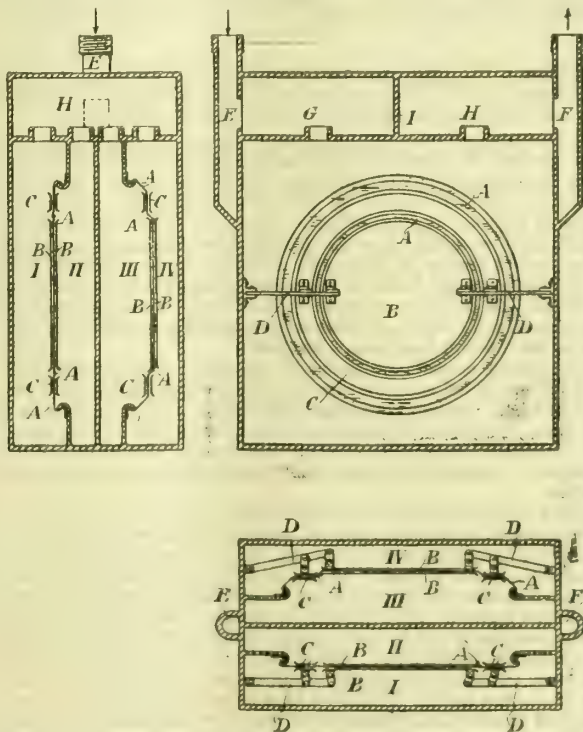


An example of the apparatus when adapted for use in connection with street lighting by incandescence gas-lamps, is shown in the engraving. The electric generator A A' contacts are carried by the upper end of a rod B, which constitutes part of a lamplighter's torch, and at the lower end of which the electric generator (a dry cell) is placed. The tap-lever of the burner is provided at one end with contacts C, shaped to suit the torch-contacts respectively. One of the tap-contacts is attached to the metal of the tap-lever; and current passes through it, through the metal-work of the burner and the clamps on it, and through a metal tube held in the clamps, to one end of a fine kindling wire, D. After traversing this wire,

the current flows through a short length of thicker platinum, through an asbestos-insulated wire, to the contact C, which is insulated from the tap-lever.

**Gas-Meters.**—Jensen, H., of Hamburg. No. 21,338; Oct. 25, 1899.

In dry gas-meters as heretofore known (says the patentee), the extensible walls of the chamber are mostly made of leather folded in the form of bellows. The disadvantages of this arrangement are that the membranes easily become altered—that is to say, they extend sometimes more and sometimes less, and also soon become cracked or split—and in view of this fact, the patentee has sought to lessen the disadvantages by reducing the membrane surface, replacing these latter by solid central plates connected to the wall of the measuring-chamber by a broad ring of fabric. This type of measuring-chamber, it is claimed, is considerably improved according to the present invention, inasmuch as the flexible material (or membrane-surface) only forms a narrow flexible ring which "nevertheless admits of a sufficient expansion of the bellows."



As shown in the engravings, the membrane of the bellows is fitted on both sides with centrally-arranged plates B; and, in addition, a number of rings C surround the plates, and, if desired, are also placed around one another as far as the size of the membrane will allow, by leaving narrow

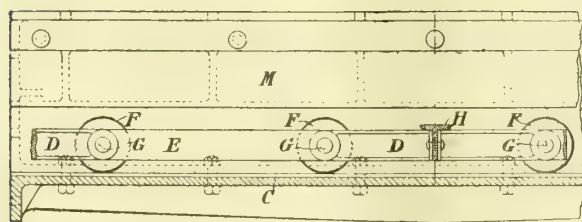
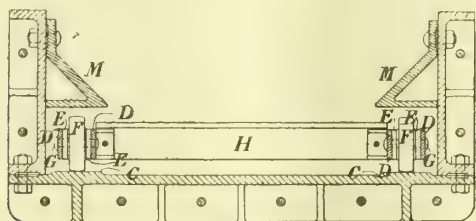


annular spaces between the solid plates and the rings respectively. The plates and rings are thus connected together, so to speak, by narrow annular strips A of flexible membrane, which permit of the bellows-movement of the walls of the measuring-chambers I, II, III., and IV. The circular link-arrangement of the flexible walls, by means of alternate solid plates B or rings C and flexible rings A, "constitutes the improvement and the novel feature of the arrangement; while the bellows itself is of the usual form, and capable of pulsating in each direction without appreciable inaccuracy." In order to prevent undue stretching (beyond a certain limit) of the annular hinge-joints A on the pulsations of the bellows, it is advisable that the central plate B, which in gas-meters is usually guided at the middle, should be connected to the rings C, by means of lever-links D adapted to maintain the rings in proper position with regard to the central plate, so that the narrow flexible rings A cannot be overstretched.

In the form shown, the meter is fitted with two bellows, thus constituting four measuring-chambers I, II, III., and IV. in connection with inlet and outlet chambers G and H for the gas. The latter are formed by a partition-wall I dividing the top space into two chambers G and H, provided with an inlet E and outlet F respectively. From the chambers suitable openings (controlled by valves) regulate the entrance into, and the escape from, the measuring-chambers I. and IV.

**Conveyors for Hot Coke.**—Graham, M., of Leeds. No. 24,659; Dec. 12, 1899.

The patentee employs a cast-iron trough, made in sections of suitable length, width, and depth; each section being preferably built up with sides, and a renewable bottom-plate, having raised roller-paths C cast thereon. Upon these raised paths runs a double endless steel chain, each side of which consists preferably of double links D E, rollers or



runners F, and pins G. The chain carries, at suitable intervals, detachable and renewable steel ploughs H (preferably of T-section), for drawing the coke along the trough; the ploughs being attached by pins or rivets in slotted brackets formed on the links. Overhanging deflecting plates M are provided, to protect the chain from the falling hot coke; the plates being also renewable as required, and being attachable either to the sides of the trough or to the top flanges. The chain, after delivering the coke at the end of the trough, returns either above or below it.

**Substances for Impregnating Incandescent Mantles.**—Pink, L., of Berlin, and the Vulkan Gesellschaft für Selbstzündende Glühkörper mit Beschränkter Haftung. No. 7933; April 28, 1900.

This invention, relating to the manufacture of substances for use in impregnating the fibrous foundation of incandescent bodies or mantles for illuminating purposes, comprises, in the first place, a process of treating cerium hydroxide, whereby two metallic bases are obtained, either of which is capable, when used alone—that is to say, without the other in combination with thoria in the manufacture of mantles for illuminating purposes—of producing "a greater radiance or more powerful emission of light for a longer period of time than obtainable by the usual mixture of thoria with ordinary or usual ceria;" and, in the second place, the manufacture of "improved incandescent bodies or mantles" by combining one or the other of two bases with thoria.

The process essentially consists in treating freshly precipitated cerium hydroxide with solutions of certain bi-basic organic acids, with the assistance of heat. By this treatment, the cerium hydroxide is split up into two bases, not hitherto known, one precipitating on cooling as a salt of the acid used, the other remaining in solution. Suitable acids are (for instance): Tartaric acid, malic acid, chloracetic acids, succinic acids, and the like.

The patentees purpose to mix an aqueous solution of tartaric acid containing about 30 per cent. of acid, and heated up to 75° to 80° C., with freshly precipitated cerium hydroxide, which is readily dissolved, and allow the clear solution to cool. The liquor will become turbid, whereby it has imparted to it a whitish appearance; and finally a white precipitate will fall to the bottom. By repeatedly re-heating and re-cooling, the quantity of the precipitate will be increased up to 35 to 40 per cent. of the amount of cerium hydroxide used. When finally the maximum of precipitate is obtained, the two are separated by filtration. It consists in a tartrate of one of the two bases. The other base is present in the solution, and is obtained therefrom as a tartrate by way of evaporation. By gentle heating, the tartrates are reduced to oxides; and by dissolving in nitric acid, they are transformed into nitrates. By dissolving the oxides in other acids, the corresponding salts are produced. The metallic base contained in the precipitate the patentees call "phosogenium" or "phoson;" and the metallic base in solution they call "lucogenium" or "lucen."

The new bases, or split-off products, obtained in the manner described,

can readily be distinguished from each other and from ordinary ceria by the different proportion of oxide present in their tartrates; by the different resistance opposed by their nitrates to decomposition; and by their different crystallization and behaviour towards certain reagents. The tartrate of lucogenium contains 42.5 per cent. of oxide; while the tartrate of phosogenium yields 36 per cent. of oxide. Lucogenium tartrate is obtained as a dry crystalline powder, whereas phosogenium tartrate is in the form of rhombic crystals, which are deliquescent. Lucogenium oxide proves to have a by far greater binding power for nitric oxide than phosogenium oxide, of which the nitrate, when exposed to a gentle heat, swells up to about twenty times its original volume, emitting reddish-brown fumes. When ammonia is added to a solution of lucogenium nitrate, a white coloured precipitate is obtained; whereas with a phosogenium nitrate solution, even an excess of ammonia will not cause a precipitate to form, and with a cerium nitrate solution a precipitate is produced which shows a colour varying from yellow to dirty brown.

When malic acid is employed, a higher temperature should be applied than with tartaric acid. The malate of lucogenium is not precipitable from its solution by means of ammonia. Ammonia oxalate causes the solution to become turbid; the original clear condition of the liquid being re-established by the addition of an excess of the oxalate.

When chloracetic acids are used, the solution becomes turbid after twelve hours boiling on a sand-bath, using a reflux cooler. The reaction is complete when at least 98 per cent. of the quantity of chlorine as calculated has disappeared, which is determined by means of a standard solution of argentic nitrate to which is added potassium chromate to serve as indicator. The nitrates prepared from the salts produced by this reaction are difficult to crystallize. It is, however, possible to cause them to crystallize out by dissolving them in an equal volume of water, and mixing this solution with alcohol—using, for instance, as much alcohol as quintuple the volume of water. In like manner, the same effect will be obtained by boiling the cerium hydroxide with succinic acid.

As already stated, the bases produced from cerium hydroxide in the manner described are more advantageous for manufacturing incandescent mantles than ceria, provided they are not used together, but each separate from the other—that is to say, so that the thoria mantle is manufactured either with a lucogenium compound or with a phosogenium compound. The use of either of these new compounds is said to result in incandescent mantles which show "a by far higher radiance, and retain their maximum of light emission for a longer period of time, than the ordinary ceriated thoria mantles are capable of, even when manufactured with the utmost care and with fabrics as free from silicic acid as possible." The candle power obtained is said to be beyond 100; and the mantles have been "proved to retain this power for more than 300 hours."

The new compounds may be used in quantities from 1 to 16 per cent. of lucogenium nitrate, and from 1 to 8 per cent. of the phosogenium nitrate, according to the shade desired for the light. For manufacturing incandescent mantles, either a lucogenium compound or a phosogenium compound (preferably the nitrate) is added to a solution of thorium nitrate, and the fabric impregnated with the compound solution, dried, and burnt—all as usual with the ordinary thoria-ceria fluid. The best results as to candle power, life, and radiance of mantles are claimed to have been obtained with lucogenium nitrate in the proportion of 4 to 8 per cent., and phosogenium nitrate in the proportion of 1.5 to 4 per cent.

**Suspension Lamps, Chandeliers, &c.**—Kemp, C. W.; a communication from W. Fahndrich, of Hamburg. No. 3009; Feb. 15, 1900.

This invention relates to suspension gas and other lamps, chandeliers, and the like; and (in the words of the patentee) it has for its objects (1) to so arrange the metal-work above the lamp that the same shall come clear of the ascending fumes—thus preventing the discoloration of the same; (2) to obtain an artistic appearance in gas-lamps to imitate (in a measure) the dropping effect of incandescent electric lights; and (3) to entirely or partially enclose or conceal from view the depending gas-pipes and the metallic fittings incidental to the supply of gas to the burner and the supporting of the chimney. The arrangement here referred to was described and illustrated in the "JOURNAL" for Oct. 16, p. 950.

**Manufacture of Water Gas.**—Slocum, F. L., of Pittsburgh, U.S.A. No. 12,335; July 7, 1900.

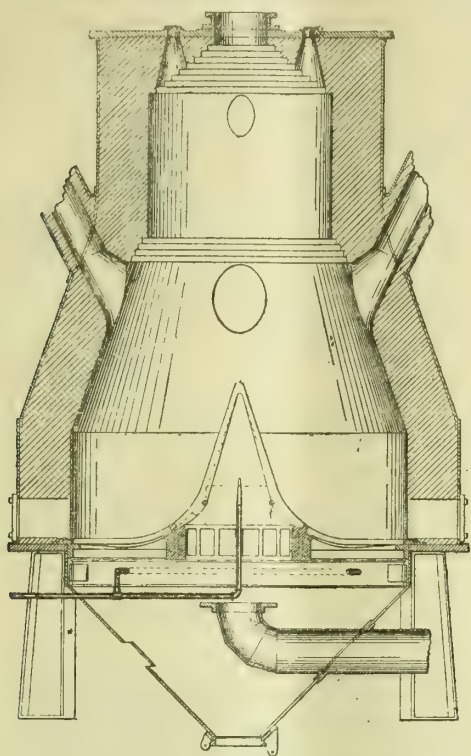
The patentee claims an "improvement in the art of making water gas," consisting in "providing a wide, shallow body of ignited fuel superimposed by a narrow body of unignited fuel, passing air in upward and diagonal outward courses through the body of ignited fuel in such quantity as to ensure the production of a major portion of carbonic acid, and subsequently passing steam in upward course through the ignited and incandescent fuel, and the gases produced upwardly through the unignited fuel."

In practising the invention, the patentee says it is preferred to employ bituminous coal, "for the reason that a large proportion of the hydrocarbons contained therein can be saved and carried off with the water gas generated, while but little of the same are wasted in connection with the blasting-up of the mass." The apparatus illustrated is considered the best suited for the practice of the method, especially in connection with the use of bituminous coal.

The generator-body is supported on suitable standards holding a bed-plate, on which the shell and the brickwork of the generator rest. The shell has a lining of brickwork, having a vertical portion extending up a short distance above the grate, and an upwardly converging or downwardly flaring portion leading up into the narrow vertical fuel-feeding portion. At or near the top of the converging portion are several blast-outlets—the drawing showing three of the four used with the type of furnace described. The number depends on the size of the generator. The outlets are arranged around the generator, so as to give free exit to the products of combustion from the wide body of fuel in the lower part. In the upper part is the gas-outlet, while the top of the generator is provided with the poke-holes and the fuel entrance, which are, of course, closed in any suitable way. In the lower part of the generator is arranged the grate above referred to, which is supported on cross-beams, and has a wide grate expanse, as illustrated, having a conoidal central grate portion extending up centrally of the generator, so as to increase the grate-surface, and provide for the distribution of the air throughout the mass of coal in the wide shallow base of the generator. As illustrated,



this conoidal grate portion rests on a ring supported on beams; the ring giving support to the lower ends of the grate-bars forming the conoidal central portion, and the inner ends of the grate-bars which extend from the ring to the outer wall of the generator. The lower portion of the generator has a closed ash-pan with a discharge-door, and an entrance-pipe for the air-blast. The steam-pipe enters through the ash-pit; and,



in order to distribute the steam quickly to the incandescent fuel in the lower part of the generator, a perforated ring-pipe is employed, extending around about mid-way of the horizontal grate portion, and also a central steam pipe rising within the conoidal grate—"it being found that by such construction the steam is discharged from the steam-pipes close to the fuel, and rises quickly so as to pass into the same."

#### APPLICATIONS FOR LETTERS PATENT.

- 18,295.—CLAYDEN, A. W., "Gas-engines." Oct. 15.  
 18,321.—NICHOLLS, R., "Improvements in gas lighting." Oct. 15.  
 18,340.—ABEL, C. D., "Internal combustion motors." A communication from Allgemeine Gesellschaft für Dieselmotoren, A. G. Oct. 15.  
 18,353.—CHAUVIN, E. L. H., "Acetylene gas-generators." Oct. 15.  
 18,358.—POLIAROFF, J., "Light measuring or calculating apparatus." Oct. 15.  
 18,365.—FOULIS, W., "Charging and drawing retorts." Oct. 15.  
 18,370-1-2-3.—SCHREINER, L., and MICHAUX, G. E. N., "Explosion stors." Oct. 15.  
 18,378.—ENCKEVORT, A. H. E. VON, "Acetylene generators." Oct. 15.  
 8,399.—BLAKEY, J. W., "Gas-heated laundry irons." Oct. 16.  
 428.—BOWLEY, J. W., "Lamps." Oct. 16.  
 489.—WILSON, P. J., and WORMALD, A. H., "Taps and valves." Oct. 16.  
 9.—DEIMEL, F., "Self gas lighter." Oct. 17.  
 12.—WALSER, C., and CARTIER, T., "Acetylene gas apparatus." Oct. 17.  
 —SCHARFBERG, M. R. M., "Apparatus in connection with water." Oct. 17.  
 —FORBES, Sir C. S., "Carburettor." Oct. 17.  
 —GREEN, S., "Automatically extinguishing lamps." Oct. 18.  
 —IMPSON, S., "Gas cooking-stoves." Oct. 18.  
 —MARLAND, W. W., and LARGE, E., "Prepayment gas-meters." Oct. 18.  
 87.—LEVETUS, E. L., "Acetylene generators." Oct. 18.  
 302.—NELSON, M., "Moveable gas-shade." Oct. 18.  
 3621.—HOLUB, B., and DVORACEK, R., "Producing acetylene gas." Oct. 18.  
 18,642.—SCHODT, P. G. DE, "Low-pressure incandescence lighting." Oct. 18.  
 18,674.—BEGGS, D. C., and FIELDING, W., "Generation of acetylene gas." Oct. 19.  
 18,699.—KUHN, C., "Acetylene generators." Oct. 19.  
 18,740.—SMITH, R. H., "Pilot lighter for street and other lamps." Oct. 20.  
 18,747.—PROCTOR, B. S. & H. F., "Meters for water or other liquids." Oct. 20.

**Bangor (Co. Down) in Darkness.**—On the night of the 17th inst., the piston-rod of the exhaust engine at the Bangor Gas-Works broke; and this threw the exhaustor out of use. The Manager (Mr. R. Gaul) tried to keep up a supply of gas without it during the repairs; but the ascension-pipes became choked, and manufacture was stopped. A fair quantity of gas was sent out till Saturday, and then it had to be curtailed. On Sunday, the 21st, most of the churches were lighted with paraffin oil and candles; but the parish church could not be opened for evening service. It appears that the present works are altogether inadequate for the supply of the town; the daily demand being 60,000 cubic feet, while only 45,000 cubic feet can be made. The total storage capacity is 78,000 cubic feet. The works are in the hands of the Local Authority, who have not increased the retorts since 1883.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Illuminating Gas from Sewage Sludge, and the Coalowners' Combination.

SIR,—Two years since, the results of experiments made at these works in obtaining illuminating gas from sewage sludge were published in the "JOURNAL." Since then, further experience has been gained. Some of the material has been carbonized in ordinary inclined retorts upon a manufacturing scale; a mixture of about 25 per cent. of sludge and 75 per cent. of coal being used. In the first place, a difficulty was experienced with the heats, due to the excessive moisture, as the sludge contained an average of 28 per cent. Hence with the coal mixture it equalled 7 per cent., excluding the moisture in the coal—altogether too high a figure for successful working. Some of the sludge material, after being dried and mixed with coal, did not present any difficulty in the matter of carbonization. The fundamental difficulty is the moisture. If this can be overcome, many gas engineers would doubtless be prepared to make extensive trials and use of the material. Of the practicability of utilizing sludge when dried, I am now thoroughly convinced.

The cost of labour alone, as compared with coal, shows, as might be expected, a large increase. This can be counterbalanced if an enterprising Sanitary Authority could be induced to pay to the Gas Department the amount it now costs them to dispose of the material, either by destruction or otherwise. The cost of destruction, including labour, fuel, and capital charges, is in some towns enormous. With the present exorbitant price of coal, an experiment on a large manufacturing scale, running on continuously for some time, would be most interesting and useful.

At these works, we have an oil enrichment plant which allows the illuminating power of the gas to be raised to the required standard when using the sludge; and at many works carburetted water gas, the Clark-Maxim carburettor, or some other enrichment process, is available for similar purposes. More will yet be done in the direction of carbonizing sewage sludge for the purpose of obtaining illuminating gas. A mixture of coal smudge and the compressed sewage sludge cake would carbonize splendidly; but by itself the viscosity of the material, unless absolutely dry, would prevent anything satisfactory being accomplished. There is not any objectionable odour resulting when a retort which has been charged with sludge is drawn; the material having been perfectly destroyed. The complete destruction of the material commends itself upon sanitary grounds.

If some few engineers would make experiments as opportunity occurred, important results would be forthcoming. The time involved in the necessary research work in this direction would be amply repaid. I am unaware whether anything has yet been done with patent No. 20,184, taken out in 1897 by Mr. W. Dancer, of Manchester, for "Producing gas from sewage sludge."\* I was pleased to see recently a report of some tests made at Chorley, showing 4000 cubic feet of 20-candle gas as being obtained per ton from dry sludge. The excellent paper read by Mr. Duncan Cameron, the City Surveyor of Exeter, in 1898, at the meeting of the Association of Municipal and County Engineers, conveyed the valuable information "that one of the most notable points observed in the Exeter (septic) tank had been the hitherto unrecognized energy stored in the sewage, as evidenced by the production of marsh gas." He also stated that the works and public baths adjoining at Exeter had been lit with the gas; and he furnished many other items of interest.

With the numerous suggestions as to manufacturing gas from garbage and other refuse, much remains to be done; but it is only by tentative efforts that some preliminary information will be available.

If anything can be done to checkmate the designs of the coalowners and the "squeezing" operations Lord Masham recently revelled in, a step in maintaining the prosperity of the Empire will have been accomplished. The coalowners have combined to raise prices beyond all reasonable limits, and it now remains for the large coal consumers to combine to resist them. Such combination can take various forms.

Huddersfield, Oct. 26, 1900.

EDWARD A. HARMAN.

## LEGAL INTELLIGENCE.

### Sugg and Co., Limited, v. The Somzee-Greyson Gas-Light Syndicate.

This was an action remitted from the Queen's Bench Division of the High Court of Justice for trial by the Official Referee, and it was before Mr. E. Pollock from Wednesday till Friday last week. As opened by Mr. Loehnis, who, with Mr. A. Neilson, appeared for the plaintiffs, the proceedings were taken to recover the sum of £900 for work done and materials supplied to the defendants in 1898 and 1899; or, in the alternative, to recover £1133 2s. 7d. on a *quantum meruit*. Some of the items were admitted by the defendants, who had paid £400 into Court in respect thereof. The Somzee-Greyson Syndicate was formed in 1897 to exploit an invention of Mr. Paul Greyson de Schodt for increasing the pressure at which gas could be brought to the burner for consumption. Mr. Francis Fox, who, with Sir Douglas Fox, was an Engineer of the Great Central Railway, was a member of the Syndicate, who desired to obtain a contract for lighting the Marylebone Terminus of the Railway; and from early in 1898 they were consulting with Mr. Sugg, the Managing Director of the plaintiff Company, as to the best means of perfecting the invention. The mechanism of the original compressor was altered from time to time, and eight large drawings and models were produced, showing the various stages through which it passed before reaching its final form. It was in respect of the alleged improvements to the compressor that the claim arose. An agreement was entered into between the parties, a considerable amount of correspondence ensued, and four different patents were taken out by Mr. Sugg, as to which the defendants claimed to be entitled to an interest of one-half. The defendants, for whom Mr. Cababé appeared, relied largely on a letter dated Sept. 27, 1898, of which the plaintiffs

\* See "JOURNAL," Vol. LXXII., p. 379.



had no recollection until their attention was called to it about a year later by the defendants, and of which a press copy was subsequently found. It was contended that by this letter Mr. Sugg had undertaken to supply drawings, &c., and execute all necessary work, at a maximum cost of £170, half to be borne by each party. For the plaintiffs, it was alleged that when Mr. Sugg signed the letter no amount was specified; but, by some means, the figures were placed upon it after the press copy was taken. The plaintiffs were unable to say who inserted them; but contended that it was ridiculous to suppose they meant to do work costing thousands of pounds for the sum mentioned. The defendants alleged that the plans and drawings for which they were now asked to pay had been used for other purposes, particularly in reference to the lighting of the Marylebone Station and the Crystal Palace. Evidence was given by Mr. W. Sugg, Mr. Sugg Wright, and Mr. Waller, the plaintiffs' Accountant and Advertising Manager. In the result, the matter was compromised upon the basis that the plaintiffs should have the money which had been paid into Court, that the drawings and compressors made as patterns should be handed over to the defendants, and that both parties should pay their own costs—an arrangement which the Official Referee thought was creditable to both sides.

#### In re the Coventry Gas-Fitting Company.

Sitting as Vacation Judge in the Chancery Division of the High Court of Justice, Mr. Justice Buckley recently had before him a motion in a debenture holder's application for the appointment of a Receiver and Manager of the above-named Company. The plaintiff was the holder of £350 of the first series of debentures, which amounted in all to £10,000; and there had also been issued second and third debentures to the amounts of £7000 and £3000. It was stated that the principal of the first debentures became due on the 30th ult., and that there was evidence that the Company were not in a position to pay them off. There was a liability of about £4000 to unsecured creditors, who were pressing for payment. As a ground for the appointment of a Manager as well as Receiver, his Lordship was informed that the Company were carrying on a considerable business, employing some fifty hands, and paying about £80 a week in wages. Debenture-holders to the amount of £3000 of the second series, and the holder of the whole of the third series were represented by Counsel, as were also the Company; but there was no opposition to the application. His Lordship appointed a gentleman named in the notice of motion as Receiver and Manager; but, in accordance with the usual practice, directed that he should not act as Manager for more than three months without the leave of the Court.

#### A Claim by the Bexhill Water and Gas Company.

Before the Hastings County Bench last Saturday week, Mr. Arthur Page was summoned by the Bexhill Water and Gas Company in respect of a claim for £69 12s. 5d. for gas and water supplied to the Marine Hotel. Mr. Hetherington appeared for the Company, and Mr. Grant for the defence. Mr. M. H. Sharpe, Chief Clerk to the Company, said that the Company had supplied gas to the hotel to the value of £46 4s. 10d., and together with the water the amount was brought up to £69 12s. 5d. The water and gas were furnished to Mr. Kirk, then to the Official Receiver, and witness went to the hotel after this to get an application signed by Mr. Page. The defendant said he would send it away and get it signed. Cross-examined: He believed Mr. Page and any caretaker in a place was liable. There had never been an application made by Mr. Page for gas and water. Mr. Frederick Russell, Manager of the Company, said he had received payment from the Trustee who succeeded the Official Receiver. He found out that Mr. Page was the Manager from an intimation from the Trustee. Mr. Grant contended that Mr. Kirk was liable, and under the present circumstances there was no change of occupancy, coming as it did through Mr. Kirk, the Official Receiver, the Trustee in bankruptcy, and then Mr. Page. In the event of a new tenancy, a gas and water company could not compel the tenant to pay up arrears left by a former tenant. But in the present case this could be done; and there was no contract on the part of Mr. Page with the Company. The Magistrates dismissed the case, allowing costs.

#### Tampering with Gas-Pipes.

At St. Helens, Henry Bridge, of College Street, has been summoned by the Corporation for laying a gas-pipe to communicate with another pipe without their consent. Mr. L. Rawlinson, Deputy Town Clerk, prosecuted; and defendant pleaded guilty. It was stated by Mr. Rawlinson that defendant was a chemical plumber as well as being the occupier of a shop. He had had a gas-meter in his cellar, but thought fit to remove it upstairs. This necessitated an extra length of piping between the meter and the iron service-pipe; and to the extra length defendant attached a branch to supply his stove in the cellar. The gas so used did not go through the meter. The Corporation did not believe that defendant meant to defraud, but asked for such a penalty as would deter others from doing a similar thing. Defendant said he put on the extra length innocently; and a fine of £1 and costs was imposed.

**The Projected New Water-Works for Rugby.**—For some considerable time past, the question of the water supply to Rugby has been exercising the minds of the members of the District Council; and some twelve months ago Mr. C. Hawksley was called in to make an inspection of the district and report as to the future supply. He recommended that water should be obtained from Shawell Brook, about three miles away, conveyed to Rugby, and stored in a large reservoir. He calculates that from this source the supply will be a million gallons a day; and the cost of the undertaking he estimates at £60,000. At a special meeting of the Council last Wednesday, it was unanimously decided to promote a Bill in the next session of Parliament to authorize the Council to construct additional water-works, &c. Mr. Hawksley's scheme is favoured; and a town's meeting is to be held to discuss the matter. In connection with the existing supply, Colonel C. H. Luard last Friday held an inquiry respecting an application by the Council to the Local Government Board for sanction to the borrowing of £9800 for purposes of water supply, and £320 for water-mains in new streets on the Moat Estate.

## MISCELLANEOUS NEWS.

### FATAL ACCIDENT AT THE SHEFFIELD GAS-WORKS.

#### Two Men Buried in a Coal-Shoot.

Last Wednesday afternoon, a serious accident occurred at the Grimes-thorpe Gas-Works, Sheffield, resulting in the death of a man named Simpson, and serious injury to another named Claridge. Both men were employed by the Sheffield Gas Company as coal trimmers; and about four o'clock on the above-named day they were engaged in shovelling coal from one of the hoppers, when a huge mass fell from above, and buried them. Mr. Hack, the Manager of the works, and Mr. J. W. Morrison, the Company's Engineer, on learning of the accident, immediately requisitioned all the available hands—some 30 or 40—for the work of rescue; and the task of digging out the unfortunate men was commenced with all possible speed. But little progress was made. In the first place, only a limited number could enter the hopper at one time, and then almost as fast as the coal was shovelled out more fell. A medical man (Dr. Mylan) had been summoned ready to offer assistance as soon as it was required; and he was present some time before the buried men were found. As seven o'clock approached, the hand of Claridge was laid bare; shortly after that hour, the efforts of the band of workers were so far rewarded that he was dragged out unconscious. Dr. Mylan quickly applied restoratives, and soon had the satisfaction of witnessing signs of returning animation. Fortunately, Claridge had been protected in a measure by a sheet of corrugated iron which fell above him, and by some shovels and other tools, which kept the full weight of the coal from his body. He, moreover, was not so far inside the hopper as his unfortunate comrade when the fall occurred; and some air was able to filter through the cobbles to him, and so keep him alive until succour arrived. As it was, he was found to be suffering severely from shock. He had slight bruises on his face and neck, as well as on his arms and left side. Dr. Mylan, having satisfied himself that the injuries were not in themselves serious, sent the man home. After Claridge had been extricated, the men worked on in the hope of soon finding his comrade. He was, however, buried much farther down than Claridge; and it was not until eight o'clock arrived that his body was discovered. It was found to be much crushed by the pressure of the coal; but death was stated to have been due not to this cause, but to suffocation. Dr. Mylan said the unfortunate man had been dead for some time. The work of rescue was carried out by Mr. Wilkinson Heap, the foreman, under the immediate supervision of Mr. Hack. To these two gentlemen, as well as to Mr. Morrison, is due everything in the way of commendation it is possible to give to them. Had it not been for the admirable manner in which Mr. Heap marshalled the men immediately engaged upon the work of rescue, it is practically certain Claridge would also have lost his life. Though Dr. Mylan could not immediately engage in the work, he was untiring in his patience; and had it not been for his prompt services, Claridge, when extricated, might not have recovered.

#### The Inquest on Simpson.

Last Friday morning, Mr. Dossey Wightman held an inquiry into the circumstances attending the death of Simpson. Among those present were Commander Hamilton Smith (one of Her Majesty's Inspectors of Factories), and Mr. W. E. Clegg, who represented the Gas Company. Evidence of identification having been given by the brother of the deceased, Mr. Morrison produced a plan of the coal-bunker in which the accident occurred, and explained that in one corner was a shoot leading to the breaking-machine, into which the coal gradually fell, and then was conveyed by elevators to the retorts. The machine had a tendency to draw the coal through the shoot; and subsequently, as long as it was working, the coal was on the move. Arnold Straw, a labourer, deposed that about ten minutes to four on the afternoon of the accident he was in No. 2 bunker—in the chamber next to where the deceased was working with a man named Claridge. He heard someone shouting and asking him to "stop the belt." He had this done, and then ran into No. 1 bunker, where he saw Claridge in the coal. Claridge called to him to lower a rope; and he dropped one, slipped it over the man's left arm, and tried to drag him out. Claridge, however, soon asked him to desist, telling him that he was "pulling his arm out." All the time this was going on, Claridge was moving down with the coal, and so was witness, as the coal was continually slipping. Witness finally had to pull himself out by the rope to save himself; and he afterwards tried to keep Claridge's mouth clear. The elevator was stopped as soon as the accident was known about. The coal was then over Claridge's head. Claridge was got out alive in about three hours, through the shoot of the elevator; but it would be four hours before Simpson was recovered, as he had to be dug out from the top. Witness went on to say, in answer to special questions put on the point, that it was a regular occurrence for the coal to "bind" at the bottom of the shoot, and the men had to do the best they could to remove the obstruction. Sometimes they started at the bottom, and at others at the top. They had heard of planks being found among the coal; but they should not be there. Witness went on to explain that some work was being done in the building over the coal, and a lot of scaffolding had been there for some time. He supposed that the planks had fallen into the coal from the scaffolding. When the planks dropped into the bunker, they should have been immediately got out. In reply to the Inspector, witness said it was the custom, when the bunker was partially empty, for men to go down and get the coal through the shoot—in fact it was part of the daily work of such men as deceased. He thought it would be an advantage to these men if there was an iron ladder from the shoot, to enable them to get out of the way in case of such a fall as the one which caused the accident. The Inspector said the idea of the ladder came from the foreman of the works. Herbert Hamilton, a foreman at the gas-works, said the block in the shoot was caused by two planks. He was not on the spot at the time of the accident; but he was present when the planks were got out, and they would be about 10 feet long. He could not state positively where they had come from; but he said they must have been in the bunker for some four or five weeks. They had most likely come from a scaffolding above the



bunker, which had been used by some contractors engaged in repairing the building. The planks were first discovered on the previous Saturday night, and a small piece of wood was then taken out. On Wednesday, the deceased and Claridge entered the bunker from above with the intention of removing the other two planks. They had got at one of them when the slip of coal occurred, and it completely buried them. A ladder put up the side of the bunker would not be of much use to the men. What was required was a side door. In answer to the Coroner, the Inspector said he thought the matter had been sufficiently explained. Mr. Clegg stated that during the whole time the shoot had been in operation there had been no trouble whatever in loosening the coal. If there had been, of course, the Company would have done everything they could to remove the difficulty. Now that they were aware there was danger, they were ready to do anything they could to minimize it. The Coroner remarked that in that case, so far as he was concerned, he would be perfectly willing to leave the matter as it stood. Mr. Clegg said that anything the Inspector suggested, the Company would be willing to carry out. The Inspector said it was a matter for consideration; but he was quite sure they would be able to discover some means of minimizing the risk. The Coroner, in summing up, advised the Jury to return a verdict of "Accidental death." He inquired after the condition of Claridge, the other victim of the accident; and Mr. Morrison said he heard the previous night that he was progressing very favourably. A verdict was then returned in accordance with the Coroner's suggestion.

#### THE WRECK OF THE BARKING HOLDER.

The accident to a gasholder at the Barking Gas-Works, which was chronicled in a few lines in last week's issue, is a more calamitous affair than the slender information which we then possessed led us to suppose.

A visit to the works and an inspection of the crippled holder have shown the seriousness of the collapse; all the circumstances being about the worst that one can imagine surrounding such an event. The holder (which is guided on Pease's wire-rope principle) is the mainstay of the gas supply of the district—in fact, the only other holder on the works is hardly worthy of the name. It is merely of 14,000 cubic feet capacity, and previous to the accident had been out of use for a considerable period. The time of the mishap was 4.30 on Thursday, the 18th inst., just as dusk was setting in, and the consumers were about to draw on the works for their means of illumination. It is an easy matter to picture the distress and embarrassment of a Manager at that hour of the day to find his store of gas, without warning, suddenly dissipated. It is sufficient to dispirit the boldest, and to upset the best balanced head. But having seen and learnt something of the steps which Mr. W. B. Reidie, the Manager, took to minimize the inconvenience and trouble occasioned to the community of Barking by being abruptly deprived of its means of lighting, we cannot refrain from paying a tribute to the presence of mind which he displayed, and the skill with which he tackled the formidable emergency.

The wrecked holder is a two-lift one, and, as we have said, is guided on the cable principle. The dimensions of the outer lift are 62 ft. by 22 ft., and the inner one 60 ft. by 20 ft. Originally the holder was a single-lift, with columns and guide-framing; but the columns were disconnected and the framing removed at the time it was telescoped some three years ago, and then the entire structure was placed under the control of the wire-rope system. But it is only some six months since that the columns, which were perfectly useless, were taken away. The additional lift raised the storage capacity from 50,000 cubic feet to 114,000 cubic feet. At the time of the unfortunate occurrence, two of the cables were in process of being renewed. As a matter of fact, we understand that one of the new cables had actually been fitted, and it was only a question of waiting until the holder was absolutely full (for, we believe, nothing can be done to



VIEW SHOWING POSITIONS OF INNER AND OUTER LIFTS.



VIEW SHOWING THE OUTER LIFT RESTING UPON THE EDGE OF THE TANK.



the cables unless the holder is completely charged) for the second one to be put into position. When the accident occurred, the holder was within a plate of being full; and Mr. Reidie computes that it contained about 108,000 cubic feet of gas, and that the whole of this was lost. As to the cause of the accident, Mr. Reidie very properly will not commit himself at present; and it is no use, under the circumstances, giving expression to mere conjecture. There has been an expert examination; but, until the inner lift can be inspected, the complete measure of the damage to the structure itself will not be known. Probably by this time something more has been learnt in this regard.

The photographs which we are able to reproduce through the kindness of Mr. Reidie, although a little obscure, depict the wreck with sufficient distinctness to show its completeness, and the ugliness of the task of reformation. The upper view, which was taken from the top of the small holder, shows the outer lift canted over and tightly fixed, and the inner one settled down in the tank. At one point the raised side of the outer lift is resting on the curb of the tank, as will be noticed on the left-hand side of the lower illustration, which, it is almost superfluous to say, is a view from the exterior of the elevated portion of the outer lift. The position of this lift suggests that there must have been considerable oscillation prior to the accident, although the day was calm.

This is the unenviable and perplexing position that Mr. Reidie found himself face to face with on the collapse of the holder: The loss of his entire store of gas; the diminutive gasholder of 14,000 cubic feet capacity not quite in usable condition; and the evening portion of a day's consumption of from 130,000 to 140,000 cubic feet about to be demanded of him. Fortunately, it was Thursday evening, when most of the shops in the district are closed; but still there was darkness throughout Barking from dusk until about 8.30, and great must have been the inconvenience and consternation. But in that short period, Mr. Reidie, tackling the situation with vigour, had a main laid above ground from the works to the outlet of the governor (which was the nearest convenient point until the small gasholder could be brought into use), and gas was delivered into the mains direct. In this way, the strain for the remaining hours of lighting that night was to some extent relieved. Since then, a neighbourly alliance entered into some time since between the Ilford and Barking Gas Companies has enabled the supply of gas to be maintained at very little less than its normal pressure. For the time being, the gas made at the Barking works in the daytime is sent, by the application of a higher pressure than usual, into the Ilford Company's holders, and that gas is returned to the Barking district at night time. We believe that the compact entered into was originally for the benefit of the Ilford Company (whose business, it may be remembered, has expanded extraordinarily of late years) had necessity demanded an auxiliary supply; but the arrangements then made have proved of inestimable service to the Barking Company in this time of trouble. What they would have done without the aid of their neighbours, it is difficult to conceive; and in this other companies may read a lesson. Since the night of the accident, the consumers have not been greatly inconvenienced; and they have been very tolerant, and many even sympathetic with the Company in their difficulty. No doubt a letter promptly addressed to them by the Secretary (Mr. Sturt Morris), expressing regret and explaining the circumstances, had a good effect. Immediate steps are being taken for the reinstatement of the holder; and before long we hope to hear that the damage to the structure itself is not of such a serious nature that much time will be consumed in restoring it to a usable condition. It is no use trying to minimize the gravity of the occurrence from its several points of view; but we have confidence in saying that all concerned will have the sympathy of the gas profession.

## LONDON LOCAL AUTHORITIES AND THE PRICE OF GAS.

### Motions to be Submitted at the Guildhall Conference.

It will doubtless be in the recollection of our readers that just before the recess the Court of Common Council of the City of London decided, on the motion of Mr. Alpheus C. Morton, to convene a conference of representatives of Local Authorities in London, to be held in the Guildhall, on the subject of "the increasing charges of the Gas Companies for the supply of gas to the Metropolis." The meeting has been fixed by the Lord Mayor for Wednesday next; and, in view thereof, the Town Clerk (Sir J. B. Monckton) has received the following notices of motions to be submitted to the delegates:—

1.—That, in the opinion of this conference, Parliament should intervene to protect gas consumers from the evil effects of the giant monopoly brought about by the Gas Acts of 1847 and 1860; and that the London Local Authorities should combine for the purpose of getting such relief from Parliament as may be deemed equitable.

2.—That, in the opinion of this conference, the Gaslight and Coke Company are not justified in charging more per 1000 cubic feet for gas supplied on the north side of the Thames than is charged by themselves and the South Metropolitan Gas Company for gas supplied on the south side; and that the Gas Companies of the Metropolis working under the sliding-scale should not be allowed to charge more per 1000 feet for gas supplied than the lowest price at which it is supplied by any one of them, so that gas consumers should not be compelled, as under the present monopoly, to make good the loss incurred by bad management.

3.—That the advantages secured to the Local Authorities on the north side of the Thames by the City of London Gas Act of 1868 and the Amalgamation Scheme of 1883, as to the supply of gas for public purposes, should not be interfered with.

4.—That the Corporation of London and the London County Council be asked to take active steps to protect the London gas consumers in the direction indicated by the resolutions passed at this conference, and to oppose the granting of further powers by Parliament to the Gas Companies unless such relief be given.

5.—That the Corporation of London be requested to send copies of these resolutions to the Board of Trade, the Local Government Board, the London County Council, and each of the new London Borough Councils.

The Cantor Lectures delivered by Professor Lewes at the Society of Arts last May, on "The Incandescent Gas-Mantle and its Uses," are now being published in the Society's "Journal."

## THE CAPITAL REQUIREMENTS OF THE WELSBACH COMPANY.

### Preference Stockholders Object; but the Proposals are Carried.

The Adjourned Meeting of the holders of preference stock of the Welsbach Incandescent Gas-Light Company, to consider the proposed alteration of the Articles of Association as set forth in the "JOURNAL" last week (pp. 1032-3), was held on Wednesday, at the Cannon Street Hotel. It will be remembered that the meeting of preference stockholders was adjourned owing to the fact that the attendants, with the proxies, did not represent by about £50,000 the two-thirds of the preference stock, or a million pounds, requisite to constitute a quorum. But at a subsequent extraordinary general meeting, the Chairman (Sir Henry Burdett, K.C.B.) detailed the circumstances under which it was sought to amend the Articles of Association. On the present occasion, there was a small gathering in comparison with the assembly of a week before, so that the appeal of the Directors for proxies, either for or against the proposals, had met with a response to a sufficient extent to enable the business for which the meeting was called to proceed.

It is unnecessary to recall the terms of the resolution; the principal portions having already been published. But, in moving its adoption, the Chairman referred to an apparent misapprehension as to the way in which the altered Articles of Association would affect the rights of the preference stockholders. Under the Articles as they exist, the Board had, he pointed out, the power to borrow up to one-fourth of the whole of the issued capital, or (say), in round figures, £850,000; and it was intended, under Article 54, that they should have power to borrow on security. As a matter of fact, however, in consequence of a recent legal decision, Counsel advised the Board that there was considerable difficulty and doubt as to how far the power conferred under Article 54 would warrant the Board in borrowing on security. The Directors thereupon came to the conclusion, in the interests of the Company, that their duty was to at once have the point dealt with, and that they should bring the matter before the preference stockholders. What the Board asked was not that they should make clear the authority to borrow £850,000, but simply that they should be given authority, as and when it might be necessary, to borrow £250,000 only on security. It was right that it should be understood that they were merely taking these powers for the purposes of their business, and that they had no immediate intention of putting them in force by issuing any debenture stock of any kind. The resolution altering the Articles had been carried by a very large majority at a general meeting of all the shareholders—preference, ordinary, and deferred; and in that majority was included £800,000 of preference stock holders. It was the intention of the Board to provide for the redemption of any debentures or debenture stock which they might ultimately issue.

The motion was seconded by Mr. C. L. Samson; and then ensued a protracted discussion. Mr. J. P. Hurst led off, by remarking that they had heard from the Chairman that, whether unwittingly or not, the preference shareholders made a better bargain for themselves than they thought they had, inasmuch as it appeared that, owing to some legal judgment, the Directors were unable to put anybody ahead of the preference stockholders at the present moment; and therefore it was for them to consider whether they were going to give up that most excellent bargain for nothing. They had not been offered even the proverbial "mess of pottage." The only mess they would be in would be a further fall in the value of their shares. The Directors' last report showed that the Company earned sufficient not only to pay the £75,000 required for the 5 per cent. preference shares, but after setting aside £5000 to reserve, there was still a margin over of £45,000. The Chairman told them very properly that the Board wanted to have power to get further capital, so as to enlarge the business; but he (the speaker) ventured to put this to the meeting: Supposing they did enlarge the business, supposing they earned millions per annum, of what benefit would that be to the preference shareholders? They were now making more than enough to get every penny they would derive from the Company. The Directors did not come to them and say: "This is a bargain for the benefit of the ordinary shareholders, who are at present in a very parlous condition, whose shares are hardly worth the paper they are printed on, and so it will be a very good thing for them if we can get the business enlarged. Therefore, if you will give up those rights which you have undoubtedly got, we will offer you something over and above the 5 per cent. We will have the Company reconstituted, and we will have the Articles drafted in such a way that you shall get something more than your 5 per cent." There was not a word of the kind; then why should the preference shareholders give way? In the City there had been a tendency to tamper with the rights of preference shareholders; and it was becoming a serious matter. He did not impugn the high honour of the Board. He was, however, afraid they had got proxies from many shareholders who had acted in ignorance that they were parting with their rights.

With the spirit of the foregoing speech, the Chairman entirely sympathized; but so far as he (Sir Henry) was personally concerned, he had looked to the utmost to see that the rights of every class of shareholder were protected. When the Company was incorporated, it was intended to give to the Directors, having regard to its size as a large commercial business, power to borrow money on security; and he did not think that the preference shareholders ought to avail themselves of an accident, to place themselves in a position which it was not intended they should occupy. He alluded to the rights of the other classes of shareholders; and he appealed to the preference stockholders, as business men and honourable men, to be content with the protection they already possessed. He and his colleagues were doing—and not under the most encouraging circumstances—their utmost, by all means, to make the property a richer one, and to secure the dividend firmly and continuously. He urged them not to take upon themselves the responsibility of not supporting the Board; to do so would imperil the welfare of the business, and cripple its earning power very considerably.

Remarking that the Company must do business, and that they could not do business without they had money, Mr. Samson said, in order to raise money on the best possible terms, they must be in a position to give security. They had power to borrow money now, and that money would come before the preference shareholders, just as if they had no security; but they would have to pay a higher rate of interest. A practical



view of the situation was taken by Colonel Mundy, who pointed out that Mr. Hurst's remarks appealed only (if they appealed at all) to those who were preference shareholders and nothing else. But there were a large number of preference shareholders who were also holders of ordinary and deferred shares; and to them there could be no doubt as to the advantage and necessity of raising such money as was required for carrying on the business on a proper footing. Preference shares in a company which was able to pay a good dividend on its ordinary shares were worth much more than preference shares in a company that could not do so. If the Company's factory and output were extended, and a better dividend paid on the ordinary shares, there was no doubt they would see the preference shares standing in a safer and more favourable position, and looked upon with much more favour in the market. Answering an inquiry, the Chairman stated that, if they issued any mortgage debenture stock, or debentures, the Directors would provide in the instrument for their redemption. On an inquiry by Mr. Layton, Sir Henry also replied that the Board did not intend to make any issue at present; and they hoped to prolong the time before they did so. It was only right and customary that the preference shareholders should have the option of taking, if not the whole, the greater portion of the debentures or debenture stock.

Following this, another shareholder spoke strongly on the question of the depreciation of the Company's stock and shares in the market; and he stated that, upon inquiry, he found stockbrokers attributed this to the Company's bad management in the past, to the Company having an enormous capital and no ready money, and to the fact that the capital had been frittered away. He feared that an issue of debentures or debenture stock would further depreciate the value of the shares. He inquired whether the Chairman would give the shareholders his idea as to why the stock had dropped so disgracefully, and wound up by saying that everybody tabooed the stock except the Directors. Sympathizing with the speaker, the Chairman pointed out that he himself was in the same position as the other shareholders. But the only effect of a speech such as the one just made would be to do further injury to the property. It was only right he should say that, under Mr. Peters' management, there was no commercial enterprise in this country that was more under control or better administered than was the Company's property to-day. It was a total misapprehension to suppose that the present Directors had had three millions, one million, or even a quarter of a million of capital to fritter away. When the existing Company (which was an amalgamation of certain other Companies) was formed, the only sum which was available as working capital was £100,000; and how this had been spent he explained in his speech the previous week. The discussion proceeded to expand. One shareholder referred to the price of the mantles, and the cheaper figure at which it was stated that other mantles could be sold for; while another proprietor suggested that the expenditure might be considerably reduced. It was thought by Mr. Williamson that the resolution was of too sweeping a nature. Though it was proposed to take these powers, he understood from the Chairman that it would not be necessary to raise the debentures for a long time. Then, he suggested that they should wait until that time arrived before making the preference shareholders give away their heritage. He wished to know if he could propose an amendment, to which the Chairman replied that any amendment travelling outside the resolution would be out of order. Upon this, Mr. Williamson inquired if the resolution could be supplemented by the Directors stating the actual amount they proposed to borrow, and what terms they would offer to the preference shareholders to find the money. The Chairman's answer was that they could not supplement the resolution. Then followed further explanations of a similar character to those already given.

On the resolution being put, 48 voted for it, and 24 against; and consequently it was not carried. A poll was demanded; and this resulted in 212,943 votes for the resolution, and 4445 votes against. The amount of stock represented for the resolution was £1,064,832, against £22,726. Thus the resolution was carried by a considerable majority.

#### OIL GAS ENRICHMENT COMPANY, LIMITED.

The Seventh Annual General Meeting of this Company was held on last week—Mr. JAMES MILNE, of Messrs. James Milne and Son, of Edinburgh, in the chair.

SECRETARY (Mr. J. Gordon Mason) having read the notice convening, the report and accounts, already noticed in the "JOURNAL," as read.

CHAIRMAN, in moving their adoption, stated that the Paisley plant completed, and they hoped to have the whole account in con- it it closed in the course of the next few weeks. He mentioned previous meeting that the Directors had made arrangements to be up another patent—viz., that of Messrs. Young and Glover for the working of the naphthalene process. They had now done so, and had begun to advertise the process, and had had several inquiries from different places in England in regard to it. With a view to helping them in this matter, the Directors had, subject to the approval of the shareholders, asked Mr. Glover to join the Board; and he had agreed to do so. The past year had not been favourable for oil gas enrichment, solely on account of the immensely increased price of the oil, which made it unprofitable for gas-works managers to use it in the way they did. However, enough had been earned to pay the dividend, and to carry forward a larger balance than on former occasions. The investments of the Company remained in the accounts at cost, as before. The decrease in value had not been great, and the Directors had no doubt they would recover and get above par again.

Mr. HUGH BROWN seconded the motion, and it was carried.

The Newbury Town Council having applied to the Local Government Board for a loan of £2500 in connection with their gas undertaking, the Board have replied that they are not prepared to consider so much of the application as related to the provision of stoves. The Council have, therefore, on the recommendation of the Gas Committee, decided to place to a suspense account the expenditure on these appliances.

#### THE LAUNCESTON TOWN COUNCIL AND THE GAS COMPANY.

Several references to the differences which have arisen between the Launceston Gas Company and the Town Council were made at a meeting of the burgesses held last week for the purpose of nominating candidates for the Council. This was, in fact, almost the only subject discussed. Mr. T. P. Trood, a member of the Council who was proposed for re-election, expressed the opinion that the town was paying too much for the gas for public lighting. There were 120 lamps, and the average price paid was £2 16s. 1d. Twelve years ago a meter was placed on one of the lamps, and it was found that the consumption was about 10,000 cubic feet per annum. As to the roads, they were vested in the Council, and no one had a right to break them without permission. Mr. T. H. Nicholls, another retiring member of the Council seeking re-election, said he was a Director of the Gas Company, but he should not object to see the electric light introduced. As to the charge for the street-lamps, if Mr. Trood was correct in his estimate that the consumption was 10,000 cubic feet, they were not paying too much. The price of gas was 4s. per 1000 cubic feet, so that with a consumption of 10,000 cubic feet, and adding 10 per cent. for leakage, they had £2 4s. for the gas alone. Then there was the cost of lighting and extinguishing the lamps, repairs, &c. In answer to questions, Mr. Nicholls said that their Articles of Association entitled the Company to pay dividends not exceeding 8 per cent. There were seven members of the Town Council who had an interest in the Company, and who therefore did not take part in the discussion or voting on the subject of the gas supply. Mr. W. L. Powell, who was proposed as a candidate, said that as the Council was now constituted one-half of the members had to leave or remain silent when gas questions came under discussion. The Company ought to have been generous to the public as well as just to themselves. Mr. J. Treleaven, jun., said the Company had not taken full dividends by £1000. As to the suggestion that they should be generous, if they lowered the price for public lighting it would simply mean that private consumers would have to pay more. Those who were attacking the Company could not show that a higher price was being paid than in other similar towns; for, as a matter of fact, the price was lower than it was in almost every other town of the same size.

#### SALES OF SHARES AND STOCK.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale new issues of gas and water stocks and shares. The first lots consisted of some new ordinary £10 shares in the Westgate and Birchington Gas Company, ranking for a maximum dividend of 7 per cent., the last paid having been at the rate of £5 12s. per cent. for the half year ending Dec. 31, 1899. They fetched from £10 to £10 15s. per share; and produced £3150. Some new ordinary stock of the New Swindon Gas Company (last dividend 5 per cent.) was next offered, and was sold at the rate of £110, £111, and £117 per cent.; the total amount realized being £1142 18s. A parcel of £10 "C" shares in the Harrow and Stanmore Gas Company (the last dividend on similar shares having been at the rate of £5 12s. per cent. per annum) was sold at prices ranging from £10 5s. to £10 15s. per share; producing £2620. Some new ordinary stock of the Southend Gas Company, carrying dividend from the 1st of December next, was then offered. The last dividend on the Company's existing ordinary capital was at the rate of 5½ per cent. per annum. The new issue was sold at from £105 10s. to £107 per cent.; the total amount produced being £5328. The last lots consisted of some "E" ordinary £10 shares (7 per cent.) and some 5 per cent. preference shares of the same nominal value in the Aldershot Gas and Water Company. The former fetched £15 10s., and the latter £12 each; the amounts produced being respectively £1240 and £3000. Among other sales of shares, the following may be noted: Some £10 shares in the St. Neots Gas Company were sold by Messrs. Maddison and Son at £21 15s. and £22 apiece. Messrs. Waters and Rawlence recently sold some £12 10s. shares (10 per cent.) in the Salisbury Gas Company at prices ranging from £25 to £25 7s. 6d. each; and £200 of perpetual 4 per cent. debenture stock at £112 per cent. On the same occasion, 15 fully-paid £10 shares in the Fisherton Anger and Bemerton Water Company fetched £19 7s. 6d. apiece. Messrs. Richardson and Pearce Brown, of Selby, lately sold some £5 shares in the York Gas Company at £12 15s. each. Messrs. Lancaster and Sons, at Barnsley, last Wednesday, realized the following prices for Barnsley gas stock and shares: For £128 19s. general capital stock, £190; six "D" shares and four "E" shares, paying 7 per cent., £14 5s.; four "F" shares of £10, paying 10 per cent., £15; four "C" preference shares of £10 each, paying 6 per cent., £13 10s.; and four "G" shares, paying 12 per cent., £14. At Wolverhampton, the same day, Mr. H. J. Lloyd offered for sale, in lots of £100 each, £15,000 new ordinary stock of the Wolverhampton Gas Company. On this particular stock, the standard dividend authorized by the Wolverhampton Gas Act, 1900, is 6 per cent., subject to the usual sliding-scale clauses. The bidding was fairly brisk; and the prices varied between £125 and £132 2s. 6d. Eight hundred additional ordinary £10 shares in the Frimley and Farnborough District Water Company have been sold by auction at from £13 2s. 6d. to £13 10s. each.

**York Streets in Darkness.**—The column of the "Northern Notes and Notions" in the "Yorkshire Herald" for last Wednesday, was headed with the following paragraph, which we will leave to speak for itself: "The principal thoroughfares in York were in darkness for the greater part of last night. . . . Pedestrians could not help stumbling against each other, and it would have been the easiest thing in the world, if any of the Hooligan element had been about, to assault and rob a person without much fear of identification. It would be well to know who is responsible for such a state of things. When the illumination of the main streets by electricity was undertaken, instructions were given by the Corporation, we believe, to cease lighting the gas-lamps, as that would have entailed unnecessary expense; but, surely, on a dark night, some steps ought to have been taken to prevent such a painful and perilous gloom."



**ELECTRIC LIGHTING NOTES.**

The Southampton Borough Council have approved a proposal of the Electricity Committee to apply for sanction to borrow an additional £12,000 for extensions.

The Electrical Engineer to the Hull Corporation (Mr. A. S. Barnard) has reported to the Electric Light Committee on the recent breakdown which resulted in the extinction of the light in parts of the district served, as already recorded in the "JOURNAL." The fault was located in a junction-box, where a joint in one of the large feeders had given way.

At the conclusion of last Thursday's meeting of the Rochdale Town Council, the members walked in procession to their electrical works in Gashouse Lane, for the purpose of formally opening them. It was remarked by the Mayor that it could not be alleged that the Corporation had been "too previous" in introducing the electric light into Rochdale; but he hoped that, while they had been waiting, they had learned something from the experience of other corporations. He presented to Alderman W. J. Petrie, the Chairman of the Gas Committee, a golden key with which to perform the ceremony. Alderman Petrie unlocked the door, and the Council inspected the works.

A Local Government Board inquiry was recently held at Dartford into the application of the District Council for sanction to a loan of £20,000 for the purposes of electric lighting. There was considerable opposition from some of the ratepayers; and the patience of the Inspector (Mr. H. P. Boulnois) was sorely tried at times by the interruptions. Lieut.-Col. C. N. Kidd, the Chairman of the Council, explained that there was no alternative but to go forward with the scheme or allow it to be at once taken up by private enterprise. The objectors confined themselves to declarations that the undertaking would not pay; and, when the Inspector said he should close the inquiry unless arguments could be brought forward, there was a hostile demonstration.

If, after the inquiry held by Mr. M. K. North on behalf of the Local Government Board at Sleaford last Tuesday, the electric lighting scheme of the District Council goes through, then our faith will be shaken in the usefulness of such investigations. The amount required for the scheme is £7000; and for this sum, Mr. Bremner Smith and Mr. W. H. Scott (Electrical Engineers of whom we have never heard before) declared that the installation could be satisfactorily carried out on the two-wire system. On the other hand, for the opposition, Mr. A. O. Gibbings and Mr. Vesey Brown (both well-known experts) held that the two-wire system was unsatisfactory, and that the lowest possible cost would be £10,759. Then came a petition signed by two-thirds of the ratepayers; and Messrs. Bass and Co., who are large ratepayers, entered a strong opposition.

Instances are constantly occurring of the danger arising from stray currents of electricity. A rather remarkable case in point happened at Bradford on the 20th inst., in the house of Dr. Baldwin. The family were having tea in the dining-room, when the gaslight suddenly went out. On investigation being made, it was discovered that one of the bedrooms was full of smoke, and that the floor was on fire. The fire, which was of a smouldering nature, was promptly put out; and examination revealed the fact that the water-pipe, which is in close proximity to

the cable supplying current for the tramcars, had burst. The conclusion came to was that the electricity was conveyed along the water-pipe, and thence to the gas-pipe—only about an inch separating the two. The sparks generated in this way, it was thought, ignited the floor of the room. The opinion that electricity from the cable caused the fire was strengthened by the fact that for some hours the tramcar traffic was delayed owing, it was presumed, to an insufficient supply of the motive power.

The annual report of Mr. A. A. Voysey, Electrical Engineer and Inspector to the Corporation of London, sets forth that last year the total number of arc lamps lighted was 507. During the year 562 lamp failures were reported by the police, and 356 by the Inspector. The sum of the figures representing for each lamp the period during which it was not alight was 167,067 minutes. The penalties inflicted on the Company for failures amounted to £173 6s. 3d. The Corporation was still without the means of testing the value of the supply given to the public lamps. The Board of Trade had not formally approved of any type of instrument for the purpose; but one of the conditions on which the City of London Electric Lighting Company were allowed to change the standard pressure from 100 to 200 volts was that they established concurrently with the change, and under the direction of the Board, a means of testing the value of the supply to the public lamps. Only eleven meters were submitted to the Inspector last year. Nine were sufficiently correct; but the others were incorrect. The Aron meter was approved by the Board of Trade for use on alternating current circuits, and the Inspector made a number of tests with a view to determine the kind of examination that would be necessary before certifying such meters in accordance with the provisions of the Electric Lighting Orders. Negotiations had been concluded between the Corporation and the Companies for the testing of all meters at the Guildhall without expense to the Corporation. The Companies had agreed to refund to the Corporation the whole of the money expended in carrying out the work, including the salary of the Inspector. The question of the lighting of the side streets had been delayed for several years, in the endeavour to obtain a legal settlement of differences with the City of London Electric Lighting Company as to the meaning of the public lighting agreements. The delay was much to be regretted, because it was undoubtedly possible, by the use of electric lamps, to make a great improvement in the lighting of the side streets without in any way increasing the present cost of lighting by gas. The Inspector was advised during 1899 of two important interruptions in the supply of electricity to private consumers—one affecting the whole and the other only a portion of the City. Defects in the pressure of the supply occurred on eleven different occasions. At present, the Inspector had no adequate means of ascertaining how far the Company complied with their obligations in respect of the maintenance of a proper pressure of supply to private consumers. The Company, however, had been put under the obligation to provide such means as the Board of Trade should direct.

The Liverpool City Council have adopted a recommendation of the Water Committee accepting a tender of Messrs. Holme and King to construct a new reservoir at Prescot for the sum of £98,425 18s.

# SUTHERLAND'S PATENT PREPAYMENT GAS-METERS

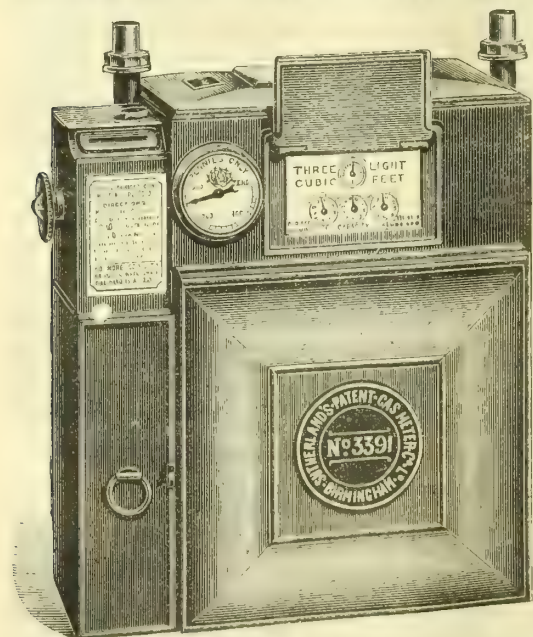
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## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At their meeting on Monday, the principal business before the Edinburgh and Leith Gas Commissioners was the letting of the contract for the construction of the carbonizing plant upon the inclined-retort system, in the new works at Granton. The tender recommended by the Works Committee, and adopted by the Commissioners without comment, was that of Messrs. Graham, Morton, and Co., Limited, of Leeds; and the price was £113,802 17s. 9d. The contract is a very fine one. Work upon it can be started at once, as the erection of the retort-house is well advanced. The Works Committee also recommended acceptance of tenders by the representatives in Glasgow of Alsen's Portland Cement Works for the supply of 900 tons of Hamburg cement, and 100 tons of Alborg (Danish) cement. The question was raised as to why it was necessary to go abroad for cement; and the interesting information was elicited, in reply, that the cement which had been accepted was 6s. per ton cheaper than that which the Commissioners had been using, and 3s. 9d. per ton cheaper than the other samples tendered. The offers were accepted. The report by Mr. W. R. Herring, the Engineer, for the month of September, showed that the output of gas increased by 2,036,000 cubic feet during the month, and that since May 16 the increase has been 7,205,000 cubic feet. The figures are not very encouraging. A pleasing incident of the meeting was the re-appearance of Mr. Kinloch Anderson, who has been so long at the head of the Works Committee of the Commission, and who has been laid aside by illness since about the end of May. He was warmly congratulated on his recovery.

It was thought that the employees of the Edinburgh and Leith Gas Commission were content with their position; and so, I believe, they are, if let alone. But the National Union of Gas Workers and General Labourers of Great Britain and Ireland have other views upon the matter. According to them no workman ought to be content unless he shapes his course according to the cast-iron regulations of the Union. A Mr. W. Blackwood, who calls himself the District Secretary of the Union, has forwarded a petition to the Works Committee of the Commission, through Mr. Herring, the Engineer, in which the following "concessions to be conceded to your workers who are members of our Union" are asked: (1) That double time for Sunday labour be granted from 12 o'clock on Saturday night till 12 o'clock on Sunday night; (2) that time-and-half for all overtime and extra work be given; (3) that, so far as possible, all unnecessary extra work and Sunday labour be abolished; (4) that whole time be given for New Year's Day, spring, and autumn holidays; and (5) "a deputation of the workmen, together with myself, will be pleased to wait upon you to explain reasons why the above should be granted." The really important condition is in the end. What is sought is not so much to benefit the men as recognition of the Union. It is evident that Mr. Blackwood is not one of the workmen; and the Commissioners should have no difficulty in telling him that they can have no negotiations with him upon the subject of their relations to their workmen.

We hear so much now of extensions of electric lighting, that it gives a

sense of refreshment to the mind to learn that the Town Council of Edinburgh are being recommended by their Lighting Committee to add about 200 gas-lamps to those already in use in the city. Nearly the whole of the new lamps are required on account of the extension of the city boundaries. Of electric arc lamps in the streets there are now 846, the charge for each of which is £13 a year.

The din of electioneering work in the burghs is still in our ears, and is louder than ever. The greatest noise continues to be made in Dundee, where the observations are so voluminous that only a small percentage of them can be taken notice of. But, apart from their bulk, there are remarks being made which would be better left unsaid. These are by municipal candidates. Besides what has been spoken from platforms, there have been two special articles in the "Dundee Courier" in both of which the method of keeping the accounts of the Commission was attacked with vigour. I must say that, so far as picking holes in the accounts is concerned, the writer makes a good case. But there are few accounts which could not be similarly dealt with; and the question remains whether any good is to be done by attempting to bring discredit upon a Corporation Department. If good is to be done, the end will have justified the means; but if no good is to be done, a great responsibility rests upon those who have stirred the matter up. At the municipal meetings, the following have been the most noteworthy expressions: Treasurer Ritchie said that, under the guidance of Mr. Foulis, it was reported in 1897 that the gas-works were not in an efficient state; and they were now laying down a system for making gas which would be second to none. They were well aware that coal gas in itself must be the foundation of whatever they were to have. They could not enrich anything else but coal gas; and, according to the best experts, it was a mere waste of money to enrich. In Dundee, they had insisted on having a certain illuminating power, which could only be obtained by enrichment, as the ordinary coal would not give it. Glasgow in its inception was wise. They brought down their capital, and kept up the price of gas. Dundee kept down the price and wrote up the capital. During the years 1890 to 1895, they laid aside for the sinking fund a sum of £17,850. During the same period Glasgow laid aside £292,220. Glasgow was practically six times larger than Dundee, whose income from gas and products was £100,000, compared with £600,000 for the western city. If they had been laying aside this £5000 extra, with accumulated interest, the price of the gas-works that day would have been £120,000 less than was the case; and they knew what this meant in sinking fund. Glasgow was paying for annuities and sinking fund in 1874-5 £62,556. They had trebled their works since, and their interest and sinking fund, with all the accumulated expense, still stood at £63,000. This was what Glasgow did; while they in Dundee were doing the other thing. In Dundee, interest on capital was 9d.; in Glasgow, it was 2½d. As to the question of rebate, according to Sir Thomas Thornton—and they preferred to take their law from the man they paid for it—they could only charge after April 30 at the higher rate. About 270 people had claims. The sums ranged from 1d. to 10s.; and all that had been paid up to Saturday was £70. The only person, however, to whom injustice was done was to anyone who removed or ceased to use gas. To those who remained in the house, a

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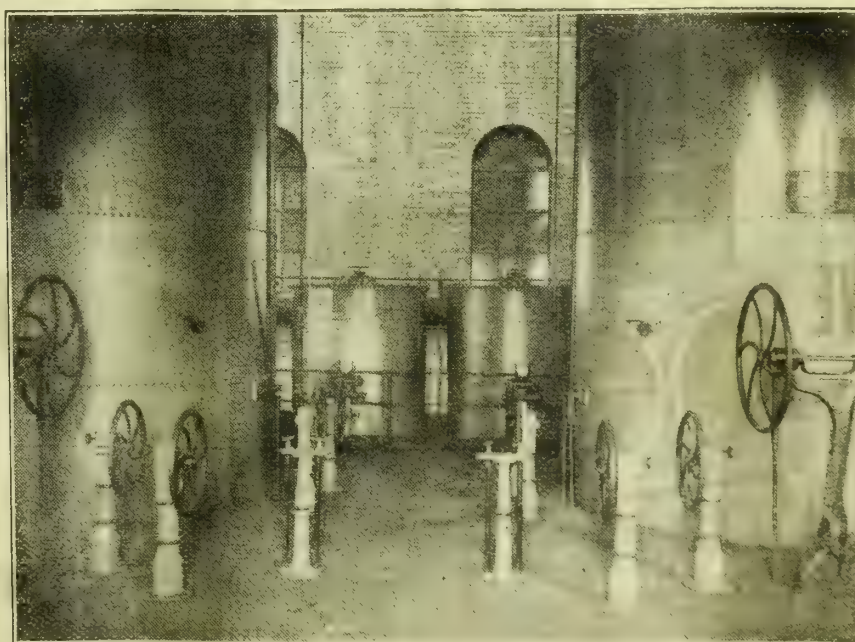
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full year's gas was given at the same price; and let them remember they had had five reductions to one advance. Bailie Robertson said that, as soon as the gas-works were reconstructed, he should be prepared to move that a Committee be appointed to sit along with Mr. Foulis, who was superintending the reconstruction of the works, to look into the entire organization and management of the works. He was informed that the proportion of foremen to the number of hands employed at the works was too large at the present time; and there were a great many people there who had not very much to do.

In an editorial in the "Dundee Courier" it is pointed out that in the estimates for the year now current the anticipated cost of coal is stated at £61,154, and that, as the sale of gas is put down at 583 million cubic feet, the cost of coal will be 25-17d. per 1000 cubic feet; whereas in Broughty Ferry the cost of coal is set down at £2289, and the sale of gas at 50 million cubic feet—making the cost of coal 10-84d. per 1000 cubic feet, or 14-33d. less than in Dundee. The price of gas to the public in Dundee is 1s. 2½d. per 1000 cubic feet more than in Broughty Ferry.

Greenock gas affairs have not been in a satisfactory state for some months. This is abundantly shown by the speeches delivered in the various wards of the town in view of the forthcoming municipal election, and also by the answers given by the councillors in the course of their "heckling." Mr. D. McCallum in the Second Ward, on Thursday night, stated, when touching on the Gas Trust, that the deficiency of £2600 was due chiefly to the high price of coal, and the great difficulty in getting supplies. There were still one or two contractors who had not yet delivered all the coals which they contracted to do, and a Special Committee was appointed to look into the matter. The audience might rest assured that the contractors would be compelled to implement their bargains or pay the differences. At the meeting of the Fifth Ward on the same evening, Bailie Cameron also referred to the affairs of the Gas Trust, touching upon the subject of the unfulfilled coal contracts. He remarked that at a meeting of the Sub-Committee it had been resolved to claim from the contractors the difference between the contract value and the price of coal at the date of the breach of contract, and he hoped that they would be able to make an arrangement which would be satisfactory both to the Corporation and to the contractors. Replying to a question at the "heckling" time, he said that it was the opinion of the Legal Adviser to the Board that it was quite legal to make the price of gas retrospective from last May, and his two colleagues, Mr. Andrew and Dean Chalmers, quite approved of the Gas Trust doing so. The Seventh Ward meeting was also held on Thursday night, and the principal speaker at it—Bailie Campbell—the Vice-Convener of the Gas Trust, dwelt at considerable length on the affairs of the Gas Department. For some months past, he said, much which could only be characterized as crude, ill-informed, and misinformed criticism had been passed on the department; and what had really been for the most part the inevitable result of absolutely abnormal conditions in the various quarters from which their materials for production were drawn had been construed into charges of incompetence and mismanagement of the grossest and most culpable character. When, however, they came to investigate the facts, they found the matter to be simplicity itself. After

making sundry explanations, he went on to refer to a number of questions dealing with the Gas Department. Some of the questions were as follows: Has there been a deficiency in the Gas Trust through irregularities? When did the irregularities begin? Has the amount been recovered, and what steps were being taken to recover the deficit? If the deficit was unpaid at the time the balance was made, how is it shown in the Yellow Book? He replied at length to these queries; saying that sums amounting to something over £600 had been collected by the late Gas Manager, and had not been handed over to the Town Chamberlain. The most careful and painstaking investigations had been made and failed to yield an explanation. They had never heard, and they could never hear, what the late collector might have said on the subject. But the late collector's representatives considered the matter carefully, and they intimated through their law agent that they were prepared to indemnify the Police Board the full amount in question. Some prominent citizens were at the meeting, and spoke very guardedly on the subject of the delinquencies of the late collector, and subsequent Gas Manager.

At Falkirk, one of the retiring representatives this year is Bailie Cook Rennie, the Convener of the Works Committee of the Gas Commission. He is being opposed by Mr. Stevenson, an ex-Treasurer of the burgh, whose platform is that during the seven years he was in the Town Council there was a reduction of 6½d. per pound upon the rates; but that since he left the Council, the rates have increased by 7½d. per pound. One of the items which he selects wherewith to connect Bailie Cook Rennie with not having a due regard for economy, is that he was the chief agent in the promotion of the Act of last session, which gives the Gas Commissioners power to acquire land at Thornhill, and to erect a new gas-works there. Mr. Stevenson asks if they have not already a site for a new gas-works at Parkhouse, for which they paid £6000, and upon which they have erected a gasholder costing about £8000. Now, the Parkhouse site, according to my recollection, was considered, and was declared to be unsuitable, on account of its being damp; and it is also said that it is not large enough. Mr. Stevenson does not controvert these statements, but simply says they were not proved. Bailie Cook Rennie informed the electors this week that the site at Thornhill had been secured, and that the erection of the new gas-works would be proceeded with so soon as negotiations relating to the railway accesses were completed. So that Mr. Stevenson is too late with his opposition to the transfer of the gas-works. It is to be hoped that he will not succeed in ousting Bailie Cook Rennie, who, whatever his merits may be, has begun a great work for the Gas Commissioners of Falkirk, and should be allowed to finish it.

In Hamilton, no gas subject can be found upon which to fight, because Mr. Ewing's appointment at Greenock has taken away the only bone of contention which has existed—his having rendered better service to the community than his predecessors did. One speaker said that they had been getting cheap management, because in gas-works where the output was less than one-half what it was in Hamilton the managers were paid larger salaries. If this be so, the reproach should be removed now. Bailie MacHale, the Convener of the Works Committee, expressed regret that they were about to lose the services of Mr. Ewing. He anticipated that they would have a profit of £1200 a year from their sulphate of

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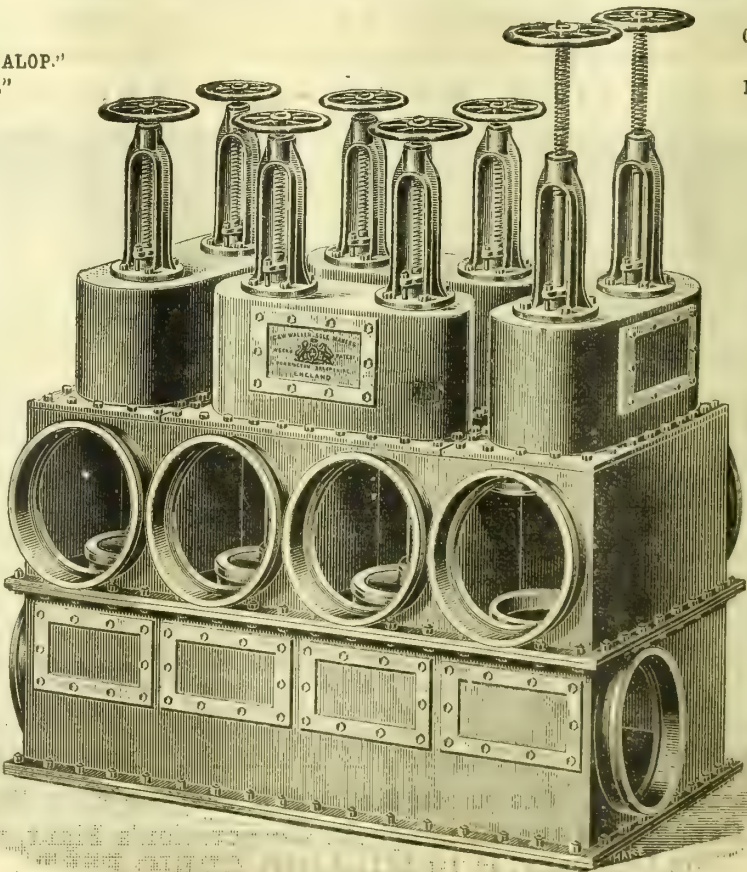
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ammonia plant; and he thought it was worth consideration whether the profit from sulphate should not be applied to some special purpose. He threw out the suggestion, so that posterity might ear-mark this profit, and devote it to the erection of a town hall and municipal buildings. Treasurer Keith heartily concurred in the suggestion that the profits on the sulphate department should not be devoted to making gas cheaper than anywhere else in Scotland, but should be applied to some purpose of public utility. It is a very specious plea that they are to take the profits upon sulphate only for public purposes, and to leave gas production to stand or fall by itself. But there is no defence for the one proposal, any more than there would be for the other; and it will be better for the community if the Corporation go no further than they have done in the matter of appropriating profits upon municipal trading for the relief of the statutory rates. The principle is not a healthy one.

At a meeting of ratepayers in Johnstone on Thursday night, Provost Lang said that the Corporation were expending upwards of £10,000 on the gas-works, to fully equip them to supply the enormously increased demand for gas. The extensions were not limited to the present pressing demands, but would meet the requirements of the burgh for a good many years to come. He pointed out that the total make of gas seven years ago in Johnstone was 26 millions; whereas, with the progress of the town and district, the make had risen to over 42 millions per annum, which he considered most satisfactory. No increase had taken place in the price; and he thought this was a matter for congratulation, as most burghs in Scotland had had to raise the price of gas from 5d. to 10d. per 1000 cubic feet.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 27.

**Sulphate of Ammonia.**—In the early part of the week, the market was very firm; and a fair business was done at full prices. Later, however, demand slackened; consumers declining to follow the upward movement, and buying being mainly in second hands. The closing quotations are £10 15s. to £10 16s. 3d. per ton f.o.b. Hull and Leith, and £10 17s. 6d. to £11 f.o.b. Liverpool. Makers are firm at these prices; but re-sales are being made at less money. There is considerable inquiry in the forward position; but the firmness of makers precludes much business, while speculators seem nervous about offering ahead. London, Beckton terms, January-March, is quoted £11 5s. per ton; and this is required f.o.b. Leith and Liverpool, ordinary terms, for November-March.

**Nitrate of Soda** is very firm at 8s. 3d. to 8s. 6d. per cwt., according to quality, on spot.

LONDON, Oct. 27.

**Tar Products.**—Excepting benzol, this market generally continues sluggish and uninteresting. For benzol, the demand seems to be better; but there is great irregularity in the prices quoted, presumably arising from the difference in the cost of putting it f.o.b. or otherwise. There is as much as 2d. a gallon difference in quotations in the various districts. 90's continue to be in more favour than 50's. For toluol, however, a

better business is in prospect; and this should influence 50's materially. Solvent naphtha continues dull, with only small inquiry. Carbolie acid is quoted lower; and the article appears to be in the hands of operators who are moving for a fall. The production of carbolie is now much larger than it has been for some months. Makers have been hoping that higher prices would be possible; and only a few of them are committed to contracts. It is possible the fall in values may be speedily arrested, as the corner is too apparent. There is no change in anthracene or pitch.

Quoted values during the week average: Tar, 15s. to 21s. Pitch, east coast, 35s. 6d.; west coast, 32s. 6d. Benzol, 90's, 9d. to 11d.; 50's, 1s. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. 0½d. Creosote, 1½d. to 2d. Heavy oils, 2½d. to 3½d. Carbolie acid, 60's, nominal, 2s. 7½d. Naphthalene, 80s.; salts, 60s. Anthracene, nominal "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia.**—The better outlook for this article has not been maintained; and to-day it is quoted lower in all positions. After touching an average of £10 16s. 3d. per ton, it is now again quoted generally at £10 12s. 6d. to £10 15s., less 3½ per cent., according to position.

#### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The talk which has been prevalent in some quarters recently of a possible further advance in prices with the close of the present month, has completely subsided; and at a meeting of the West Lancashire Coal Sales Association held last week, no proposition was even made that prices should be altered. The question was unanimously adjourned till towards the close of November; the representatives present evidently being content to allow both inland and shipping list rates to remain for the present on their existing basis, although, in the case of shipping orders, this represents 1s. to 1s. 6d. per ton under what is just now actually being obtained on current sales. The better qualities of round coal have been in rather more active request during the past week; no doubt owing to the winterlike weather, and pits remain in the position that they are accumulating very little in the way of stocks for winter requirements. Common round coals, although in less pressing inland demand, especially for iron-making purposes, are still moving away pretty freely for shipment; and there is no surplus of any moment hanging at collieries. Prices at the pit mouth remain firm at 16s. 6d. to 17s. 6d. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, and 12s. 6d. to 13s. for steam and forge coal; while for shipment, although the official minimum basis is 15s. 3d. per ton, 16s. to 16s. 6d. is being obtained for the ordinary sorts, up to 16s. 9d. and 17s. for the very best qualities of steam coal, delivered at the ports on the Mersey. The position with regard to engine fuel is not quite so satisfactory as in round coals. Though at a meeting of the West Lancashire Coal Sales Association a formal resolution was passed confirming the minimum basis of 10s. 6d. for slack, list prices are not being maintained outside the Association; and even some associated members are reported

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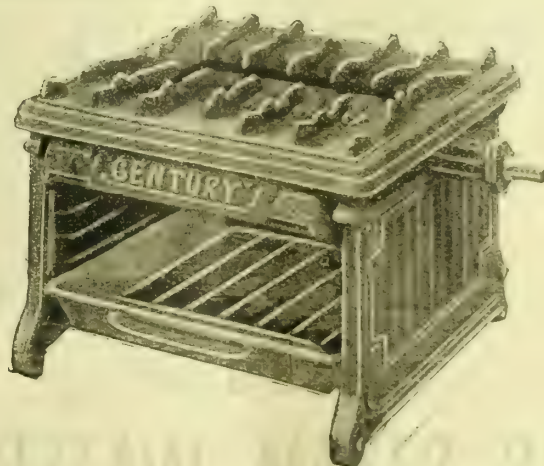
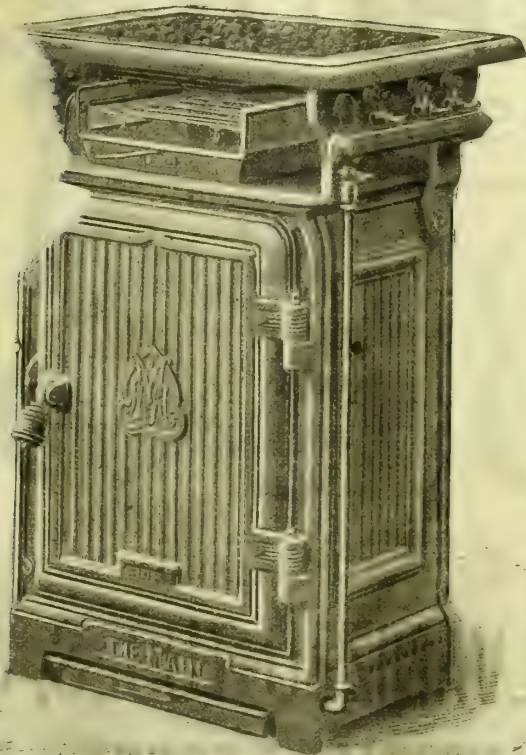
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to have been underselling recently in the open market. At any rate, the question has been adjourned for further consideration. In the meantime, surplus slack is coming in from other districts at much under the official quotations of the Lancashire collieries. Common qualities of Lancashire slack can be bought at from about 9s. to 9s. 6d. per ton, with best sorts quoted from 10s. 6d. to 11s. per ton at the pit. The inferior qualities of coke for furnace purposes continue weak, with lower prices quoted, not so much by Lancashire makers as in the Yorkshire district; and from 15s. to 20s. at the ovens, according to quality, represent about the figures at which contracts could now be placed. Foundry cokes continue in fairly good demand, and are generally maintaining late rates; averaging about 28s. to 30s. per ton at the ovens.

**Northern Coal Trade.**—The coal trade of the North shows continued quietness, more especially in the steam coal trade. Best Northumbrian steam coals are rather weaker in demand, and lower in price; the effect of the loss of the Baltic trade being more greatly felt. The price of this class of coals is about 17s. to 17s. 3d. per ton, f.o.b., second qualities are 16s. 6d., and steam snalls are 9s. 6d. to 10s. In the gas coal trade, the demand increases as the nights lengthen, so that a large portion of the production is taken up in the supply of the large contracts that are running. For occasional cargoes, the quoted price is about 17s. per ton. This is lower than a month ago, but is still 1s. per ton above the rate at which the chief contracts are now being delivered, and still more above those which have been settled for long periods ahead at from 13s. 6d. to 13s. 9d. per ton f.o.b. The coke trade is steady, except for the export kinds; the closing of the Baltic having minimized the demand for the latter. For export, 25s. to 29s. per ton is the f.o.b. price; while for blast-furnace kinds about 26s. is the medium quotation. Gas coke is quoted at from 24s. to 25s. per ton, f.o.b.; but there are some contracts running at lower figures.

**Scotch Coal Trade.**—It is now admitted that a time of difficulty is ahead in the coal trade. Exports are declining; the home demand is largely due to a desire to stock coal, which the miners object to; and, according to the wording of the agreement which has been come to, the miners' wages are to rise higher still. When the inevitable rush of workmen to the pits takes place, these wages will not be maintainable; and then trouble with the Unions may be looked for. Over and above all, if rings or corners be formed among those who have coal to sell, the market will be an exceedingly ticklish one to operate in for some months to come. The prices quoted are: Main, 15s. to 15s. 3d. per ton, Glasgow, f.o.b., ell 15s. 6d. to 16s. 6d., and splint 16s. 6d. to 17s. The shipments for the week amounted to 227,519 tons—a decrease of 13,048 tons upon the previous week, but an increase of 46,587 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,135,478 tons—an increase of 1,967,451 tons over the same period of last year.

**The Proposed New Gas-Works for Coventry.**—At to-day's meeting of the Coventry City Council, a report will be presented from the Gas Committee, recommending the erection of auxiliary gas-works, at an estimated cost of £130,000.

**Proposed Purchase of the Devonport Gas-Works by the Corporation.**—Notice has been given by the Devonport Gas Company of their intention to promote a Bill in the ensuing session for the increase of the capital and other purposes; and last Thursday, a private meeting of the Town Council was held to consider the matter. The Corporation recently consulted Mr. C. R. Bellamy, of Liverpool, as to the improvement of the street lighting; and they have since asked his advice on the subject of the purchase of the undertaking. It is stated that Mr. Bellamy has strongly advised the Council to promote a Bill for the purchase of the works. A resolution in favour of this course was adopted after considerable discussion. The Company was formed in 1853, and the capital consists of 7000 original and 300 guaranteed shares, each of £5, and of £15,000 in debenture bonds—a total of £65,000. The income last year amounted to £39,312.

**Honiton Water Supply.**—The question of the water supply was further considered by the Honiton Town Council at a special meeting held last Wednesday. It was decided to proceed with the scheme proposed by Messrs. Beesley, Son, and Nichols, of Westminster, and to make application to the Local Government Board for permission to borrow the money. In the course of the discussion, Mr. F. A. Buckingham accused the majority of the Council of attempting to rush the scheme through; and he proposed that its consideration be deferred until after the municipal elections on the 1st prox. Mr. G. Gidley, who seconded this, alleged that the water with which the town is supplied from St. Cyres is not pure, and that to impound it in a reservoir would make its condition worse. The Mayor (Mr. R. H. Matthews) said the reports of the Medical Officer of Health showed that the water was pure; and Mr. E. W. Matthews added that two-thirds of the competing engineers totally or in part favoured the present source of supply.

**Gas at the Brewers' Exhibition.**—There was little of special interest to readers of the "JOURNAL" at the Brewers' Exhibition, held at the Agricultural Hall, Islington, last week. Incandescent gas lighting was in use at several of the stalls; but the brilliant display made for several years in succession by the Incandescent Gas-Light Company at the end of the arcade leading to the hall from the principal entrance was conspicuous by its absence. Messrs. Richmond and Co., Limited, had a representative show of their stoves on the ground floor of the hall; and so had the Eagle Range and Gas-Stove Company, Limited, both there and in the gallery—the exhibits in the latter place comprising the latest types of "Acme" gas-stoves, carving-tables, hot closets, &c. As usual, Messrs. S. Clark and Co. had a varied and very effective collection of gas heating-stoves, gas and oil bar-stoves, and gas mullers. Gas-engines were shown by Messrs. Crossley Bros., Limited, and by the National Gas-Engine Company, Limited; the former having a 26½-horse, and the latter a 12½-horse power engine at work. The "Stockport" gas-engine may be said to have found a permanent home for the provision of power at the Agricultural Hall. At the stand of Messrs. M'Rae and Co., new types of small gas and oil engines, constructed according to the Gardner patent, were on view. The Matchless Gas Lighting Syndicate and the Incandescent Accessories and Maintenance Syndicate were showing their respective specialities.

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## EDITORIAL NOTES.

## The Fall in Iron and the Coal Outlook.

WE touched briefly upon the coal situation last week, and should not have reverted to the subject so quickly had not events that have since occurred been so pregnant of hope for the future as to demand the attention of all concerned in the prosperity of the gas industry. We refer to the action of two of the leading bar-iron makers, which resulted in the issue last Thursday of circulars by all the principal merchants in the trade, reducing their list price of bars by £1 a ton, making a fall of 35s. in the month. This acceptance of what has for some time been the inevitable result further in a general reduction of prices in the iron and steel trades; the level now reached being on the average that of this time last year. This level is, however, still too high to induce business. In fact, the cutting down of prices has had an opposite to the desired effect; for it has made customers more cautious and reluctant to buy than ever. No one, naturally, will buy more than actual daily requirements until he feel assured that prices will not go lower; and the man who possesses such an assurance at the present time is not to be found, even among those most willing to be convinced—namely, the sellers. It is, indeed, candidly admitted that prices must come down further in order to meet foreign competition, "which is more in evidence than it has ever been before."

The bearing of these facts upon the future of the coal trade is obvious. If, in order to secure orders (which are becoming daily more scarce), the iron trade has to largely cut down prices, one of two things must happen—either coal must come down in price as well, or the ironmasters must blow out their furnaces, as, indeed, some of them have already done. There were only 360 furnaces in blast in Great Britain at the end of September, as compared with 372 at the end of August, and 380 the year before. The iron (like the coal) merchants are beginning to realize that it is possible to kill the goose that lays the golden eggs. Gas managers will, we feel sure, not rush to their assistance, but will conserve their orders for mains and structural iron as closely as possible in order to help, not hinder, the fall in the present prices of these goods. The large orders for locomotives recently placed by the railway companies must, for the credit of the directors, be deemed to have been urgent, or the contracts may have had provisional clauses. Otherwise the policy of giving out the orders at present does not commend itself as the most wise. The contracts for cruisers just concluded by the Government will keep the Scotch trade from any absolute lack of business during the coming year, but will not have any marked effect in arresting the depression that is creeping over the engineering and iron trades in general. The downward progress of coal prices will in all probability not be so rapid as that of iron, and may be retarded by a spell of cold weather. But that it has begun, is very evident.

As is noticed in another editorial paragraph to-day, Mr. Livesey announced at the meeting of the Gas Companies' Protection Association last Tuesday that the Crystal Palace Company have been able to buy some additional coal at a reduction (as compared with contract rates) of 3s. a ton; and, although prices have not been officially marked down to any material extent, a good deal of quiet underselling is going on in the market. The situation is, in fact, causing no little uneasiness in the trade. Stocks all round are heavy; and deliveries to the London Gas Companies are, we understand, close up to, or in excess of, the quantities scheduled—a very different state of affairs from that which prevailed at the beginning of last winter. Collieries, too, are pressing forward contract deliveries, in order not to either accumulate coal at the pit head or stop work. Little casual buying of gas coal is being done, as few companies have run the risk of repeating their last winter's experience. As, moreover, the shipment of coal abroad is reported to be easing off—we shall to-morrow know more definitely to what extent, when the Board of Trade returns for October are available—and the great activity of Continental trade appears to have passed its climax and to be falling away, there is every prospect of a decidedly easier market in the spring, and of a gradual fall during the winter, unless the weather be very severe. As to that, who shall prophesy?

## The Result of the London Borough Elections.

THE London municipal borough elections were held last Thursday, with the result, as is candidly admitted by the



"Daily News," that "the Moderates have swept the board." There are many and substantial reasons why this result should be regarded with deep satisfaction by the public, as well as by ratepayers generally and the owners of public supply undertakings of all kinds. It is a sign, to begin with, that the monstrous pretensions of Progressivism are now being found out, and that London ratepayers are tired of being bled for the sustenance of "organized Labour," and of seeing all municipal institutions exploited in the interest of a class. Progressivism, as a classification in municipal politics, dates from the bad time of the first London County Council, when all manner of charlatans and busybodies of no importance foisted themselves into the new body by adroitly using the electoral organization of one political party, while professing to be superior to all considerations of party. They simply claimed to be pre-eminent in public spirit, and to have the monopoly of civic virtue. The bulk of the ratepayers were caught napping, and awoke to find themselves saddled with a set of representatives in local government with whose ideas they had no sympathy. Those reasonable men who did not happen to be Fabians, or Social Democrats, or Philosophic Radicals, or professional Trade Unionists, were forthwith dubbed Moderates by their triumphant opponents, who appropriated to themselves the more attractive name of Progressives. There is a good deal in a name; and by degrees this new-fangled classification in municipal politics spread over the whole Metropolitan government system, and also throughout the country. For a time, this trick of nomenclature rewarded its originators with power and popularity. "Progressive" was a name to conjure with; while "Moderate" was only just removed from being a term of reproach. As a keen critic of municipal politics has well observed, "no one would be satisfied with a 'moderately fresh egg or a moderately honest servant.'" So, this time, the prejudicial label was discarded. The Progressives, unabashed as usual, were to be heard of in connection with Radical and Socialistic organizations; while the opposing candidates' cause was espoused by the Conservative and Liberal Unionist Alliance.

The practical effect of this manner of conducting the election is that the party convicted of extravagance, faddism, and truckling to Trade Unionism, has been placed in a minority in all but five of the new Borough Councils. Lord Rosebery's advice to the ratepayers to choose men of business and sound views of public duty, has been generally followed. The voters have rejected the appeals made to them to return only the candidates pledged to make municipal employment a Paradise for Trade Unionists, and have polled solidly for men who promised, first and foremost, to keep an efficient guard upon the public purse. Wherever Progressivism has been most rampant, there the rates have risen fastest; and the ordinary ratepayer has seen nothing in return for it. This observation has gone home to the average Metropolitan ratepayer at last; and consequently the very sound of Progress, in the municipal sense, frightens him to the poll in the opposite interest. The "Daily News" sapiently puts down the defeat of the Progressives to the "public-house" interest, which is one more example of that disinclination to look facts in the face of which we spoke last week as a weakness of one school of politicians. Progressivism has been cast out of the London boroughs because of its shortcomings and extravagant cost. While the rates have largely increased, the ordinary and necessary work of town management has not been better done. The streets are no cleaner, nor better lighted and paved, than when the rates were lower. If there is one thing connected with local self-government that impresses the ordinary citizen more than another, it is the continual rise of the rates and the portentous growth of local indebtedness, although rateable value is continually increasing also. The more people there are to pay rates, the higher the rates they have to pay. This is the gist of the whole popular view of the rating question. There is no "public-house" or "vested interest" influence about this deliberate judgment of the ordinary ratepayer. He sees local government outlay mounting faster than local resources; and he thinks it ought to be otherwise. For this reason, chiefly, he is giving his support to men who promise to look after the pence in local expenditure. He is persuaded that economy might be combined with efficiency in a degree that cannot be expected while the minds of those who hold the purse-strings are filled with grandiose schemes for benefiting the labouring class population solely; and he means to try to

get his views on this matter carried out. This, it appears to us, is the moral of the London borough elections.

#### The Guildhall Conference on the London Gas Question.

THE Conference of Local Authorities convened by the Corporation of the City of London, to consider the question of the charges of the London Gas Companies, was duly held last Wednesday, at the Guildhall. The proceedings were formally opened by the Lord Mayor, who was succeeded in the chair by Mr. Alpheus Cleophas Morton, who, as our readers are aware, has of late years devoted to the work of the Common Council, and concentrated upon the Gas Question in all its phases, that meticulous attention which he once gave to the affairs of an ungrateful Empire in Parliament. Mr. Morton delivered himself of a smashing indictment of the Gaslight and Coke Company's administration of their great property—of course, contrasting it with that of the South Metropolitan Gas Company, which he reminded his auditory is "not a charitable institution." Naturally, the burden of his song was that one Gas Company ought to be able to do the same as another; and, if not, he wanted to know the reason why. Mr. Morton's speech was pointed at the end by reference to some very remarkable gas consumers' complaints. Mr. H. C. Richards, Q.C., M.P.—strange to find this name in such company—supported the object of the meeting. Mr. Trenner, of Holborn, endeavoured, without success, to improve the position he gained at the earlier conference of the London County Council. Mr. B. L. Cohen, M.P., spoke well and much to the point, as usual. His was the gravest pronouncement of all; and we prefer to leave his reported words to speak for themselves. Another serious speaker was Colonel Blair, of Paddington, who rightly protested against the insensate manner in which the London County Council have dealt with the Gas Question. There were, as a matter of fact, several sensible contributors to the discussion, who really knew what they were talking about. Others, of course, only aired their ignorance. We fancy there might be a Committee of thirteen or so, selected from among these delegates, to whom Parliament would be likely to listen in respect of the proposals of any future London Gas Bill. Perhaps it would not be a bad thing if the Companies themselves could confer with these gentlemen beforehand, and so find out exactly where the trouble lies. Sooner or later, *ex parte* proceedings come to a dead stand. Then a way to further progress must be opened by arbitration or war; and it seems a pity that it must always be war.

#### Gas Workers' Wages.

FROM different parts of the country intelligence reaches us to the purport that the Gas Workers' Union are moving again to get a general advance of wages for all descriptions of gas-works labour. We are not disposed to press once more in this connection the vexatious question of "recognition of the Union." In works where this desire of Trade Union officialdom has been compassed, there is small probability of the rates of wages being determined by ordinary commercial considerations; but where labour is free, it will be for the employers who are asked to pay more to satisfy themselves as to how their employ stands in the market. In London, for example, about two years ago, gas stokers' wages were voluntarily advanced by the leading Companies, making this class of labour worth an even 6s. for an eight-hour shift. Naturally, at the time, credit for securing this advance was promptly taken by the Gas Workers' Union, who obtained some gratuitous advertisement, in a few newspapers, on this account. The fact of the matter was that prior to the advance stokers' wages had remained stationary for many years; while the pay in all the employments chiefly affected by winter hands—such as the brickmaking and building trades—had risen considerably. The turn of the labour market, that is to say, was against the gas manufacturer; and he had to raise his rate of pay accordingly. Up to, and including, the present hour, 6s. per shift has proved adequate to attract an ample supply and satisfactory quality of labour. There is no indication of the supply of suitable labour falling off in the London district; while there are certain good and definite reasons why it should continue to flow into gas-works throughout the kingdom. Unskilled labour in the building trade has been in less demand this year. The brick trade has been much depressed, especially in the Midlands. The increase of wages paid to colliers and iron workers in consequence of the inflation of these trades—now showing signs of collapse—which may be adduced as a reason for the movement under



notice, has no natural connection with gas stokers' remuneration. In the first place, wages in these trades are shifting. When trade is good, they go up; when it is bad, they fall. Gas-works labour, on the contrary, is not subject to these fluctuations. Wages may, and do, rise in gas-works; but they never drop. The bulk of the men employed in gas manufacture know this well enough, and are content to have it so. Besides, with the close of the war in South Africa, the supply of labour must increase. All this goes to show that where stokers' wages are proved to be sufficient to attract enough suitable applicants for employment, the demands of the Gas Workers' Union can be treated with the scant respect they deserve. There is no prospect whatever that unskilled labour will be generally dearer this winter than it is now. This being notoriously the case, the presumption of the Union in seeking to force a general advance in gas workers' wages is merely a piece of "bounce," which can only succeed by artificial aid. It has no justification in the state of the labour market; and without this foundation to work upon, no Trade Union demand for higher wages has ever borne fruit.

#### The Work of the Gas Companies' Protection Association.

THE third annual meeting of the Gas Companies' Protection Association, held under the presidency of Mr. G. Livesey, was attended by a small but representative group of supporters of the organization. The report submitted by the Secretary (Mr. F. E. Cooper) testified to the usefulness of the Association, particularly as regards the smaller Gas Companies; and the Chairman delivered a speech warmly commending the Association to the support of all Companies, who never know when they may need competent legal and parliamentary advice. It is satisfactory to learn that measures are actually under consideration for opening the Association to the smallest Companies at a low rate of subscription. There is money in hand at present; and as this state of things is not a necessary feature of the prosperity of the organization, it becomes a fair question how to extend its benefits at a smaller charge. As Mr. H. E. Jones remarked, the opportunity afforded by the meetings of the Association for ventilating in council the most important points of Gas Company administration, is worth more than the subscription. On the present occasion, an interesting discussion on local stock issues was raised on an inquiry by Mr. R. Hall, of Matlock. Some valuable information relating to the subject was given by the Chairman, Mr. William King, Mr. Charles M. Ohren, and others. Mr. Livesey also took the opportunity for publishing the comforting intelligence that the Crystal Palace District Gas Company have managed to buy some coal for the winter at a fall of 3s. per ton in the three weeks the bargaining lasted. It was assuredly worth going to the meeting only to hear this news.

#### Bradford Declines Municipal Collieries.

BRADFORD, having slept upon the proposal to apply for parliamentary powers to go into municipal coal mining, has thought better of it, and dropped the idea, though only by a narrow vote in the Town Council. The story is very instructive. Less than a month ago, the Bradford Corporation passed the resolution to apply for these powers, seemingly in a very light-hearted way. The portentous proposition was adopted as if it had been a mere question of detail in the ordinary work of the Corporation. Now, however, Mr. Williamson has criticized the suggestion in a manner worthy of the reputation of Yorkshiremen for level-headedness. He asked the Corporation to rescind the resolution, for weighty reasons which, one would think, ought to have prevented the majority of the Council from ever committing themselves to this "Midsummer madness" of municipal trading. He declared that no sensible man would talk about buying collieries just now. It is not a question of Municipalism, but of common sense. Two years ago, the Bradford Corporation Gas-Works used coal costing 8s. a ton. The present price is nominally 15s.; but a reaction has already set in, and probably in two years' time coal will be down to the old price. Meanwhile, on the top of this inflation of values, the proposal is made to buy the necessary collieries. This would mean a capital outlay for Bradford of at least £7,000,000, on the most moderate estimate. Where is the money to come from? Why buy collieries at the top price, and take all the risk of the value falling, as it can hardly increase? Mr. J. Triffitt followed on the same lines; but, for all this weight

of reason, the foolish resolution was only rescinded by 31 votes to 29. This does not speak highly for the collective wisdom of Bradford, as represented in the Corporation. Eternal vigilance on the part of the wise men to be found in all cities would still appear to be the only safeguard against the democracy making a fool of itself. Suppose Bradford to be a seaport, would high freights be accepted as a sufficient reason for the municipality purchasing a fleet of colliers? It is high time the scales of an inflammatory Municipalism dropped from the eyes of local authorities generally. It is a good thing that the Bradford case was cured by an appeal to ordinary business considerations, without any reference to "principle." That is the best way to deal with these questions. Even the most confirmed municipalizer will shrink from the avowal that he would commit the ratepayers to a transaction which he would not enter into on his own personal behalf.

#### An Architectural Competition that Failed.

It has been a stock grievance of British architects that the national and local government works departments have a habit of neglecting to take the advice of members of their profession in regard to the design of bridges and the laying out of new streets. There was a tremendous fuss made in professional circles over the circumstance that an architect was not joined with the Engineer of the London County Council for getting out the drawings of the new Vauxhall Bridge; and over and over again it has been preached in the editorial columns of the "Builder" that the disappointing character of much of the modern public work done in London and elsewhere is due to this habitual slighting of the architectural profession. The assumption at the back of all this complaining was, of course, that if public authorities only paid as much regard to architects as they do to engineers, all would be well. Unfortunately, this assumption, natural enough in the columns of the "Builder," is just what ample experience of the performance of British architects deters outsiders from accepting as an article of faith. Without attempting to frame an indictment against the profession as a whole, it is only too easy to show that, when implicit confidence has been reposed, on occasion, upon selected architectural advisers of public authorities, the result has been disappointing. It is to be feared that the latest experiment in the way of consulting eminent architects on the laying out of a great London street will not be regarded as a success. As all the world knows, the London County Council have in hand the making of a new street from Holborn to the Strand, involving a sweeping reconstruction of the whole region lying to the north of Somerset House. With a view to getting some expert guidance as to the most effective utilization of the new frontages and thoroughfares, the Council invited designs from eight architects who were paid £250 each for their work. There was no pledge to carry out anything. During the past week, all the sketches have been publicly exhibited; and, to the general surprise, many people went to see them. Our own interest in the subject is chiefly centred on the question whether, when it is made, the new quarter of the town will be as bright and easy to light as Paris and Berlin, or as tomb-like as the newly-built precinct lying between East Strand and the River Thames. Such public opinion as has found utterance respecting the plans, condemns them roundly. Even the "Builder" only utters the faintest of faint praise. None of the eminent architects has risen above "an astonishing degree of impracticability," as one critic ably expresses it. The paramount requirements of light and air and business convenience are, as usual, to seek. Nobody affects to believe that this interesting competition is likely to result in anything practical. The money it cost has not been thrown away, inasmuch as it has exposed the weakness of contemporary British architectural art, and the impossibility of relying on it implicitly to rise to any occasion.

For the Secretaryship of the Birmingham Corporation Gas Department, which will be resigned by Mr. Edwin Smith at Christmas, there are 120 candidates.

Mr. George Laurence Gomme, the Statistical Officer of the London County Council, has been appointed Clerk, in succession to Mr. C. J. Stewart, who resigned a few months ago.

An interim dividend will be paid by the Singapore Gas Company, Limited, on the 10th inst. for the half year ended the 30th of June last, at the rate of 3 per cent. per annum; being at the same rate as that paid for the corresponding period last year.



## WATER AND SANITARY AFFAIRS.

As the Local Government Board is the Department of State which includes among its multifarious duties the supervision of the Metropolitan Water Supply, a considerable portion of its annual reports, which increase in bulk as years roll on, consists of a record of the work of the two officials appointed under the Metropolis Water Act, 1871—the Auditor and the Water Examiner—who keep a watchful eye, on behalf of the public, on the Water Companies' operations and on the general condition of their finances. The twenty-ninth of the series, which has lately been issued, deals, as far as water supply is concerned, with the year ending Dec. 31, 1899; and though this period does not coincide in all cases with the Companies' financial year, the particulars given are none the less interesting. The portion of the report furnished by the Water Examiner (Mr. Charles Perrin, M.Inst.C.E.) is longer and of rather more general interest to our readers than that of his colleague (Mr. Allen Stoneham); and therefore it claims preferential notice. It is supplemented by an interesting "Memorandum" giving the results of the chemical and physical examination of the waters supplied by the Companies, together with six diagrams. As Mr. Perrin took up his duties in succession to Major-General Scott somewhat late in the year covered by the report, he admits that the information he furnishes cannot be based on personal knowledge, and that therefore it has been compiled from facts already on record, as well as from particulars obtained from officers of the Companies. These show clearly that there was no falling off either in the quantity or the quality of the water supplied to London in 1899. The population served on the 31st of December was approximately 6,020,845, as compared with 5,875,000 at the corresponding date in 1898, and the total volume of water delivered was 76,741,974,268 gallons, against 74,479,593,644 gallons in the previous year. Of the entire bulk, the Thames furnished 57.43 per cent.; the River Lea, 21.3 per cent.; springs and wells, 21.21 per cent.; and ponds (for non-domestic purposes), 0.06 per cent. Allowing for the increase in the number of people served, these proportions do not vary to any great extent from those for the year 1898; but the principal difference is on the side of improvement—the water derived from springs and wells being 21.21 per cent. of the entire bulk, as compared with 20.78 per cent. in the previous year. In fact, there has been, on the whole, a gradual increase in the quantity of water obtained from the purest sources since 1885, when it was only 11.16 per cent. The total daily supply was 210,251,984 gallons, for a population averaging 5,948,338; representing a daily consumption of 35.35 gallons per head and 238.05 gallons per house for all purposes, against 35.09 gallons and 236 gallons per house in 1898. The past year was a dry one; the rainfall being 12.4 per cent. below the average for the ten years 1870-79. On the 31st of December, about 93 per cent. of the houses in the Metropolis were on constant supply; and in 1793 $\frac{1}{2}$  miles of streets the mains were always charged. Mr. Perrin recognizes the efforts made by the Companies to render the water supply more efficient by connecting their systems of distribution at various points, so as to facilitate mutual assistance; and he gives particulars of the new works carried out during the year.

The figures already cited furnish evidence, we think, that the Water Companies have proved themselves to be equal to meeting all the demands of the consumers. A supply of nearly 35 $\frac{1}{2}$  gallons of water per head of the population for all purposes, or 28 $\frac{1}{2}$  gallons for strictly domestic uses, surely cannot truthfully be called inadequate. Nor is its quality such as to justify the opprobrious terms applied to it by certain public speakers who persistently condemn the reports of chemists of the highest standing. This is amply shown by the "Memorandum" to which reference has already been made. The Local Government Board sustained a double misfortune last year by the loss of Sir Edward Frankland almost simultaneously with the death of General Scott; and consequently the reports on the chemical and physical examination of the waters supplied to London emanate from three sources. Those for the first seven months of the year were, as usual, by Sir Edward Frankland; those for August and September, by his son, Dr. Percy F. Frankland, F.R.S.;

and the rest by Dr. T. E. Thorpe, F.R.S., who succeeded to the position held for so many years by the above-named distinguished Chemist. Under these circumstances, no general report could be made to the Board on the examinations; and therefore the "Memorandum," which is based upon the monthly reports, was prepared in the Department. It is gratifying to find that its compilers have been able to vindicate the Metropolitan Water Supply from the aspersions freely cast upon it. It is pointed out, at the commencement, that the only chemical impurity of any consequence is organic matter; and the second of the diagrams given, in which the raw Thames water at Hampton is compared with the average filtered water as delivered to the consumers, demonstrates how great is the chemical improvement effected by the Companies' operations. Unfortunately, the Board were not in possession of the information necessary to enable them to carry the curves on the diagram on for the last three months of the year. Another striking diagram is that referring to the Lea. It shows that, except in January, February, and November, the water delivered by the East London Company was "uniformly of excellent chemical quality." A further diagram gives proof that the New River Company's supply was, for seven out of the first ten months of the year, substantially "of the chemical character of excellent spring water;" while for four months it was "even better than the average of the deep-well waters." Let us see what improvement has been made in this respect during the past thirty years. Taking the mean proportion of organic matter contained in the Thames water delivered in 1868 as 1000, the figure in 1899 was 818. Applying the same standard to the Lea, the figure, which went up from 484 in 1868 and 618 in 1869 to 1013 in 1880, was 566 in 1899. The water from that river delivered last year, therefore, was, in respect of organic purity, of fair average quality. Mr. Perrin reports, however, that the year 1899 was, on the whole, favourable for the filtration operations of the Companies supplied from these rivers. This testimony to the character of the London Water Supply may be left to the consideration of those members of the new Borough Councils who contemplate making a bid for cheap notoriety by abusing the Water Companies, and depreciating the commodity they sell.

Turning to Mr. Stoneham's report, we find that the rates of dividend paid by the Companies last year were, with the exception of the East London Company, either the same as, or slightly higher than, those for the previous twelve months. The total amount received by the Chamberlain of London, up to the end of 1899, under the operation of the sinking-fund clauses in the Acts of the East London, Lambeth, and Southwark and Vauxhall Companies, was £35,793, of which £35,312 has been employed in the purchase of stock for the ultimate extinction of the Companies' capital. The Official Auditor's relations with two of the Companies were not of the most harmonious character last year; and he sets forth the points on which difficulties arose. A sum of about £3550, expenses incurred by the Companies collectively in connection with the investigation and verification of the books of reference and plans deposited by the London County Council in respect of the London Water (Welsh Reservoirs and Works) Bill, and the procuring of evidence of non-compliance with Standing Orders in the case of the petition for the Bill, is specially singled out by Mr. Stoneham for objection, on the ground that the Companies had "no direct interest in the lands and water rights proposed to be taken." With all respect, we submit that they had a very direct interest in opposing *in limine* the measure referred to, forming as it did a portion of a gigantic scheme which they conceived, and which Lord Llandaff's Commission have since declared, to be unnecessary. However, the Official Auditor was advised that the Companies had no right to be heard at the initial stage; and therefore he deemed it to be his duty to take the necessary steps for giving them an opportunity of appealing to an arbitrator on the matter. The Auditor's objection will scarcely hold good in the case of similar expenditure in connection with the Bill which the London County Council will be asked by their Water Committee to promote at their meeting to-day; its single object being, as shown by the report which appears elsewhere, to sanction "the purchase by the Council of the undertakings of the eight Metropolitan Water Companies." In this measure the Companies certainly cannot be said to have "no direct interest."



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1161.)

THE Stock Exchange had another dull period during the week just closed. To begin with, business was, of course, a good deal handicapped by the triumphal entry into the City of the C.I.V. on Monday. Then, Thursday was an annual holiday, on which the Exchange is always closed. This left two disjointed breaks of two days each to represent a week's work. There was scarcely time to develop any marked tendency; and business continued dull, flattish, and generally devoid of interest. Prices for the most part are down; but the drop everywhere was only of inconsiderable magnitude. Perhaps when the American election and our own Cabinet arrangements have been got over, the markets may grow livelier and firmer. There was nothing of importance to note in the Money Market beyond a quiet, firm attitude. Changes now-a-days are swift and sudden; but, without venturing in the dangerous field of prophecy, it may be said that the 4 per cent. Bank rate, now nearly four months old, looks as if it were going to last a bit longer. Business in the Gas Market was certainly not so quiet as it had been the preceding week; but still it was not active. On the first day or two, there was very little doing; but Wednesday and Friday redeemed the week from a position of threatening stagnation. But there was almost absolute stagnation in values. A couple of minor issues had a slight advance, and none receded; but all the leading issues were marked continuously at unchanging figures, never ranging off the line more than a fraction either way. Thus, Gaslight ordinary was done every day at 99; and sometimes a fraction above or below that figure. The secured issues did nothing to speak of. The South Metropolitan price was 130½—once only varying to 130¼. Commercially were hardly noticed—one transaction in the debenture being the total. Next to nothing was done in the Suburban and Provincial group; but Crystal Palace had a rise of a couple of points. The Continental Companies were as quiet and as level as the rest; but Imperial Continental debenture improved a point. There was no incident among the remoter undertakings. Among the Water Companies, business was much the same as usual; and the tendency to improve in value which recently showed itself continued by a few moderate advances.

The operations of the week showed that only on one day did Gas quotations make a move; Crystal Palace advancing 2, and Imperial Continental debenture 1 on Friday. In Water, on Monday East London rose 1, and Grand Junction 1½. On Tuesday, Southwark ordinary rose 2. On Friday, East London debenture gained 1, and West Middlesex ½. On Saturday, New River fell 2.

### ELECTRIC LIGHTING MEMORANDA.

**Why Local Authorities Shun Depreciation of Electric Lighting Plant—Example of the London County Council—Free Wiring as a Bribe to Municipal Electors.**

THE wilful blindness of local authorities to the necessity of providing for the depreciation of electricity supply plant seems to be incurable where the profits of the undertaking do not pay working expenses and the first capital charges of interest and sinking fund. That is the sum and substance of the matter. While it remains imperatively necessary, notwithstanding most complaisant book-keeping, to draw upon the rates for keeping the concern going, municipal electric lighting committees cannot bring themselves to ask the ratepayers of the present to hand over something extra to provide for the future. The position is quite intelligible, and (human nature being what it is) excusable. Nevertheless, the trick of living upon capital is bound to land those who practise it, or their successors, into difficulties hereafter. One of the ugliest workings of municipalism under this policy of make-believe is the constraint put upon public officers, who know better, to back up the false pretences of their committees. Many municipal electrical engineers in all parts of the country are found writing reports, or making statements in the local newspapers, to protest that they do not want any depreciation fund. It is scandalous; but these officials cannot help themselves. Perhaps some strong local critic of the corporation finds this hole in the electric lighting accounts, and draws attention to its existence by a letter to the leading local newspaper. The committee know that not one of their body is able to rebut the allegation; and consequently they put up the electrical engineer to do it. This kind of municipal cowardice is far more common than would be believed. Few municipal electrical engineers are strong enough to stand on the ground that their duties do not include the defence of the finance of the committee in the public Press.

It would be invidious, as it certainly is impossible, to keep the track of all municipal tricks of the kind; and therefore we judge it sufficient for the time being to remind all local authorities having indebtedness on account of electric lighting, of the very sound and unmistakable practice of the London County Council, acting in conjunction with the Treasury, with reference to the electric lighting loans of Metropolitan local authorities. Poplar, for example, applies for a loan of £25,000 on account of the electric lighting of the parish. This happens to form part of a very much larger capital amount; but the whole of it is advanced

on the same terms—namely, on the instalment system for 42 years, at 3½ per cent. The condition attached to this advance is that the Council will decline to sanction the raising of any loan to replace any of the plant and machinery during the currency of this loan, and will expect the borrowers to provide for all replacements and renewals required during that period (of 42 years) out of a sinking fund to be provided for the purpose, or from maintenance account. This ought to settle the question of the necessity of a depreciation fund. It is not that the Council are solicitous merely for the repayment of the loan. This is duly provided for, by the agreement that a rateable proportion of the total is to be paid back annually, on a fixed date. What the Council say besides is that the plant purchased out of the advance must be kept up out of revenue. This is not merely an obligation to repair, but also to renew. It is not too much to say that there are few local authorities' electricity undertakings in the kingdom that could replace a boiler or a dynamo out of revenue. The solvent ones, naturally, pay into a depreciation fund as a matter of course. Their only care is to ascertain what is a fair and proper allowance. The insolvent ones simply pretend that nothing of the kind is necessary—apparently unsuspecting the fact that every such undertaking that has no adequate depreciation fund stands thereby confessed of insolvency.

We are very glad indeed to notice that the "Electrician" utters a timely protest against the pandering of some candidates for election to the new Metropolitan Borough Councils, to the artizan voters, by promising free wiring and penny-in-the-slot electric meters at the public expense. This has been done rather largely in those Metropolitan districts where the local authorities have been "Progressive" enough to launch into electric lighting. As our contemporary observes, no exception can be taken to the working classes having electric light if they want it, or to their having it as cheaply as it is equitable to supply it. "But the terms in which these electoral addresses are couched reveal only too plainly the class prejudices to which they appeal, and convey the impression that whoever else may pay dearly for electricity—whether the well-to-do consumer or the ratepayers—the working man shall have it dirt cheap." This is obviously an electioneering promise of the "*panem et circenses*" order; and respectable politicians of every party ought to be above bidding for popularity in any such mischievous fashion. It reminds us of what we recently had to say in this column about the Poplar performance. These Progressive gentlemen, who thus offer bribes to the populace, would doubtless resent being likened to the Great Tempter; but they resemble him in at least this remarkable point—the bribes they offer are things which do not belong to them. One could understand a downright bid of five shillings a vote, or thereabouts, payable out of the candidate's own pocket. Such a way of bribing is at least honest and aboveboard. But our Corrupt Practices at Elections legislation will be a dead-letter if persons of advanced views of such matters are allowed to offer boons to people whose poverty appears to render them amenable to influences of this kind—boons to be provided in the long run at somebody else's expense.

### INCANDESCENT GAS-MANTLE COMPETITION.

THE article in last week's issue on the subject of gas-mantle competition and prices has received complimentary attention, and from no quarter has there come a note of disapproval. It is not intended to pursue the discussion of the general question to-day; but we may say that we shall watch heedfully for, give careful consideration to, and keep our readers apprised of, any evidence which points to the time when the gas manager and the gas consumer will be able to go openly and purchase, without fear of any unpleasant consequences, good mantles at a reasonable price—say, 4s. or 4s. 6d. per dozen. We do not give this as the ultimate or lowest figure at which progress in invention and knowledge may enable makers to profitably work; but it is mentioned as we have present incontrovertible evidence in England that mantles of quality can be put on to the market at that price, to the benefit of both producer and user. No one respects legitimate patent rights more than we do; but it frets one to see an unconscionably large capital, built up by various agencies in the past, causing any sluggishness in the advance of the system of lighting upon which the gas industry has centred its hopes, and stunting the growth of offshoots from the chief arteries in which progress has so far been effected.

We are merely reverting to the subject this week for the purpose of calling attention to two matters which have a direct connection with the competitive aspect—in the one case competition is, we are told, already active, and in the other the seed has been sown, but whether it will grow and be fruitful it is impossible to foretell. We will refer to the latter first. Incidentally in last week's article, we mentioned rumours which had reached this office of a new Company which was being formed for the purpose of introducing a mantle to be known as the "Standard." This Company was lifted from obscurity within the past few days by the publication of news as to its registration. It is proposed that the new concern shall have a capital of £60,000 in £1 shares; and the patents which it is intended to acquire and work are Nos. 2000 and 15,500 of 1896. Extracts from the specifications of the inventions were published in the "JOURNAL" for May 5 and October 27 of that year. The birth-place of both was Berlin; and the first bears the name of



C. Kortwich and the second R. J. Eiffe—this being a communication from F. Meyer and Co. Until we have a closer acquaintance with the mantles made under these patents, we cannot give any independent information about them; and readers who are impatient for precise knowledge as to their constitution must in the meantime be referred to our abstracts of the specifications in the issues of the "JOURNAL" already mentioned. Writing without investigation, there are about both mantles points which have the appearance of novelty. Herr Kortwich in his mantle aims at combining certain substances, possessing, on the one hand, a crystalline structure, and, on the other, the property of not readily entering into combination with the bodies contained in atmospheric dust—the mantle constructed according to the invention being, it is said, characterized by a high degree of firmness, illuminating capacity, and resistance to external influences. The researches of the patentee of the second invention to be acquired by the Company have demonstrated to him the following principle on which the luminosity of incandescent light depends: The oxides of certain elements are capable at high temperatures of taking up oxygen, and of yielding the same again; and thus, in the presence of reducing gases, or the like, of converting themselves into lower oxides, and on the subsequent access of oxygen again absorbing the same. All these bodies are designated "oxygen conveyors." The patentee illustrates his points fully in the specification; and, by following his prescription, he claims that a compound of "very good power of resistance and hardness" is obtained, which, on being exposed in the finished product to the outer surface of a non-luminous flame, emits an "intense light"—the combustion is intense, and the temperature is considerably increased. A pronouncement as to whether these patents are, or are not, anticipated by the Welsbach or any others is beyond ordinary mortals like ourselves; and to experts and lawyers we gladly resign the task of wrestling with the perplexing problem until they, or higher arbiters, solve it to the satisfaction of one or other of the parties. But if we may make use of Cowper here, we would say that these incandescent mantle questions appear to present

"Knots worthy of solution, which alone  
A Deity could solve."

Whoever comes into the field does so with full knowledge that their competition will be contested step by step by those already in possession; and preparation must be made accordingly.

Correspondents have been encouraged by last week's article to call attention to certain productions in which they are interested having a more or less intimate relation to the subject under notice. But we would point out that in our last article we steered altogether clear of the question of burners—confining ourselves entirely to that of cheaper mantles. Burners suitable and unsuitable for incandescent lighting, and at all prices, can be obtained in almost every town; and there is no bar to using on them mantles which in days past have maintained a legal status, and upon which there is no "limited license." The free competition in them will ensure that users are fairly treated; and therefore we do not see that anything would be gained by opening up a fresh question on that line. One correspondent calls attention to a bye-pass arrangement which he invented a few years ago for incandescent burners. But that has a very remote connection with the present subject; and, moreover, we find that the invention was described by us at the time the patent specification was issued. Perhaps the most interesting communication which the article produced was from the Birmingham Incandescent Lighting Company, Limited, who sent us a complete incandescent light which they sell in quantities of a dozen at the low price of 1s. each. Of course, there is not, and it can hardly be expected that there would be, that high-class finish about the burner which one gets with higher priced goods; and, as to the mantles, unfortunately those forwarded were damaged in transit, so that we cannot speak either of their efficiency or strength. But our correspondents assert that the mantles are not infringements of the Welsbach patent of 1893, "even supposing that document to be of any value," as they contain absolutely no oxide of cerium or uranium. The mantles, the Company inform us, are being retailed at 6d. each, 5s. a doz., or 50s. a gross—the last figure being "generally reduced to 48s." We give these prices not for the purpose of advertising the mantle, but solely as a point of interest for readers. The last figure shows that, for large users, the fourpenny mantle (if serviceable) is an accomplished fact in Birmingham. In the concluding paragraph of the Company's communication, they write: "These mantles are being used by the Birmingham Corporation and Board of Guardians; and this is not by any means the only Corporation which has adopted our mantle. . . . Trade with us is simply flourishing." This looks like active competition. In giving this information, however, we should like it to be clearly understood that we are not commending this burner or the mantle. We reserve our right in all these matters to commend or to condemn after trial; and this, we regret, through the accident of the mantles being fractured before their arrival, we have been unable to give in this instance. Nor can we state the manufacturers' own figures regarding the illuminating power and the consumption of gas, as they were not furnished. But the complete light can be obtained at such a nominal figure that many gas managers may be disposed to test it on their own account. For a cheap incandescent light, the prepayment meter system has created an opening the extent of which is beyond measurement.

## MINERS AND LAWYERS ON THE COMPENSATION ACT.

THE Workmen's Compensation Act recently underwent criticism by the representatives of two large classes of society interested in its working—the Miners' Federation of Great Britain and the Incorporated Law Society—and suffered little damage therefrom. Indeed, Mr. J. H. Cooke, the President of the North Wales branch of the latter Society, who read a paper dealing at length with the (1) Home Office report, (2) statistics furnished by a large Insurance Company, and (3) the decisions of the Court of Appeal under the Act, had nothing but good to say of its effects. With the statistics published by the Home Office, and with many of the appeals, we have already dealt in these columns; but the figures given to Mr. Cooke by the Ocean Accident and Guarantee Corporation are of considerable interest and constitute a new contribution to the somewhat meagre fund of reliable information available as to the working of the Act.

The Insurance Company referred to informed Mr. Cooke that they had issued policies covering the risks attached to employees earning over 80 millions sterling per annum—that is to say, something more than a million hands; and that, since the Act came into force, rather over 100,000 accidents had been reported to them, of which 1700 had terminated fatally. As probably these policies did not all commence so soon as the Act came into force, it may be said that this Company alone dealt with 50,000 cases of accident in the course of a twelvemonth. The Home Office estimate of 150,000 accidents in all occupations affected by the Act is, therefore, obviously within the mark. Yet only 999 cases, or about half of one per cent. of the total, were actually adjudicated upon in the Courts in 1899; and only a fraction of these could be classed as disputes—many being merely in the nature of friendly arbitrations. The cry that the Act breeds litigation, so frequently raised by those who love not the handiwork of Mr. Chamberlain, looks rather ridiculous in the face of the facts that are coming to light as time goes on. No wonder that Mr. Cooke, differing from some of the legal luminaries who think fit to air their views of the Act from the Bench, declared that, considering the Act to be a novelty in legislation, it had so far worked very satisfactorily, with a minimum of litigation, and had not proved to be a serious financial burden. He added that it had a general tendency to prevent pauperism, as in many cases the workman who was totally disabled would have to go upon the parish but for the compensation provided for him by the Act: "To the honest disabled workman, who hated the workhouse, the Act had been a ray of light and joy."

In the same strain spoke Mr. Parrott, one of the Yorkshire delegates to the Miners' Federation. He said that, "in many cases, the Act had been a perfect blessing." The chief amendment urged by other of the speakers on the subject at the Federation meetings, was one to extend the benefits of the Act to every worker—a proposal which, as we have before now pointed out, is by way of being a compliment, not a commination. The only other proposal of any importance for the amendment of the Compensation Act that was made at the miners' conference, was one to petition for the abolition of "contracting out." Upon this point the men seemed to have some curiously inaccurate notions; one being that, if a mutual scheme (quite erroneously called a "contracting-out" scheme) be certified by the Registrar of Friendly Societies, all the employees are compelled to accept it. Yet it is one of the principal conditions that must be fulfilled by any mutual scheme before it can be allowed to pass Mr. Brabrook, that it shall not contain any provision making it in any degree obligatory upon any man to become a party thereto.

Another wholly inaccurate idea that appeared to possess the speakers, was that a scheme certified by the Registrar could be, and in some instances was, deliberately less favourable in its terms than the provisions of the Act itself. One speaker at the conference said that, "as an instance of this, he would quote a case where a man was killed, and his widow received £90 as compensation. One-half of this sum, however, was contributed by the workmen themselves; whereas, if there had been no contracting-out, the widow would have been entitled to £300 compensation, all of which would have come out of the pockets of the employers." We wish the speaker had quoted the employment in which this scheme is in force. It would then have been possible to refer to Mr. Brabrook, when we should without any doubt have found that by its terms many substantial benefits outside those granted by the Act—such, for instance, as payment from date of injury, free medical attendance, or a higher rate of compensation in case of temporary incapacitation—were provided; and that the contribution of the employers was fully equal to their liability under the Act. The statement made by the delegate was doubtless the product of ignorance, and not malice; but a more misleading idea of the operations of a mutual scheme under the Act could not well be conveyed. If a chosen representative of the miners is so ignorant of those operations, and of the decided benefits accruing from the adoption of such schemes, it is little to be wondered at if they are unpopular with the rank and file.

No other criticism of the Act could be found to be made by the Miners' Federation, and what that was said by way of criticism is there that weighs aught against the first remark we quoted—"in many cases it has been a perfect blessing"? It may truly be said that the Workmen's Compensation Act is justified by its critics.



## THE SCIENCE OF GAS MANUFACTURE AND OTHER THINGS.

IN a recent issue of the "Engineer," there appeared an article professing to deal with the subject of Works Management, as a branch of a general discussion of Foreign and English practice in electrical and technical industry. Perusal of the article quickly reveals the interesting fact that the writer has very little to say on the subject of the management of works, but a good deal to advance, that certainly needed saying, about the whims and oddities of the men of science, the technicians, and the work-people of his country and time. We follow his pointed, occasionally stinging, observations here, because some of them have considerable bearing on certain recent statements of our own respecting the barrenness of British gas engineering, and the paucity of aspirants for distinction in this avocation.

Speaking of German works offices and their occupants, this candid critic of his countrymen and others makes bold to declare that the German engineer is, as a rule, better informed concerning what is going on in the world than the average young Englishman. Among the most striking of the things he notices in a German works office—apart from the polished parquet floor and clean and orderly look—are the "files of technical periodicals." The German is not always inventing and scheming things out of his own head. He is careful to know, to the very smallest detail, what is being done by every other engineer all over the world. "He reads French, English, and even American with ease. He carefully weighs the merits of various novelties, and quietly produces slightly improved versions of the best of them, without the expense or anxiety of working them out from the beginning." That is what makes the German such a thorn in the side of the original inventors of other lands. He is no believer in the old English fashion of keeping shop only in specialities. Unhappily, this fashion is not yet obsolete in England. We still have manufacturing firms whose goods are all patented, in consideration of which they are usually half as dear again as they might be. The perception that over-patenting is as bad as over-advertising, makes headway slowly in England and America. In Germany, on the contrary, the superstitious belief in the superiority of patented and much-advertised articles is not generally held. You will not persuade a German to pay a fraction more money for a cake of soap that is advertised everywhere as being the best, than the price at which any other satisfactory make of a similar sort of commodity can be had across the counter.

On the other hand, foreign workmen are, if anything, rather more disposed than English workmen to swallow the fallacies of Socialists, Communists, and Anarchists. Consequently, British engineering trade is protected not a little by the existence in this country of this superior political intelligence on the part of the working people. Our working folk are given to striking on small provocation, or none; and they—or the Trade Unionist contingent of them—believe as firmly as the Continentals in the iniquity of capital, and all the other economic garbage of Social Democracy. But the real liberty, and freedom from over-government, enjoyed by the English working man save him from falling into the worst political blunders of his foreign compeers. Besides, neither the English engineer nor his workpeople take their industrial and political affairs so seriously as foreigners do, when they think of these matters at all. Cricket and football are powerful social antiseptics; and such causes as Anarchy cannot co-exist with them.

It appears that English engineering in general shares with gas engineering the complaint of a lack of competent young men. Gas people have been under the impression that the electricians must be getting them all; but, according to this writer, it is not so. Then where are they? Can it be that our elementary and preparatory educational system does not produce them at all? It is remarked that most of our young electrical engineers come from technical colleges; and it is flatly declared that they are not of much use. The critic goes so far as to say that the colleges had better confine their teaching to principles only, with just a skeleton of their application to practice. "Mathematics, electricity and magnetism, chemistry, thermodynamics, and so on, can best be learnt at college; and college teachers are more competent than anyone else to teach such subjects. It is, therefore, false economy for them to try to teach practical work, of which they have only a second-hand knowledge, suffering from a very serious time-lag. The teacher of electrotechnics, or any other technology, always misses the most important factor of all—namely, price. There is no difficulty in designing an engine or a dynamo; the problem is to design one that will do as well as others and cost less." This criticism, pushed to the logical conclusion, would destroy so-called technical colleges altogether; and one is not sure this would not be the best thing. It would not be necessary to condemn young people, thirsting for knowledge, to the old mill-horse round of classical and mathematical studies. There is aplenty for them to learn, without exceeding the bounds of pure preparatory teaching. How hopelessly astray the British technical college system has gone, is proved by the ridiculous figures cut occasionally by their heads, when they try to lecture and write to the papers about matters of business more or less connected with their science. The professor, roaring from his chair, is often taken, outside the college, for another animal.

The candid writer goes on to declare that "a great deal of

harm is done to technical progress in this country by scientific cant." Fortunately, this country does not suffer alone from the evil, which is particularly rampant in France, where the Academy of Sciences gives it its best encouragement and highest expression. Scientific cant is the abnegation of utility and the avoidance of application in the pursuit of experimental research. Nothing that is technical can be scientific, according to this order of thought. "If you experiment with 37 grammes of steel in a Berlin porcelain crucible, or especially in a tiny electrical furnace, with a standardized platinum pyrometer and a spectroscope, you are doing scientific work; but if you work with a ton in a converter, that is merely technical—though you will be patronizingly told your work may throw some light on scientific questions." Technicians are quite accustomed to be told that their work is altogether inferior to pure science. It is quite refreshing to find somebody who knows what he is talking about "going for" the men of so-called pure science, and telling them that the true order in these things is the other way about. "One kind of knowledge is not purer than another. What is called pure science is really merely the raw material; and the raw material has to be worked up by the engineer for the use of man. Which is higher—the raw material or the finished product? In the case of ordinary raw material, such as iron, it is produced intelligently, with the view of being worked up—that is to say, it is produced for a given purpose. The scientific man does not work intelligently in this sense. He produces raw material without knowing or caring whether it can be worked up, just as the insect produces silk. If anything, he prefers what cannot be worked up."

The gas industry has suffered much from this same canting science, whose professors have called it crude, unscientific, and wasteful. They would be puzzled to name an industry in which so little is wasted. Young men taking to this industry need not be ashamed of its science, when they meet their compeers at the door of the professor's lecture theatre. The truth is that of the greatest science of all, the science by which civilization lives—the science of getting the most for the money—the Professor is usually a child, outside the question of his own fees. For, as the writer in the "Engineer" observes, to the cant of science is generally added the hypocrisy of making believe that the man of pure science has nothing but love of science for his motive and his reward. Yet, somehow, when advice upon a mere point of technique is wanted by Government or any other power—when a water supply is to be pronounced upon, or a referee is to be named for settling questions of town's gas-testing—the men of pure science rarely despise the appointment, however little they may know about the business.

Of course, the world wants all the science there is, and more. It also needs all the technical knowledge, and all the common-sense and commercial activity that can be brought to bear upon its business. The great point to be remembered is that science, as pure as may be, in the sense of exact knowledge, is not a thing apart from the concerns of everyday life and work. It is really but another name for the true inwardness of phenomenal knowledge. Not all science is immediately applicable to technics or commerce. The mere utilitarian judgment of science is a heresy; but while science may not always be useful, nothing that is practically right should be demonstrably unscientific. When this appears to be the case, we may begin to suspect that our science is defective, or wrong. Our contemporary, whose views we have followed with appreciation, makes one small slip in an otherwise sound and inspiring argument, in asserting that the idea is that if a scientific man finds out a new phenomenon he should read a paper on it; but it is beneath his dignity to take out a patent for it. This is not quite the way of it. Many scientific men have taken out patents, for patentable inventions. But the glory of a man is to make a discovery. Men go to the ends of the earth, and scale the mountains and plumb the seas, with the object of discovering something. So in the world of phenomena, the man who discovers a thing does not patent it. He could not, if he would. Some men are so wedded to the search for the undiscovered, that they heed nothing else. But are they necessarily more scientific on this account than other men who apply their powers to the intelligent carrying on, say, of a gas-works? Subject, in science as in art, is of no moment. The spirit and the method alone determine the quality of work; and therefore the man who, of set purpose and by rational means, gets the utmost return from a ton of coal, is as truly a man of science as he who determines the value of the Clark cell to seven significant figures. Wherefore, let not the latter set himself up to judge the former, as he is too often tempted and encouraged to do.

The Torquay Town Council last week decided to pay Mr. Ingham, their Water Engineer, £125 for his extra services in connection with the purchase of the watershed, and £20 for those rendered in the matter of the extension of the borough. It was stated that the watershed question had involved the preparation of 150 plans.

The Russian Minister of Finance has decided to introduce the metric system on the 14th of January next in St. Petersburg, Moscow, and six other large cities within the Empire. The rest of the country will gradually be brought to use the system during the course of the next five years, by which time it is believed the whole of Russia will have adopted it.



## WATER, CORPORATION, AND ELECTRIC POWER ACTS OF 1900.

*(Concluded from p. 1079.)*

The following Local Authorities' Acts are of a general character, but contain references to authorized water and gas works.

The Barnsley Corporation (Water) Act, as its name signifies, relates to water supply exclusively; but it is of a peculiar character, and differs materially from ordinary Water Acts. It empowers the Corporation of Barnsley to make deviations in constructing certain pipe-lines authorized by their Act of 1896; and confirms certain agreements entered into by the Corporation with the Corporation of Sheffield, who have concurrent rights over the Don watershed. A reservoir on the Knoll Brook which the Sheffield Corporation were authorized to make will now be constructed by the Barnsley Corporation, within an extended period of time.

The Bradford Corporation (Tramways, Gas, and Various Powers) Act sanctions the acquisition of scheduled lands required for the protection of the drainage area. An agreement between the Corporation and the North Bierley Gas Company, for the purchase of the undertaking of the Company, is scheduled and confirmed. Outlying portions of the undertaking may be purchased by the local authorities interested. The price of gas in Cleckheaton is not to be more than 10d. per 1000 cubic feet above that charged for the time being within the city. Additional water and gas capital is to be borrowed.

The City of London (Various Powers) Act contains a part authorizing the construction of subways for the accommodation of pipes and wires belonging to undertakers having powers to lay the same in the City streets. Where such subways are made, and the Corporation direct the removal into them of existing mains, &c., this is to be carried out by the owners at the expense of the Corporation. Mainlaying powers of the ordinary kind are abolished where subways exist. A rent for the use of the subways is to be paid, determined only by the amount of saving of expense attributable to the use of the subway over the cost of mains lying in an ordinary street. The question of liability for accidents is dealt with in a clause. The Corporation are to indemnify companies from any extra risk due to obeying their instructions to use the subways. Power is taken to fix public lighting attachments to building frontages.

The Edinburgh Corporation Act provides for the protection of gas and water mains in regard to tramway works. Sanction is given to the erection of a Corporation tramway power station at Portobello.

The Falkirk and District Water-Works Act authorizes the construction of an impounding reservoir on the Earls Burn, in the parish of St. Minians, Stirlingshire, and other works for improving the water supply of the district. Compensation water is to be discharged. The works are to be completed within seven years. Additional water capital to the amount of £90,000 is sanctioned. The area of compulsory supply by the Trustees is extended.

The Halifax Corporation Act extends the boundaries of the borough, dissolves the Urban District Councils of Northowram and Warley, and transfers their property and rights to the Corporation. Dispossessed officials are to be compensated under section 120 of the Local Government Act, 1888. Power is taken to hold lands in the drainage areas for the protection of the Corporation water-works. The Elland and North Bierley Gas Companies' mains are protected in the case of road alterations by the Corporation for tramway purposes. The Corporation take powers to alter gas and water service pipes when necessitated by street improvements. Compulsory powers are given for the attachment of wall-brackets to building frontages. A Corporation Fire Insurance Fund may be founded, to the amount of £50,000.

The Margate Corporation Act extends the water limits of the Corporation to include the parish of Northdown and (subject to conditions) the parish of Garlinge. The pressure of the supply is to be that by gravitation from the high-service reservoir of the Corporation. The rate for domestic supplies is not to exceed 7 per cent. upon the gross estimated rental. The maximum price for metered supplies is 1s. 6d. per 1000 gallons. Public drinking fountains may be supplied gratis. The Margate Water-Works Act, 1857, the Margate Water Order, 1872, and the Margate Water Order, 1879, are repealed. The right (if any) of the Corporation to supply part of the parish of Westgate-on-Sea is preserved. If the right exists, the Thanet Rural District Council may buy the Corporation out within two years; but if it does not exist, then the distributing plant only is to be bought by the District Council. Before this purchase is effected, the District Council must acquire the undertaking of the Westgate and Birchington Water-Works Company. Further water lands to the extent of 40 acres are sanctioned, together with £15,000 additional water loan, repayable in 60 years. Surplus water profits are to go to the district fund.

The Morley Corporation Act contains provisions relating to the administration of the water undertaking of the Corporation. These are of an ordinary and detail character, and include permission to supply public drinking fountains gratis. Water-works loans spent on the construction of the original works are excluded from calculations under the Public Health Act, 1875.

The Motherwell Water (Additional Supply) Act authorizes the Commissioners of the burgh to provide an additional water

supply by impounding the Culter Water; the reservoir to be situated wholly in Culter Parish, Lanarkshire. Compensation water is to be discharged down the stream at the rate of 850,000 gallons per day. The land is to be acquired within three years, and the works completed within seven years. Distributing pipes are to be laid in every street of the district, and a sufficient supply afforded on demand. Trade supplies may be metered. A supply in bulk, not exceeding 250,000 gallons per day, is to be given to the District Committee of the Upper Ward of Lanarkshire, on terms to be settled. The Middle Ward Committee may also claim a similar supply, not exceeding 200,000 gallons per day, if there is water to spare. Supplies of water for sanitary or other public purposes may be at a reduced charge, or gratis. No private hose-pipes are to be used without the consent of the Commissioners. The water-rate is to be estimated and levied every year on the full annual value of all lands and premises within the limits of compulsory supply. Provided that for shops the domestic water-rate is to be charged on only one-fourth of the rental, unless the Commissioners shall see cause to charge the full amount. Agricultural lands, underground pipes, &c., are to be rated at one-fourth their annual value. No profits are to be made to relieve rates. Water loans are repayable in 50 years.

The Rotherham Corporation Act contains parts relating to gas and water supply. Additional gas lands are to be acquired for the erection of works, and £65,000 is to be borrowed for this purpose. As regards water, it is enacted that the Corporation shall not be under any obligation to supply the Rawmarsh Council after 1903. A fresh arrangement may be entered into for the supply of water to Rawmarsh at cost price. Nothing in the Act is to entitle the Rotherham Corporation to a greater quantity of water from the Derwent Valley than that to which they are now entitled under the Act of 1899.

The Salford Corporation Act contains provisions enabling the Corporation to make regulations relating to the size of consumers' gas-pipes, and the position of meters. Persons aggrieved by these orders have a right of appeal to a Petty Sessional Court. Anti-fluctuators may be required for gas-engine services; and certain scheduled lands are to be used for the conversion of residuals. Additional gas capital to the amount of £200,000 is sanctioned.

The following Acts form a class by themselves.

The Walker and Wallsend Union Gas Company's (Electricity Capital) Act sanctions the raising of £200,000 additional capital for the Company's electricity supply undertaking, with power to borrow one-fourth of the amount. Debenture stock is not to be issued. Interest is not to be paid on calls out of capital; but the Company may pay interest on calls paid in advance, in conformity with the Companies Clauses Act, 1845.

The County of Durham Electric Power Supply Act incorporates a Company for generating and supplying electrical energy in bulk. The area of operations is specified as comprising seven Poor-Law Union Districts in the county. The general powers of the Company are for the supply of electrical energy in bulk to authorized undertakers of electricity supply. The supply is to be given on demand, upon conditions set out, and is to be metered. Three meters may be used, to check one another. The mains may be either overhead or underground. The capital of the Company is £500,000, with power to borrow £166,000. The prices chargeable for energy supplied are stated in a schedule, and range from 4d. to 1d. per unit, according to the number of hours of maximum supply. There is a sliding-scale, whereby the normal 8 per cent. dividend payable on the capital stock may be increased  $\frac{1}{2}$  per cent. for every  $1\frac{1}{2}$  per cent. reduction in the price of current. The Board of Trade may revise the whole of this arrangement every ten years. Lands for generating stations are to be acquired at Gateshead and at Harraton; but the powers of compulsory purchase are not to be exercised until £25,000 of capital has been subscribed. If the authorized works are not begun within two years and completed within four years, the Board of Trade may order the powers of the Company to cease.

The Lancashire Electric Power Act incorporates a Company with a capital of £3,000,000 with one-third borrowing powers, for the generation and supply of electrical energy. Not less than £100,000 is to be subscribed before the powers of compulsory land purchase are put in force. The works sites scheduled are situated in the parishes of Aspull (Wigan Coal and Iron Company), Parr (R. Evans and Co., Limited), Little Lever (Thos. Fletcher and Sons, Limited), and Davyhulme (Trafford Park Estate). The district of supply is the county of Lancaster south of the River Ribble, and excluding the county boroughs of Manchester, Salford, Liverpool, Bootle, Stockport, and Bolton. The powers of the Act are only to be exercised for the purpose of supplying energy to some general supply district, or to, or on behalf of, some statutory undertakers of such supply. Regulations are imposed for the laying and removal of mains; and the powers of the Act cease if not begun to be exercised in two years, and fully exercised in four years. Statutory undertakers may demand to be supplied with all the electrical energy they need, on scheduled terms. These and the sliding-scale are the same as in the preceding Act.

The South Wales Electrical Power Distribution Act incorporates a Company with a capital of £750,000, and power to borrow £250,000, for the supply of electrical energy from sites at Llantwit, Panteg, and Neath. These lands are to be acquired



within five years. The area of supply includes the whole of the county of Glamorgan, and Monmouthshire west of the Usk, with the county boroughs of Cardiff, Swansea, and Newport. Energy is to be supplied under the Act only to authorized undertakers for distribution, and for power to any person. The Company are not to supply energy directly for lighting purposes. The general provisions of the Act are the same as those of the two preceding Acts. As regards prices of energy and rates of dividend, the former are put at 3d. and 2d. per unit and the latter at 8 per cent. normal. If the Company are supplying at an average price of less than 2½d. per unit, which is called the standard price, then they may divide ¼ per cent. extra for every 1¼ per cent. by which the average price has been below the standard price. This sliding-scale works the other way also. Back-dividends are payable. As in the other cases, these arrangements may be revised every ten years. The Act contains many saving clauses—including one for protecting the Pontypool, Swansea, and Aberdare Gas Companies from injury to their pipes by fusion or electrolysis.

### PERSONAL.

Mr. H. M. BAIRSTOW, Assistant Gas Manager to the Darwen Corporation, has been appointed, out of 117 applicants, Assistant to Mr. R. Brown at the Cambridge Gas-Works.

Mr. JOHN BALDWIN, of Honley, near Huddersfield, and formerly assistant at the Brighouse Gas-Works, has been appointed Manager of the newly-acquired gas-works of the Gainsborough District Council.

The will of the late Mr. R. C. SMITH, for many years Chairman of the Devonport Gas Company, has been proved in the sum of £10,787. Mr. Smith was unmarried, and most of his property is bequeathed to nephews and nieces.

As mentioned in our "Notes from Scotland," Mr. J. BALLANTYNE, Manager of the Rothesay Corporation Gas-Works, was last Friday appointed Manager at Hamilton, in succession to Mr. W. Ewing. The salary is £250 a year.

So much nonsense is sometimes talked at meetings of municipal councils when gas matters are under discussion, that the possession of technical knowledge on this subject by even one member of such a body must have a beneficial effect; and when this is allied to other qualifications which are specially valuable in a councillor, the combination cannot fail to be appreciated by the burgesses. An instance of this appreciativeness occurred last week at Banbury, where Mr. W. R. COOPER, the Manager of the Gas Company, was returned for the third time at the top of the poll. Mr. Cooper has been on the Council of that ancient borough since 1891, when he stood fourth on the list, with 897 votes. In 1894, he increased his number to 1003, in 1897 to 1150, and now it is 1207—being 297 above the second man. Such success is evidence of the confidence reposed in him by his fellow-townsmen; and we heartily congratulate him upon it.

### OBITUARY.

We regret to learn of the death of Herr OTTO OECHELHAEUSER, of Berlin, at the age of 75. He was the proprietor of the Wilhelmshaven Gas-Works, and during the sixties and seventies, he constructed several other gas-works—including plants at Breslau, Chemnitz, and Cronstadt. Many well-known Continental gas engineers had formerly served under him; among others being Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, and Herr Herzberg, of Berlin.

We regret to record the death, on the 1st ult., at Denver (Col.), as the result of a severe cold, of Mr. GEORGE TREADWAY THOMPSON, the President of the Denver Gas and Electric Light Company. Deceased commenced his professional work with the Laclede Gas Company, and was subsequently associated in New York with Mr. Emerson M'Millin, who was President of that and several other gas companies. In June last year Mr. Thompson became the first President and Treasurer of the Denver Company. He was a member of the Engineers' Club and of the Society of Gas Lighting of New York, as well as of the Western Gas Association, of which he was President last year. He joined the American Gaslight Association in October, 1891, and served on the Council. He was only in his 32nd year, and was not married.

### NOTES.

#### An Acetylene Blowpipe.

M. Bourgerel has communicated to the "Moniteur Scientifique" the results of some experiments on acetylene regarded as a source of high temperature. He had occasion to seek such a source other than that of the electric furnace, so as to avoid all electro-chemical action. He used acetylene in a table blowpipe, such as is commonly used for glass-blowing, and obtained his blast with compressed oxygen from a cylinder. Great, however, was his surprise to find that the flame leaving the blowpipe was

exceedingly brilliant, and that, as a matter of fact, the gases did not mix, but burnt only in contact with one another, like a lamp-flame. Little by little there forms at the extremity of the blowpipe a cone of deposited carbon, in the form of a truncated cone with the base outwards. This carbon is very hard, with a bright steel-grey fracture. The very brilliant flame produced at the upper end of the cone is also exceedingly hot. The temperature of the acetylene which burns in the air round the end of this carbon cone is not very high. An examination of the flame quite justifies the theory of the dissociation of the acetylene at the moment of its combustion. As M. Bourgerel did not want an incomplete combustion in his blowpipe, he hit upon the idea of returning to the use of compressed air, enriched with oxygen to such a degree as experience might show to be expedient. This arrangement answered perfectly. With the non-luminous flame, there is heat enough to melt platinum in a few seconds; while the disadvantages of the electric furnace and the oxy-hydrogen blowpipe are avoided. M. Bourgerel thinks that, both in commercial work and also for laboratory purposes, there are immense advantages to be gained by the use of such a source of heat.

#### Making an Engineer's Note-Book.

Mr. John H. Gregory, Assistant Engineer of the Philadelphia Water-Works, contributes to the "Engineering Record" some hints on the preparation of a professional note-book. It has been said that an engineer's note-book is his stock-in-trade; and Mr. Gregory and Mr. W. B. Fuller claim to have devised a convenient method for keeping such a book. The method is that of using single sheets of paper of a standard size, and binding with M'Gill fasteners in a cloth cover. There are several sizes of such covers; but the writer prefers the 6¼ in. by 9¼ in. size, which is convenient for writing, and possesses the advantage of stacking up with the ordinary octavo volume so extensively used for engineering text-books. With the ordinary bound note-book, notes are jotted down as occasion requires; and unless blank pages are left, in the end the book is filled with disjointed memoranda on a variety of matters—those relating to one subject being scattered all the way through. Of course, the book can be indexed; but even so, it is less convenient than the system of single sheets of punched paper which can always be filed in the right place. It is suggested that a thin paper of good quality should be used for making the book, and that notes should only be made on one side, with ink, preferably by means of a fountain pen. The advantage of this is that a blue-print may be taken of any writing or sketching on such sheets. The writer says he has at present eight of these covers in use, classed under various heads—as Filters, Hydraulics, Sewers, Miscellaneous, &c. He very truly remarks that, if a thing is worth preserving, it is worth preserving well, and in such shape as will always be readily accessible. Neatness and system in note-taking cannot be too early acquired by the engineering student. Since Mr. Gregory hit upon the arrangement described, he has actually transferred his most valuable notes to this system, by doing a sheet or two a day, which requires but a few minutes; and the convenience for reference, compared with looking through the pages of old note-books, has far outweighed the time spent in copying.

#### Lessons of the Paris Exhibition.

The Manchester Association of Engineers are the first technical body to hold a "symposium" on the lessons of the Paris Exhibition. Mr. Henry Webb read a short paper on "Metallurgy" at the exhibition, in which the excellence and number of the French exhibits were acknowledged. Several British firms maintained the reputation of this country; and the feature of the American show was the tool steel, working hot at high speeds, of Messrs. Taylor and White. He thought the exhibits showed, as a whole, that other nations could do as well as ourselves, and will become increasingly keen competitors in the markets of the world. Mr. Alfred Saxon spoke of the stationary engines shown at the exhibition; remarking that this section might fairly be said to be the largest, most comprehensive, and cosmopolitan collection ever brought together. He drew attention to the improvement in lubrication devices, and the study of valves and their gearing. The slide-valve appears to have become obsolete, and the piston-valve nearly so. The Sulzer and Corliss types predominated. Mr. Saxon thought that English engineers were not behind-hand in the principles and ideals of steam-engine practice; but they did not pay sufficient attention to details and finish. High speeds are inevitable; and better design and workmanship must be forthcoming. The steam-engine of the future will be a more expensive article. Speaking of machine tools, Mr. Samuel Dixon characterized the national exhibits as typical. Compared with previous exhibitions in Paris, the machine tools showed a striking advance in every respect. There was ample evidence that high mechanical skill is not the monopoly of any one firm or country. Among the machines for light manufacturing purposes, the Americans showed to advantage; but in heavy machines for general engineering work, the best examples were to be found in the English, German, and French sections. Reviewing the exhibition as a whole, it was evident that the important part which machine tools play in the productive capacity of a nation is becoming much more generally recognized; and engineers are becoming more alive to the necessity of only putting down the very best of everything.



## COMMUNICATED ARTICLE.

## ILLUMINATING GAS FROM SEWAGE SLUDGE.

By N. Y. Z.

Although not coming within the range of what are regarded as practical politics, this subject is one, akin to many others, from which, by careful and impartial consideration, much benefit may be derived. The first impression likely to be created at the bare suggestion, to an unscientific mind, is one of contempt and ridicule. This has also been true of many another suggestion which time has modified, and in many cases completely overcome. It cannot be readily forgotten that our forefathers treated with the utmost disdain the suggestion of coal carbonization. The apparently preposterous idea of distributing an inflammable fluid through pipes, was one ridiculed alike by the Press and public. Great alarm was evinced at the proposal to store gas in holders at various stations. It is therefore only reasonable to briefly pass in review the early history of coal-gas lighting, when considering a new proposition relating to gas manufacture generally.

The presence of large quantities of marsh gas existent in sewage matter has been realized for many years; but the utilization of the same, and more particularly in connection with gas-works, is comparatively speaking new. At the outset, it will be recognized that only exceptional circumstances can possibly justify the carbonization of such sewage material in a properly organized gas-works. Unfortunately, exceptional circumstances are not so rare as might at first be conceived. As an illustration, it may be pointed out that difficulties with coalowners have arisen upon more than one occasion in the history of coal-gas manufacture and distribution. Such contingencies as a water-way being blocked with ice, or railway traffic congested, thrown into confusion, and utterly demoralized by a fog of some days' duration, when stocks of coal are at a minimum, are emergencies liable to arise every winter in connection with some gas-works undertakings.

It must be at once assumed that special apparatus for the carbonization of different material is necessary. Retort settings, however well constructed for coal, pure and simple, would require certain modifications to suit them for another and totally different class of raw material. Lower heats would of necessity be desirable for the proper distillation of material including quantities of oil; the latter having to be "cracked up" at the most suitable and uniform temperatures. Alterations, too, in the methods of purification of the gas would have to be carefully adjusted. A few years ago, the idea was suggested in the "JOURNAL" columns that the Yeadon revolving retort was likely to be the best form for the perfect carbonization of sludge. This retort has not been a success for "high" heats, such as are used in coal-gas manufacture, but would probably be useful for "low" ones; the working parts of the gear-work being unlikely to be affected by the lower heat to which they would be subjected.

Respecting the objectionable nature of sewage sludge, it might be argued that this material has to be dealt with somewhere and somehow; and therefore, if it is possible to cope with it once and for all by carbonization, the better for all parties concerned. Considerable objections would arise between two departments—such as the gas and the sanitary—if the material were carted to the gas-works. The sanitary authorities might advantageously erect at their sewage-works a retort-bench and purification apparatus capable of dealing with the quantity of material for disposal, thereby performing the duplicate process of manufacturing gas and destroying the sludge. Such gas could then be purified and delivered through a meter, or any other method of measurement, into the gas-mains. This arrangement would be in accordance with the views expressed in an "Editorial Note" last week, to the effect that it was undesirable to allow any such material to enter a gas-works, as it would upset the carbonizing plant and alter all the existing methods of calculation as to results. The raising of the heat required for the retort-settings by dust refuse may be disregarded. In some sewage and electric works, steam is raised by this means, with the assistance of forced-draught appliances to a greater or less degree. To what extent this arrangement is a success is doubtful. In any case, forced draught contrivances have not been applied to retort-settings, except in rare instances. Certainly, no well-designed setting, worth the name, has such an apparatus attached to it.

There is a serious aspect likely to arise from the side of the consumer, as the moment it was suspected that sewage sludge material was being used, there would undoubtedly be a "hue and cry" respecting the vileness and impurities emanating from the gas. This, of course, would be only the result of want of information on the subject, as the purification of any gas can be readily accomplished; it being only a chemical problem to decide the means. A diamond is only carbon; and marsh gas, from whatever source obtained, remains unaffected. In dealing with such a subject, the objectionable idea must be subordinated for the time being, except so far as it becomes injurious to health.

The practicability of obtaining illuminating gas from sewage sludge has been pointed out at intervals by correspondents. The latest published results forthcoming are from Mr. Edward A. Harman, M.Inst.C.E., the Gas Engineer of Huddersfield. In the

"JOURNAL" last week certain results were stated, and opinions held by him were published, which are worthy of close attention. Other results have been obtained at Chorley; and further experiments are in progress, as was also indicated last week. It is not surprising to find a praiseworthy desire on the part of gas engineers to recover the percentage of illuminating gas known to be present in sewage matter, and to apply it to economic use. Such a desire is the natural outcome of, and possibly one of the benefits to be derived from, the extortionate high prices demanded for coal. Times of stress and storm reveal certain weaknesses in the vessel, which the skilled mariner quietly makes note of for use in fair weather. Similarly, the unpleasant position the gas industry has been forced into by the combination of the coalowners, leads thoughtful men to consider what resources can be relied upon and adopted to provide, in some measure at least, against distress. The development of carburetted water gas is only one aspect of the great question. The economical working, too, of these plants is dependent upon low prices prevailing for coke and oil. At the present time, these commodities are at maximum rates; thereby handicapping this method of manufacture considerably. The important argument for the manufacture of water gas now relies upon its rapidity and easy usage when required.

To-day, the calorific value of gas is of really greater importance than its illuminating property. According to the evidence of experts upon the subject, gas of low illuminating power, within certain limits, has a higher calorific value than that of better quality. To such an extent has this become realized, that few gas-works of any size do not now daily make regular calorific tests contemporaneously with the photometrical ones. After all, the question becomes merely one of cost. If from inferior material illuminating gas can be produced capable of performing the duty required by coal gas, although possibly with slightly less efficiency, it is one which will commend itself to consumers.

The question of a combination of coal consumers to resist the greedy demands of the coalowners is one alluded to by Mr. Harman in his letter last week. He rightly says that such combination can take various forms. Therein lies the strength of the argument. One cannot confess to being in love with the idea of raising illuminating gas from sewage sludge. But in this connection, it may be remarked that every experimentalist is in danger of thinking too highly of his own pet scheme. Although the subject is likely to be an unpopular one, the principle of searching for some substitute for coal is one which commends itself to all gas engineers under the existing circumstances—circumstances which have paralyzed the efficiency and profit-earning capacity of the undertakings placed under their control, and for which they are directly responsible.

The question of carbonizing sludge in inclined retorts is certainly open to criticism and doubt. Even coals of different qualities and size require the retorts set at different angles. It has frequently been pointed out that one reason why inclined retorts fail to discharge their contents automatically, is because the coal with which the retort is charged has an angle of repose differing from the residual coke after carbonization.

The evidence as yet in favour of the wholesale carbonization of sludge is absolutely inconclusive; nor, it will be admitted by the most sanguine, is it particularly favourable. The results obtainable by local tests on an admittedly small scale of a material noted for its variability of composition, do not warrant any immediate excitement upon the subject. At the same time, it will not be forgotten that history has repeatedly proved that small beginnings have frequently big endings; so, in all justice to those gentlemen who have gone to considerable trouble experimenting with the material, the subject should not be disregarded, much less carped at. It has been suggested that some engineers could very desirably make tests occasionally as opportunity may arise. Some gas-works are situated in close proximity to the local sewage-works; and in these cases the opportunity for experiments is always more or less present, with a minimum of difficulty. As stated, the cost of destroying sewage matter in some towns is enormous. Many conflicting interests will, however, have to be overcome before the sanitary authorities will be prepared to pay to the local gas undertaking the amount, or any portion of it, it now costs them to destroy their sewage. The correct solution of the problem, as heretofore hinted at, would be for the sanitary authority to erect a retort-bench, or preferably a small gas-works, suitable for the special work. The money now spent in destructors, &c., would fully warrant such a step. By this means, all such tests could be kept independently from the gas-works. The variability in the composition of sewage matter presents a real difficulty; but an experimental plant at a sewage-works would provide means for ascertaining approximately the average quantity and quality of gas obtainable throughout an entire period.

The abolition of the moisture from the sewage sludge does not present an insuperable difficulty. Greater pressure brought to bear upon the material in its preliminary stages would accomplish much. If, instead of the material being pressed into cakes, it were made into briquettes in an efficient machine, these would be much better in every way for subsequent handling. The sludge, indeed, requires careful study and arrangement to adapt it to its changed manipulation and circumstances.

The large quantity of marsh gas, &c., present in sewage matter, certainly warrants an extensive and full inquiry. From the sanitary standpoint, the subject is full of importance. The complete



destruction of the material alone favours the process. It is a fact that the question of sanitation is becoming an increasingly difficult problem in all large centres of population. Anything, therefore, which will aid in such a matter should unquestionably be gladly welcomed by sanitary authorities. Something further requires doing now. Mr. Harman and others have demonstrated the practicability of sewage sludge being carbonized under different conditions. Careful analyses of the composition of the material in various parts of the country should be attempted. This could be well dealt with by the medical officer of health, upon whom devolves the direct responsibility for the health of the community. Possibly such information is already in the hands of many of these gentlemen, including, as they do, some of the first scientists of the day. At the majority of sewage works, too, qualified chemists are engaged, who may well turn their attention to the subject. What in days gone by must have proved a sufficient obstacle to the handling of the material, is in these days of multiplied mechanical contrivances abolished with the greatest ease.

The absence of tar is inconsequential for the moment, while that residual is at so low a price. The quantity of ammonia recoverable will compensate; sulphate of ammonia being likely to well maintain its price in future. The education of the farmer to its agricultural value is spreading, as the result of the energetic efforts of the Sulphate of Ammonia Committee, with Mr. W. G. Blagden as Chairman. A reduced quantity of coke output would also enhance the price of that placed upon the market, as, in a measure, carburetted water-gas plants must already have done.

**Scraping Water-Mains.**—The practice of scraping water-pipes by means of a revolving tool carried along by the pressure of the water is on the increase. The operation has just been performed at Dunfermline, where the main was delivering water at the rate of 1,350,000 gallons per 24 hours. After it had been scraped, its delivery was increased by 100,000 gallons a day.

**The "Largest Order" for Coal ever Placed.**—The leading colliery proprietors in South Wales have been invited by the Admiralty to tender for the supply of about 800,000 tons of steam coal for delivery over next year. This is intended to obviate the spasmodic purchases formerly made by the Admiralty Lords, which often had a disorganizing effect upon the market. It has been widely stated (even in the journals of the coal trade) that this is the largest order ever placed at one time in the coal market. Of course, that is very far from being true; the Gas-light and Coke Company having frequently invited tenders for close on two million tons—their annual consumption of coal.

**Estimating the Sulphur in Coal.**—In the "Gazzetta Chimica Italiana," Signori V. Antony and A. Lucchesi have modified Eschka's method of estimating the sulphur in coal, and proceed by heating 1 gramme of the material, 4 grammes of pure manganese dioxide ( $MnO_2$ ), 1 gramme of  $MnO_4$ , and 2 grammes of dry  $Na_2CO_3$  in a small platinum crucible. The heat is applied gently at first, and finally increased up to a bright red. The mass is then plunged into from 40 to 50 c.c. of water, acidulated with nitric acid, boiled, filtered, and the sulphate finally precipitated with barium chloride. The authors give a series of comparative analyses made by their method and by that of Eschka, which show theirs to be as exact as the latter.

**Coating for Underground Pipes.**—A new construction of underground pipe has been devised, according to the "Chemical Trade Journal," by a resident of Los Angeles, California—Mr. William Lacey. It is an improvement on a former patent, and is intended to provide a pipe having superior powers of resistance to the destructive forces to which underground mains are subjected after being laid, and also to prevent injury to the pipe while in transit. It comprises a metal shell, or body, a fibrous coating outside the shell, an outer coating of granulated hard non-elastic material, and a suitable binding substance. Preferably the shell has a coating inside and out of asphaltum or other gum, and a fibrous sheet is applied outside the coated pipe with a coating of asphaltum or other gum. Over the sheet is a coating of fine gravel embedded in, and held by, the coating of gum on the sheet.

**Smoke Abatement.**—Writing on this subject in "Cassier's Magazine" for the present month, Mr. W. H. Bryan points out that the largest smoke makers, and the most difficult to deal with, have always been the furnaces of steam-boilers. No war against the smoke nuisance can be waged successfully without a good working ordinance, clearly defining the character of the smoke emission which is unlawful, and providing suitable penalties. Many such ordinances have been passed—in fact, nearly all the larger cities of the United States have enacted legislation of this kind. Much of this was experimental, and, when carried into the Courts, did not stand against the attacks of opposing Counsel. Many ordinances were declared invalid; but some have been upheld by the higher Courts. In addition to providing a good ordinance, a municipality can help the movement in other ways. It can provide an expert Commission, to aid smoke makers in finding proper remedies, and to investigate and test improved devices; and—most important of all—it can take the lead, and set a good example by stopping the smoke from its own furnaces, in water-works, schools, public buildings, and institutions.

## THE INTERNATIONAL GAS CONGRESS.

### THERMIC REACTIONS IN THE DISTILLATION OF COAL.

(Concluded from p. 1084.)

By M. EUCHENE.

[A Communication to the International Gas Congress in Paris.]

The heat-balance for the distillation of coal in an ordinary setting of seven retorts, and the sources of loss of heat in such a setting, having been dealt with, M. Eucène proceeds to draw up a similar heat-balance for the Siemens setting of eight retorts, and then discusses the relative advantages of the two settings in regard to the loss of heat through different channels. He deals only with coal of Type No. 3 in the Siemens setting. In this setting, the consumption of fuel varies with the season and the works; but the mean of several years' work with modern installations is 14.80 parts of coke per 100 parts (by weight) of coal distilled. In 24 hours, 7200 kilos. (141½ cwt.) of coal was carbonized in the setting of eight retorts. The water evaporated and carried into the furnace amounted to 40 per cent. of the weight of coke, or 5.92 kilos. per 100 kilos. of coal carbonized. The coke had the same composition as that used in the ordinary furnace. The operations must be discussed under three heads—viz., (1) the producer, (2) the furnace, and (3) the recuperator or regenerating system. A summary of the data and the calculations, which are given at length in the Sixth Appendix to M. Eucène's communication, follows.

The average composition of the producer gas was: Carbonic acid 6 per cent., carbonic oxide 25 per cent., hydrogen 8 per cent., and nitrogen 61 per cent. Its temperature was 800° C. The smoke or chimney gases from the furnace consisted of: Carbonic acid 18.37 per cent., oxygen 1.82 per cent., and nitrogen 79.81 per cent.; and their temperature was 1050° C., which was reduced to 600° at the outlet of the recuperator. In addition to the moisture (= 1.104 cubic metres of vapour) in the coke, there had been introduced into the producer 5.92 kilos. (= 7.363 cubic metres of vapour) of water evaporated under the grate; and the producer gas contained 5.803 cubic metres of hydrogen, of which the coke had yielded 0.828 cubic metre, leaving 4.975 cubic metres of hydrogen as having been produced by the decomposition of an equal volume of water vapour. Hence, of the water evaporated under the grate, 7.363 - 4.975 = 2.388 cubic metres remained as undecomposed water vapour. The loss of heat through radiation, &c., from the furnace was found to amount to 55,933 calories per hour for the whole setting; and as the setting carbonized 7200 kilos. of coal per 24 hours, the loss of heat from this cause amounted, per 100 kilos. of coal carbonized, to

$$\frac{55,933 \times 24 \times 100}{7200} = 18,644 \text{ calories.}$$

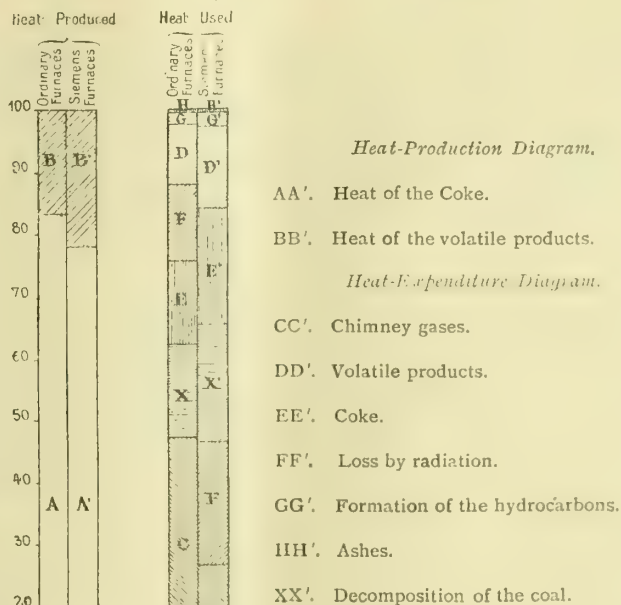


FIG. 5.

The loss of heat through radiation, &c., from the recuperator was found to amount to 7158 calories per hour; and therefore the loss of heat from this cause amounted, per 100 kilos. of coal carbonized, to

$$\frac{7158 \times 24 \times 100}{7200} = 2386 \text{ calories.}$$

The balance of heat provided and consumed in the Siemens setting, as shown in the table on next page, is then compared by M. Eucène with the similar balance for an ordinary setting carbonizing the same coal, as given earlier in his communication (*ante*, p. 1084). Fig. 5 gives a graphic comparison of the







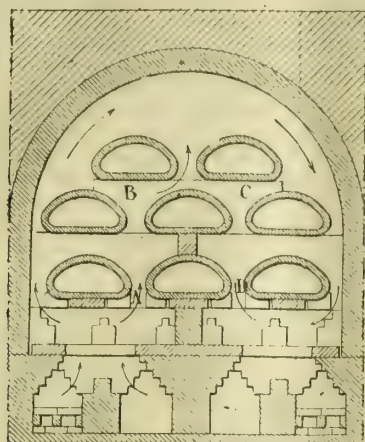


FIG. 6.

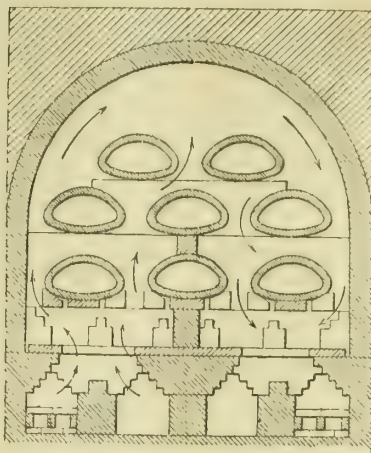


FIG. 8.

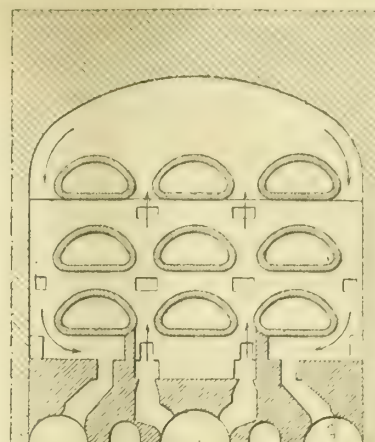


FIG. 9.

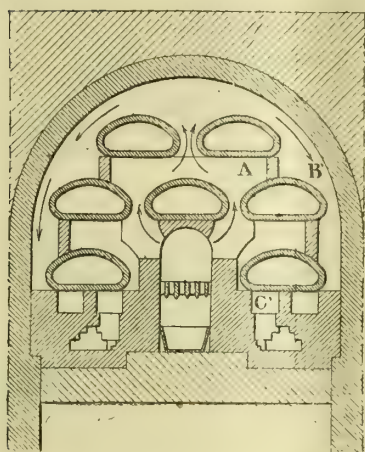


FIG. 7.

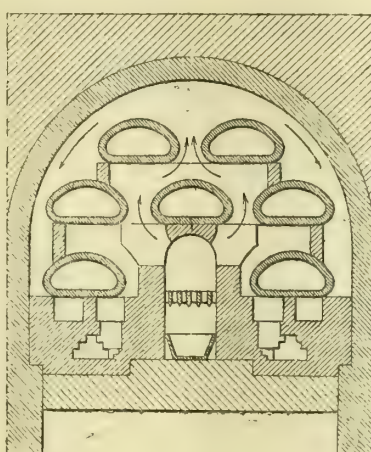


FIG. 10.

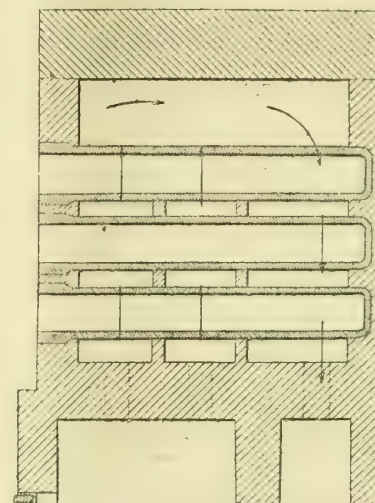


FIG. 11.

results recorded in the tables for the two types of setting. It is evident that the differences between the two types are chiefly in the losses due to the smoke or chimney gases. Speaking generally, other losses appear higher in the Siemens setting, because, even though they are actually the same as with the ordinary setting, they are compared with a smaller consumption of fuel. The losses through radiation, however, are really greater with the Siemens setting, because of the producer and recuperator, which are absent with the ordinary setting.

On comparing the heat carried off by the chimney gases, the following differences are apparent :—

	Temperature of the Chimney Gases.	Heat Lost through the Chimney Gases. Calories.	Volume of Chimney Gases. Cubic Metres.
Ordinary setting	975° C.	81,311	212
Siemens "	600° "	32,649	132
Differences	375° C.	48,662	80

It is evident from these figures that the economy of fuel is not due simply to the difference of 375° C. in the temperature, but also to the smaller volume of the chimney gases. The heating of the air by these gases in the first place is responsible for an economy of fuel, which reacts on, and diminishes, the volume of the gases, thereby inducing a further economy. These are the two chief causes of the economy. There are subsidiary ones, which may also be glanced at.

The excess of air in the ordinary setting, which is equivalent to an excess of oxygen amounting to 4½ per cent., corresponds to a loss of heat of 14,000 calories, or 9·7 per cent. In the Siemens setting, the excess may be entirely avoided; but practically the regulation of the air supply is such that a mean of 2 per cent. of oxygen is allowed in the chimney gases. This 2 per cent. of oxygen, however, has not the same significance as in the gases from an ordinary furnace, because it is referred to a smaller volume of gases, and because the surplus volume leaves the setting ultimately at 600° C., instead of 975° C.

Next, with regard to the temperature of the chimney gases at the outlet of the furnace proper, 1050° C. in the Siemens compares with 975° C. in the ordinary setting. When the temperatures are observed at different parts of the settings, as shown in figs. 6 and 7, the following results are found :—

Setting.	Temperature (° C.) at Points.					
	A.	B.	C.	D.	A¹.	C¹.
Siemens	1250	1120	1080	1050	..	..
Ordinary	..	..	..	..	1250	1070
						975

If the temperature at that point in the ordinary furnace which

corresponds with the point A in the Siemens furnace—viz., near the grate below the middle retort—is determined, it will be found to be 1350°, or even 1400° C. The fall of temperature will be, in the Siemens furnace, from 1250° to 1050° = 200° C.; and in the ordinary furnace, from at least 1350° to 975° = 375° C. The fall in temperature is equivalent to a thermic efficiency of 13·1 per cent. in the case of the Siemens, and of 23·1 per cent. in that of the ordinary setting, which shows that, from the *thermic standpoint exclusively*, the ordinary setting utilizes the heat better than the Siemens setting apart from its recuperator. But from the *gas maker's standpoint* such a great fall of temperature must be avoided, because all the retorts in the setting are charged alike, and the last ought to be as highly heated as the first. The Siemens setting most nearly gives this ideal condition of heating, as will be apparent from a study of figs. 8, 9, and 10. The defect indicated is not peculiar to the ordinary setting. It occurs in most furnaces in which the stream of gases continuously follows the same course, as in those generator furnaces and recuperative settings in which the stream of gas ascends in the middle and descends at the sides. In these cases, the fall in temperature is less than with the ordinary setting; but it is greater than with the Siemens setting, as shown in fig. 8, because the latter admits of the reversing of the direction of the stream of gases, so that it is sent equally to the right and to the left. There is, however, a later pattern of Siemens setting (shown in fig. 11) in which the recuperation is direct and continuous. The excess of heat which prevails at the far ends of the retorts is taken advantage of; and the stream of gases is there deflected downwards. Combustion takes place above two-thirds of the base of the furnace; while the remaining one-third is heated by the flames as they return. The stream of gases in this case takes a constant course. The arrangement, however, possesses method, in that the flames which are already somewhat cooled are used to heat the part of the setting which naturally is the hottest.

The more uniform heating which the Siemens alternating furnace affords, presents the means of working off properly larger charges of coal; for all the retorts are equally hot, whereas in the ordinary setting the first retort is very hot, and if the charges are regulated according to what this retort will work off, the charges in the other retorts will be only partially carbonized—it being practically impossible to alter the weight of the charge to suit each retort in a setting. Hence it has been found that a Siemens setting of eight retorts carbonizes 7200 kilos. (7·085 tons) per 24 hours, against about 5800 kilos. (5·710 tons) with an ordinary setting of seven retorts. Moreover, the number of retorts in a Siemens setting may be increased to nine, or even more, with advantage. Further, a great fall of temperature in



the setting is fatal to the durability of the retorts; while the grate of the ordinary setting also becomes rapidly corroded. Consequently, while the average life of retorts in ordinary settings is about twenty months, and the grate in that time needs repair twice or thrice, the average life of retorts in the Siemens setting is four to five years, with slight repairs and cleaning of the recuperators, at intervals of twenty months. Every means which, like the Siemens alternating furnace, helps to reduce the fall of temperature in the furnace-chamber, is favourable to the carbonization of the coal, because it makes larger charges feasible, and prolongs the life of the retorts.

But if the observation of the fall of temperature is extended to the exit of the recuperator of the Siemens setting, we find the fall is from 1250° to 600° C., or 650° C., against the 375° observed in the ordinary setting. The thermic efficiency is 43·3 per cent. for the Siemens setting, against 23·1 per cent. for the ordinary. Clearly this is the characteristic feature of the recuperative setting. On the other hand, the total losses from radiation are somewhat increased with the latter; but this is a slight disadvantage compared with the many advantages which recuperation affords. The heat of decomposition of coal Type No. 3 was found to be only—1419 calories in the trials with the Siemens setting, against—3598 calories with the ordinary setting. The difference is very small, when all the possible sources of error are considered.

From this comparison of the results obtained with the two settings, M. Euchène passes on to consider in detail the different terms of the equation for the Siemens setting.

In the producer, the aim, he says, should be to secure gas as rich as possible in combustible constituents. Theoretically, the producer gas should consist of 34·7 per cent. of carbonic oxide and 65·3 per cent. of nitrogen. The composition which has been taken as a normal average in this communication is 6 per cent. of carbonic acid, 25 per cent. of carbonic oxide, 8 per cent. of hydrogen, and 61 per cent. of nitrogen. The gas actually, as it leaves the producer, would contain only 5 per cent. of carbonic acid; but a slight combustion of carbonic oxide occurs in the gas-nozzles leading to the combustion-chamber. The sum of the combustible constituents is  $25 + 8 = 33$  per cent., which is much the same as the theoretical 34·7 per cent. of carbonic oxide; and hydrogen has, volume for volume, nearly the same calorific power as carbonic oxide. Thus the calorific power of the mixture actually obtained is practically the same as that of the theoretically perfect producer gas. But it should not be forgotten that 1·14 of the 8 per cent. of hydrogen is the hydrogen of the coke, and that the remaining 6·86 per cent. only comes from the decomposition of water. Consequently, properly speaking, only 31·5 to 32 per cent. of the mixture consists of combustible constituents derived from the gasification process; and carbonic acid has taken the place of the balance which should theoretically be present. But theoretical reactions cannot be achieved in an industrial operation, and a little carbonic acid escapes the decomposition by which it would yield carbonic oxide. Further, the water below the fire-bars, which is needed to keep them cool, tends to reduce the temperature of the fuel and to impede the formation of carbonic oxide; while the decomposition of the water vapour by carbon yields hydrogen and carbonic acid rather than hydrogen and carbonic oxide, unless there is an excess of heat available to furnish the greater amount of heat required for the latter reaction. The best conceivable conditions would be the vaporization of just sufficient water to keep the fire-bars cool, and the avoidance of any surplus water vapour passing into the fuel to lower its temperature. Actually, some water vapour passes undecomposed through the producer, and leaves the recuperator at 600° C., thereby carrying off 1769 calories. The amount will vary with the section of the producer and grate; being less where they are large, and frequent cleaning of the fire-bars is unnecessary.

Though hydrogen and carbonic oxide have, volume for volume, nearly the same calorific power, the heat carried off by the products of their combustion differs greatly; being, at 600° C., 298 calories for carbonic acid and 741 calories for water vapour. Hence it would appear better to burn carbonic oxide than hydrogen. But, on the other hand, the hydrogen and its attendant carbonic oxide are produced without the aid of primary air, though double the amount of secondary air is subsequently needed, since a given weight of carbon always requires the same volume of air for its complete combustion. But where the secondary air supply only is heated, the decomposition of water vapour increases the heat recovered by recuperation.

Means may be taken to limit the amount of carbonic acid formed in the producer—for instance, the maintenance of a constant and sufficient depth (not less than 4 feet) of coke in the producer, and the adoption of large producers in which the gas is brought as little as possible in contact with the walls. It was proved, by analyses of samples of gas drawn from different points in a producer, that carbonic acid is really formed in the first place, and carbonic oxide subsequently. At a distance of 12 inches above the fire-bars, the gas contained carbonic acid (from 3 to 8 per cent.) and oxygen ( $9\frac{1}{2}$  to  $16\frac{1}{2}$  per cent.), but no carbonic oxide. At 24 to 28 inches above the grate, there was from 5 to 10 per cent. of carbonic acid, and from 11 to 25 per cent. of carbonic oxide. At 40 inches above the grate, the carbonic acid was from 2 to 4 per cent., and the carbonic oxide from 26 to 28 per cent. Hence the transformation of carbonic acid into carbonic oxide may be regarded as being first complete at about 40 inches from the grate.

The producer gas leaves the producer at about 800° C., and should enter the combustion-chamber as quickly as possible, in order that loss of the sensible heat of the gas may be avoided. In the early Siemens furnaces, a long collecting syphon allowed the gas to cool to 400° C., entailing a loss equal to about 10 per cent. of the calorific value of the coke; but this loss is avoided in the present Siemens settings. The losses through radiation amount to 12·8 per cent. of the heat liberated in the producer, or to 4·7 per cent. of the total calorific value of the coke. The feeding of the producer with red-hot coke would result in an economy of 5·9 per cent. of the coke consumed; but, as already pointed out in the case of the ordinary setting, the plan would be troublesome, and at times impracticable.

With regard to the furnace of the Siemens setting, the utility of the alternating procedure and the ease of regulation of the secondary air supply have already been insisted upon. The theory of recuperation may, however, be considered with advantage. In ordinary combustion of carbon to carbonic acid, the chimney gases have a volume equal to that of the air needed for the combustion. When the combustion is effected in two stages, as in regenerative settings, the volume of primary air needed is equal to that of the volume of secondary air, and is half the volume of the chimney gases produced. Hence, when only the secondary air is heated, since there is double its volume of chimney gases, only half of their heating value is utilized. In the recuperator, the heat is distributed thus:—

Calories.	Calories.
Heat furnished by the chimney gases at 1050° C. . . = 57,370	Heat carried off by the chimney gases at 600° C. . . = 32,649
	Radiation . . . = 2,386
	Difference = the heat recovered by the secondary air = 22,335
57,370	57,370

From these figures, the temperature of the secondary air may be calculated, taking the capacity for heat of the air at 800° to 1000° C. as 0·325. The volume of secondary air is 67,635 cubic metres; hence—

$$\text{Temperature of the secondary air} \times 0\cdot325 \times 67,635 = 22,335$$

$$\therefore \text{the temperature of the secondary air} = 1016^{\circ} \text{C.}$$

As the chimney gases leave the furnace at 1050° C., better recuperation than these figures indicate could scarcely be had.

In systems of recuperation other than the Siemens alternating one, the heat is transmitted from the gases to the air through thin fire-brick walls. The scope of this communication does not admit of their consideration; but it may be pointed out that the alternating system precludes any admixture of the streams of gases and air, and affords uniformity in the heating of the retorts. But whatever system of regenerative firing is adopted, a somewhat costly installation is required.

As the chimney gases leave the recuperator carrying 32,649 calories, it is important to see if a part of this heat cannot be utilized. A temperature of 150° C. is sufficient to ensure the draught of the chimney; and this would necessitate 11,376 calories passing away with the chimney gases, leaving a balance of 21,273 calories. The utilization of this amount of heat would be equivalent to a saving of 21·2 per cent. of the heating value of the coke. Hitherto the utilization of this heat has been seldom attempted, for fear of the complication of the working and apparatus. Economy of fuel is always a desirable achievement; but it is not the chief object of gas-works management. Nevertheless, the most simple means of economizing fuel should be studied, and two appear feasible. The first consists in cooling the chimney gases from 600° to 150°, in the manner in which it is actually effected in the Munich settings, in which continuous recuperation takes place; the primary air being heated after the secondary air. The second is to modify the Siemens alternating system so that both secondary and primary air are heated to a uniform temperature of about 1000° C., and the chimney gases cooled to 150°. This appears a rational scheme. But to carry it out, reversing or alternating of the primary air and a steam-injector, as well as of the secondary air and gases, would have to be arranged for; and the Siemens system would become much more complicated than now. If it were a question of extremely high temperatures, such as are required in the glass industry and in metallurgy, or if economy of fuel were a paramount consideration, the additional complication could be tolerated; but in the gas industry only comparatively high temperatures are needed, and economy of fuel is a secondary consideration. Hence a scheme involving such great complication cannot be entertained in gas manufacture.

M. Euchène next proceeds to discuss the distribution of the heat furnished by the furnaces at the different stages of carbonization, &c., it having been taken for granted hitherto that all the reactions occur uniformly and constantly. He observes that it is difficult to locate the causes of variations which have their origin outside the retort; but in the ordinary furnace the frequency of the cleaning of the grate has considerable effect. Even when the clinker is removed as frequently as once in four hours, the chimney gases will show great variations in composition. For instance, immediately after cleaning they may contain 18 per cent. of carbonic acid and 2 per cent. of carbonic oxide, and just before cleaning 14 per cent. of carbonic acid and 6 per cent. of oxygen; the residue in both cases being nitrogen. The variations may be reduced by means of orifices in the furnace-door. In regenerative settings, however, if the producers are



of adequate size, only insignificant variations are found even with but one cleaning of the fire-bars in 24 hours. The exterior of the retort does not vary greatly in temperature with the interior conditions, for it is constantly in contact with the hot gases and the hot fire-brick supports, &c., in the setting.

In the interior of the retort, however, some great variations occur. As a first step towards their investigation, an attempt was made to determine the temperature at different stages during the carbonization. In order to avoid exposing the couple of the Le Chatelier pyrometer to the sulphuretted hydrogen in the retort, two iron tubes plugged at the end within the retort were used; one being plunged in the charge and the other being above it. Observations were made at distances of 1·3 metres (51 inches) and 0·45 metre (18 inches) from the mouth of the retort; and the results are shown in the diagrams figs. 12 and 13. Above the charge, the temperatures gradually rise as carbonization proceeds; but in the charge they are more irregular, owing to fluctuations in the course of the changes taking place, and the want of homogeneity of the charge. The temperatures are higher farther from the mouth of the retort; hence 950° C. has been assumed to be the average temperature of the red-hot coke. The curves indicate that the charge is carbonized under the best conditions between 500° and 700° C.; but it is necessary that a higher temperature should be attained towards the end, in order that a quantity of heat may be stored in the retort, to be given up to the next charge, and that the interior of the charge may be properly carbonized.

When the coal is carbonized in four hours in the setting of seven retorts, the percentage of the total volume of gas evolved during each hour is shown in the following table for the five types of coal. The retorts were charged as rapidly as possible in succession, and the make from the whole setting taken for the calculation of the yields for each hour.

Percentage of the Total Volume of Gas Evolved.

Type of coal.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
In 1st hour . . .	24·9	25·0	24·7	24·1	23·4
" 2nd " . . .	29·9	28·4	29·2	29·6	26·9
" 3rd " . . .	28·8	28·6	29·8	29·4	29·0
" 4th " . . .	16·4	18·0	16·3	16·9	20·7

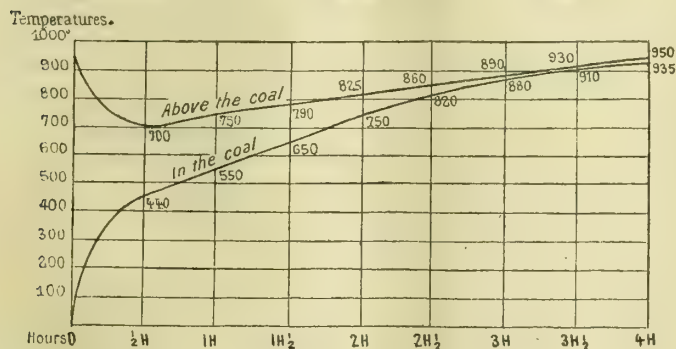


FIG. 12.

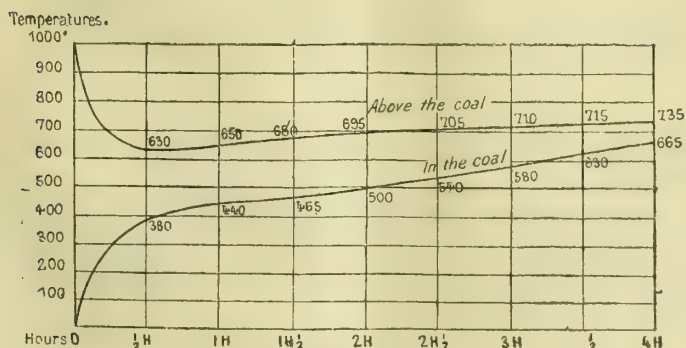


FIG. 13.

An exact comparison would entail the charges being of precisely the same weight for each type of coal; but as some types need more heat for their proper carbonization than others, uniformity of conditions would be attained with difficulty. Practically the simplest plan is to regulate the weight of charge so as to attain nearly uniform temperatures of carbonization.

The proportion of carbonic oxide and nitrogen in the gas produced at the different periods may be taken as nearly constant.

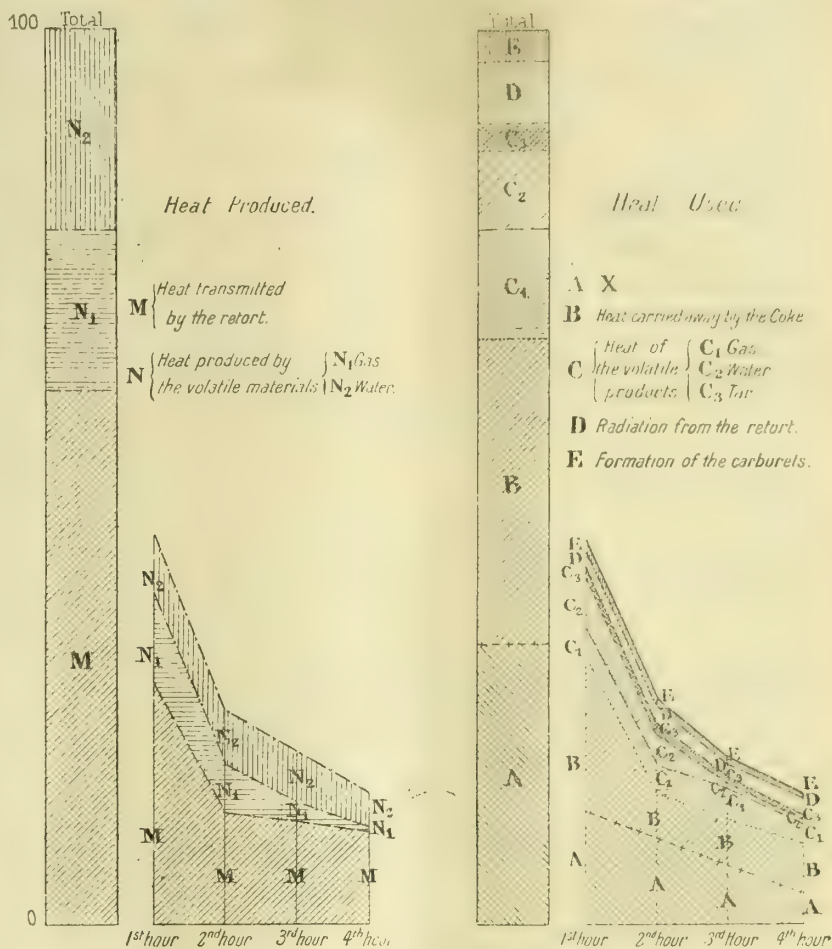


FIG. 14.

The percentage by volume of the remaining constituents of the gas produced each hour is shown in the following table:—

Hour.	Carbonic Acid.	Hydrogen.	Marsh Gas.	Benzene.	Ethylene.
First . . .	3·08	41·60	36·98	1·39	6·12
Second . . .	1·90	49·72	32·08	1·24	3·46
Third . . .	1·40	57·52	25·98	0·84	1·72
Fourth . . .	1·08	58·64	23·72	0·25	1·12

The proportions by weight have been calculated, and the following table shows the gaseous products per hour for coal of Type No. 1 in parts (by weight) per 100 parts (by weight) of coal carbonized:—

	1st Hour.	2nd Hour.	3rd Hour.	4th Hour.	Total.
Carbonic acid . . .	0·3534	0·2508	0·1868	0·0859	0·877
Carbonic oxide . . .	0·6310	0·6310	0·6310	0·6310	2·525
Hydrogen . . .	0·2897	0·4023	0·4769	0·2941	1·463
Marsh gas . . .	2·1768	2·2633	1·8452	0·9226	7·208
Nitrogen . . .	0·0950	0·0950	0·0950	0·0950	0·379
Benzene . . .	0·3093	0·3245	0·2208	0·0304	0·894
Ethylene . . .	0·4498	0·2853	0·1443	0·0572	0·937
Impurities . . .	0·1425	0·1425	0·1425	0·1425	0·570
Totals . . .	4·4475	4·3952	3·7115	2·2177	14·853

The distribution of the tar and water over the period of carbonization was similarly studied; and the results for all the volatile matters were summarized. The following is the summary for coal of Type No. 3:—

Distribution by Weight of Volatile Matters during Carbonization.

	1st Hour.	2nd Hour.	3rd Hour.	4th Hour.	Total.
Gas . . .	17·3	16·6	14·3	9·5	57·7
Water . . .	12·3	7·3	2·9	1·0	23·5
Tar . . .	10·1	5·3	2·8	0·6	18·8
Totals . . .	39·7	29·2	20·0	11·1	100·0

Consequently, the numbers 40, 30, 20, and 10 approximately represent the quantities of coal decomposed per hour from the first hour to the fourth or last. During the last two hours, the tar and water which are produced are decomposed to a considerable extent into gas, owing to the higher temperature which then prevails—just as high heats give a large make of gas and a small make of tar.

From the foregoing observations, M. Euehène proceeds to a discussion of the distribution of the heat produced and consumed at the different stages of carbonization. The following table



shows the results at which he arrives in respect of coal of Type No. 2 :—

Heat Produced and Consumed (in Calories) per Hour per 100 Kilos. of Coal Carbonized.

	1st Hr.	2nd Hr.	3rd Hr.	4th Hr.	Total.
Heat Expended.					
Formation of carbon com-					
pounds . . . . .	1,126	613	365	148	2,282
Loss from retort mouthpieces,					
&c. . . . .	1,054	1,231	1,407	1,583	5,275
Volatile products at 650° C.—					
Tar . . . . .	1,151	598	317	79	2,145
Water . . . . .	2,775	1,655	647	233	5,310
Gas . . . . .	2,558	2,706	2,503	1,457	9,224
Hot coke . . . . .	13,000	3,856	4,192	4,525	25,573
Decomposition of coal . . . . .	9,000	6,800	4,500	2,407	22,707
Totals . . . . .	30,664	17,489	13,931	10,432	72,516
Heat Furnished.					
Volatile products—					
Water . . . . .	5,727	3,416	1,336	480	10,959
Gas . . . . .	4,662	4,532	3,798	2,277	15,269
Heat transmitted by wall of					
retort (by difference) . . . . .	20,275	9,541	8,797	7,675	46,288
Totals . . . . .	30,664	17,489	13,931	10,432	72,516

It is to be remarked (1) that the heat transmitted by the wall of the retort diminishes from start to finish, while the temperature within the retort increases progressively; and (2) that the total heat produced for the distillation of 100 kilos. of coal Type No. 2 amounts to 178,044 calories, while there is utilized in the retort only 72,575 calories; and hence there is expended externally 105,469 calories.

For three types of coal, the percentage of the total heat produced which is expended in the retort and externally is shown below.

	No. 2.	No. 3.	No. 4.
Heat expended in retort. . . . .	40.8	42.3	44.5
" " outside the retort . . . . .	59.2	57.7	55.5

The variations are due to the different quantities of heat produced by the formation of volatile matters. The distribution of heat during the four hours of distillation is shown graphically for coal Type No. 3 in fig. 14.

The study of the principal thermic reactions which take place in the distillation of coal for gas manufacture is now concluded, according to the programme drawn up. The limits of this programme might have been extended in several directions—in fact, there is an almost boundless field of research lying open on every side. The gas industry will benefit by such researches; for it is confronted by young and vigorous rival industries, with which it must strive armed with weapons of modern science.

HEATING AND COOKING BY GAS.

By M. AUGUSTE LÉVY.

[A Paper communicated to the International Gas Congress at Paris.]

The Paris Gas Company have already done much to advance the use of gas for heating by placing reliable apparatus for the purpose before their *clientèle* at a cheap rate. Apart from the trials they have themselves made, foreign makers have been permitted to carry on every possible investigation into their appliances, and been given every facility for the exhibition of apparatus for domestic or industrial heating by gas. While granting these favours to manufacturers, they have been at some pains to exclude any apparatus which, from improper design or construction, would give rise to dissatisfaction in regard to hygienic or other matters. To this end, they have specially set apart a department of the Landy laboratory for the examination of various types of apparatus. The tests thus made have been confined principally to the following points: Hygienic construction, complete combustion of gas, thermal efficiency, and reliable working properties.

The first experiments were made to ascertain the capacity of a heating appliance to discharge the products of combustion. The method consisted in an estimation of the proportion of carbonic acid in the air of the room in which the stove was used. The estimations were made by the volumetric method of titration, with a solution of baryta; the air being aspirated through a given volume, and the alkalinity of the solution tested before and after the precipitation of the barium carbonate. It was considered that all appliances which permitted the proportion of carbon dioxide to rise to 5 parts in 10,000 in ten hours were non-hygienic.

The completeness of combustion is of importance on financial as well as on hygienic grounds, although supposing combustion were incomplete there would be no real danger provided the removal of the products was properly allowed for. In testing, the apparatus is arranged without its outlet-tube; the burnt gas is allowed to escape into the room, and the air afterwards examined for carbon monoxide and hydrocarbons. These, as the combustion of the gas never gets very far away from completeness, must be looked for in very minute traces. For

this purpose, Gréchant's process (based on the fixation of the carbon monoxide by the blood of a living mammal and the subsequent analysis of the gas given off by a sample of the blood from the carotid artery) can only be used by those who are physiologists. A second method worked out by M. Nicloux is better because colorimetric. In it, iodic acid is used to oxidize the carbon monoxide to carbonic acid; the liberated iodine representing the proportion of the former gas, and also of any hydrocarbons. The liberated iodine is absorbed in a solution of soda, to which is afterwards added potassium nitrite and sulphuric acid. The iodine is again liberated, and is taken up in 5 c.c. of carbon bisulphide. A comparative test on an iodide solution of known strength permits the iodine to be estimated colorimetrically. The test is delicate—showing one part of carbon monoxide in 40,000 to 60,000.

The tests on the thermal efficiency of a stove bear on the two questions: What number of heat-units are received per hour in the room? and How is this heat distributed—i.e., what proportion is supplied by radiation, what by the heating surface, and what by the conduction of the walls? The efficiency is given by the formula  $\frac{Q - P}{Q}$  where A = calories furnished by the

heating surface; B, calories supplied by radiation; C, calories supplied by the walls of the stove to the surrounding air; P, calories lost in the products of combustion; and Q, total heat produced by the combustion of the gas. With gas of an average calorific power of 5300 calories per cubic metre, the efficiency of a stove burning *n* cubic metres should be  $\frac{5300n - P}{5300n}$ . The above

factors are measured by the methods which are here described in outline.

*Loss of Heat in Waste Gases.*—Analysis of the waste gas (estimation of the carbon and hydrogen) gives us the volumes of air in excess of that required for combustion and of the burnt gas. If P be the weight in grammes of the water vapour in 1 cubic metre of the burnt gases, and *p* the water vapour in the same volume of the atmosphere supplying the stove with oxygen, it can be shown that the volume of gases produced by the combustion of 1 metre of gas is  $\frac{1030 - 6p}{P - p}$ ; assuming that 1 cubic metre of gas

produces 1030 grammes of water. Or a similar result can be obtained by applying the constant that 1 cubic metre of gas produces 600 litres of carbon dioxide. If *a* is the number of litres of carbon dioxide in 1 cubic metre of the products of combustion,

$\frac{a}{600}$  gives the volume of gas consumed. With *n* cubic metres of gas

per hour, the volume of the products of combustion is  $\frac{600n}{a}$ ; and

the air in excess,  $6n \left( \frac{100}{a} - 1 \right)$  (call this expression Y)

The loss of heat is calculated from the volume of (1) products of combustion and water vapour, and (2) excess of air. Since 1 cubic metre of gas gives 1.03 kilos. of water, of specific heat .45, and 7.5 kilos. of carbon dioxide and nitrogen (specific heat, say, .21) the heat lost in (1) is  $[(7.5 \times .21) + (1.03 \times .45)] [T - t] n$ ; i.e.,  $2.04n (T - t)$ , where T and *t* are the temperatures of the escaping gases and the outside air respectively.

As regards (2), the specific heat of air being .2374, the corresponding heat will be  $Y \times .2374 \times 1.293 \times (T - t) = .3069 Y (T - t)$ . (One litre of air weighs 1.293 grammes.) Hence the heat lost is  $(T - t) (2.04n + .3069 Y)$ ; and the efficiency of the stove =  $\frac{5300n - (2.04 + .3069 Y) (T - t)}{5.3n}$

The first table on p. 1147 gives some results by this method.

*Heat of the Incandescent Zone.*—The cast-iron plate is replaced by one of sheet iron, open in the middle, so as to form a rectangular channel, in which an anemometer is placed, and the speed of the current of hot air determined. From this speed, V, K, the sectional area of the channel, T and *t*, temperatures of the air at its outlet and the surrounding atmosphere, and *c*, the specific heat of air, we can calculate the heat thus produced from the formula:—

$$\frac{3600 V K}{1 + a t} + c + 1 - 293 \text{ (kg.)} \times (T - t)$$

The heat obtained from this source is fairly proportional to the gas consumed.

*Heat of Radiation* is estimated by exposing, at a given distance, a copper globe coated with dead-black, and filled with water, in which a thermometer is immersed. When a constant temperature has been reached, a screen is placed in front of the globe, and the fall in temperature noted. Some results obtained by this method are appended—

	Nov. 20, 1896.	Nov. 30, 1896.
Gas per hour . . . . . litres	1232.0	1118.0
Distance of globe from stove. . metres	0.8	0.8
Temperature of the globe. . . . .	49.8° C.	42.4° C.
" " room. . . . .	32.2	24.0
Heat per hour on burning gas (= Q), cal.	6529.0	5925.0
Heat radiated per hour (= R), " "	775.0	773.0
Ratio of heat radiated to total heat (R/Q) } per cent. . . . .	11.5	13.0

*Remarks.*—The appliance used was the Company's radiant stove, No. 2. In the first experiments, the radiant surface was composed of refractory earth covered with flexible asbestos, with grating. In the second, the grating was removed.



Apparatus.	Sectional Area of Flue.	Gas per Hour.	Atmospheric Pressure.	Temperature of Surrounding Air.	Temperature in Main at Time of Test.	Products of Combustion in 6 Litres.		Volume of Products of Combustion per Hour.	Water in 2 Litres of Surrounding Air.	Heat per Hour.	Heat Lost per Hour.	Efficiency.
	Square Centimetres	Litres.	Millimetres	OC.	OC.	Gr. CO <sub>2</sub> .	Gr. H <sub>2</sub> O.	Cub. Met.	Gramme.	Calories.	Calories.	..
Company's Stove—												
No. 1 . . . . .	S = 900	800	760	19	150	0'081	0'123	60	0'015	4240	2696	36 p. ct.
" ID. . . . .	150	800	760	20	170	0'121	0'150	40	0'015	4240	1930	54 "
" ID. . . . .	75	800	755	21	190	0'177	0'181	28	0'010	4240	1542	63 "
" ID. . . . .	24	800	765	23	210	0'282	0'298	18	0'013	4240	1333	68 "

Apparatus and Date of Trial.	Hourly Consumption.	PRESSURE.		TEMPERATURE.			Speed of Vapours.	Volume per Hour of Vapour in the Flue.		Heat Produced.	Heat Lost.	Efficiency Per Cent.
		Gas.	Atmo-sphere.	Outside.	In the Room.	In the Sheet-Iron Flue.		At T°.	At O°.			
		Mm.	Mm.	° C.	° C.	° C.		Cub. Met.	Cub. Met.	Cal.	Cal.	
Radiant stove, No. 1, square (March) .	562'50	20	..	..	20'0	148	2'150	21'887	14'18	2981	562	81
	720'00	30	..	..	20'0	176	2'400	24'432	14'84	3816	717	81
	857'14	40	..	..	16'0	190	2'570	26'163	15'39	4543	830	82
	972'97	50	..	..	18'0	204	2'880	29'318	16'75	5157	950	81
	318'58	20	..	..	15'0	120	1'500	15'270	10'60	1688	326	80
Same, but circular (April) . . . . .	375'00	30	..	..	16'0	130	1'500	15'880	10'70	1988	354	82
	401'64	40	..	..	17'0	140	1'650	16'800	11'00	2447	420	82
	537'31	50	..	..	16'0	153	1'740	17'713	11'00	2848	468	83
	860'00	20	763	22	30'5	77	0'615	200'000	155'00	4618	2232	51
	1090'00	30	767	18	33'5	89	0'620	201'000	151'00	5777	2598	55
No. 1 circular stove (April) . . . . .	1250'00	40	763	12	32'0	92	0'730	236'000	176'00	6625	3274	50
	1440'00	50	755	20	32'5	93	0'690	223'000	166'00	7632	3084	68

Conduction from the Walls of the Apparatus is not easy to estimate directly; but it can be obtained, by difference, from the equation  $Q = A + B + C + P$  (see above).

A simple method of ascertaining the efficiency of a stove depends on the anemometer, and consists in determining the speed of the products of combustion at some given point in the outlet-flue—calculating therefrom the hourly consumption (by multiplying the speed by the sectional area), and afterwards finding the heat carried off in this way from the temperatures,  $T$  and  $t$ , of the products of combustion and of the surrounding air. The results, though not exact, are useful. We obtained 2696 by analysis, and 2400 by the anemometer, for a stove of No. 1 size, as supplied by the Paris Gas Company.

As regards draught, it will be readily understood that the heat withdrawn with the spent gases increases with the speed of the same. The wisdom of reducing the draught is seen by the table already given. The efficiency of the stove is increased from 36 to 68 per cent. by reducing the sectional area of the flue from 900 to 24 square centimetres. The proper working of the apparatus sets a limit on this procedure. With too small an area of flue, the proportion of carbon dioxide in the air rises to more than the permissible quantity.

The tests of the good working of the appliances in practice include: (1) The determination of the hourly consumption of gas at all pressures (differing by 10 millimetres) between 10 mm. and 100 mm. of water; (2) lighting and extinction; and (3) special advantages of a given apparatus over others of like kind. These practical trials were made in two identical rooms, in one of which was an apparatus for comparison. They were carried on for eight or ten days; and a mean was taken of the results. During this period, the temperature of various points in the heated apartment was noted, from the results of which, when plotted on a diagram, a good idea was obtained of the distribution of heat by a stove.

The stoves usually employed may be classified into: (1) "Log-fires," (2) reflectors, (3) coke-fires, (4) radiating.

(1) This type—first made by Bardot, of Lyons—possesses a very low efficiency, although for some years past this has been improved by placing the "logs" in a sheet-iron enclosure so as to produce an increased circulation of air.

(2) In these, a cylindrical parabolic plate is used to reflect the heat rays from the upper part of the stoves—i.e., the part consisting of a mass of white flame. Like other similar appliances, they require the gas-outlet to be of certain given proportions if combustion is to be complete, and they give rise (especially on lighting) to a deposit of soot. The relations between the heating power and the air supply in this type of stove are such that to increase the former so as to meet the requirements of a given sized room means that the space required for the latter makes the stove too large for the flue intended for its reception. In the Wybauw stove, the regenerative principle has been applied.

(3) These stoves present the appearance of a coke-fire, and their efficiency is better than those of the preceding classes. They have the disadvantage of containing so much refractory material that they do not heat until fully in action; and moreover they emit a rather unpleasant odour when lighting up.

(4) Immediate heating on lighting up is obtained with stoves of the radiating type. The ideal conditions are: A radiating surface of small mass and low conductivity, and as high a temperature as possible. In the models of the Paris Gas Company the radiating surfaces are composed of asbestos fitted on vertical plates of some refractory earth, on which the flames play. The asbestos is thus raised to incandescence on lighting up, and

heating by radiation commences at once. In the first models made by the Company, the air on entering was heated by the spent gases on their way to the outlet; but, with a view to increase this preliminary heating of the air supply as much as possible, the spent gases are now led into a chamber of thin wrought iron, around which the entering air circulates. The results obtained with several of the Company's burners are given in the second of the above tables.

These results were obtained without artificial draught—that is, the gases were discharged into the atmosphere simply through a sheet-iron tube, 1·5 metres in height. The conditions being the same throughout, the figures in the last column are comparable, and show whether one apparatus is better than another as regards the interior circulation of hot gases. They thus serve as a guide to the manufacturer, but are very different from practical figures obtained when the apparatus is fixed in the chimney-place of an apartment. Under these last-mentioned conditions, the efficiency of the radiating stoves is much lower, although the "calorifiers" do not lose much; in fact, they may even give results exceeding those in the table.

The comparison of these different types of stove shows the actual progress made in this direction during the past few years. The principal advantage of this mode of heating is the ease of regulation—a point which the Company have endeavoured to turn to account in a device whereby some gas would be shut off when the room reached a certain temperature. Two regulators of this kind have been devised by Dr. Roux and M. Dorian, and have been tested by the Company. Both have given good results; but the former is applicable only to the regulation of temperature in small spaces, such as drying ovens, &c.

The use of gas for cooking is, of course, familiar to everyone. The public do not, however, seem to be awake to the importance this agent has assumed in restaurants, where more extended and varied assistance is derived from it every year. In their endeavours to place the use of gas for this purpose upon as satisfactory a basis as possible, the Company have been assisted by specialists, such as MM. Driessens, Colombié, and others. The installations placed in the large restaurants (with the permission of the proprietors) have shown us the faults which must be corrected; so that to-day we can exhibit a large number of appliances which leave nothing to be desired.

The cooking of food is done: (1) In a saucepan or digester; (2) over the naked fire; or (3) in an oven. Gas can be used in all these methods. In the case of (1), cooking is done more rapidly than with coal; in (2) the gas-grill replaces the wood or charcoal fire; and in (3) the gas-heated oven is more uniformly heated than is possible with coal.

Much discussion has taken place on luminous *versus* non-luminous flames for cooking purposes. The latter are used in all the Company's apparatus. As regards transmission of heat, the bunsen flame is not so suitable for the grill as the luminous flame, because the latter can be made longer. For the same consumption of gas, a series of luminous flames give a heating surface much greater than that produced by bunsen flames; but an even better result can be obtained with the latter by using them on the radiation system, and also to heat a plate of refractory earth or cast iron which would, in turn, radiate heat.

For domestic use, the most suitable apparatus is the stove with two burners, horizontal fitting, and a dripping pan permitting of a small piece of meat being roasted. In all, some 315,000 of these appliances are in use in Paris. They are supplied free by the Company. In them the direct burners are



always of the bunsen type, while in grills luminous flames are generally used—this construction permitting of a simpler and cheaper apparatus.

The installations for cooking in restaurants include the large apparatus known as the "Saucier-entremettier," for the cooking of foods in saucepans, &c. The whole top of this stove is hot. It can even be made red-hot (when coal is used). It is employed for certain methods of cooking only. The surface is flat all over, so that heavy vessels can be easily moved about; and in the lower parts of the apparatus (between the fires), there are ovens for roasting purposes. Hot-water reservoirs are placed above the level of the saucepans for convenience in filling. Frying, roasting, and grilling appliances are provided, as are also apparatus for cleaning plates, &c., warming dishes, heating coffee, milk, &c., in their appropriate vessels.

Up to 1893, scarcely any use was made of gas for cooking in Paris, until the Company made a big roaster for a large casino. In this, the spits were replaced by a grill on which the joint to be cooked was laid. This plan of cooking retained the juices in the meat much better. The same apparatus was arranged to heat water for the use of the kitchen; and the roasters and ovens were lined with refractory materials—two advances in gas cooking appliances. In 1898, the Company entered upon a very active period in the application of gas to cooking. They constructed a large double roaster for the Ecole Polytechnique,\* where comparative tests were made, which showed that the loss in weight of meat during cooking with gas was only 20 per cent., as against 30 per cent. with the wood previously in use as fuel. A cooker of still larger dimensions was made in 1899 for the Grands Magasins du Bon Marché. It was 4'25 metres in length, 0'8 metre deep, and 1'65 metres in height. This was followed by two large appliances which the Company named "La Salamandre" and "La Grillade-Braisière." The first was much used for the preparation of toasted bread. In the second apparatus, the meat was heated from below, under the eyes of the cook, just as in heating on the coals, which were replaced by an arrangement of small fragments of refractory earths heated to redness by the gas.

Roasting and grilling having been thus provided for, the Company proceeded to design a cooker to take the place of the "Saucier-entremettier" above described. This they were able to do by means of (1) large burners 40 centimetres in diameter, placed under gratings shaped like a St. Andrew's cross, and alongside these smaller burners served to heat saucepans and other vessels of lesser size; (2) hot plates placed between the large burners and heated from below by the waste heat from the ovens.

At present, thirty establishments in Paris are using cooking appliances made by the Paris Gas Company. Special mention should be made of the Restaurant Fouquet, No. 99, Avenue des Champs Elysées, which has placed a gas-cooker in the public dining-hall. The apparatus interests visitors; and owing to the excellent ventilation, it does not give rise to any inconvenience.

**Preserving and Fireproofing Wood.**—The following is a German method of effecting the above objects; Subject the wood for six to eight hours to the boiling heat of a solution of 33 grammes of manganese chloride, 20 grammes of orthophosphoric acid, 12 grammes of magnesium carbonate, 10 grammes of boracic acid, and 25 grammes of ammonium chloride in 1 litre of water. The wood thus treated is said to be perfectly incombustible, even at great heat, and to be also protected by this method against decay, injury by insects, and putrefaction.

**Southern District Association of Gas Engineers and Managers.** We learn from the circular issued by Mr. J. W. Helps, the Hon. Secretary of this Association, that the business for the meeting on the 15th inst. will, as usual at the last gathering of members in the year, consist of the election of the President and office-bearers for the ensuing twelve months, and, in addition, the reading of the following papers: "Purifier Construction," by Mr. G. P. Lewis, of Lower Sydenham; "Difficulties Met With in the Construction of a Concrete Gasholder Tank," by Mr. F. G. Cockey, of Newport (I.W.); and "High-Pressure Gas for Incandescent Lighting," by Mr. A. W. Onslow, of the Royal Arsenal, Woolwich.

**Re-Burning Damaged Portland Cement.**—According to an article by Mr. R. W. Egerton in "Indian Engineering," the following process has been successfully adopted for re-burning cement: The damaged cement was set solid to the centre of the barrels in most cases. It was broken into pieces small enough to pass through a 3-inch ring, and placed in one end of a horizontal semi-cylindrical furnace, 15½ feet long and 4 feet wide. A fire of dust coal was kept up at the other end. When the cement was clinkered, it was cooled and ground in a mortar-mill to pass a screen of 1600 meshes to the square inch. If used fresh, this cement heated when slaked; but the trouble disappeared after weathering for 15 to 20 days. Two more furnaces of this sort were built as soon as the first trials proved successful; and later a kiln like those for burning lime was erected. The body was about 3 feet in diameter inside at the top, 8 feet at the bottom, and 8 feet high; the thimble or lower frustum being 6½ feet deep. The cement re-burnt in this way was about one-third as strong as the uninjured material.

\* This appliance was described and illustrated in the "JOURNAL" for Feb. 27, p. 541.—ED. J.G.L.

## TECHNICAL RECORD.

### COKE-OVENS AS GAS-WORKS.

Dr. H. Wiechell has contributed an interesting article, on the "Application of the Surplus Gas from Coke-Ovens to Illuminating Purposes," to a recent number of the "Journal für Gasbeleuchtung." He refers to recent papers on the subject—such as those reported in the "JOURNAL," Vol. LXXIII., pp. 364 and 1213, and Vol. LXXIV., pp. 176, 1114, and 1176—and he then proceeds to examine the financial aspects of the question.

He points out that the coke-oven processes, which have been discussed in the papers quoted, must be regarded not merely as means of affording the highest return from the coal, but also as a basis for simplification and economy of manufacture. For equal production of gas, the oven plant required costs considerably less than retort plant, while manual labour is reduced to a minimum, and thus the cost of operating oven plant is lower. But if the results obtained in American installations are applied to German coal supplies (taking account of the difference in quality), it will be found that there is not the same large surplus of gas available. For instance, the surplus gas from Otto-Hoffmann ovens dealing with Westphalian or Saar coal would on the average be less by more than 10 per cent. than the surplus gas from American coal from the Connelsville district. Upper Silesian coal would give better results; but even that is not so rich a gas coal as is the American coal. But technical progress lies in the direction of the utilization of less rich gas coal, and in the partial or complete abolition of the use of enriching coals. The necessity for the application of varieties of coal selected for their gas-making properties should be wholly or partially done away with.

Gas from well-managed coke-ovens closely resembles that from gas-retorts. According to data published in "Stahl und Eisen" in 1895, the calorific power of Cologne gas made from Westphalian coal was to that of the gas made in Otto-Hoffmann coke-ovens from the same coal as 100 : 95. The calorific power of Cologne gas, moreover, agrees closely with that of the gas made in America from the coal in use there. The calculation given below shows that the heating effect of the gas used in heating coke-ovens is equal to, or better than, that produced from coal or coke for heating retort-settings. An illuminating power of from 14 to 18 candles is found in the rich gas which is produced during the first third of the whole period of distillation. Suitable working of the ovens, with a shortened period of distillation, and distillation chambers of smaller size, which would result in the more rapid extraction of the gas and consequently better preservation of the illuminants from destruction, would have the desired effect of wholly or partially abolishing any necessity for carburetting the gas. The yield of coke is closely dependent on the duration of the period of distillation. It is greater the less thorough the carbonization. In places where foundry coke is not required, and only household coke has to be supplied, coke suited to the local requirements could be produced along with gas of higher illuminating power. Evidently, the financial results must depend on the adaptation of the coke to the market demands, and on the working and the choice of coal being regulated according to the relative amounts of gas needed for illuminating or for heating and power purposes. The coke-oven process admits of considerable modifications to suit varying requirements; and thus its ultimate value for gas-works purposes is really very high.

In order to form an idea of the returns which such an installation would afford, a general glance may be taken at figures computed for an equal quantity of gas from gas-retorts and coke-ovens. It will be assumed that the same coal would afford the same yield of gas, coke, tar, and ammonium sulphate, and that gas coke would fetch the same price as foundry coke, especially as an entire production of the latter by the coke-ovens is not contemplated. The prevailing average prices of the products are taken; and the calorific power of the gas in each case is assumed to be in the aforementioned ratio. The cost of the plant in each case is estimated as closely as possible, and includes the carbonizing, condensing, washing, and purifying plant, and gasholders. Where coke-ovens are engaged in producing illuminating gas, benzol-recovery plant will be needed at the most for one-half or two-thirds of the gas made—that is, for the gas used for heating purposes. Thus the benzol-recovery plant will be on a smaller scale than for coke-ovens where the whole of the gas is dealt with in it. But, on the other hand, cyanogen washers will be needed for carrying out Bueb's cyanogen-recovery process. Therefore, the cost of the whole plant may be estimated at that of benzol-recovery plant of a capacity adequate to deal with the whole of the gas made. An Otto-Hoffmann oven, completely equipped for the recovery of tar and ammonium sulphate, costs £650; or, allowing £250 also for benzol-recovery plant, a total of £900. In twenty-four hours, such an oven would work off 3½ (metric) tons of coal, yielding 10,065 cubic feet of gas per metric ton (= 10,227 cubic feet per English ton), and 70 per cent. of its weight of coke, 3½ per cent. of tar, and 1 per cent. of sulphate of ammonia. Messrs. Otto also find the yield of cyanogen is equivalent to 1'5 oz. to 1'8 oz. of potassium ferrocyanide per 1000 cubic feet; but this yield will probably be considerably exceeded. Benzol is not taken into account, as it will merely



diminish the cost of producing carburetted gas, and thus be so much to the good. One Otto-Hoffmann oven would produce in twenty-four hours 35,300 cubic feet of gas, of which 40 per cent. would be surplus available for disposal. For instance, for an output of 706 million cubic feet (20 million cubic metres) of gas per annum, an installation of 135 ovens would be required. This would cost, including benzol-recovery plant, £121,500. To this must be added the cost of a gasholder—say, £75,000—making a total of £196,500.

The cost of retort plant capable of making the same volume of gas would (including a similar gasholder) be £225,000; or £28,500 more than the coke-oven plant. The selling price of the gas, regarding it as sold for heating purposes, whether it be actually used for lighting or heating, would be about 3s. 5d. per 1000 cubic feet (12 ft. per cubic metre). The retort plant on this basis would bring in £120,000 per annum; but the gas from the coke-oven plant, having only 95 per cent. of the calorific power of the retort gas, would accordingly fetch only £114,000. Nevertheless, the gas revenue from the oven installation would amount to 58 per cent. of the capital outlay; that from the retort plant to only 53·33 per cent. Consequently, the ovens return, for gas disposed of, 4·67 per cent. more on the capital outlay than do the retorts.

Even more striking are the differences in the revenue from bye-products and in the cost of coal. The 706 million cubic feet of gas would be obtained in retorts from 70,000 metric tons (= 68,880 English tons) of coal. The make of, and the returns from, bye-products would be as follows:—

Product.	Percentage of the Weight of Coal Carbonized.	Quantity Made. Metric Tons.	Price per Metric Ton.	Receipts.
Coke . . .	70·0	49,000	£0 15 0	£36,750
Tar. . . .	3·5	2,450	1 0 0	2,450
Sulphate . .	1·0	700	12 0 0	8,400
Potassium ferrocyanide	(4 oz. per 1000 cub. ft. of gas*)	80	57 10 0	4,600
Total . . .				£52,200

\* According to Dr. Bueb's results.

The coke-ovens, on the other hand, would have to carbonize 175,000 metric tons (= 172,200 English tons) of coal in order to yield a surplus of 706 million cubic feet of gas. Thence it follows that the remaining products would give receipts as shown in the next table. The figures assume the yields and prices as for the retort products, with the exception that it is reckoned that cyanogen is recovered from the whole of the gas produced—viz., about 50 million cubic metres (= 1766 million cubic feet), and that the yield is as found by Messrs. Otto—viz., 1·5 oz. of potassium ferrocyanide per 1000 cubic feet.

Product.	Quantity Made. Metric Tons.	Receipts.
Coke. . . . .	123,000	£92,250
Tar . . . . .	6,120	6,120
Sulphate of ammonia .	1,750	21,000
Potassium ferrocyanide .	75	4,312
Total . . .		£123,682

These figures show that the gross receipts from the bye-products are approximately proportional to the amounts of coal carbonized—viz., as 4 (retort plant) is to 9·48 (coke-ovens). Deductions for materials, and the cost of recovering and working up the bye-products, are not to be taken into account here, as this is only an attempt to show the relative receipts. The expenses are less, the greater the quantity dealt with. The charges for quenching, transporting, and loading the greater quantities of coke produced in the coke-ovens, are considerably less per unit, owing to simplification of working by mechanical means. In the Boston plant, the ovens are erected in a high position; so that the coke, as it is drawn from the ovens, falls down an inclined plane, on which it is quenched, directly into the waggons which are ready for its reception. Further, there must be taken into consideration the relative efficiencies of the gas used as fuel in the ovens and of the fuel consumed in heating the retort-settings. For their carbonization in gas-retorts 100 parts by weight of coal require, on a favourable estimate, 15 parts by weight of coal, or the equivalent thereof. In Otto-Hoffmann ovens a (metric) ton of coal is carbonized by the consumption of 6040 cubic feet of the oven gas, which, according to figures given in "Stahl und Eisen" in 1892, would be equivalent to 0·1496 (metric) ton of coal, or 14·96 per cent. of the weight of coal carbonized. This is practically the same as the percentage of coal (15) used for heating retorts. But other estimates give a much higher relative heating value to the coke-oven gas; and consequently the figures might be made more favourable to the coke-ovens.

At times of great demand for gas, when the surplus proved insufficient, producer gas might be used as a good and cheap auxiliary for heating the ovens. The foregoing deals only with Otto-Hoffmann ovens on the regenerative system. Undoubtedly,

however, Otto ovens with direct firing would give equally good results, taking into consideration the special circumstances of each case. If the surplus gas proved considerably less than the quantity contemplated above, the gas would have a correspondingly higher illuminating power.

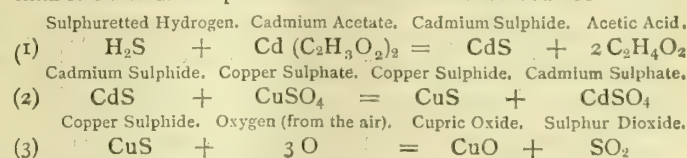
Coke-oven installations such as that considered would be applicable in the cases of towns of moderate or large size. An installation of sixty Otto-Hoffmann ovens would serve to supply a town of 80,000 to 100,000 inhabitants. The foregoing statement of returns would (says the author) lead to the anticipation that such gas-works have an unquestioned future in Germany.

#### ESTIMATION OF SULPHURETTED HYDROGEN IN GAS.

The following is an account of a method of estimating sulphuretted hydrogen in illuminating gas, devised by Herr A. Müller of Völklingen, and described by him in a recent number of the "Journal für Gasbeleuchtung."

The method is essentially the same as that of estimating sulphur in iron which was recommended by Schulte in 1896. Two solutions are required—one of 25 grammes of cadmium acetate with 200 c.c. of acetic acid, made up to a litre with distilled water; the other of 80 grammes of crystallized sulphate of copper dissolved in 750 c.c. of distilled water, to which (on cooling) 175 c.c. of concentrated sulphuric acid is added, and the whole made up to a litre with distilled water and filtered. Then 25 c.c. of the cadmium solution is brought into an Erlenmeyer flask provided with a plug with two perforations, through one of which passes an inlet-tube extending nearly to the bottom of the flask, and through the other of which passes an outlet-tube with end open to the air. The volume of gas passed through the solution is measured either by means of an experimental meter, or a bottle of which the capacity down to a given mark is exactly known and is about 15 litres (530 fluid ounces, or 0·53 cubic foot). The bottle should have a tubulure at both top and bottom, and the water in it should have its surface covered by a layer of petroleum. Gas is admitted through the upper tubulure, and the water is allowed to escape through the lower one until it reaches the level of the mark on the bottle. The Erlenmeyer flask is then connected with the upper tubulure of the bottle, to the lower tubulure of which a water reservoir or service-pipe is connected. The cocks at both tubulures are opened, so that the gas contained in the bottle is driven in a slow stream through the cadmium solution in the flask. There is no risk of sulphuretted hydrogen escaping absorption. A second absorption flask will be found to absorb no more.

After the gas has been passed through the solution, the plug of the Erlenmeyer flask is removed, the inlet-tube is rinsed out into the flask, and the contents of the latter are heated to about 120° to 140° Fahr., and 10 c.c. of the copper sulphate solution is added. The cadmium sulphide and the copper sulphate at once react, causing a change of the yellow colour of the precipitate suspended in the liquid to a dark brown. The copper sulphide formed is filtered off, washed well with hot water, dried, ignited, and weighed. The copper sulphide is far more easily washed than is cadmium sulphide. The reactions involved are—



Thus a molecule of sulphuretted hydrogen yields a molecule of cupric oxide. Consequently the weight of sulphuretted hydrogen absorbed is equal to  $\frac{34}{79}$  times the weight of cupric oxide obtained. The weight of a litre of sulphuretted hydrogen at 64° Fahr., which may be assumed for the purpose of this calculation to be near the usual temperature, is about 1·43 grammes. Therefore, if the weight in grammes of cupric oxide obtained is multiplied by  $\frac{34}{79 \times 1·43} = 0·301$ , the result is the volume (in litres) of sulphuretted hydrogen in the volume of gas employed under the prevailing pressure.

**Wood Gas for Public Lighting.**—The public buildings of Petersburg, South Australia, have been lighted by gas made from wood; and the result is reported to have been so satisfactory that this illuminant is to be used for the streets. It costs about 5s. per 1000 cubic feet. The charcoal resulting from the carbonization of the wood is a valuable residual; and there is a certain yield of tar.

**Midland Association of Gas Managers.**—As already announced, the autumn general meeting of this Association will be held at the Grand Hotel, Birmingham, next Thursday; and we learn from the circular which the Hon. Secretary (Mr. C. Meiklejohn, of Rugby) has issued that Mr. J. Ferguson Bell, of Derby, the President, will read a paper on "Standardizing Meter-Unions." This will be the only technical matter to be brought before the members.



## REGISTER OF PATENTS.

**Explosion Engines.**—Johnson, C. M., of Redhill. No. 15,633; July 31, 1899.

The patentee proposes to use one or more balanced piston-valves outside the cylinder of the engine, to regulate the admission of the explosive mixture and the expulsion of the products of combustion resulting from the exploded charge after it has performed its work. The invention further consists in constructing and operating the piston-valves so that, if it is desired to obtain an explosion at each end of the cylinder, the valves are so adjusted and operated (by either a crank, cam, eccentric, or other device) that they are always tight and seated to prevent the flow of gases except when they are travelling over the port out of the piston-valve chamber. By this means, it is possible to dispense with the noise and pounding of ordinary explosion-engine valves, and to run them at much greater speed, and, if desired, in either direction.

The invention also consists in mechanism attached, when wished, to any of the moving parts of the engine (or a part connected thereto), for the purpose of storing up power which may be utilized when desired to start the engine in either direction—thus avoiding the manual labour and inconvenience necessary to start an ordinarily constructed explosion engine.

**Internal Combustion Engines.**—Mitchell, E. A., of West Norwood, S.E. No. 20,163; Oct. 7, 1899. Date claimed under International Convention, March 8, 1899.

The object of this invention is to provide an engine in which a working stroke may be given to the piston once during every revolution of the crank-shaft without the use of a force-pump for compressing the motive fluid, as commonly employed in engines of this type. The patentee provides a closed chamber, in which the motive fluid is under pressure; and the pressure which he contemplates making use of is that occasioned by the production of combustible gas in a confined space—as, for instance, by the action of dilute acid on granulated zinc, or by the action of water upon a combination of calcium and hydrocarbon, or upon calcium carbide or any other similar compound.

**Gas-Burners.**—Wilkinson, J., of Burton-in-Lonsdale. No. 20,690; Oct. 16, 1899.

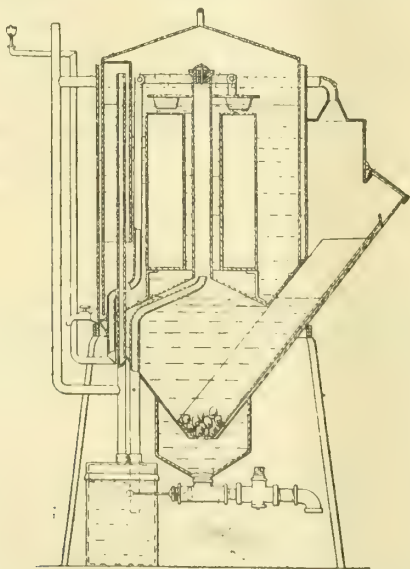
This invention relates to gas-burners particularly applicable for gassing silk and other fibres. In the burner preferably used for this purpose, the body of the burner has a recess formed around the supply-orifices; and a cover or hood (preferably square), with a downwardly projecting rim, is provided. The cover tends to return the flame, and concentrate the heat; and it also prevents carbon deposit from the burnt fluff. The side and ends of the burner are left open, to facilitate the passage of the fibres, and to allow of its being moved out of contact with them. In place of the hood, an auxiliary vertical downward pipe may be employed, causing two jets to meet on the fibres; or a series of such pipes may be arranged at any suitable angle, so as to cause three or more flames to concentrate on the fibres.

When it is required to adapt for lighting purposes the gas produced for heating, a flat box-burner is employed, with a series of holes or perforations, and a cover for concentrating the flame, over which is fixed a "carbon comb."

**Acetylene Generator.**—Ross, W., of Montreal, Canada. No. 22,828; Nov. 15, 1899.

This invention has for its objects: To supply absolutely pure acetylene to the consumer; to enable all the air that may happen to gather in the apparatus to be exhausted before any gas can flow; to provide an automatic feed of the calcium carbide as the gas-generating power of the apparatus diminishes; to provide a gasholder that will be capable of containing a comparatively large supply of gas—thus necessitating a long seal, and at the same time enabling the gas when generated to pass through, and free itself only from, the amount of water necessary to its generation; to provide an apparatus that can be carried from place to place without any danger of its parts becoming disarranged; and to "further improve the general construction of this class of apparatus."

The cylindrical-body portion of the apparatus has (as shown) a pair of oppositely arranged truncated cones, connected at their bases to the bottom



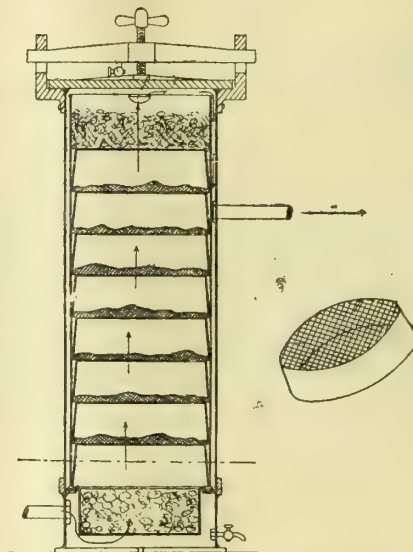
edge, and forming the generating or decomposing chamber. Openings are cut through the cylindrical-body portion and the upper cone; and the edges of the openings are connected by a diaphragm, forming a passage.

A chamber, constituting a shoot, is formed on the exterior of the body portion, and has an opening (corresponding to the openings cut in its side) to receive a drawer, to slide into the passage; the drawer having its inner end formed of wire mesh, so as to close the open end of the cone, and act as a false bottom to the generating or decomposing chamber. The drawer carries the quantity of carbide being used at any one time; and the passage serves as a port through which the chamber can be supplied with water. A gas-conducting pipe is connected to, and leads from, the truncated apex of the upper cone, to a point on a level with the upper end of the cylindrical-body portion. A cylindrical section—constituting a well to receive the residue, and having a conical bottom—is secured to the lower cone; and the bottom of this well is provided with a draw-off pipe furnished with a piston, to enable it to be cleared in case it becomes clogged. A dome or gasholder, about equal in length to, and slightly less in diameter than, the cylindrical-body portion, is placed within the body portion; a water-seal serving to retain the gas fed to the interior.

**Purification of Acetylene.**—Bailey, J. W., and Clapham, J., of Keighley. No. 23,073; Nov. 20, 1899.

In the production of acetylene from calcium carbide which is only commercially pure, it is found (the patentees point out) that a certain amount of impurities—such as aqueous vapour, sulphuretted and phosphoretted hydrogen, and the like—are given off along with the gas; and if allowed to remain present in it, they "considerably affect the illuminating power of the gas, have a deleterious action on most of the metals employed in connection with its conduction and combustion, and otherwise seriously interfere with its successful use." The invention consists in means whereby the impurities may be entirely or to a certain extent removed.

For this purpose, the patentees employ a case or holder (as shown) of circular or other shape in cross section; and inside this is mounted, at a suitable distance from the lower end, a container having a perforated bottom, and holding a quantity of slag wool or other similar substance. Above the container, and reaching to within a short distance of the upper end of the



outer vessel or holder, is an open-ended cylinder or case, placed in such a manner that its lower end forms a gas-tight joint with the container for the slag wool. Within the cylinder is a tray, perforated or formed of trellis work; and above this is a receptacle or bag formed of some porous material, and containing calcium chloride or other purifying agent—the bag being made to fit tightly against the sides of the inner receptacle. Above the bag is placed another perforated tray; on this another receptacle; and so on, until there is a series of trays and receptacles. Above the uppermost receptacle is superimposed another perforated tray, on which is placed slag wool or a layer or sheet of cotton wool. The outer casing is covered by a lid.

The inlet and outlet pipes for the acetylene are so formed that the gas is caused to travel first through the container in which is placed the slag wool—the gas by this means being split up, and any solid particles removed from it; then through the series of receptacles containing the calcium carbide or other purifying agent; and finally through the remaining layer of slag wool. If desired, the gas may be further passed over or through lime, or a solution of caustic soda or caustic potash, to remove any traces of chlorine remaining after its previous treatment.

**Mixing Gas and Air or Gases of Different Gravities.**—Cottrell, G. R., of New York, U.S.A. No. 4381; March 7, 1900.

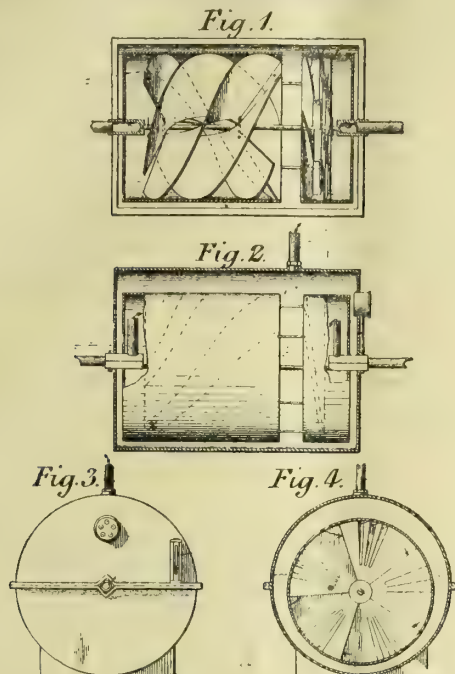
This invention relates to apparatus "for mixing gas and air, or gaseous fluids of different gravities, in the desired proportions, under the same pressure or velocity, and thereby obtain a perfectly homogeneous mixture of the gas and air, or other fluid, at a moderate pressure, for supplying the burners of heating and cooking stoves, and for other purposes."

In burning gas for such purposes, it is now a common practice, the patentee remarks, to supply the current of gas to the burner-orifice at a comparatively high velocity, by means of an induction burner of the bunsen type—thereby drawing in, or inducing the flow of, a current of air at a low velocity, for mingling with the gas to cause combustion. The results attained in practice are unsatisfactory and wasteful of gas, for the reason that the currents of gas and air, moving at different velocities, and the fluids being of different gravities, do not diffuse and perfectly commingle, but, on the contrary, are held apart by "a great law in Nature," resulting in imperfect and only partial combustion of the carbon particles and a corresponding waste of gas. Gases of different gravities (such as gas and air) "must be united in positive measured proportions, and also at the same velocity, so that when they are brought



together the mixture will be perfect and homogeneous, and in uniform proportions."

The object of the present invention is to provide for overcoming such defects and objections in the gas and air mixing devices, and to provide for mixing together currents of gas and air under a uniform pressure and at the same velocity, and in positively measured proportions. Accordingly, the air-meter drum and the gas-meter drum are mounted upon the same shaft (as shown), and the pressure of gas is utilized for revolving the gas and air drums. One of the special objects of the invention is to



reduce to a minimum the resistance to the revolution of the drums by providing comparatively narrow or small inlet-openings to their screw-measuring compartments, and comparatively wide or large outlet-openings. Another object is to provide increased and more efficient driving surfaces or shoulders in the spiral vanes of the gas-meter drum, so that the drum shall be more readily and effectively propelled by the pressure of the gas which is to be metered and mixed with the air. Fig. 1 represents a horizontal section of the casing and meter-drums, excepting that the vanes in the drums are shown in plan. Fig. 2 is a vertical longitudinal section of the casing, with the meter-drums in elevation, and illustrating (diagrammatically, by dotted line) the screw-measuring compartments of gradually increasing diameter from the inlet-ends to the discharge-ends. Fig. 3 represents an end elevation. Fig. 4 shows a transverse section through the casing and one end of the gas-meter drum.

**Gas or Vapour Burners.**—Boult, A. J.; a communication from J. Sauvan, of Montpellier, France. No. 6608; April 9, 1900.

The patentee claims as his invention "a gas or vapour burner adapted for either lighting purposes by means of incandescence devices or for heating purposes, comprising an annular double-walled burner-tube, through and around which air can pass to be mixed above the tube with the gas issuing from the double-walled tube—the air being guided at the upper part of the burner by means of a cone; a disc above the burner-tube, perforated; and means for adjusting the cone and disc relatively to the burner-tube, for the purpose of regulating the position of these two parts and the air-passage."

#### APPLICATIONS FOR LETTERS PATENT.

- 18,802.—PHILBROW, W. E., "Internal combustion engines." Oct. 22.
- 18,881.—BOHNE, M., "Gas-motors." Oct. 23.
- 18,892.—WRIGHT, J. W. B., and DARWIN, H., "Fixing gas-fires in open grates." Oct. 23.
- 18,902.—HENTRICH, F., "Gas or petroleum cooking-stoves." Oct. 23.
- 18,927.—LAKE, W. B., and ELLIOT, E. F., "Self-generating gas or vapour burners." Oct. 23.
- 18,933.—HARVEY, E. C., "Gas heating appliances." Oct. 23.
- 18,947.—DEIKE, A. H., MITCHELL, J., and ALEXANDER, A. W., "Acetylene generators." Oct. 23.
- 18,988.—JACKSON, J., "Gas cooking and other stoves." Oct. 24.
- 19,016.—RAILSBACK, L. D., "Acetylene gas-generator." Oct. 24.
- 19,028.—JONES, P. C., "Improvements in gas-cocks and the method of igniting the gas issuing from the burner." Oct. 24.
- 19,038.—MORGAN, D., "Compression and exhaustion of air or gas." Oct. 24.
- 19,061.—SUGG, W. T., "Incandescent gas-burners." Oct. 24.
- 19,104.—SIMMANCE, J. F., and ABADY, J., "Gas lamps or lanterns." Oct. 25.
- 19,154.—HANCOCK, J. W., "Gas blowpipes." Oct. 26.
- 19,254.—PACTET, A. P., "Separation of gases from their mixtures." Oct. 27.
- 19,267.—SCHEELE, T. A., "Incandescent gas-burners." Oct. 27.
- 19,275.—HUNT, R., "Gas or oil stoves." Oct. 27.
- 19,289.—NEWTON, H., "Fluid-pressure engines." Oct. 27.

Sir Courtenay Boyle presided last Wednesday over a meeting at the Board of Trade with reference to the regulations desired by the scientific departments of the Government in order to prevent interference with the delicate magnetic observations at Kew and Greenwich by the influence of electric traction.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Condensation in Relation to Naphthalene Deposits.

SIR,—Will you allow me to draw the attention of readers of the "JOURNAL" to the above question. From observations made, I find that where trouble is experienced by the deposits of naphthalene in mains and services, the deposits mainly occur in the summer time, and not in winter. It appears to me reasonable to assume that the amount of naphthalene per ton of coal carbonized is the same winter and summer; and as the make of gas is generally, say, three times as great in winter, it follows that the amount of naphthalene to be dealt with in summer is only about one-third of what it is in winter. Yet there is practically all the trouble in the summer. What is the reason?

I think it is due to the altered conditions of the works plant in the two seasons. In winter, the foul mains and condensers are, as a rule, large enough to cool the gas to about 55° Fahr.; and after flowing through other parts of the plant, which are exposed in a cold atmosphere, it is passed into the holders at a temperature of probably not more than 60° Fahr. It is then cooled in the holders (which are huge coolers in winter) to a temperature which is probably as low as it is ever likely to be brought to. In the summer time, there is available, and often used, a far greater proportion of foul main and condenser for the gas made (which I think may possibly be an aggravation of the trouble, by reason of keeping the gas, at a comparatively high temperature, in prolonged contact with the tar in the foul mains). The gas probably leaves the condenser at a temperature higher than 60° Fahr., from which point it is likely that the temperature increases up to, and in, the gasholders, owing to the great surface exposed to the action of the heated atmosphere.

I submit that the works plant should be cooled by water in the summer time—especially the gasholders—so that the gas is not permitted to leave the works at a temperature exceeding the temperature of the street mains; and I believe that, if the gas were gradually cooled in the works, no trouble would be experienced in the mains and services. Cooling apparatus of this description could be arranged to be absolutely under control to suit the varied atmospheric conditions, at not very great outlay. The only cost would be a little decrease of the illuminating power of the gas, which would be effected on the works instead of in the street mains; but this would be trifling as compared with the cost of clearing stoppages in services.

Nov. 2, 1900.

ENGINEER.

### Ability—Luck—or Influence?

SIR,—I have been a reader of the "JOURNAL" for twenty years, and have always looked upon its columns with awe and respect; and whenever my ambition has been fired to pen a few lines for insertion, I have usually quenched the rising wish by thinking that it was not for juveniles like myself to aspire to such notoriety.

But in two recent issues of the "JOURNAL" I have read with particular and growing interest the "Editorial Notes" on Mr. Carnegie's speech at Halifax, on the Educational scheme of the Chamber of Commerce, in which he speaks of "the adaptability of young men to fill leading positions requiring intellect and ability." The letters, too, under the heading of "The British Gas Engineering Profession," which appeared in the "JOURNAL" for Oct. 23, on "the difficulty of true talent and perseverance meeting with its just reward" have touched me in a somewhat sore place. I have, therefore, made up my mind (with your kind permission) to throw off my nervousness, and boldly write you a few lines for insertion on this question of securing a berth in the gas profession after having what is usually regarded as an up-to-date knowledge of the duties.

I was destined for the gas profession "right through," as the Americans would say; and my uncle, a gas and water works engineer and manager, had, I know, very fond hopes that I would blossom into a real modern gas and water works manager, and he spared no pains in putting me up to all he knew of gas and water works construction. When I left school, I was at once placed in my uncle's works, as an ordinary apprentice, to learn mainlaying, gas-fitting, and plumbing. Following this, for a period of fourteen years, I rose from one department to another, until I had charge of the books, stores, was foreman and clerk of works for alterations, new plant, &c.—in fact, had a hand in everything that had to be done at the works. My uncle died when I was 23. The position was duly advertised; and a gentleman was selected, coming from a large works, and under him, for the next five years, I gained additional training, as he was an engineer of good modern experience. I also went in for studying Mr. Newbigging's latest "Handbook," Butterfield on "Gas Manufacture," and several others on chemistry, &c.

Eventually, my chief accepted a better position; and, acting on his advice and with his support, I applied for the post as manager. But the decision came to by the directors was that I did not possess sufficient experience to secure the appointment. Well, I must admit to being keenly disappointed. I had a lot of detail improvements in my mind, which I thought of carrying out, to reduce the cost of working; and I also had a scheme for securing every large customer for cooking and cottagers for lighting purposes. However, my brilliant aspirations were not to be realized.

We talked it all out at home (for by this time I was married); and we came to the conclusion that possibly there might be some truth in the directors' remarks, and that I did not possess sufficient training for the job. The question was "How was I to get this extra training?" for there was such a lack of facility for obtaining it. I was at a 16-million feet works, at a small watering place of 7000 inhabitants, and we were removed some 60 miles from any large centre of manufacture or commerce. I mentally made a list of the departments that I had had no opportunity of being initiated in, up to that time; and they were: Gas-engines, elevators and conveyors, the manufacture of gas plant, and I did not know exactly what gas managers were doing to combat the electric light, which at the time was thought to interfere very much with the consumption of gas, wherever it was introduced. So I deliberately set myself to attain this standard of proficiency. I secured an appointment with a large firm of gas-stove manufacturers, who were also agents over an extensive area



for a leading firm of gas-engine makers. After twelve months, I knew pretty well how to secure customers for cookers, fires, and gas-engines. I then went to a firm of electric lighting and gas engineers; and I had an insight into electrical work, and the fitting up of gas installations on a bigger scale than what I had formerly been accustomed to. My next two places were among hydraulic engineering, electric lighting, and ironfoundry work—chiefly pumps, pipes, sulphate plant, and elevators and conveyors.

Now during the last five years, I have kept a watchful eye on the advertisements for gas or gas and water works managers; and if they were works of from 13 to 20 millions, I have generally sent in an application. The usual reply is that someone else has been selected; but often, no word is sent at all. However, on two occasions I was lucky enough to be on the short list, but failed to secure the appointment owing to my not being in a gas-works at the time of applying. My assurance that I had gained a knowledge that could not by any chance be acquired in staying at a small gas-works, was of no avail whatever. I have lately concluded that I had better get back again into a gas-works, as stove department manager or book-keeper and manager's assistant, and sacrifice 10s. or 15s. per week in salary for a time, and work my way up from this point. But up to the present, I have failed to secure a berth in these departments.

I have never for one moment felt anything but goodwill towards the successful candidates; but I have often thought how perverse it is to miss, and such funny men to secure, the preference. At one place I tried for, a man was selected who got turned out of his previous appointment for drunkenness. He had the berth a month, got turned out again for drunkenness; and—would you believe it?—he secured another place as gas manager shortly after. Another position of gas and water manager was given to a gentleman who was previously in charge of a set of steam-pumps at a water-works. At another, the gas-fitter on the works was appointed manager.

My efforts for minor positions are destined to meet with failure. I tried for the berth as book-keeper to a gas and water company, and a gentleman secured this place who had assisted to edit a treatise on book-keeping; and my latest exploit was as secretary, book-keeper, and manager's assistant at a small works. A gentleman (I am told) out of a grocer's or greengrocer's shop in a neighbouring town secured this place; and the company are paying the retiring book-keeper twelve months' salary to teach this new secretary what he has to do.

My object in detailing my experience is to show that what "Provincial Gas Engineer" says is perfectly correct—that there should be, after attaining a standard of proficiency, some certificate that would guarantee the fitness of a candidate when applying for a berth in the gas profession. For at present, influence and luck have more to do with securing a berth in the gas profession than years of patient work and study.

Oct. 30, 1900.

ARGUMENTUM AD JUDICIUM.

### The Alcohol Lighting in Paris.

SIR,—In reference to the article in to-day's issue of the "JOURNAL," entitled "The Prospects of Alcohol Lighting," I am informed, by a gentleman who has had something to do with the municipal lighting in Paris, that the so-called "alcohol" lights now being used at the Pont d'Iéna are obtained by a mixture of 5 per cent. of alcohol and 95 per cent. of gasoline. I give you this statement as it was given to me.

London, Oct. 30, 1900.

A SCEPTIC.

**Retford Gas-Works Profits.**—The Retford Corporation Gas Committee report a net profit for the past year of £1081; making the total standing to the credit of profit and loss account £4356. The Committee recommend the erection of a new gasholder at a cost of £5000 or £6000. It will, they anticipate, effect a considerable saving.

**Precautions against Accidents with Gas-Stoves.**—We learn from the "Chemical Trade Journal" that, in view of the numerous accidents caused by the defective construction and fixing of gas cooking and heating stoves, the Hamburg Police Authorities have issued the following precautions to be observed by persons who instal these appliances: "All gas heating apparatus for baths, cooking, or other fixed gas installations for industrial uses, should be connected with a good exit-flue. The communicating-pipe should have a diameter at least three times that of the service-pipe. When the ventilation of the place in question is sufficiently assured, there can be connected ventilating flues from small gas cookers and heaters, such as teapot stands, chafing-dishes, sad-iron heaters, and other portable apparatus."

**Gas Profits and the Rates at Walsall.**—At the last meeting of the Walsall Town Council, the Finance Committee submitted the estimates for the district and borough rates for the half year ending March 25, 1901, and recommended that the former should be 1s. 10d. and the latter 6d. in the pound on agricultural land and 1s. on all other hereditaments; making 2s. 10d. in the pound for all hereditaments except land. The financial details of the estimates showed that while for the second half of the past year £1750 was reckoned as profit from the gas undertaking, nothing was put down for the portion of the year 1900-1901. Alderman Baker, in moving the adoption of the estimates, said that, although there was an increase in one rate, there was a corresponding diminution in the other; so that the two would amount to the same sum as for the past half year. There was 1d. off the district rate, and 1d. on the borough rate. Public lighting was about £340 more, in consequence of the higher price of gas. Dealing with the latter rate, he explained that nothing was estimated to come from the gas-works in the current six months, owing to the "unfortunate prices;" and that therefore the £1750 they had in the corresponding half of the last financial year would have to be provided for out of the increased rate. The estimates were passed. Commenting on this matter, the "Walsall Advertiser" declares Alderman Baker's apology for the absence of gas profits to be only "half the truth." The writer says: "An extra 3d. has been put upon the gas because of the increased cost of coal. This has been done in connection with other gas-works, which are still able to yield handsome profits. The real fact is that the Corporation are having to spend extra money to bring the antiquated gas-works up to date, and put them in a satisfactory state to get a proper yield of gas per ton of coal carbonized."

## MISCELLANEOUS NEWS.

### GAS COMPANIES' PROTECTION ASSOCIATION.

The Third Annual General Meeting of the Association was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W. Mr. GEORGE LIVESSEY, the Chairman, presided; and there were fourteen other members present—viz., Messrs. T. Berridge (Leamington), C. E. Botley (Hastings), G. Clarry (Cardiff), R. Hall (Matlock), H. Hart (Canterbury), H. E. Jones (London), William King (Liverpool), Chas. M. Ohren (Lower Sydenham), R. O. Paterson (Cheltenham), W. R. Phillips (Hitchin), Sydney Y. Shoubridge (Lower Sydenham), C. C. Smith (Southampton), A. G. Snelgrove (West Ham), and Hanbury Thomas (Sheffield).

The SECRETARY (Mr. F. E. Cooper), having read the notice convening the meeting, referred to the letters of apology he had received. The minutes of the second annual meeting, held on Oct. 26, 1899, were also read by him and confirmed. He then mentioned that he had invited nominations for members to serve on the Committee in place of the gentlemen retiring by rotation; but none having been made, those retiring offered themselves for re-election.

#### THE YEAR'S WORK—ADVANTAGES OF MEMBERSHIP TO SMALL CONCERNS.

The annual accounts and report were next read by the SECRETARY. In the former, it was shown that £324 16s. 10d. was brought forward from the preceding year; and the subscriptions received totalled to £367 10s.—making together £692 6s. 10d. Deducting the expenditure, the balance at bankers and in hand amounted to £465 15s. 6d. The report read—

During the past year, the Association has zealously watched the general interests of Gas Companies.

The following is a list of the Bills which have been introduced into Parliament during the past year, affecting the interests of Gas Companies: Boilers Registration and Inspection Bill, Boilers Registration and Inspection (No. 2) Bill, Engines and Boilers (Persons in Charge) Bill, Petroleum Bill, and Borough Funds Bill. All these Bills were blocked on behalf of the Association; and they all failed to pass into law.

As regards the Borough Funds Bill, the opposition on behalf of the Association on second reading was unsuccessful, as the second reading was passed by a catch vote. Steps were then taken, in conjunction with the Liberty and Property Defence League, to secure numerous necessary amendments being made in the Bill as amended in Committee on its consideration; and the result of such opposition was that the Bill did not proceed further.

The Sub-Committee appointed to consider the question of Municipal Trading requested the Chairman to give evidence before the Joint Committee of the House of Lords and House of Commons, which met to consider this question. This Mr. Livesey did; and the Committee have not yet made their report, but have recommended that they should be re-appointed to continue their inquiries next session.

A large number of companies during the past year have applied to the Secretary for information and assistance on many points connected with the working of gas companies. Amongst the questions upon which the Secretary has been able to assist the members may be mentioned: Assessment of works for income-tax purposes; dispute with surveyor of taxes on question of income; claim of Somerset House authorities for payment of stamp duty on increase of nominal capital by reason of duplication of stock; damage done to gas-mains by electrolysis; question of coal contracts; disputes between gas companies and local authorities consequent upon the companies raising the price of gas, as regards price charged for public lamps and to private consumers; alleged nuisance arising from the use of water gas; fraudulent abstraction of gas; proposals of local authorities to purchase compulsorily gas undertakings; and supply of electricity by local authorities.

It is satisfactory to note that the Association continues in a prosperous condition; and the following ten Companies have joined the Association during the past year: City of Chichester Gas Company, Cullingworth Gas Company, Drighlington and Gildersome Gaslight Company, Horsham Gas Company, Devonport Gas and Coke Company, Cambridge University and Town Gaslight Company, Chigwell, Loughton, and Woodford Gas Company, Newcastle-upon-Tyne and Gateshead Gas Company, Newport (Isle of Wight) Gas Company, St. Annes-on-the-Sea Gaslight and Coke Company. One small Company has resigned its membership.

In regard to the first question upon which he had rendered assistance—the assessment of works for income-tax purposes—the Secretary said that was a case where the Company wanted to know whether or not the rental value of the Manager's house should be included for income-tax purposes. In the next, a Company had incurred very considerable expenditure—nearly £2000—in defending an action brought against them. The Surveyor of Taxes claimed that these costs came under the heading of capital expenditure, and declined to allow their deduction from the amount upon which income-tax was calculated. He (Mr. Cooper) did not think the Surveyor of Taxes could sustain his point, but did not know what had been done since. Regarding the third item, that was an old question. The Somerset House authorities claimed that gas companies should pay double stamp duty on the increased capital in cases where it had been converted, although it was merely a nominal increase. The question was awaiting the settlement of the Midland Railway case, which was going to the House of Lords.

The CHAIRMAN: So far it has been decided against the Midland Company; and I understand, if they are unsuccessful, it will make a difference to them of nearly £60,000.

The SECRETARY (proceeding) said the item as to the damage to gas-mains by electrolysis explained itself. The question of coal contracts was one where the coal contractors wanted to impose something very binding; and he was asked to communicate with other companies to see whether similar conditions were inflicted on them. Disputes between gas companies and local authorities as to the price of gas referred to the power to raise the price and as to whether or not the increase could be retrospective. In the Brierley Hill case, the Council declined to pay the increased price; and the town was put in darkness. The item as to alleged nuisance arising from the use of water gas referred to Dublin; and a question upon the subject was asked in Parliament by Mr. Healy.



The point was as to the deleteriousness of the gas. As to the propose compulsory purchase of a gas-works by a local authority, this referred to one of the smaller companies, who asked for guidance as to the proper course to take under the circumstances. In another instance, information was desired as to whether a gas company could do anything to stop the supply of electricity.

The CHAIRMAN said it became his duty to move the acceptance and adoption of the accounts and the report. Dealing first with the accounts, the satisfactory part about them was that the income exceeded the expenditure by an appreciable amount; and the Committee had resolved to invest in Consols £300 of the £462 balance at the bankers. Whether they should alter the subscription or not was a moot point; and the Committee had referred to a Sub-Committee the consideration of the question whether another class of subscribers might not be admitted—that was to say, the very small companies at a lower rate of subscription. But this would be reported upon by the Sub-Committee at a later date. It was satisfactory to find that they had increased their membership during the year. And the strength of an Association of this sort no doubt lay in having a large number of members—not in a few companies paying relatively high subscriptions, but a large number paying moderate subscriptions; and thus have a ramification of the Association all through the country, so as to get as many companies as possible interested in it, because help might be given in various ways, even by small companies. Proceeding to the report, he said he knew the Secretary had watched very closely all the Bills mentioned therein, and had taken a great deal of trouble in getting members of Parliament to block those which were obnoxious. It was satisfactory that none of them had passed. As to the question of municipal trading, this was gone into by the Committee; and he (the Chairman) was requested to appear before the Lords and Commons Committee who were deputed to consider the subject. This he did; but as to what would be the effect of the inquiry, they did not at present know. One of the main uses of the Association was the dissemination of information. Many companies—large ones as well as the small ones—found knotty points come before them, and then they wanted someone to whom they could apply for assistance. If there were no such Association, what would they do? but having such an Association, the most natural and proper thing was to apply to the Secretary. He thought he might say that the number of such applications during the past year proved its usefulness; and the result, he hoped, had been satisfactory to the applicants. Of course, the list of questions in the report was merely a sample; the Secretary had had a great many more communications than were there represented. As to the question of the assessment of works for income-tax purposes, he believed one point that had arisen had been whether anything should be allowed for depreciation. The authorities would not allow it for the general plant; but they had allowed it for gasholders, because they could not depreciate a gasholder year by year. It lasted until it was worn out; and then it was gone. He understood from Mr. Crowther Smith that the course they had adopted in his case was to allow a certain percentage from the value of the holders to be deducted every year. He (the Chairman) some years ago, went to Somerset House in connection with the same point. They were then unwilling to allow a percentage; but they said they would allow the Company to deduct the value of the holder when it was worn out. And so, when a holder had become worn out, they had deducted the value of it at £15 per 1000 cubic feet capacity. Most of the holders had been small ones; but the authorities had always allowed the deduction at this rate. All the other questions the Secretary had explained; but, as the report said, it was satisfactory to know the Association continued in a prosperous condition in one sense. But in a double sense it was very prosperous. It was prosperous financially; and prosperous in even a better way, in that it had proved its usefulness. All they wanted to do was to convince gas companies generally that this was a useful Association—that it could render them essential service. And this being so, the natural result should be that they should all become members.

Mr. H. E. JONES seconded the motion; remarking that, if gas companies realized the return they got for their subscriptions—the consultation and deliberation twice a year and more frequently of men such as were then in the room, he was sure they would feel the money was well laid out.

Mr. R. HALL (Matlock) spoke of the special advantages which such an Association offered to the smaller gas companies, in the matter of assistance and advice, for no other expense than the amount of the subscription. Only a few weeks ago, he had a dispute with the Clerk of the District Council. He (Mr. Hall) took one view and the Clerk took another. Ultimately, the Council, being members of the Urban District Councils Association, referred the question to the Agents of that body; and they replied at great length—taking, happily, his (Mr. Hall's) view. The Clerk and the Council accepted the advice of the Agents, and saved further dispute. The District Councils Association was therefore of great service to the Council; and the Company were well satisfied. The assistance rendered by the Agents of that Association could be rendered as efficiently and usefully by Mr. Cooper. If the smaller companies realized this, he was sure they would become members at once.

The motion was unanimously carried.

#### RE-APPOINTMENT OF MEMBERS OF COMMITTEE.

The CHAIRMAN said the next business was the re-election of the retiring members of Committee. They were: Messrs. Thornton Andrews (Swansea), C. E. Botley (Hastings), H. B. Chamberlain (British Gaslight Company), G. Clarry (Cardiff), J. W. Helps (Croydon), and R. O. Paterson (Cheltenham). He mentioned that the members were largely indebted to Mr. Thornton Andrews for the formation of the Association; and as to the other names, they could not have a better selection.

Mr. T. BERRIDGE proposed, and Mr. CHAS. M. OHREN seconded, the re-election of the retiring members; and the proposition was unanimously carried.

#### ISSUE OF STOCK AND SHARES LOCALLY—A POINT IN GAS-WORKS PURCHASE.

Mr. HALL said there were one or two points he should like to bring before the meeting. He happened to be a representative of a very small Company; and he thought the Committee were all representatives of large companies. [No.] At any rate, those who were connected with the

management of small companies took a very deep interest in all that was passing, and especially in the doings of the two Metropolitan Gas Companies. So far as the South Metropolitan Company and its Chairman were concerned, they took the greatest interest and pleasure in their proceedings. It was a fact, and a material fact, that what was done in connection with the two London Gas Companies gave a turn to affairs relating to gas companies generally, just as the London County Council was a kind of example to local authorities all over the country. The London Companies fought on a large scale the battles which some of the other companies had to fight every now and then on a small scale. There was one point on which he felt very strongly—that was, the desirability of keeping new capital in their own district. Mr. Livesey had managed to do this in the case of the South Metropolitan Company. A local complaint was that the profits were made in the place, and then distributed among shareholders all over the country. The local authorities conveniently forgot, when they acquired the undertakings themselves, that they went far enough away to get their capital. But that was the local complaint in many cases—that a great number of the shareholders to whom the profits went resided a distance away. But it was no use sending out invitations to tender for stock or shares. They found that very few people tendered; and in one case he knew of a wealthy lady who stepped in and cleared the whole lot. But they were anxious to distribute the shares among the ratepayers and the consumers. If they could go to them and say, "We offer you the shares at a certain price," they would have them applied for over and over again. It would be better for the company, better for the consumers, and more satisfactory to the neighbourhood. There was another matter upon which he wished to speak, and which was always in their minds—that was, the question of purchase. To show his point, he mentioned an instance where the price of gas was put up in consequence of the increase in the price of coal; but the company he referred to did not want to do so, had it not happened that they were afraid of letting down the profits for the local authority to step in and take the advantage. It worked out against the public that they should always be compelled to keep up their profits lest advantage should be taken of their letting them down. This was really, if they looked at it from a just point of view, a great hardship for a company who were doing their duty in every respect, and taking no advantage of the sliding-scale—keeping the dividend down to the ordinary 10 per cent., and giving any advantage beyond that to the consumer. It was a great hardship that they should always be feeling themselves at the mercy of some clap-trap fellow, and never feel free from attack. That was the sort of thing they had to put up with in the country. There was all the difference in the world between an offer from an authority to treat with a company, and going to them and saying "we mean to have you."

The CHAIRMAN said, as a rule, the local authorities waited until a company went to Parliament; and then it was for the company to see that their case was put properly before the Parliamentary Committee. He was afraid all they could do was to wait for the report of the Lords and Commons Committee on Municipal Trading. The Association would watch the matter; and whenever there was an opportunity of putting in a word against purchase, they would do so.

On the motion of Mr. SNELGROVE, seconded by Mr. CROWTHER SMITH, a unanimous vote of thanks was passed to the Chairman for the courteous way in which he had presided over the meeting.

The CHAIRMAN expressed his appreciation; and, referring to Mr. Hall's remarks, said he might say a few words about the issue of stock to consumers. He had done his part to induce gas companies to take this course, and had found fault with some of them coming to London to sell stock. Take Brighton, for instance, they sold in London. But his friend Mr. H. E. Jones was Consulting Engineer for the Eastbourne Gas Company; and they sold at Eastbourne. The Croydon Gas Company sold their stock in their own town. When the South Metropolitan Company were in Parliament some three or four years ago, they asked permission to offer stock directly to the consumers; but they could not get it. They were told it would be an alteration of the Standing Order about the Auction Clauses; and there was a difficulty in fixing the price. What ordinary investors wanted to know was at what price they could buy the stock. They did not understand tendering at a reserve price, and that they should tender at something above it. There were two Companies who did this: The Act required that they should advertise the stock for sale by tender in papers circulating in the district. These Companies selected papers that were not read by financial people. They complied with the letter of the Act absolutely. They got no tenders, and then, having advertised it, they were free to offer it elsewhere, at the reserve price. Both Companies had it in their Acts that, if the stock was not sold by tender or auction, then it might be offered to "shareholders, consumers, or employees." They consequently offered it to the consumers. At the present time the two Companies were issuing stock in this way—the Crystal Palace Company were offering £20,000, and the South Metropolitan Company £100,000. Neither of the Companies previously got a single tender, though they strictly complied with the Act.

Mr. OHREN (in answer to the Chairman) said that upwards of £18,000 had been applied for up to the present; and there was yet another fortnight for applications to be sent in.

The CHAIRMAN stated that out of the £100,000 in the case of the South Metropolitan Company £90,000 had been applied for up to that day. He was told that companies who were trying to sell stock by auction or tender could not get tenders.

Mr. WILLIAM KING stated his experience in selling in Liverpool (say) £50,000 or £70,000 of stock at a time. They advertised in the local papers, and had the sale in a public sale-room. The stock was put up in £100 or smaller lots; and the people came in—brokers, consumers, or anyone else—and bid just as they pleased. Each lot was put up separately. They had not the slightest difficulty in selling the stock; and they could put more up at any time.

The CHAIRMAN said that was just what they did not want to do—to sell stock to the ordinary investors. They wanted to sell to the customers. But they found the consumers did not buy when stock was offered at the Auction Mart—the Stock Exchange people being the ones who bought it. They issued a circular to every consumer with the quarterly accounts or independently, offering the stock in £5 or multiples of £5, at the reserve price, on the ground that the consumer who invested his £5, £10, or £50 would fight for the Company, while the man who invested his £5000 did not care for them a snap. Thus they secured a number of local friends,



and got better prices than if they sold by auction or tender in the ordinary way.

#### THE PRICE OF COAL—A HEALTHY SIGN.

The CHAIRMAN further remarked that he had received an interesting piece of information. The Crystal Palace Gas Company required a small additional quantity of coal for the winter. But they would not give the price asked by the coalowners; and in about three weeks it had gradually come down by 3s.—from 22s. 6d. delivered, to 19s. 7d.

This concluded the proceedings.

### CITY CORPORATION CONFERENCE ON THE PRICE OF GAS IN LONDON.

The Conference of Local Authorities convened by the Corporation of London to consider the question of the charges for gas in the Metropolis was held last Wednesday at the Guildhall. Of the 44 Authorities invited to send delegates, 37 were represented. The proceedings were opened with due ceremony by the Right Hon. the Lord Mayor.

His LORDSHIP, on taking the chair, informed those assembled that the Corporation, with that regard for the public interest which distinguished them, had agreed, by resolution, that a Conference of the Local Authorities should be held to consider the increasing charges of the Gas Companies in the Metropolis. He extended to the delegates a hearty welcome, and trusted that arrangements would be made which would be for the public benefit. He invited them to elect a Chairman to succeed him.

Mr. A. C. MORTON, who, as our readers are aware, has taken a great interest in the question, was unanimously appointed to the chair.

Following this, Mr. H. M. BATES, the Principal Clerk of the Corporation Health Department, was selected to perform the duties of Clerk to the conference.

The CHAIRMAN, in his opening address, said this was a conference of all the Local Authorities of London. He believed all had appointed three delegates, excepting perhaps two. So far as he knew at the moment, 117 delegates had been appointed to meet; but, of course, all who were selected might not be present. They were assembled on an equal footing; the Corporation having only three delegates the same as the other Authorities. The conference had been convened largely on account of the great interest the Corporation had for many years taken in the wants and requirements of the gas consumers of the whole of London. They had felt for some time that the considerable difference existing in the price of gas on the north of the Thames as compared with the south side, was a matter that required the serious attention of the people of London. They had invited delegates from the Local Authorities in the south as well as on the north, in order that they might assist them. For many years, it had been felt a great burden, and a distinct grievance, that consumers who by accident or necessity lived on the north side of the Thames should be compelled to pay a higher price for gas than those who resided on the south side. Why gas should cost on the north 3s. 5d. per 1000 cubic feet, and only 2s. 8d. on the south was a mystery which called for a solution. But whether it was solved that day or not, it was clear that the Gaslight and Coke Company must reduce their charges, failing which, steps would have to be taken in Parliament to provide a remedy. This question of excessive charge against the Gaslight Company was not in any sense a new one. As far back as 1868, the difference between them and the South Metropolitan Company was 9d. per 1000 cubic feet—viz., 4s. against 3s. 3d.; while to-day it was still 9d., 3s. 5d., and 2s. 8d. respectively, or, if they allowed the Gaslight Company the 3d. per 1000 feet they claimed by giving free meters to consumers, the figure would be 8½d. per 1000 cubic feet. The South Metropolitan Company was not a charitable institution. They were told this Company paid their men better, and gave their shareholders a good dividend; and, consequently, it did not want any great strength of mind to see that gas should be made as cheaply on the north as in the south. Since 1868, the great difference had gone on—sometimes the figure was a little more, sometimes a trifle less than 9d. per 1000 feet—until Parliament appointed last year a Select Committee of Inquiry into the charges of the Metropolitan Companies. The Corporation (who, between the years 1860 and 1880, had spent upwards of £29,000 in opposing or promoting Bills in the interest of the gas consumers) gave evidence before that Committee. The results of the labours of the Committee were embodied in a report, and were well known to all. The figure of 9d. per 1000 cubic feet which the Gaslight and Coke Company demanded above the South Metropolitan Company did not convey much information until they looked at the enormous annual output of the former—viz., nearly 22,000 million cubic feet, about 19,500 million feet of which was sold to private customers on the north side of the Thames, which, at the present difference of 9d., represented between £700,000 and £800,000 per annum, of which sum the Corporation paid annually about £3000 for markets, police stations, &c. This large sum of money was the extra annual burden upon the gas consumers north of the Thames. This, of course, was the great point before them—that over three-quarters of a million of money was taken out of the pockets of the consumers on the north. The burden fell hardly on the small manufacturers and printers, who were compelled to use gas-engines because they had no room for steam power. They paid large sums for gas, making a difference on manufactured articles of about 40 per cent. between the north and south. In the district served by the three large Gas Companies, there were, at the beginning of 1897, about 4600 gas-engines of all sizes, from ½-man power to 100-horse power. At that time, there were in the South Metropolitan district alone, 150 ½-horse power, 100 1-horse power, and 120 2-horse power engines at work. Since then the number in the Metropolis had grown to above 7000, of which about 3500 to 4000 were in the district of the Gaslight and Coke Company, and about 1500 were in the City. The best customers in the City of London of the gas-engine manufacturers were the printing, publishing, book-binding, and allied trades, situated in the neighbourhood of Fleet Street and Whitefriars. These firms used the major portion of the 1500 gas-engines in the City. In 1867, on the consideration of the Metropolis Gas Bill, a statement was given in to the Parliamentary Committee presided over by Lord Cardwell from the Gas Companies' Committee to the effect that, if they

were allowed to amalgamate, it would result in a reduction of working expenses, and thus ultimately benefit the consumers. The exact contrary had come to pass. There were thirteen Companies at that date; there were but three now. How, he asked, had the Gaslight and Coke Company justified this great privilege of amalgamating with the Gas Companies north of the Thames? It was not found that the benefits of amalgamation, and the consequent reduction of expenditure that should have followed, had been of any use whatever to the consumer, though this great monopolist Company had everything in their favour to warrant them in supplying gas at least as cheaply as on the south. He had a statement which showed they had the largest area, that they supplied more gas per mile of main than the other Companies, that they had the richest class of consumers, the biggest income, and the largest profit—

#### Area, &c., of the Gaslight and Coke Company.

The largest and most compact district in the world	67 square miles
Most densely populated	About 2½ millions
Largest number of consumers	353,740
Rateable value of area	£25,666,000
Greatest consumption per mile of main	10,595,000 cub. ft.
Customers per mile of main	173
Largest number of public lights	1,083,212
Public lamps per mile of main	24
The richest private customers (i.e., average consumption per annum)—	
Gaslight and Coke Company	58,160 cubic feet
South Metropolitan Company	49,571 " "
Gas sold (1899)	21,656,746 thousands
Income from all sources	£4,129,272
Net profit.	£1,117,233

Mr. Morton then dealt at some length with the Bills of the two Companies that were before Parliament last session, commenting on the proposal in the South Metropolitan Bill to take over the southern portion of the district of the Gaslight Company, and the possible effect, if the transfer had been carried through, on the price charged for public purposes north of the Thames. Had, he remarked, the southern district been sold, the lowest charge to private consumers in any part of the Gaslight Company's district would have been the price charged on the north side; and the cost of public lamps would have automatically risen to that level. The aggregate quantity of gas consumed by public authorities for public lamps in the north was about 1000 million cubic feet. Upon this quantity, every penny of difference in price amounted to more than £4000. At 9d., the present difference was about £36,000 in favour of the public lighting, or about 16s. per annum for every public lamp consuming 5 feet per hour. In the City alone, the difference was about £1746 per annum. As there was no provision in the South Metropolitan Bill for keeping this arrangement alive, the Corporation, in conjunction with the London County Council and the Local Authorities, strenuously opposed the Bill both in the House of Lords and the Commons; and the House of Lords Committee unanimously rejected the preamble so far as it related to this matter. Had the opposition not succeeded, the Bill would have practically given to the Gaslight Company a present of nearly £1,000,000—that being the capitalized value of the amount the Local Authorities would have lost on the public lighting. In addition to this, a further sum of £900,000 would have been received by the Company from the South Metropolitan Company as the agreed price to be paid by the latter for the southern area. Thus Parliament would have put an enormous amount of capital at the disposal of the Gaslight Company, without any conditions attached, such as were drawn up by the Select Committee of Inquiry; and this after Parliament had twice refused to grant the Company a single penny of additional capital. They were not assembled that day to run down public joint-stock companies; but they had a right to say that, when Parliament granted a giant monopoly like this, there should be some restriction—some regulation—whereby the gas consumers (who were at the mercy of this big Company) should be protected against unfair prices. It had been suggested that the conference should have been postponed until after the new municipal bodies had been elected; but he gave reasons why it should not. He next referred to communications received on the subject. In one, a Mr. Phillips, of 27, Nicholas Lane, wrote that one of the reasons given by the Gas Companies for their extra charges was that they had to pay rates and taxes; and these rates and taxes added 2½d. per 1000 cubic feet to the price of gas. He (Mr. Morton) believed there had been a general complaint that the Companies were not rated high enough. They got the use of the streets for nothing; and therefore it was not much to ask them to pay something towards the general rates, the same as other people. Another letter was from the St. Luke's (Peabody Buildings) Protection League, and was signed by 400 persons.\*

Mr. HUDSON (Chairman of the Corporation Streets Committee) moved the first resolution—

That, in the opinion of this conference, Parliament should intervene to protect gas consumers from the evil effects of the giant monopoly brought about by the Gas Acts of 1847 and 1860, and that the London Local Authorities should combine for the purpose of getting such relief from Parliament as may be deemed equitable.

In his remarks, he spoke of the value of combination among the Local Authorities, and said it was right they should combine together to this one particular end—to prevent any increase in the price of gas.

Mr. EDGAR SYDNEY (Greenwich) seconded the motion.

Mr. H. C. RICHARDS, Q.C., M.P., remarked that the letter last referred to by the Chairman was from a number of his constituents. The people living in Peabody Buildings, some 800 in number, felt very acutely the difference in the price of gas, as consumed through the penny-in-the-slot meters. In his profession, he could make excuses for most people—(laughter)—but not for the Gas Companies. He could not see why the mere crossing of the river should lead to this wonderful difference in price. The working people felt the increase so strongly that many of

\* The communication signed by the 400 tenants of Peabody Buildings, St. Luke's, was as follows: "Pledge of 400 Consumers in St. Luke's—I the undersigned do support a request to the Gaslight and Coke Company for a reduction in the price of gas consumed by me; and, in the event of a refusal by the Gaslight and Coke Company, I do pledge myself not to use the penny-in-the-slot in my rooms until the price of gas is reduced." Then followed the signatures.



them were gradually buying oil-lamps, which were most dangerous things. He suggested that the new Councils should push forward the provision of electric lighting—particularly for the humbler dwellings. If the Gas Companies were going to fight the City with the new Municipalities behind it, he was perfectly certain they would come a cropper. He hoped the London Members of Parliament would do all they could in supporting the House of Lords in resisting these great monopolies, for the Lords appeared to do more in this way than the Commons.

Mr. TRENNER (Holborn) urged that the resolution should go further than it did. Parliament had intervened already; and they wanted Parliament to do something more than intervene. They ought not to have to wait until the Companies went to Parliament before something definite was done. Alluding to the inquiry by the Powers of Charge Committee, he asserted that no satisfactory reason was given for the high price of gas on behalf of the Gaslight and Coke Company. One reason Mr. Field, the General Manager, then gave for the high price was that they had so much obsolete capital, which ranked for dividend, and consequently represented a difference in the price of gas of 1d. or 2d. per 1000 cubic feet. It did not seem to occur to Mr. Field that they ought to wipe off this obsolete capital by a sinking fund. Another reason he gave was the competition of the electric light. But the higher they raised the price of gas, the more the competition would go on; and if this sort of thing continued, it appeared to him it would lead to the price of gas going up to perhaps 10s. per 1000 cubic feet. If the Company lowered the price of gas, and so sold more, and utilized their capital to a greater extent, that would be one way of bringing about further reductions. In Holborn, they so much resented the increase that they had swept gas from the Town Hall, and put in the electric light.

Mr. WENBORN (Shoreditch) did not think there would be much difference of opinion on this particular resolution. Somewhat to his regret, the Board he represented had taken a determined stand against any and all proposals for amalgamation. He should like to hear speakers refer incidentally to this point.

Mr. DOBSON (St. George's-the-Martyr) agreed that the Companies should be opposed; but it was to the Houses of Lords and Commons they must look to bring these monopolies under control.

Mr. F. W. VERNY (London County Council) spoke of the oppression of these monopolies on the poorer people of the Metropolis. He represented Peckham; and there, it was true, they were not so hardly dealt with as the consumers north of the river. But still they in the south felt this was a matter that should be taken up and dealt with by practical business men. He proceeded to quote the conclusions of Lord Cardwell's Committee in 1867—emphasizing the one where they said: "Your Committee have now to repeat the expression of their decided opinion that, either by way of regulation or independent supply, the consumer is entitled to far more efficient control than he at present enjoys with respect to the supply of gas in the Metropolis." Here they had a Committee actually recommending independent competition; and, in this report, the Local Authorities had strong confirmation of the action they were taking.

Mr. GOODWIN (St. Saviour's) thought that what they wanted to know was the cost to the Company of making gas per 1000 cubic feet. The *crux* of the whole thing, it seemed to him, was that the Company in the north did not know how to make gas so well as the Company in the south; and if the Board of Trade or some body was brought into existence to check the cost of manufacture, they would know exactly where the fault laid.

Mr. J. GLASS (Stoke Newington) opposed; his first reason being that he felt his Board should have had an opportunity of discussing the resolutions before being finally set for presentation at the conference. He was as eager to get cheap gas as anybody. But he believed no greater boon had been conferred upon the City or any other place than the supply of gas by those who had devoted their time and capital in that direction. Perhaps it was time that the regulation of the Companies was reviewed; but he was not one of those who felt that, because the Companies had carried on business for many years, and because they were successful, the Local Authorities should now seize hold of the undertakings, and turn them to the benefit of the public generally. This cry about cheap gas was not a new one; and there might be a good deal to say on the other side. The cry about high charges was heard in 1875; and the sliding-scale of price and dividend was the consequence. It was eagerly accepted by the City, the Metropolitan Board of Works, and by Lord Salisbury; and it had hitherto been carried out very properly by the Companies. The time had perhaps arrived when it might be revised; but there was no mention of this in the resolution, which went back to the Gas Acts of 1847 and 1860—ignoring altogether the compact made between the consumers and the Companies in 1875. Referring to the comparisons between the cost of gas north and south of the Thames, he alluded to the fact that the Gaslight Company were compelled, in consequence of pressure, to go several miles out of London to manufacture a large portion of their gas, and to lay immense mains to bring it to London. These mains cost an enormous sum. This was unproductive capital, but dividends had to be paid upon it. The South Metropolitan Company had nothing to pay in this way.

The resolution was then put and carried unanimously.

The second resolution submitted was as follows:—

That, in the opinion of this conference, the Gaslight and Coke Company are not justified in charging more per 1000 feet for gas supplied on the north side of the Thames than is charged by themselves and the South Metropolitan Gas Company for gas supplied on the south side, and that the Gas Companies of the Metropolis working under the sliding-scale should not be allowed to charge more per 1000 feet for gas supplied than the lowest price at which it is supplied by any one of them, so that gas consumers should not be compelled, as under the present monopoly, to make good the loss incurred by bad management.

Mr. SUTHERLAND (Marylebone), speaking in support, referred to the change in the local government of London; observing that, in setting things in train for a reduction in the price of gas, the Vestries would go out of office with the feeling that they had done all they could for the consumers. If they succeeded in bringing the price of gas down in the north to what it was in the south, they would have accomplished a useful work. The electric light and the poorer class of consumer also received the attention of the speaker; and he concluded by urging that what they should aim at was the revision of the sliding-scale.

Mr. COX SINCLAIR (St. Pancras) stated that, in his district, they did not

feel the increased price of gas so much as in some others, because they had an excellent electric lighting installation, and were no doubt great competitors of the Gas Company. He believed they were now virtually supplying electricity to the consumers cheaper than gas. They had not yet installed the light into the poorer neighbourhoods; and it would take some years to get it all over the parish. They were, however, pushing on the works as fast as possible.

Mr. B. L. COHEN, M.P. (London County Council) thought the resolution most equitable and moderate. They were doing, and would continue to do, a powerful and beneficent work by bringing to bear, by these resolutions, a certain amount of pressure on the local bodies, which, if exercised temperately and unitedly, would not fail to impress Parliament. As a member of the House of Commons in the last Parliament, he moved for, and perhaps was instrumental in obtaining, the Select Committee of 1898. He thought he might say that all the members of the Committee were powerfully impressed by the manner in which the Gaslight and Coke Company emerged from the inquiry. None of them ought to complain of the rise in the price of gas, which was brought about by the deplorable increase in the cost of coal; but the enhanced price which was levied most inequitably by the Gaslight and Coke Company north of the Thames was not brought about mainly by the price of coal, but it was the outcome of mismanagement, due to thoughtlessness on the part of the management; and for this the shareholders must suffer—certainly the consumers ought not to. He considered, in the inquiry by the House of Commons a year and a half ago, there was not a shred of a pretext whereon the Gaslight and Coke Company could make out a claim for charging an enhanced price in comparison with the Company on the south side of the river. If the Gaslight and Coke Company had only pursued, he would almost say, the decorous course of paying some regard to the Select Committee of the House of Commons, they would come before Parliament, at any rate if not with clean hands, with hands not so soiled as those with which they would appear the next time they came before the House. Unless they showed some deference to the recommendations of the Select Committee, they would keep on going before the House of Commons for a new trial, and they would be refused in the manner which their past mismanagement richly deserved.

Colonel BLAIR (Paddington) said he should not be satisfied until he saw the price of gas down to 2s. 6d. per 1000 feet. The consumers had been under a kind of partnership with the Gas Companies; but, if the sliding-scale did not act now, he did not feel inclined to rest content with the judgment of his forefathers. They ought to begin the new century with a new and honest sliding-scale. He thought the most sensible thing to do would be to elect a committee of experts to fix a decent sliding-scale, and force it in Parliament. The aim of the County Council was to buy up and confiscate; and this set many men against them. He personally always thought the Council were not dealing quite fairly with the Gas Companies. As the consumers stood at present, they were co-partners with the Companies. It was all very well to speak of monopolies; but where would the 30 millions of money have been got for these supplies had it not been for monopolies? The Local Authorities could never have carried out the work themselves; and they ought to be thankful to the Companies for what they had done. Look, he remarked, at the money that had been spent in fighting the Companies, which had all come out of the pockets of the ratepayers. "For goodness sake," he said in conclusion, "let a committee of gentlemen be appointed who know what they are doing, and have a decent sliding-scale framed and carried through Parliament."

Mr. COX (Shoreditch) pointed out that if the competition of the electric light forced up the price of gas, the poorer people would be the greatest sufferers. The only possible way to meet this was by the extension of the electric light system. In Shoreditch they had one of the best electric lighting installations in London; and they supplied electricity more generally than most parishes. They were supplying in streets where the residential population resided; and they had one or two blocks of excellent model dwellings where the light was supplied to the tenants for a small charge per week.

Mr. TRENNER stated that he knew a manufacturer on the north side of the river whose gas bill for his engines came to £1000 a year; and if his factory was on the south side of the Thames the same quantity of gas would only cost £750. It was monstrous that a manufacturer on the north should have to pay this excess for no reason excepting the arbitrary action of a Company.

Mr. JOHNSON (Clerkenwell) pointed out that conference after conference had been held on this question of the price of gas; and it was time a drastic resolution was passed, and something really done. The sliding-scale arrangement needed reconsideration, as the conditions had altered since its inception twenty-five years ago.

Mr. VERNY desired to correct a previous speaker. It was untrue that no capital was raised, or not much, before a monopoly was created. For many years—from 1810 onwards—capital was raised before the Companies had monopolies, which were created by the action of the Companies themselves.

Mr. VEZEY (Rotherhithe) gave some information about the South Metropolitan Bill of last session, which revealed his ignorance on the subject.

Mr. HOWARD (Mile End) complained that in Stepney the Commercial Company sent a notice, on the 6th of April, to the Local Authority to say that the price of gas had been raised from 2s. 6d. to 3s. He thought this was overstepping the mark. Gas Companies ought not to be allowed to raise the price, when they had contracts with public bodies, without giving certainly three months' notice.

The resolution was unanimously carried.

Mr. TRENNER introduced the next resolution—

That the advantages secured to the Local Authorities on the north side of the Thames by the City of London Gas Act of 1868 and the Amalgamation Scheme of 1883, as to the supply of gas for public purposes, should not be interfered with.

In the course of his remarks, Mr. Trenner went over the well-trodden ground in connection with the recommendation of the Select Committee of last year, that the southern portion of the Gaslight Company's area should be transferred to the South Metropolitan Company; the proposals in this direction contained in the Bill of the latter Company last session; and their possible effect on the price of gas for public purposes in the northern part of the Gaslight Company's district. The money expended



by the Local Authorities in defending this part of the Bill was, in his opinion, well spent. The present resolution was designed for the purpose of securing to them the advantages now possessed in the event of the transfer taking place.

Mr. WILKES (Islington), among other remarks in supporting the resolution, stated that when coal was, comparatively speaking, at a low figure, and the Company were charging 2s. 11d. per 1000 cubic feet for gas, their profit was not so large as it was now from residuals. They were making a much larger amount by the residuals at present than they were in the early part of the year; and the cost price of the gas was far less now, although coal had increased in cost so much.

Colonel BLAIR (Paddington) was against robbing the gas consumer to get cheap lighting for the streets. He regarded it as an unsound principle.

Mr. WILSON (St. George's-the-Martyr) stated that his district was supplied partly by the South Metropolitan Gas Company and partly by the Gaslight and Coke Company. They had just entered into a contract with the former for street lighting by No. 4 incandescent burners for £3 6s. each lamp per annum. They were supposed to be supplied with gas at the same price by the Gaslight Company, who wanted to charge £4 2s. 11d., and in addition 8d. for every new mantle, and 1s. for putting it on. Then they had had new columns from the South Metropolitan Company for £2 10s. each and from the Gaslight Company for £7 19s. 6d. These figures showed that a few safeguards were required in connection with other matters than the actual price of gas. Things wanted looking into all round.

The resolution was agreed to.

After a short conversation, a slight addition was made to the next resolution as originally drafted, in order to include the conference convened by the London County Council. The following is the form in which it was finally passed:—

That the Corporation of London and the London County Council be asked to take active steps to protect the London gas consumers in the direction indicated by the resolutions passed at the Conferences convened by the Corporation and the London County Council, and to oppose the granting of further powers by Parliament to the Gas Companies unless such relief be given.

Finally, the Corporation were requested to send copies of the resolutions to the Board of Trade, the Local Government Board, the London County Council, and each of the new London Borough Councils.

The Chairman was heartily thanked for the courteous manner in which he had conducted the proceedings; and shortly afterwards the Lady Mayoress entertained the delegates to tea at the Mansion House.

#### PRESENTATIONS TO MR. J. FERGUSON BELL.

Last Tuesday evening, Mr. John Ferguson Bell, Assoc.M.Inst.C.E., late Engineer and Manager of the gas and electricity works of the Stafford Corporation, was the recipient of a testimonial from many friends in the town on his leaving to take the management of the Derby Gas-Works. The presentation was made in the Mayor's Parlour, at the Borough Hall—Mr. C. H. Wright, Chairman of the Gas and Electricity Committee presiding, in the unavoidable absence of the Mayor (Mr. W. C. T. Mynors), who, however, telegraphed his good wishes for Mr. Bell's future, and his thanks for his zeal and energy, and his successful management of the works which had been under his charge.

The CHAIRMAN, in making the presentation, expressed regret at the absence of the Mayor, and said that during the time Mr. Bell had been at Stafford—nearly seventeen years—the gas-works had been turned absolutely upside down and inside out. This spoke well for his ability. Mr. Bell had always been to the front in dealing with matters connected with his work. In addition to being an able Gas Engineer, he was thoroughly capable as an Electrical Engineer; and he had saved the town a large amount of money by the efficient way in which he had carried out the electric lighting works when called upon to do so five or six years ago. In addition to carrying out all the works in a successful way from an engineering point of view, he had also acquitted himself well from the commercial standpoint. While the gas-works had been altered, Mr. Bell had made them pay handsomely. The ratepayers had had a contribution from them for many years. During Mr. Bell's management, they had repaid between £30,000 and £40,000 on capital account, and had contributed something like £30,000 to the rates; so that he had been responsible for paying over £60,000 for the good of the town. This was a matter of great satisfaction to them all. The appreciation of his services was shown by the fact that, the moment the testimonial was set on foot, there was a spontaneous response. In handing Mr. Bell the gifts on behalf of the subscribers, he (the Chairman) knew he was expressing their sentiments when he said they all hoped that in the future he would have a happy and prosperous career. He joined with the Mayor in thanking Mr. Bell for the zeal and energy he had displayed, and for his successful management of the Gas and Electricity Departments. These were the sentiments of all present, and of nearly every inhabitant of Stafford; and he hoped Mr. Bell would accept them as being expressed with all sincerity.

The testimonial consisted of an illuminated address and a silver tea and coffee service and salver. Upon the salver was the following inscription: "Presented, with a silver tea and coffee service, to Mr. John Ferguson Bell, C.E., late Engineer and Manager of the Stafford Corporation Gas and Electricity Works, by numerous friends and well-wishers. October, 1900." The text of the illuminated address was as follows:—

To John Ferguson Bell, Esq., C.E., Late Engineer and Manager of the Stafford Corporation Gas and Electricity Works.

We, the undersigned, as representatives of a large number of your friends, desire to place on record our high appreciation of the conscientious manner in which for a period of seventeen years you have discharged the important duties attached to your late appointment, and of the ability and zeal with which such duties have been performed, to the great benefit of the inhabitants of the borough and its environs.

Under your personal supervision, the gas-works have been entirely reconstructed and enlarged, and the electricity works established and developed. Exactness as have been your duties, you have evidenced a real interest in the furtherance of every object affecting the welfare of the town.

While we regret the termination of your official connection with the

borough, we heartily congratulate you on your appointment to the post of Engineer and Manager of the Derby Gas-Works, where you will find wider scope for the exercise of your talents.

In wishing you every success for the future, we beg, on behalf of the subscribers, your acceptance of the accompanying silver tea and coffee service as a lasting proof of our esteem and regard.

The address bore the signatures of the Mayor, the Town Clerk (Mr. M. F. Blakiston), the Chairman of the Gas and Electricity Committee (Mr. C. H. Wright), the late Chairman and Vice-Chairman of the Committee, and the members of the Presentation Committee.

Mr. BELL, on rising to acknowledge the gifts, was very warmly received. He said everybody had a red-letter day in his life, and that was pre-eminently his. He thanked all from the bottom of his heart, but especially the Chairman for the kind and flattering remarks he had made. Having referred to his relations with his various Chairmen, the Town Clerk, and the other signatories of the address, he went on to say that when he took charge of the gas-works the output was 80 million cubic feet. At the present time it was more than double that quantity; and the price had been reduced from 3s. 6d. with meter-rents to 2s. 6d. without them. While he was Engineer, the sum of £30,000 was handed over to the rates; and a similar amount had been employed in reduction of capital. The works had been remodelled and extended, the railway siding had been made to connect them with the two railway systems, and the electric light works had been in operation for five years without, he believed, a single failure. About two years ago an expert was called in to make a valuation of the gas-works; and his figures showed that the works were worth double the amount at which they stood in the books. It was not so much for their intrinsic value that he should treasure the gifts, but because they represented to him good and kindly feelings—the feelings of those who had known him for a period of sixteen years or more, and among whom he had moved from day to day. The address would remind him of the pleasant days he had spent in the service of the town, and of the gentlemen with whom he had been closely associated; and to all of them he offered his heartfelt thanks. In Mr. Pooley, his successor, they had a capable and competent Engineer for both departments; and he believed that the longer he remained with them, the more he would be appreciated. He thanked them also on behalf of his good wife. They would always look back to Stafford with pleasant memories.

Votes of thanks were then accorded to the Chairman and to Mr. W. Ward (the Hon. Secretary to the Testimonial Committee); and these having been briefly acknowledged, the proceedings closed.

The following morning, the employees at the gas and electric light works presented Mr. Bell with a very handsome silver tray in a morocco case, with the following inscription upon it: "Presented to J. F. Bell, Esq., C.E., by the staff and workmen of the Stafford Corporation Gas and Electric Department, on his leaving for Derby, 31st July." Mr. Hubert Pooley, the new Manager, was present. Mr. A. Poulson made the presentation, and spoke in high terms of Mr. Bell, who briefly responded; saying that one of the best things the Gas Committee had done was to introduce the profit-sharing system. He added that the way to increase dividends was to work as hard as they could. He was sure Mr. Pooley would do his duty well, and that they would get on satisfactorily together.

#### NEW GAS-WORKS SCHEME FOR COVENTRY.

At the Meeting of the Coventry City Council last Tuesday, the Gas Committee reported on the steps taken to obtain land at Foleshill for additional gas-works. They had caused plans to be prepared by the Gas Engineer (Mr. George Winstanley) for laying out the site. The plans showed sections for buildings and plant, with a producing capacity of 2½ million cubic feet per day; and the estimates were: Lands and preparation £11,250, trunk main from works to Coventry £14,000, manufacturing plant £98,270, and contingencies £6480—total £130,000. The Committee recommended that the Council authorize them to proceed with the erection of the buildings and plant, in accordance with the plans and estimates, and that the Estates and Finance Committee be empowered to raise the necessary funds by loan as required. Mr. Griffiths, Chairman of the Committee, in moving the adoption of the recommendations, said the necessity for the new works was absolute. The wonder was there had not been a very serious breakdown under the present arrangements. The new works would permit of 2½ million cubic feet of gas per day being made; but at present provision would only be made for 1½ millions. It would be two years before the new plant would be in working order. The manufacture of gas at the new site would be less expensive than at the present works. A letter was read from Mr. George Livesey, their Consulting Engineer, in favour of the scheme. Mr. R. S. Rotherham seconded the proposal, and said a great deal more gas was being turned out of the present works than they were really capable of producing. If the works had been removed to Foleshill as suggested some years ago, a very considerable sum of money might have been saved, especially in regard to the cost of materials and labour. Alderman Hill generally approved of the points raised in favour of the scheme; and Mr. Lee thought the Gas Committee's case had been proved. Alderman Gulson hoped the new works would produce considerable profits in aid of the rates; while Dr. Callaghan questioned whether the present was a proper time to go in for this expense. Alderman Andrews thought the Gas Committee rather too sanguine about the prospects of the Foleshill works, especially taking into consideration the spread of electric lighting. Other members supported the proposals; and eventually the recommendations were adopted without dissent.

An extraordinary general meeting of the Welsbach Incandescent Gas-Light Company, Limited, was held last Friday, at which the resolution altering the Articles of Association, and conferring upon the Directors borrowing powers to the extent of £250,000, was submitted for confirmation. The matter was so fully dealt with at the two preceding meetings (as reported in the "JOURNAL") that Sir Henry Burdett merely formally moved the confirmation of the resolution; and it was at once agreed to.



## COLONIAL GAS ASSOCIATION, LIMITED.

The Annual General Meeting of the Association was held last Tuesday, at the London Offices, Suffolk House, Laurence Pountney Hill, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) having read the notice convening the meeting, the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he had much pleasure in saying the Association had again improved their position; and the Directors were enabled to recommend an increased dividend, as foreshadowed at the annual meeting last year. Further than this, they were fully justified in saying that they would be able to do so again when they met the shareholders next year, as the prospects of Australia were improving, and the trade of the country was steadily increasing. It was highly gratifying to find that the Colony was gradually getting back to a prosperous condition. It was pleasing to him to be in a position to point out that the reserve fund was now £1496, or some £800 in excess of the amount at which it stood last year. After adding so much to this fund, and paying an increased dividend for the year, it was with much pleasure that they carried a little more forward—viz., £471—as undivided profits than last year. They therefore started the current year in a very satisfactory position. The increase of the business this year had equalled 8 per cent.; and they had 97 new consumers. The stocks, it would be noticed, were considerably more than last year; the chief item being coal. Their Managing-Director (Mr. G. Swinburne) considered it a wise thing to have a larger stock, as coal in Australia, though not advancing in anything like the proportion it had in this country, did show signs of some 20 or 25 per cent. increase. Mr. Swinburne therefore took advantage of the opportunity of putting into store a considerable quantity (nearly double the amount he usually held); and they hoped to secure their remaining requirements at a reasonable price. Mr. Swinburne feared it might mean a rise of 2s. per ton. Still he would do his best to obtain cheap supplies; and he was hopeful the increase would not exceed that figure. Since closing the accounts, the Directors had made arrangements to take over the Bairnsdale Gas Company; and he (the Chairman) was pleased to say it had been carried out, so that the Association now possessed twelve works. The terms of purchase they considered were favourable to both parties; and the result to the Association had been arranged on a 5 per cent. profit basis. The sum agreed upon was £8250; and it was paid by the issue of £6000 in 1200 fully-paid £5 shares, and taking over a mortgage of £2250 at 5 per cent., which could be continued, or paid off, at pleasure. The Directors thought, however, it would be well to continue this, as their invested funds, which were more than enough to meet this sum, returned a larger amount than 5 per cent., and therefore they considered it advisable, in the interests of the Company, not to disturb the investments, as they were in companies that had good prospects of increasing dividends. With the issue made, in acquiring these works, the Association were now in a position to apply for a Stock Exchange quotation; and if it met with the approval of the meeting, they would be pleased to take steps to bring it about at an early date. Personally he should like it to be done, as, though it might not just now improve the value of the shares, he felt confident that they would find a much wider market for the disposal of them when occasion required. Very few of the shares came on to the market; and those that did had always been easily disposed of. Still, by the shares being better known, they might get a larger demand for them; and the price would almost to a certainty increase. It was gratifying to know they had had a transfer through the office this month at £3 2s. 6d.; and as the dividend for this year was 3½ per cent., with the prospect of an increase during the coming year, the purchase gave at once over 6 per cent., and in the course of next year probably 7 per cent., which was a good return on the investment. Alluding next to the balance-sheet, he said he thought the figures he had to give would be satisfactory evidence of the progress they were making. During the past three years, the dividend had been increased ½ per cent. annually; and it would be noticed that the net revenue this year was £4170, against £3809 last year. The reserve fund was £1496, against £671. The receipts for gas came to £10,839, against £9502; and, with residuals, the total sales amounted to £11,755, against £10,388, which must be considered extremely satisfactory. Coal, wages, &c., totalled to £6239, against £5351. The coal, &c., in stock was valued at £1166, compared with £597; and this the Managing-Director considered a wise increase. In conclusion, the Chairman read an extract from a recent speech by the Hon. Robert Reid, of Melbourne. Speaking of the future of Australian commerce, he said: "After forty years' experience in the trade of Victoria, I think we may confidently assert that it is now in a sound and safer position than it ever has been in our history. It is pleasant for me to state that it has improved in every sense of the word."

Mr. W. C. PARKINSON, in seconding the motion, said the accounts they received from the other side were most satisfactory, considering that he works were not an easy matter for the Managing-Director to look after. If they had twelve works squeezed into one—making one good-sized works of the whole—the management would be a simple matter; but, instead of that, they were spread over twelve different places, and very small some of them were. However, they found there were satisfactory increases going on at nearly all the works; and, from recent information, the Directors believed the movement for federation in the Colonies would considerably benefit the Association at several of their works. Probably new railways would be opened up; and at one of the works, particularly, the Manager expected a considerable increase. The anticipations of twelve months ago had been fully realized; and the Directors felt inclined to prophesy there were still better days to come.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. G. HAMMACK, a dividend for the half year was declared at the rate of 4½ per cent. per annum, free of income-tax.

The CHAIRMAN next moved, and Mr. PARKINSON seconded, the re-election of Mr. G. H. Haywood as a Director. This was agreed to; and then Mr. Parkinson was re-elected on the motion of Mr. HAYWOOD, seconded by the CHAIRMAN.

Messrs. Lass, Wood, and Drew were re-appointed Auditors, on the motion of Mr. M. CURRY, seconded by Mr. W. CHAFFER.

A little conversation ensued with reference to an application being made for a Stock Exchange quotation. No formal resolution was pro-

posed; but the shareholders expressed their approval of the suggestion—leaving the matter in the hands of the Directors to do as they thought wise, after receiving the necessary documents from Australia, and consulting with brokers.

The CHAIRMAN, in proposing a vote of thanks to Mr. Swinburne, remarked that their Managing-Director had the affairs of the Association closely at heart. To show the esteem in which he was held, it might be mentioned that since the last meeting, Mr. Swinburne had been elected a Director of the Metropolitan Gas Company of Melbourne, and Chairman of the Broken Hill Water Company.

Mr. PARKINSON seconded the motion, which was heartily agreed to.

The CHAIRMAN, replying to questions, said the price of coal in Australia had not been affected very much. The best coal was now only about 10s. per ton; and if they could get 50 per cent. slack, it reduced the price, because the slack was only one-half the price of the other. In answer to Mr. Samuel While, he added that they would have to pay for coal perhaps 2s. per ton more after March, as what they had in stock and still coming in would carry them on till then. In regard to residuals, he thought they came out somewhat better in proportion than they did in England.

On the motion of Mr. R. H. DYER, seconded by Mr. WHILE, the thanks of the shareholders were tendered to the Chairman and Directors; and a reply by the CHAIRMAN concluded the proceedings.

## DEVONPORT GAS COMPANY.

## The Proposed Application to Parliament.

A Meeting of this Company was held last Tuesday to consider resolutions authorizing the Directors to promote a Bill to extend the powers conferred on the Company by their Act of 1853. Mr. A. BENNEE presided.

The CHAIRMAN said the Directors had not come to the conclusion to go to Parliament without full deliberation—in fact, they had been accused of neglect of their duty to the town and the shareholders for not having taken this step before. However, the Directors believed they knew their business, and the way in which they should supply the wants of the town, quite as well as their critics, some of whom had shown not an atom of knowledge of the Company's real position. It would have been more charitable and honest, as well as more conducive to the welfare of the town, if those who troubled so much about the affairs of the Company had only sought a little real light, instead of publishing false and calumnious statements about them. The Directors had watched the progress of the Company, and had endeavoured to economize at all times. They challenged any amount of inquiry. The time had now come when they felt that they could justly ask the shareholders to permit them to go to Parliament for increased powers. Their business had extended, and was still growing; and they wanted more capital. It was desirable to substitute mechanical for manual stoking. They had ordered machines—anticipating the shareholders' permission—and hoped to have them at work in a few days. Coal and freight had advanced in price cent. per cent., which also meant that more capital was required. As more streets were built, the mains had to be extended; and they knew as well as their critics that the cost of this should be debited to capital. Nothing had been done but what was to the interest of the shareholders and the consumers. They were told they would be opposed by the Town Council, who were promoting a Bill of their own. Well, as soon as the time arrived when the Directors deemed it necessary to promote a Bill, they thought it only just to the town to communicate the fact, through their Solicitor, to the Town Clerk; and as they wished to do the thing as pleasantly and amicably as possible, they added that, if the Town Council had any suggestion to make, they would be prepared to consider it. Naturally, they did not want to waste their own money; nor, as they were large ratepayers, did they desire to see that of the ratepayers wasted. The Town Clerk very properly communicated to the Council what the Directors said; but instructions were given, though not unanimously, for steps to be taken with a view to the promotion of a Bill. If the Council wished to do this, they were as much at liberty to do so as the Company. The Directors did not fear any parliamentary or other inquiry. The Company's position was impregnable; and if the town wished to waste money, so much the worse for the ratepayers. If Parliament gave them the power to buy the gas undertaking, he did not think the Council would have anything for many a long year to hand over to supplement the rates. Local authorities bled gas consumers to conceal their own mismanagement of local affairs; but the consumers at Devonport were not likely to assist the Town Council in buying up the Company's property. The Directors were desirous of meeting the Corporation; but if it was to be a fight, then a fight it must be. It was said that in the public lighting they had been robbing the town of 10s. to 12s. per lamp per annum "Robbing" was a harsh term to make use of, even if they had had the best of the bargain. But had they had the best of it? They provided the lamps, posts, service-pipes, and everything in connection with them, supplied them with gas, and lighted and maintained them, for £3 7s. 6d. each per annum. As to the outlay, he found that the lamp-posts cost the Company £1 15s. each; lamps, 13s. 6d.; governors, 1s. 6d.; service, 10s.; opening and repairing the roads, 10s.; frame, 7s.; and frog, 4s.—a total capital outlay of £4 1s. They supplied 20,750 cubic feet of gas per annum; but taking it at 20,000 cubic feet, the cost for gas, at 2s. 6d. per 1000 feet, was £2 10s.; interest on outlay, 4s.; painting, reglazing, &c., 1s.; and lamplighters' wages, 13s.—making a total of £3 8s., as compared with £3 7s. 6d. which they charged the Corporation. Another grievance was that the Company refused to supply gas to the district of St. Budeaux which had been added to the borough. This had been magnified. They had never refused to go to St. Budeaux. When the Corporation, after a vain application to the Plymouth Gas Company, asked them for terms, they supplied them. The Corporation thought they knew the Company's business better than they did themselves, and said they could do the lighting on very different terms. Then the Company wrote asking for the Corporation's views; but, though this was two years ago, they had never received an answer. As to the public lighting, the Directors agreed with the Council that it was the best thing they could do to take it into their own hands. They had an interview with representatives of the Council on this subject, and the Town Clerk asked if the terms which were suggested would include St. Budeaux. His reply was "No;"



but that if the lighting of the added area was to be discussed, they were quite prepared to attend another meeting. That meeting had never been called; but about a month ago Mr. Bellamy, of Liverpool, representing the Corporation, had a long interview with him on the subject of the lighting, with the result that they drew up some heads of agreement, and the Directors proposed to fall in with the view of the Corporation. Though Mr. Bellamy came to talk professedly of the public lighting, it did not require much acumen to see that he had another object in view. He asked whether the Company would sell the undertaking; and told him they could get a splendid price for it—mentioning 27 or even 28 years' purchase. He (Mr. Bennet) reminded Mr. Bellamy that the general terms of agreement were 30 or 31 years' purchase, and that in one case 33 years' purchase had been allowed. He also told him the Company were not going to sell; that they had engaged Counsel and engineering experts, and were quite prepared to fight, but were equally ready, if possible, to avoid fighting. They had made advances, so that it might not be said that there was any difficulty in coming to terms short of selling. He concluded by submitting a formal motion authorizing the Directors to promote a Bill or Bills to alter or amend the Devonport Gas and Coke Act, 1853, and to confer further money and other powers upon the Company.

The DEPUTY-CHAIRMAN (Mr. A. White) seconded the motion.

The CHAIRMAN, in reply to questions, explained that the new capital would be raised under the auction clauses, and that the sliding-scale would be adopted. It was proposed to convert the present original shares into £10 shares at 5 per cent., instead of £5 shares at 10 per cent., and the guaranteed shares into permanent £7 10s. shares at 4 per cent., which would give in perpetuity the same rate of interest as they were now getting. As to the manufacture of water gas, the question of the relative cheapness of this and coal gas was one of the price of oil *versus* coal. He thought oil was just now dearer than coal. There were advantages in connection with water gas, and the time might come when the Company would supply it; but they did not anticipate doing so at present.

Mr. FINCH suggested that, as the Corporation expressed a determination to buy the undertaking, it was not wise to give the Directors power to throw money away in promoting the Bill.

The CHAIRMAN said the Directors had faith in the impartiality and fairness of the Parliamentary Committees, and did not fear the result. They knew they had a valuable property, and meant to preserve it. They were ready to meet the Town Council and discuss the question in any phase they pleased; but they were not going to have their property taken away by anybody.

The motion was carried unanimously.

#### A DISPUTE REGARDING COKE-CONVEYORS AT THE KEIGHLEY GAS-WORKS.

During two days of the past week, Mr. Thomas Newbigging has sat at Keighley as Umpire in an arbitration between Messrs. Newton, Chambers, and Co., Limited, of Sheffield, and the Keighley Corporation. It appears that the firm named have installed some labour-saving machinery at the Corporation gas-works, in the shape of a system of coke-conveyors and elevators. The conveyor does not work to the satisfaction of the Corporation; hence the proceedings. Messrs. Newton, Chambers, and Co. sought to enforce a claim of £2537 18s. 6d., less £2140 payment on account; leaving a balance due of £397 18s. 6d. The Corporation filed a counter-claim for £4212 14s. 4d., in order to have the machinery put into satisfactory working order, or, in the alternative, for £7042 14s. 4d. damages for breach of contract.

The Contractors were represented by Mr. F. P. Rhodes, and the Corporation by Mr. W. J. Waugh.

Opening the case for the plaintiffs on Tuesday, Mr. Rhodes explained that the proceedings arose out of a dispute as to a small railway or tramway erected by his clients at the gas-works whereby the coke was conveyed from the retorts to a large hopper ready for removal off the premises, instead of having all this work done by manual labour. Messrs. Newton, Chambers, and Co. fitted the apparatus; but at first it was found that it would not work, owing to there being running sand and water 15 feet below the floor-line of the retort-house, which found their way into the conveyors. A modified system was put in; and the conveyors were lifted from under the floor and put under the roof. But unfortunately it had been forgotten that the men working at the regenerator furnace would be underneath, or in such a position that they might get the "drips" from the conveyors. The Manager was, under the circumstances, between the devil and the deep sea. He must either quench the hot coke in the conveyors earlier than he did, or he would have grumbling from the men below. Mr. Rhodes went on to say that his clients' position was that the machinery would have worked under fair conditions, but it was absolutely unfair to expect any machinery to work under the conditions that the Corporation asked. They must expect in labour-saving appliances of this kind that there should be a large amount of wear and tear; and when the conditions were so unfavourable as in the present case, it was not surprising that the machinery did not work smoothly.

The Umpire afterwards inspected the apparatus at the works; and he concluded the first day's sitting by hearing one witness for the plaintiffs, Mr. Robert Nesbitt, a foreman.

The following day was occupied in completing the evidence of Mr. Nesbitt, and the taking of the evidence of Mr. William Froggatt, the Assistant-Manager of the plaintiffs. During the cross-examination, Mr. Waugh dropped some incidental observation that the parties had kept good friends through all the stages of the dispute. The Arbitrator then interposed, and asked if they could not go one step further and compromise it, and save him the trouble of deciding. Mr. Waugh answered that that would have been done before all the cost had been incurred if it had been possible. Mr. Rhodes said he should be glad were there any road which would land them at a conclusion. The case then proceeded, and was adjourned to Monday, Nov. 19, in Leeds.

The Directors of the South African Lighting Association, Limited, have declared a dividend of 4 per cent. (8 per cent. per annum), free of income-tax.

#### MANCHESTER CORPORATION GAS SUPPLY.

##### The Proposed Purchase of a Colliery—Gas Profits and the Rates.

At the Meeting of the Manchester City Council last Wednesday, the minutes presented by the Gas Committee contained a resolution whereby a Special Sub-Committee, consisting of the Chairman, Deputy-Chairman, Alderman Rushworth, and Messrs. Bowes, Harrop, Jennison, Lambert, Phythian, and Smethurst, was appointed to consider and report as to the desirability of purchasing a coal mine or colliery for the supply of coal to the Corporation for gas-making and other purposes. A further resolution of the Committee was to the effect that in future the meter inspectors should be instructed to leave a card with each ordinary consumer, showing the date of inspection, the state of the index, and the quantity of gas registered by each meter at the time of such inspection. The minutes were passed without discussion. In addition to the ordinary minutes, the Chairman (Alderman Gibson) had on the agenda a motion to the effect that the present system of subsidizing the rates out of the profits of the gas undertaking was wrong in principle, unjust in practice, inimical to the best interests of the ratepayers, and ought to be discontinued. As, however, this part of the business was not reached until a late hour in the afternoon, Alderman Gibson asked that discussion on the matter should be adjourned to a future meeting. Although, however, his motion has not yet been discussed by the Council, it has aroused considerable public interest; and, together with other matters connected with the gas supply, it has been put prominently before the ratepayers at the municipal elections just decided. In an anonymous statement which has been posted all over the city, the ratepayers were asked the question as to whether they were content with the policy of the Committee in making enormous profits out of gas, which meant the taxing of gas users more than other citizens for the common requirements of all. After giving details of the liabilities and assets of the Gas Department, and its contributions in aid of rates, it was pointed out that the impounded profits in 38 years—that is to say, the excessive charges made to the gas consumers—have amounted to nearly twice as much as the present capital and other liabilities, and have more than supplied the whole of the present property and assets of the undertaking. How long, it was asked, would gas consumers submit to the injustice of having to provide money to reduce the rates of property-owners and others, many of whom were not even residents, and used little or no Manchester gas. The recent increase in the price of gas was carried in the Council notwithstanding the earnest protest of the Chairman of the Committee, who had given notice of a motion against subsidizing the rates out of the profits of the gas undertaking. It was also stated that a reduction in price to 2s. per 1000 cubic feet would leave a good margin of profit, even with coal at its present temporary high price, and would cause an enormous increase in the consumption of gas for motive power, heating, and cooking; thus encouraging industries, and, by largely reducing the consumption of coal, helping to keep down its price, and effecting great improvement in the atmosphere of the city.

#### GLASGOW CORPORATION GAS SUPPLY.

##### Proposed Reduction of Illuminating Power.

At the Meeting of the Glasgow Corporation last Thursday, a Sub-Committee of the Gas Committee reported that they had considered the advisability of applying to Parliament for power to amend section 4 of the Glasgow Corporation Gas Act of 1882, which fixes the minimum standard of the illuminating power of the gas supplied by the Corporation at 20 candles. In a memorandum, prepared by Mr. Foulis, the Gas Engineer and General Manager, it was pointed out that the quantities of cannel coal offered to the Corporation, of such a quality as was necessary for the manufacture of gas of 20-candle power, had, for some years, been gradually decreasing; and that the supplies of this class of coal now procurable were quite insufficient to enable so high an illuminating power to be constantly maintained, and, so far as the coalfields in Scotland were concerned, would ere long become practically unobtainable. The Special Sub-Committee, having fully considered and discussed the subject, were of opinion that the time had come when it was expedient to obtain legislative sanction for fixing the minimum standard of the gas supplied by the Corporation for illuminating purposes at 16 candles, which was the quality supplied for similar purposes in most of the towns in England and on the Continent; and, accordingly, they unanimously resolved to recommend to the Corporation that an application be made to Parliament in the ensuing session for power to effect this object.

Mr. R. M. MITCHELL, the Convener of the Committee, in moving that the recommendation be adopted, explained that until recently the Engineer thought the matter might be deferred until next year; but, looking to the state of the coal and oil trades, he now considered it should be pushed forward as rapidly as possible. There was great and increasing difficulty in getting cannel coal in sufficient quantity to ensure that the gas manufactured would be equal to the present standard. The quantity of cannel offered to the Gas Committee this year was about 128,000 tons, as against 357,000 tons in the year 1896. It was not a matter of price. The citizens would be glad to pay a good figure; but the class of coal required was becoming exhausted in Scotland. In 1882, the illuminating power of the gas was reduced to 20 candles; and it was more necessary now to lower the standard. A large quantity of gas was used for cooking, heating, and motive power; and for these purposes a high quality was not necessary. A lower quality would be more profitable to the consumers. Again, incandescent gas lighting was now more extensively used for domestic and public purposes; and in that case also there was no advantage to be gained by using a high-quality gas. As to the illuminating power of gas in other cities, he pointed out that Glasgow was pretty much at the head of towns in Scotland, and that in most places in England and on the Continent the quality of the gas for lighting purposes did not exceed 16 candles. This was the highest illuminating power which any corporation or private company supplied in England; and they found difficulty in keeping up that standard. The power sought would be permissive. It was only intended to be used when the Committee found it was impossible for them



to do better. They did not wish to try to rob the citizens, but to give them the best gas they could at cost price, according to the kind of coal they could buy. But if it was impossible to get the coal needed for a high illuminating power, the Committee should not be bound to maintain the higher standard.

Mr. Bow seconded the motion.

In reply to a question by Baillie W. F. Anderson,

Mr. Foulis stated that the result of his experience was that 16-candle gas consumed with an incandescent burner gave as good a light as 20-candle gas in the same burner, or, probably, a better one.

The recommendation was confirmed.

The Gas Committee recommended that application be made to Parliament in the ensuing session for permissive power to establish a superannuation fund in connection with the Gas Department, which would be applicable to, and compulsory upon, all the permanent officials (excepting the General Manager and Treasurer) and workmen of the department; to make contributions to the fund from the gas revenues, in aid of the subscriptions thereto by the workmen themselves; and also for authority to take over and appropriate, in connection with the fund, any moneys or funds received from either of the old Gas Companies, which are at present applied by the Gas Department for benevolent or superannuation purposes.

Mr. MITCHELL moved the approval of the minute.

Preceptor GRAY moved, as an amendment, that the minute be not approved. This, he said, was a far-reaching proposal—the first of its kind to be submitted to the Corporation. The police were pensioned; but their case was exceptional, and they got £40,000 from Government to start the fund. In the Tramway Department there was a friendly society to which the Corporation contributed 4d. for every 6d. paid by the men; but this scheme was not compulsory. The proposal now made would form a precedent which went much farther than they had ever yet gone. They were told that in Manchester and other places a similar grant was given. But they had no information from either that city or Birmingham for the guidance of the Council; and he desired some as to the basis on which the Gas Committee had come to this apparently unanimous recommendation. In the Gas Department they were giving somewhat less than £700 for aiding people who were either unable or less able to work. This money was given pleasantly; and no one need say that anyone came forward as an abject beggar.

Mr. J. H. DICKSON asked that the scheme should be withdrawn. They were there, he said, in the interest of the rich as well as the poor, and to look after all classes. In his opinion, they could do all that was wanted without the sanction of Parliament, if they had the consent of the men.

Baillie STEVENSON asked if it was competent to take money out of the gas-rents, for the purpose suggested, without statutory authority.

The CLERK (Mr. Bowers) said the Act of Parliament stated how the revenue of the Gas Trust was to be applied; and they could not do as was proposed without the sanction of Parliament.

Treasurer MURRAY, in supporting the minute, said all that was required was to have a short clause in an Act of Parliament empowering the Corporation to establish a superannuation fund. He reminded the Council that every day the evil attendant on grants to workmen was increasing, and said that whoever devised a scheme by which some superannuation would be started in any department would do really good service to the Corporation.

On a division, the motion was carried by a large majority; only two members voting for the amendment.

## BRADFORD AND THE PROPOSED MUNICIPAL COLLIERY.

### The Resolution Rescinded.

On the 9th ult., the Bradford Corporation passed a resolution, instructing the Town Clerk to insert in the Bill to be promoted by the Council in the next session of Parliament a clause empowering them to become the owners of, and to work, a colliery or collieries, with powers to borrow the necessary moneys required. Last Wednesday, Mr. Williamson proposed that the resolution be rescinded. He urged the importance of taking this course, as, in his opinion, in the not very distant future it might, and would be, very disastrous, and entail on the city a great and serious loss if such powers were put into practical operation. As guardians of the ratepayers' money, the Council must abstain from so risky an enterprise and speculation. Glasgow, Manchester, and Leeds had refused to entertain such proposals, even with coal-mines at their very doors. Every sensible man knew that this was not the time to talk about buying collieries. Coal was now about double its average value, taking the prices of the last thirty years into account; but less than two years ago the gas-works were consuming coal which had been delivered at 8s. a ton. The present price was 15s.; but a reaction had set in. The market had a downward tendency; and he had no doubt that well within two years' time coal could be bought at the old price. The whole city of Bradford, for all purposes, consumed about 1,300,000 tons of coal a year, which was equal to the output of seven large collieries. If each pit produced 4000 tons per week, or 200,000 tons per annum, this, on a twenty years' purchase at the rate of 10s. a ton, would mean a cost of £2,000,000 for each pit. Even at half this estimate, altogether £7,000,000 would be required; and where was so enormous a sum to come from? Mr. J. Triffitt seconded the resolution; remarking that with coal at its present price it was a most inopportune period for buying a mine. The time must not be so very far distant when the price would come down, though a continuance of activity in the iron trade would be against such a reduction. At the same time, there were thousands of waggons of coal which the coal-owners were holding, and in time these waggons would all be full, when the masters would become independent of the men. Sometimes the men were almost masters of the situation; and the Corporation would find that they would not be able to rule a mine unless they became colliers themselves. Mr. E. R. Hartley observed that mines had been described as almost unpurchasable; but he had received offers of three collieries. Taking the increase in the price of coal at 5s. per ton, this cost the consumers in Bradford a sum equal, in a year, to doubling the rates of the city. Whenever a monopoly became a danger to the public, it was time for public bodies to tackle it. The resolution was passed by 31 votes to 29.

## ELECTRIC LIGHTING NOTES.

Among Local Authorities who last week decided to make application for electric lighting powers were Beverley, Neath, Todmorden, Wellington, and Widnes.

The Shipley District Council have received a communication from the Local Government Board, authorizing the borrowing of £22,000 for electricity supply purposes.

Mr. G. W. Willecocks, of the Local Government Board, has held an inquiry at Leigh into an application by the Town Council to borrow £5000 for electric lighting extensions. No objection was raised.

The Rhyl District Council have arrived at an agreement with the Tramways Company for the supply of electric current; and this will necessitate an application for an additional loan for extending the installation. The Council have already been authorized to borrow £15,000 for the works.

A Local Government Board inquiry was held at Dewsbury last Wednesday by Colonel Marsh, the Corporation having applied for power to borrow £4500 and £3000 to carry out extensions at their electricity works. It was proved that new works were required, and that additional cables and other plant had had to be obtained. There was no opposition.

In consequence, according to the local view, of the "surprisingly" large demand for electric current, it has been decided to recommend the Canterbury Council to apply for sanction to raise a further loan of £13,000 for the purpose of enlarging the electricity works and extending the plant. The amount of the additional outlay will eventually be £21,000, but for the present it is proposed to carry out only a portion of the scheme.

A conference of representatives from the Nantyglo and Blaina, Abergillery, Abercarn, and Risca District Councils was held at the Abercarn District Council Offices on Monday last week, for the purpose of considering the advisability of promoting a joint scheme of public lighting of the Western Valley by means of electricity. After considerable discussion, it was resolved to recommend the various Councils to jointly employ an expert to report on the subject.

The Wolverhampton Town Council last Wednesday adopted a report of the Lighting Committee recommending the borrowing of £58,942 for the purpose of carrying out extensions to the electrical equipment, to meet the demands for electricity for lighting, power, and traction purposes during the next two years. It was stated that it was intended to bring up the total generating capacity of the lighting and traction plant to 2640 kilowatts, of which 750 kilowatts would be spare plant available for emergencies.

For something like ten years, Chelmsford has had the electric light in the streets; and many of the ratepayers no doubt wish it had not. It has been a constant worry; and complaints as to inefficient lighting have been constant. At the meeting of the Council last Wednesday, the same old story was told; and one councillor stated that they did not by any means get value for their money. The Town Clerk (who must be getting weary of writing on the subject) was instructed to again communicate with the Company, but a despondent member thought this would be useless.

The Walton-on-Thames District Council have been discussing the question of electric lighting. Edmundson's Electricity Corporation, Limited, have notified their intention of applying for a Provisional Order; but the Council have decided to withhold their consent, and to consider the advisability of applying for powers themselves. One member of the Council is dissatisfied with the present lighting by gas, and thinks Walton is the worst lighted place round about. He asserts that the Gas Company have had plenty of chances of improving it, but have failed to do so up to the present. This is a very common story at district council meetings; and more often than not, there is another side to it.

The Batley Corporation, having received authority to supply electricity in the borough and to construct tramways, have applied to the Local Government Board for sanction to borrow £25,602 to cover the cost of a generating station and the laying of cables for electric lighting in the centre of the town. Mr. Sandford Fawcett, an Inspector of the Board, conducted a local inquiry last Wednesday; and the Electrical Engineer (Mr. Clirehugh) and the Town Clerk (Mr. J. H. Craik) laid before him the necessary information. The latter stated that Batley had acquired its own gas-works and constructed water-works; and it was the feeling of the Corporation that electric lighting and traction ought also to be in their hands. There was no opposition.

Stafford requires £10,000 for the extension of the electric lighting works; and an application by the Corporation for permission to borrow this sum occupied the attention last Wednesday of Mr. H. P. Boulnois, of the Local Government Board. The Town Clerk (Mr. M. F. Blakiston) stated that the works were started in 1895; and the sanction of the Local Government Board for £20,000 was obtained, and had been spent. There was a growing demand for electric light. The works were progressing, as was seen by the fact that in 1896-7 there was a charge on the rates of something like £1000, but since then nothing had been charged. There was, however, an adverse balance of £400 to be provided for next year. Mr. H. Pooley, the new Gas and Electricity Engineer, said the present demand for the light was enormous. Last year the current generated was 33,369 units; this year it had increased to 100,733 units. It was proposed to lay down 4600 yards of new mains, and to put in an additional engine and dynamo. They estimated the cost of laying the mains at £3500, and of the additional plant, engines, dynamo, &c., at £6500. Mr. J. Ferguson Bell also gave the Inspector some explanatory details as to the works.

Reference has already been made in these "Notes" (*ante*, p. 969) to the dispute between the Canterbury Corporation and the Assessment Committee of the Board of Guardians, with regard to the assessment of the electric light undertaking of the former. The matter has lately been before the Recorder of Canterbury (Mr. F. Safford), sitting at the Surveyors' Institution, as Arbitrator; Mr. G. Thorn Drury appearing for the Corporation, and Mr. Craig, with whom was Mr. Pitman, for the Committee. The Guardians' valuer, it may be remembered, put the gross value of the electric lighting works at £1050, and the rateable value at £700; the gross value of the dust destructor at £300, and the rateable value at £250. The Corporation accepted the proportions assigned, but urged that the Guardians' valuer had simply taken the worth of the building, without regard to the actual profits obtained. The valuation amounted to 24 per cent. of the gross receipts of the undertaking, which, it was submitted, was a proportion immensely higher than that usually reached. Mr. Philip Faraday (Messrs. Faraday and Rogers) assessed the



works at £942 gross and £342 rateable. Mr. Herbert Fuller gave the rateable value as £345. Other expert witnesses were called. The Recorder will announce his decision at the next Quarter Sessions.

We learn from local papers which have reached us that the Ryde municipal election this year has been one of the most exciting struggles since the proposed purchase of the gas-works, nearly thirty years ago. It turned upon a very similar question—whether the Council should provide works necessary for the electric lighting of the town, or whether a Company should do so. The contest was decided almost entirely on the merits of the electric light scheme. Having regard to other projects which the Corporation have in the fire, involving a heavy outlay, the question arose as to whether it was wise of them at the present time to burden themselves and the town with the very serious obligations which the new lighting project would impose. This was an issue on which the ratepayers had a right to be heard; and they spoke with no uncertain sound last Thursday. The candidates in favour of mortgaging the rates to the extent of an initial outlay of £30,000 were Messrs. T. F. Ellery, J. Evans, and H. Sweetman in the west ward. On the other hand, Col. E. Howard-Brooke, Lieut.-Col. J. F. C. Hamilton, J.P., and Mr. A. Teague, in the west ward, and Messrs. P. R. Denny, G. E. Mears, and A. Millward, in the east ward, objected to the expenditure of so large a sum on a speculative undertaking. The result of last Thursday's polling was that the opposition candidates were returned in each case by large majorities. The day was an extremely unpleasant one; so that the large number of the ratepayers who took the trouble to record their votes was evidence of the keen interest shown in the contest.

### THE LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

#### Another Purchase Bill to be Promoted.

At the Meeting of the London County Council to-day, the Water Committee will present the following report:—

On May 29 last, the Council, on our recommendation, suspended its Standing Orders so far as they would affect proposals for legislation in the session of 1901 dealing with the Metropolitan Water Supply, and authorized us, if we deemed it advisable, notwithstanding the Standing Orders, to recommend application to Parliament on this subject at any time not later than Nov. 13. We have therefore considered the matter, and now propose to bring it again before the Council. We have already in past years reported from time to time fully on the question of the water supply and the acquisition of the Companies' undertakings. We refer more especially to our report considered by the Council on Nov. 7, 1899, to that on the report of the Royal Commission which was before the Council on March 6, 1900, and to the report of the Parliamentary Committee, which was before the Council on May 22, 1900, on the rejection of the London Water (Purchase) Bill, and the withdrawal, on the same day, of the London Water (Welsh Supply) Bill. These reports appear to us to embody all the material facts connected with the recent legislation promoted by the Council on the water question.

The report of the Royal Commission, published in January last, recommended the acquisition of the Companies' undertakings; thus confirming the policy of purchase—as, indeed, it had already been confirmed years ago by more than one Committee of Parliament. The Council's views as to the terms of purchase may be briefly stated as follows: (1) That the arbitrators should be men of eminence and impartiality, not named by the parties in the ordinary way, but appointed by Parliament or by an independent authority nominated by Parliament. (2) That the price to be paid should be the fair and reasonable value of the undertakings, taking into consideration all the circumstances of the case, and having regard both to the rights and obligations of the Companies. (3) That no additional *solatium* should be given for compulsory purchase, but that the Council should pay "such further sum as the arbitrator may award to meet the cost of re-investing such money (in the event of no arrangement being made by the Council under which such money may be re-invested without cost)." These views were generally approved by the Committee of the House of Commons presided over by Mr. David Plunket, and a careful reading of paragraph 52 of the report of the Commission; which lays down the principles which should guide the arbitrators, will show that there is no irreconcilable conflict in principle between their views and those of the Council. As regards the third point, to which we have always attached special importance, the Commissioners say that in the present case it would be improper for an arbitrator to give any compensation in the nature of a *solatium* for the deprivation of water shares, although he might justly award something to meet the cost of re-investment, and consequent delay, the amount of which would probably be comparatively small. Under these circumstances, we do not anticipate that any serious difficulty will arise as to the precise terms of the arbitration clause which will be submitted to the Council in the Bill.

We need not in this report deal with the views of the Royal Commission as regards the future additional supply, as we cannot recommend the Council to introduce a Bill this session. But there is one recommendation of the Royal Commission to which we must refer, as it is not one which we can recommend the Council to introduce into its Purchase Bill. The Commission proposes the creation of a Water Board on which the Council, as representing London, shall only appoint one-third of the whole—viz., ten members out of a total of thirty. Seeing that three-quarters of the population supplied by the Companies reside in London, and that of the rateable value upon which water-rate is charged 84 per cent. is within the county, we cannot believe that members representing London, whatever their views as to the general question of a Trust, can assent to this proposal, which so manifestly ignores the predominant interests and rights of the Metropolitan ratepayers. Without, therefore, discussing the general question, we trust that nearly the whole Council will agree with us that we cannot, in justice to those whom we represent, endorse the recommendations of the Commission in regard to the authority. Of the proposals for legislation during the coming session, one has already been approved by the Council—viz., the Bill which has been rendered necessary by past delays for the prolongation of the period during which what are known as the "sterilization clauses" shall remain effective. The failure of this Bill would be of

enormous pecuniary advantage to the Companies; and if there is no Purchase Bill before Parliament, that fact will doubtless be strongly urged as an argument against the Bill. If purchase is further delayed (for which, in view of the report of the Royal Commission, we can see no adequate reason), and if the period of the operation of the "sterilization clauses" is allowed to lapse, as it will very soon, the loss to the London ratepayers will be very great indeed.

We have no information that the Government intend to introduce any Bill dealing with the question, and as the last day on which the matter can be considered by the Council is Nov. 13, we are now obliged to bring up our recommendations. We do not ask the Council at this moment to settle the precise details of the Bill, but to decide the broad question of maintaining the policy of purchase, which has been confirmed by the Royal Commission, and, so far as lies in its power, to press upon the new Parliament the fact, which we do not think can be questioned, that the delay of purchase is annually adding to its costliness. Although we may still be unsuccessful, we feel that no other course is open to us. It will not be the fault of the Council if another year is lost. If a second reading is refused, we are advised that the expense up to that stage will not exceed £200. Should our recommendations be adopted, there will be full opportunity afforded for consideration of the details of the Bill when it is submitted to the Council for approval before deposit. We have requested the Finance Committee to report on the financial bearings of our proposal, and we understand they will do so at the meeting of the Council on Nov. 13. We recommend—(a) "That a Bill be promoted in the session of 1901 for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies. (b) That it be referred to the Parliamentary Committee to prepare and present to the Council the necessary Bill for carrying out the above recommendation, and also the necessary Water (Finance) Bill."

### SCHEME OF WATER SUPPLY FOR DERBYSHIRE.

We learn from local papers that some singular discoveries were made last week in connection with a great water scheme for Derbyshire. The source of the proposed supply is the famous Meerbrook Sough, in Wirksworth and Matlock. A Bill is to be promoted next session for powers to take this water, and to expend a large sum in conveying it from the side of the Derwent to the eastern division of the county of Derby. The spring in question is one of the wonders of the Peak district. It yields from 14 to 18 million gallons per diem at the output near the Matlock highway, and is an overflow from ancient disused lead workings, for which this district was at one time so notable. The water in the hill above has been traced; and there is a natural reservoir of enormous capacity, on which boats are floated similarly to those at Castleton, in North Derbyshire. The supply belongs to the Meerbrook Sough Company, who formerly paid large dividends from lead working; and it has been retained for years with no revenue worthy of the name—the only prospect being a scheme like the one now in hand for water supply. Derby first tested the spring, and then Belper; but it was abandoned, because of the abnormal hardness of the water. Now Ilkeston and Heanor have bought from the Company the option of the source; and a Bill is being prepared. The revelations, which come opportunely before the Bill is presented to Parliament, are, however, such as will, it is expected, necessitate some important amendments to the plans. According to the scheme adopted by the two districts concerned, the Meerbrook is to be pumped from its lower level to a reservoir on the Crich Hill, a height of 700 feet, and conveyed thence in a main to another reservoir at Codnor Park, at an elevation of 500 feet, by gravitation; this being high enough to supply Ilkeston and Heanor. But by carrying out this project it will not be possible to have an auxiliary supply from the forthcoming Derwent Valley water scheme, which is to serve Nottingham, Sheffield, Derby, and Leicester. That scheme will furnish supplies *en route*; but the elevation is at 600 feet—that being sufficient for the towns named. If the height of the reservoir on Crich Hill is reduced to 600 feet, and the mains are enlarged, the extra cost would be about £2000. The Derwent water will not need lime for softening purposes; and there will be no fear of lead contamination. Ilkeston and Heanor have had their water supplies condemned by the Local Government Board; and it is generally thought that something will have to be done without waiting for the Derwent scheme, which cannot be completed under ten years.

**"Rates-in-Aid" for Cardiff Corporation Undertakings.**—It was stated at the meeting of the Cardiff Finance Committee last Tuesday, that the rate in aid of the water-works for the half year was £4093, equal to nearly a penny rate. This is a considerable improvement on former accounts. Last half the rate in aid of the department was about £6000, and a year ago the sum required was £7704. The rate in aid of the Electrical Department was £564.

**Emsworth Gas Company.**—The annual meeting of this Company was held on the 25th ult., when the Directors reported that, owing chiefly to an increase in the sale of gas, there had been a substantial profit, notwithstanding the fact that the charge for gas had had to be raised owing to the increased cost of coal. It was recommended that a dividend of 7 per cent., free of income-tax, should be declared. The sum of £948 14s. 8d. had been received for gas during the twelve months ending the 29th of September; and the total receipts were £1180 6s. 1d. There was a sum of £263 15s. 7d. to be carried to the profit and loss account. The report was unanimously adopted. The payment of dividends took £182, and the interest on bonds £43 10s.

**Gas Workers' Wages in the South Shields District.**—On Saturday, the 27th ult., a deputation representing the workmen, accompanied by Mr. H. Lynas, District Secretary, and Mr. H. Picard, General Organizer of the National Union of Gas Workers and General Labourers, waited upon the Directors of the Federated Gas Companies of Sunderland, South Shields, and Tynemouth, on the subject of wages. After deliberations lasting about five hours, a settlement was arrived at, whereby the stokers will receive 5 per cent. increase on their present rates, and the yard labourers and all other classes included in the application a 4 per cent. increase—the advance to come into force at once. These concessions are to be granted on an agreement being entered into for two years.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

They have a prompt way of doing business in the Corporation of Glasgow. Outside their own circle, it was scarcely known that there was any consideration being given to the question of an immediate reduction in the illuminating power of the gas supplied to the city; but on Thursday the Gas Committee submitted a recommendation to this effect, founded upon a memorandum by the Engineer (Mr. Foulis), and the Corporation adopted it straight off. [See p. 1158.] There is an end of it, so far as the Corporation are concerned. The officials will now take the matter up; and in due time notice will be given of a Bill in Parliament giving authority to do what is proposed. How different it would have been in other places. There are some we know of where the suggestion would have involved an all-round discussion upon a proposal to remit to a Committee to consider; the doings of the Committee would have been followed step by step; and on the presentation of their report, the local universe would have been shaken to its foundations. The Glasgow method is an easy manner in which to get what is wanted. But the arrangement cuts the other way; and it may be truly said that it is risky, because a vote cannot be reviewed till after a certain time, and if the vote had gone against the Gas Committee on this occasion, there could have been no application to Parliament in the next session. In some places there is an extreme of caution in new proposals, which is as far the other way. To take the case of Edinburgh, in this city a Committee cannot initiate new business; they must receive a remit from the Council. That is the first appearance. The presentation and adoption of the report is the next; and after that the business is not final until it has appeared three times in the minutes. That is five appearances instead of one. The meetings are fortnightly; and thus, at the best, a new subject takes ten weeks to "muddle through." This subject of the reduction of the illuminating power is also under consideration in Edinburgh, where Mr. Herring, the Engineer to the Gas Commission, is preparing a report upon it. It is one which it is appropriate to consider at this time. It is almost startling to learn that cannel coal is getting so scarce that only 128,000 tons were offered to the Gas Committee in Glasgow, as compared with 357,000 tons four years ago. With cannel disappearing at this rate, it is an absolute necessity that some provision should be made for the lowering of the illuminating power which is required to be provided. I observe that in Glasgow the power sought is permissive, and will only be used when it is necessary. This is quite proper, because, if cannel can be had, or as long as it can be obtained, there is every reason why it should be used. But, on the other hand, it is also proper that the Gas Committee should have the power, in the event of their not being able to secure the better classes of coal at a reasonable figure, to use coal of lower quality. It is a great power to place in the hands of a Committee; but the coal merchants have unlimited powers, and do not scruple to use them, and where you have limitation on the one side, and no limit on the other, the advantages or disadvantages can easily be premised.

The establishment of a superannuation fund for gas workers is a step in the right direction—this direction being towards the making of the men more contented with their lot, and less disposed to give ear to the blandishments of the wandering stars in the labour world, who, loud-voiced exponents though they may be of the brotherhood of man, always leave behind them recollections of other relations than that of brotherhood as between employers and employed. This superannuation plan cannot be called a profit-sharing scheme, and is, indeed, inferior to it, because of the difficulty of "superannuating" a man who may only work six months in the gas-works, and then leave for other employment. To be just, such a man should get back his contributions to the superannuation fund; but this arrangement would nullify the intended effect of the fund, because, if one man were able to withdraw his contributions to it, so might a thousand. In all such funds there are apparent injustices, in that one man contributes for many years, and dies without deriving benefit; his surviving comrades getting the advantage of his contributions. This is according to the decrees of Providence, however, and cannot be complained of; but it is quite a different case from that of the casual worker. There are hundreds of casual workers in the gas-works of large towns every winter; and it would scarcely be right to make them compulsory contributors to a fund which, from the time they were taken on till they were discharged, it was never intended that they should participate in. This is a point which requires consideration. There is another matter of not less importance, which should be carefully considered. A man is employed for years in a gas-works; every week so much of his pay is retained for superannuation; but he dies before he retires from work, and the Corporation retain his contributions. Those contributions would have gone a certain length in assisting to maintain his wife and family. When he is taken away, should not his widow, or his relatives—at least any dependents he might have—get a sum proportionate to the amount he had contributed? I know that it is a most galling arrangement, in connection with superannuation in the Post Office department, that a man must contribute, and that he may contribute for 49 years, and then die; and his dependents may be obliged to go on to the parish. It would require a higher rate of contribution to add this, which is in reality an insurance branch, to the fund; but it would be a much more satisfying provision for workmen than would be the old-age pension scheme worked alone.

The Corporation of Glasgow are also to ask power in Parliament to reorganize the public lighting arrangements. There are two branches of this service—street lighting and the lighting of common-stairs. The lighting of the streets costs about £30,000 a year, and is wholly charged upon occupiers. The lighting of stairs and closes costs about another £30,000, of which sum £18,000 is charged upon occupiers. It is, however—an awkward arrangement, which is always giving trouble—collected from the occupiers along with the rent, by the owners, who pay it over to the Corporation, retaining 25 per cent. for the trouble of collecting. The balance is defrayed from the general police rate. It is proposed to make all lighting a general charge upon the police rates, and to impose it upon landlords and tenants in equal proportions. This system has been in operation in Edinburgh for some years; and my comment upon it then is what I say now—that it is a simple way of providing for lighting, but

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1135.

Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.															
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	13-14	..	5 7 2					People's Gas } 2nd Mtg. of Chicago } Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	500,000	100	June 1	6	River Plate Ord.	104-105	..	6 10 2
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	851,070	10	Oct. 12	7	Do. 4 p.c. Deb.	99-101	..	3 19 8
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	Stk.	June 28	4	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 11 1	250,000	10	Sept. 28	8	Sheffield A.	234-239	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	135,000	Stk.	Sept. 14	10	Do. B.	234-239	..	4 3 8
60,000	"	"	5	Do. 5 p.c. Pref.	137-142	..	3 10 5	209,700	"	"	10	Do. C.	232-237	..	4 4 5
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	447,427	"	"	10	Do. C.	232-237	..	4 4 5
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	5,641,885	Stk.	Aug. 15	5½	South Metrop. 4 p.c. Ord.	128-132	..	4 0 10
226,320	"	"	7	Do. A. Ord. Stk.	150-160	..	4 7 6	1,520,000	"	July 12	3	Do. 3 p.c. Deb.	94-97	..	3 1 10
1,000,600	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	117-118	..	4 4 9	380,940	Stk.	May 16	5	Southampton Ord.	110-115	..	4 6 11
420,000	20	Sept. 28	10	British	39-41	..	4 17 7	70,825	"	July 12	4	Do. 4 p.c. Deb.	117-122	..	3 5 7
60,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	112-117	..	5 2 7
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	250,520	"	"	4½	and B. 3½ p.c.	80-85	..	5 5 11
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	82-83	..	6 17 2	61,550	"	June 14	4	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	6 12 0	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	96-102	..	4 18 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	134-144	..	5 10 4					WATER COMPANIES.			
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	58-55	..	5 9 1	780,404	Stk.	June 28	11	Chelsea, Ord.	302-307	..	3 11 8
550,000	Stk.	Oct. 12	12½	Commercial Old Stock.	265-275	..	4 12 8	150,000	"	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
236,425	"	"	9½	Do. New do.	200-210	..	4 12 10	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
238,237	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3	176,785	"	Sept. 28	4½	Do. 4½ p.c. Deb.	143-148	..	3 0 10
600,000	Stk.	May 31	9	Continental Union, Ltd.	175-180	..	5 0 0	1,720,560	Stk.	Oct. 12	7	East London, Ord.	195-200	+1	3 10 0
200,000	"	"	7	Do. 7 p.c. Pref.	170-175	..	4 0 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	147-152	..	2 19 3
51,600	Stk.	"	14	Croydon A 10 p.c.	—	..	—	797,687	"	"	9	Do. 3 p.c. Deb.	98-100	+1	3 0 0
178,400	"	"	11	Do. B 7 p.c.	—	..	—	700,000	50	June 14	7½	Grand Junction 10 p.c. max.	108-112	+1½	3 7 0
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	117-122	+2	4 6 1	810,000	Stk.	Sept. 28	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
60,000	"	"	5	Do. 5 p.c. Pref.	130-135	..	3 14 1	708,000	Stk.	Aug. 30	14	Kent	300-305	..	4 11 10
486,090	"	July 27	11	European, Ltd.	19-20	..	5 10 0	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	..	3 6 8
354,060	10	"	11	Do. £7 10s. paid.	14-15	..	5 10 0	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	292-297	..	3 10 8
14,993,075	Stk.	Aug. 15	4½	Gas- 4 p.c. Ord.	98-100	..	4 8 0	406,200	100	"	8	Do. 7½ p.c. max.	205-210	..	3 16 2
2,600,000	"	"	8½	light 8½ p.c. max.	92-94	..	3 14 6	1,000,000	100	Aug. 15	14	Do. 4 p.c. Deb.	127-130	..	3 1 7
3,799,735	"	"	4	and 4 p.c. Con. Pref.	114-117	..	3 8 5	500,000	Stk.	July 27	11	New River, New Shares	408-413	-2	3 7 10
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	94-96	..	3 2 6	902,300	Stk.	June 14	7½	Do. 4 p.c. Deb.	128-133	-2	3 0 2
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13-14	..	5 14 4	126,500	100	"	7½	South- wark } 7½ p.c. max. and 5 p.c. Pref.	155-160	..	3 2 6
3,800,000	Stk.	May 16	10	Imperial Continental	208-213	..	4 13 11	1,489,200	Stk.	"	5	Vauxhall 4 p.c. A Deb.	128-138	..	3 0 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100-102	+1	3 8 8	1,155,066	Stk.	June 14	10	West Middlesex	278-280	+½	3 10 8
76,000	5	June 14	6	Malta & Medna, Ltd.	42-52	..	5 14 3	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 1
560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	105-108	..	4 12 7	200,000	"	Sept. 14	8	Do. 8 p.c. Deb.	97-99	..	3 0 7
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	104-106	..	4 4 11					*Ex div.			
641,920	20	May 31	8½	Melbourne Video, Ltd.	104-113	..	6 1 8								
667,946	Stk.	Aug. 30	9½	Newcastle & Gateshead Con.	210-215	..	4 6 1								
299,855	Stk.	June 28	8½	Do. 8½ p.c. Deb.	104-107	..	3 5 5								
150,000	5	May 16	8	Oriental, Ltd.	7-7½	..	5 6 8								
135,000	5	"	8	Do. New, £1 10s. pd.	51-61	..	5 15 3								
15,000	5	"	8	Do. do. 1879, £1 pd.	14-13	..	4 11 5								



it is open to the objection that it makes the one class pay for the lighting of the premises of another class in the community.

I rejoice at the appointment of Mr. J. Ballantyne, who has been so long Manager of the Rothesay Gas-Works, to succeed Mr. W. Ewing as Manager at Hamilton. I confess that I did not think there was any Town Council at present who could have met and made any appointment, because this is the election week. The nominations were made on Thursday last, and the elections take place on Tuesday next; and it has been matter of common acceptance that the Council went out of office with the nominations—the non-retiring magistrates and the returning officer alone remaining in power. I suppose this must be an erroneous belief. But it may possibly be right; and in that case there might be objection to Mr. Ballantyne's appointment, on technical grounds. At the meeting last night, there was a slight show of opposition; the ground taken being that the vacancy was not advertised. The real reason, however, was that some of the members favoured someone else for the appointment. It is unusual not to advertise a position of so much importance as that of Engineer and Manager at Hamilton. The reasons given for its not being advertised were that the Committee wished the situation to be filled up speedily; and that they knew of a number of men who were perfectly capable of managing the works, and had dealt with them. Of course, there is no duty to advertise; and it is, on all grounds, better that, if the Corporation have made up their minds, they should not advertise, rather than that they should, and put a large number of men to the trouble of applying, and the vexation of being refused, as I have known happen (not, however, in connection with a gas undertaking). The only other name before the Town Council was that of Mr. J. Gibb, who recently went from Lanark to Kirkintilloch. The other two men who were interviewed by the Committee were Mr. J. McNair, of Wishaw, and Mr. L. Hislop, of Uddingston. Any one of these would have been quite capable for the post at Hamilton. The choice has fallen upon Mr. Ballantyne, who has had an opportunity of showing what he can do, which the others have not. I refer to the transfer of the gas-works from one site to another, which took place a year or two ago, and which Mr. Ballantyne was able to effect at a moderate cost. The quality of his management is to be gathered from the fact that he has, notwithstanding heavy capital charges, been able to sell gas at 3s. 4d. per 1000 cubic feet. When he is removed from an insular position to the heart of the coal-fields, he will find the production of gas a much easier matter. Mr. Ballantyne was one of the first in Scotland to perceive that a large revenue could be derived from the sale of gas for cooking and heating. In 1893, he read a paper on the subject before the North British Association of Gas Managers at Dundee, which attracted wide attention. He was also among the first to adopt sulphate of ammonia manufacture.

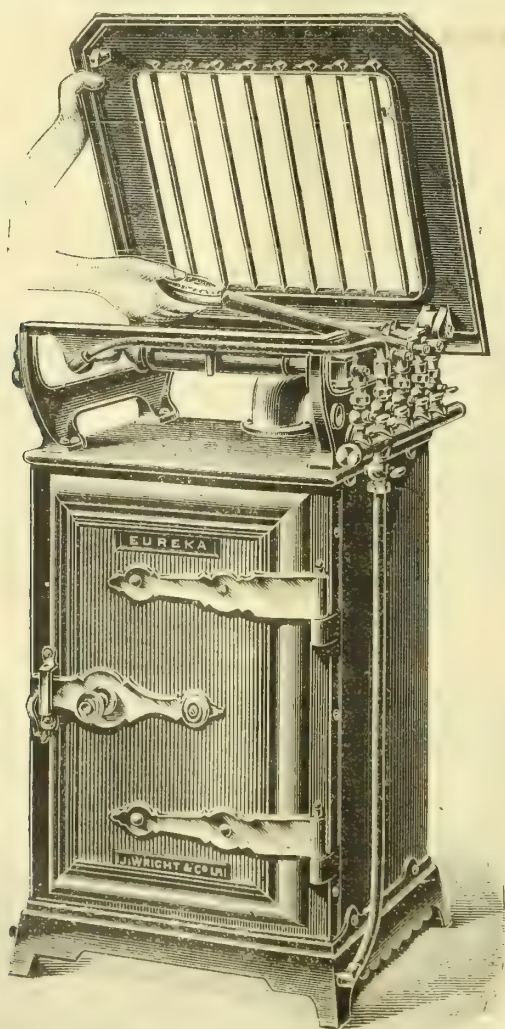
The slander case from Forfar, in which one member of the Town Council and Gas Corporation sued another, and in which the animosity which was said to have led to the utterance of the words complained of arose over the conduct of the gas undertaking, though the words themselves had reference to dealings in hay and straw, came to an end in the Court of Session last week. In March last, a Jury awarded the pursuer (Mr. Christie) one farthing damages. The defender (Mr. R. F. Craik, for

a long time Convener of the Gas Committee) sought a new trial, on the ground that the verdict was contrary to the evidence. The Court refused this motion; and they also refused the pursuer his expenses, so that each side will have to bear its own costs. There is not much satisfaction to either party in this.

The ground required for No. 1 Railway in connection with the new Provan Gas-Works at Glasgow—over 6 acres—belongs to the Glasgow Iron and Steel Company, Limited. The Company ask £6386 for the ground, and an annual feu-duty of £154 10s. The Corporation have agreed to offer £3000; and failing acceptance of this, the matter will go to arbitration.

Mr. W. Foulis is to be paid a fee of 200 guineas for his services as Consulting Engineer in connection with the new gas-works at Perth.

The talk of the municipal candidate is more voluminous this week than ever; and, as before, it is in Dundee that the greatest noise about gas supply is being made. Early in the week, Mr. J. R. Christie, who is Convener of the Corporation Gas Committee in Broughty Ferry, and an elector, I presume, in Dundee, spoke at a meeting in support of Mr. Smith's candidature. In the course of his remarks, he contradicted the statements, some of which I have given, that the benzol method of enrichment was an experiment, and that in Broughty Ferry they purchased a two-years' supply of coal. They did not adopt the benzol enricher, he said, without due inquiry; nor without first trying it and being satisfied with it. As to the two-years' supply of coal, they found, when they made up their estimates for the current year, that they had three-tenths of their year's supply of coal left over, and they bought seven-tenths. It had been said that they were paying 19s. 9d. per ton for coal in Broughty Ferry, as against 18s. 11d. in Dundee. If this were the case, why was the price of gas dearer in Dundee than it was in Broughty Ferry? But it was not the case, as the price of their coal and oil together was only 15s. 6d. per ton. On the other side of the account, they would find that Broughty Ferry got back £2 for every £4 worth of coal used; whereas Dundee only received £2 for every £9 worth of coal used. If Dundee secured as much as they did, it would mean a sum of £22,400 a year. The Dundee Commissioners seemed to be wedded to, and could not get a divorce from, cannell as an enricher. In Broughty Ferry they used the same materials six years ago as in Dundee; but they tried the Peebles oil process, and now they had it and the benzol plant, both of which were already far more than paid for out of profits. It was since these had been adopted that Broughty Ferry had scored its very signal success in the gas-making world. Mr. Christie also combated the theory that it was the heavy sum paid for the Dundee gas undertakings which was the cause of the high price of gas there. The capital charges in Dundee, he said, were slightly over 10d. per 1000 cubic feet sold; in Broughty Ferry, 9s. 37d. Then Mr. Longair, a prominent member of the Gas Commission, made a speech, on Wednesday, in which he said that his sympathies went out to the Gas Manager, who was at times unfairly blamed. He was afraid the Manager had succeeded to a very undesirable and unenviable heritage. Nobody could be held responsible for not foreseeing the great extension and prosperity of the city of Dundee. The docks were useful in their day; but two of them at least were now almost obsolete. The same thing applied to the gas-works.



## LATEST DEVELOPMENT IN GAS-COOKERS

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Notwithstanding the arbitration, he held that the gas-works had been taken over at a very high price; and when the £39,000 of legal expenses was added, the figure paid was undoubtedly excessive. With regard to the new works, which they might expect to see in full swing about a year hence, a valuation by two of the most competent experts in Great Britain must be insisted upon. The true value of the works must be ascertained. He believed that they would be found to be hopelessly bankrupt. That was to say, when they had put on the one side their financial obligations, these would not be far short of £500,000; while on the other side their assets would show a very large deficiency, and bankruptcy would only be saved by the fact that the ratepayers might be rated without limit to make up for the deficiency. Here was the specific. It would never do to make arrangements for paying this deficit in 10 or 20 years. The sinking fund should be worked out over a period of, say, 55 or 60 years, at 1½ per cent. In Dundee they were at present paying 4s. 5d. per ton for carbonizing coal; but the hope was that with the new machinery they would be able to reduce the cost to the neighbourhood of 2s. The capital account seemed to be excessive, when compared with those of other centres. With nearly £500,000 of capital carbonizing 65,000 tons of coal, it cost Dundee £8 of capital per ton of coal carbonized, instead of £2 in Glasgow and £4 10s. in Edinburgh. They were in a most extraordinary position; and it would have to be faced. It was obvious that they would have to lower the candle power from 26 to 20 or 16. By keeping up the candle power, they could not possibly have cheap gas. They must buy a different class of coal, sell more coke, and bury less refuse. Bailie Robertson, at the same meeting, said there was no question that the fault lay in the past management of the works in Dundee—that while in other places they were adopting modern machinery and modern methods, the Gas Managers and Gas Conveners in Dundee were content to plod on with the old fashion until they were outrun. He thought an exhaustive inquiry would have to be made into the whole system. Very strong statements were made at meetings last night. At one, Mr. Smith said that the supposed value of the gas-works was something like £380,000. What they believed to be the actual value was £182,000. They were therefore in a bankrupt condition. Ex-Provost Ballingall, the Convener of the Gas Committee, at another meeting, said that in Dundee they were some ten years behind all other towns in Scotland. Every pound of coal was handled in the most primitive manner. It was perfectly clear that they could not make gas so cheap as in Glasgow or Aberdeen. In Dundee, the cost of carbonizing and handling the coal was 4s. 3d. per ton, in Glasgow it was only 1s. 10d., and in Aberdeen it was 1s. 11d. In the early part of his address, Mr. Ballingall said that the new retort-house would have been finished, and they would now have been getting the benefit of cheaper gas, if it had not been for the obstruction of Mr. Brownlee (his predecessor in the conveyance) and Mr. McCrae (the Manager). "There would be less of ex-Provost Brownlee's, and his friend Mr. McCrae's advice taken in the near future." He then went on to express his opinion that they should take the advice of Mr. Foulis in regard to the class of coal they should purchase. The "Dundee Courier" also this week publishes another special article on the subject, in which the estimates of the Gas Commissioners, or their methods of estimating,

are severely handled; and the blame for the sore is put upon the Gas Commissioners.

Of course, it is the Gas Commissioners who are to blame. Some are clamouring for an inquiry. Well, a look at the minutes of the Commission, to go no further, will show that for some years the Manager has been desirous of having the works improved, but that he has been constantly thwarted, and the work delayed so long that much money has been lost. I do not like ex-Provost Ballingall's remarks. He seems to be out of sympathy with Mr. McCrae; and he ought, therefore, to retire. There are, indeed, too many ex-Provosts in the Dundee Town Council. Such men are always enamoured of whatever arrangements existed when they were Provost. It is my experience that a man who has been once the head of a municipality scarcely ever makes a good common councillor again. When his term of office is past, a man should retire into private life. I am sick of this washing of dirty linen in public in Dundee, and am thankful that it is nearly over. The pity is that the public men who have been taking part in the work do not seem to see how they have been exposing their own incompetence.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 3.

**Sulphate of Ammonia.**—The weakness observed at the end of last week developed into a sharp decline in values; and the closing quotations are £10 11s. 3d. per ton f.o.b. Hull and Leith, and £10 13s. 9d. to £10 15s. f.o.b. Liverpool. The mischief has been brought about mainly by the anxiety of middlemen to realize, not only abroad, but on the home markets, and especially in Scotland; speculative purchases made in October causing buyers to retire from the market. Makers, being well sold in October, have not been prominent as sellers; but towards the close larger supplies are being offered at first hand. There is still considerable inquiry for spring months; but makers maintain their quotations in this position notwithstanding the weak spot market, while buyers will only operate at a substantial decline.

**Nitrate of Soda** is firm at 8s. 3d. to 8s. 6d. per cwt., according to quality, on spot, while for spring months the quotations are 8s. 7½d. to 8s. 9d.

LONDON, Nov. 3.

**Tar Products.**—Business is a little steadier; and though one or two of the principal products somewhat drag, there is a tendency to firmness in the others. Benzol continues in excellent inquiry; but there is no further advance in value, although there is still a marked difference between quotations at the various points of production. The question of carrying benzol by rail is exercising makers very much; the railway restrictions in some instances being very adverse to facilitating trade in the article. Carbolic acid is, if anything, a little better, with more genuine demand. Crude naphtha and other naphthas are dull. Creosote is realizing a little higher price. Anthracene shows no change; and pitch,

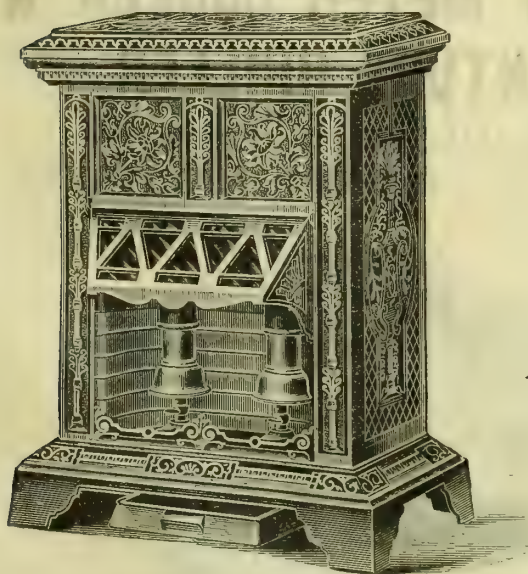
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No. 22 "SYPHONETTE."

WRITE FOR NEW SEASON'S CATALOGUE.

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if anything, is better. The difficulty in respect to freights for pitch is hampering shipments.

The week's values may be taken at: Tar, 15s. to 21s. Pitch, east coast, 35s. 6d.; west coast, 32s. 6d. Benzol, 90's, 10d. to 11d.; 50's, 1s. 1d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 2d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 8d. Naphthalene, 80s.; salts, 60s. Anthracene nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** has fluctuated a good deal during the week, oscillating between £10 10s. and £10 15s. per ton. The week closes, however, with a good deal of inquiry, and, after some weakness for a day or two, an inclination to better business. The average value may be taken at all ports at about £10 13s. 9d., less 3½ per cent.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Although list rates in the Manchester district remain unchanged, the coal trade here is barely maintaining its position; and this is specially noticeable in the quotations that are now being made for renewal contracts, which collieries are showing a disposition to accept at substantially lower prices than they would have entertained a month or two back. The weakening for the present is, however, rather coming from the outside than from within; but the market is undoubtedly being very considerably unsettled by the keen competition of surplus supplies of both round coal and engine fuel, which collieries from other districts are offering here at very much below the quotations of Lancashire collieries for similar classes of fuel. There are also some extraordinarily low quotations just now being made from outside districts for cannell. In the better qualities of round coal, a fairly good demand is kept up, which is taking away pretty nearly all the present restricted output. Stocks are therefore not increasing to any material extent; and collieries are able to hold firmly to their list basis rates of 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Occasional lots of house coal, however, are to be bought from outside districts, more particularly Yorkshire, at specially low-cut prices. Steam coals generally meet with a tolerably ready sale, as notwithstanding a somewhat lessened inland demand, the shipping trade is still taking away fairly large quantities, and sufficient to relieve collieries of any surplus common round coal they may have to offer, at better prices than are obtainable on inland sales. At the pit, steam and forge coals are quoted inland at about 12s. 6d. to 13s. per ton. For shipment, 16s. to 16s. 6d. for ordinary, up to 17s. for some special qualities, delivered at the ports on the Mersey, is being obtained. Slack continues plentiful on the market, with cheap lots offering; and it seems very doubtful whether Lancashire collieries will be able to much longer hold on to their present list basis, unless there is a very decided improvement in the cotton trade. At the pit, they are still quoting on the basis of 10s. 6d. to 11s. per ton; but some of the non-associated collieries are taking 6d. to 1s. less, and on

forward contracts quotations are now being made at 1s. to 1s. 6d. below the present list basis.

**Northern Coal Trade.**—The coal trade has been somewhat irregular of late; and on the whole this has led to rather lower prices. In the steam coal trade, there has been enough work to keep the collieries well employed; but future orders are only obtained by some concession in the prices. Best Northumbrian steam coals are from 16s. 9d. to 17s. 3d. per ton f.o.b., and steam smalls are 9s. 6d. to 9s. 9d.; the latter kind being very plentiful. Manufacturing coals are steady; but buyers hold off from new contracts, as they seem to expect lower prices before the end of the year. In the gas coal trade, there is an increasing demand on contracts; and the deliveries will soon be at the highest point for the year. Gas companies seem to have a fair stock; and there is not the pressure for supplies that there was in the November of last year. For occasional cargoes, the price quoted is from 16s. 6d. to 17s. per ton f.o.b.; but there is not, after meeting the contracts, much coal left for such sale. In the coke trade, there is rather a recovery in prices; and for best coke for export the quotation is from 24s. to 26s. per ton f.o.b., while blast-furnace coke is about 25s. per ton at the Teesside furnaces. Gas coke is steady in price, at about 24s. to 25s. per ton f.o.b. The production is now increasing, and exports are only maintained; so that the stocks may begin to grow soon.

**Scotch Coal Trade.**—There has been a considerable fall in prices. It is beyond question that the price of coal has been forced this year beyond what is maintainable; and the result has been the shortening, by every means possible, of the consumption. Men are being dismissed from employment; and many of these, as well as thousands who are being discharged from the army, will find their way into the coal pits, where wages are higher than they are anywhere else. The reaction which has set in will probably develop rapidly, as coalowners will be immediately at sixes and sevens, in their endeavours to avoid losses in the falling market. The prices quoted are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 14s. 6d. to 16s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 206,357 tons—a decrease of 21,162 tons when compared with the preceding week, but an increase of 31,190 tons over the corresponding week of last year. For the year to date, the total shipments have been 9,146,501 tons—an increase of 1,807,266 tons upon the same period of last year.

**Barry Gas-Works Extensions.**—The Gas and Water Committee of the Barry District Council last Tuesday passed plans of a new retort-house, to cost about £10,000; and application was ordered to be made to the Local Government Board for permission to borrow the money.

**Cumberland Water-Works Scheme.**—A meeting of the property owners and ratepayers in Wigton and district was held last Tuesday to consider the proposal to join in the scheme for tapping the sources of the Upper Ellen and Lake Overwater to provide a water supply; the cost being estimated at £30,000. After an animated discussion, the motion in support of the project was carried by a majority of 47 votes.

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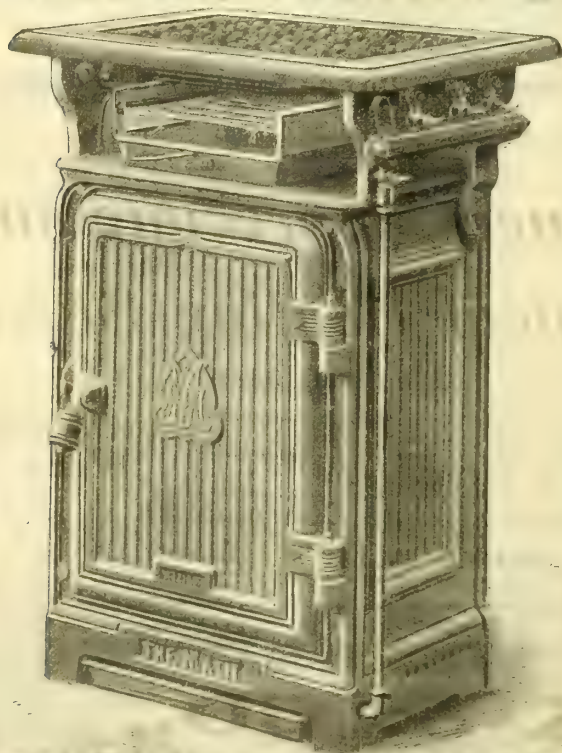
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**Lambeth Water-Works Company.**—The Directors have decided, subject to audit, to transfer £3000 to the contingency fund, and to recommend the payment of dividends for the past half year at the prescribed rates of 10 per cent. and 7½ per cent. per annum respectively on the share capital, together with a further payment at the rate of ½ per cent. per annum on all the share capital on account of arrears of previous dividends; leaving a balance of £5962 to be carried forward, after making provision for the statutory payment to the Chamberlain's sinking fund.

**Failure of the Gas Supply at Pontypridd.**—Just before ten o'clock on Monday night last week the gas supply of Pontypridd failed. There was but a faint glimmer of light in the public lamps, and the main streets were almost in total darkness. There was not much improvement on Tuesday night; and during the evening circulars, signed on behalf of the District Council by Mr. Edward Jones, Manager of the Gas-Works, were distributed informing the public that owing to breakages in the main, caused by subsidence, a great quantity of gas had been lost, and a full supply could not be guaranteed until Wednesday.

**Damage to Property by Gas Explosions.**—A destructive gas explosion occurred on Monday night last week in Glenarm Road, Lower Clapton, caused by a young man named Henry Blake seeking to trace a leakage of gas with a light, in the house of his father, Mr. T. E. Blake, which was completely wrecked, and subsequently set on fire. The force of the explosion was such that ten houses, some of them on the opposite side of the way, were damaged, though in a minor degree. Mr. Henry Blake, who is 23 years of age, was badly burnt about the face and hands, and was blown a considerable distance; while his father received slight injury. The local brigade quickly overcame the fire. On the previous day, an explosion, which did a good deal of damage to property and injured two persons, occurred at Ashton-under-Lyne. The affair happened in Hamilton Street about lighting-up time. It has been ascertained that the explosion was caused by an accumulation of gas under the floor of three houses, Nos. 88, 90, and 92. The report is said to have been terrific; and the neighbourhood was greatly startled. Each house was badly damaged; and No. 90 was set on fire. The fire brigade was soon on the spot; and, after considerable further damage had been done by water and flames, the fire was subdued. It was found that the leakage came from the street-main, and the pavement had to be taken up to obviate further disaster. William Haughton and his wife, who resided at No. 90, were both found badly cut about the head. An explosion of gas took place in the office of a firm of law agents, in Renfield Street, Glasgow, last Friday morning. When the office was opened a smell of gas was perceived. One of the partners put water into the gaselier, and then (it is said at the suggestion of his partner), before he descended from the chair, upon which he was standing, he lighted a match and was applying it to the pipe, near the ceiling, when the explosion occurred. The windows of the apartment were blown out, the doors destroyed, and both partners injured—one by burning, and the other by falling glass. The leakage must have been near the roof, or the escaped gas had found its way upwards and collected. There must have been a large accumulation, for the first thing the clerk did on arriving at the office was to open the windows and turn off the gas at the meter.

**Bradford Gas-Works Extensions.**—The Bradford City Council last Wednesday confirmed their proposal to take steps to promote a Bill for various purposes in the ensuing session of Parliament. The Corporation, it may be remembered, intend to ask for power to extend the Birkshall and Valley Road Gas-Works; to enable them to manufacture and store gas on lands in their possession, but on which they are not at present authorized to manufacture and store gas; and to borrow the sum of £150,000 for carrying out these extensions, and other works in connection with the gas undertaking.

**Bury Public Lighting.**—In his annual report on the work of the Public Lighting Department of the Bury Corporation, the Superintendent (Mr. E. Geall) states that the quantity of gas consumed in the street-lamps during the past year was 26,837,900 cubic feet, which cost £2733 12s. 11d. In the course of the twelve months, 32 lamps were erected; bringing up the total to 2185. There are 31 arc lamps, each of 1000-candle power, and two 800-candle lamps—all in the principal thoroughfares; also 127 incandescent lights. The greater portion of the lamps burn 3285 hours per annum.

**Lighting of Bude.**—A scheme for the erection of works for the supply of gas to Bude and Stratton has recently been projected. A few weeks ago, Messrs. Willey and Co., of Exeter, wrote to the District Council for permission to lay and maintain mains; mentioning that they were supported by many of the principal inhabitants. The Council appear to have been in doubt as to whether they had power to grant permission, and, in any case, decided to refuse it. The ground for the refusal is that, if their projected water scheme receives the sanction of Parliament, it is intended to use the surplus water power as a means of supplying electric light.

**Flamborough Water Supply.**—At the monthly meeting of the Bridlington Rural District Council, the minutes of the Executive Committee showed that the members had again had under consideration the question of the water supply of Flamborough, following a letter read at the previous meeting from the Local Government Board. The Parish Council of Flamborough have repeatedly stated that the water supply to the village is ample and good. The letter of the Department intimated that the Rural District Council, and not the Parish Council, were responsible for the provision of an adequate supply of water to every occupied house, and stated that "having pointed out the Rural Council's statutory duties in this respect, the Local Government Board could only say that, in their opinion, a serious responsibility would rest upon the Rural Council should they continue to neglect to secure to Flamborough an adequate supply of wholesome water." The Executive Committee had instructed the Sanitary Inspector to make a special inspection of the parish of Flamborough, and to mark every pump and cistern in the village on a 25-inch map of the Ordnance survey, at the same time instructing the Clerk to inform the Department of the course taken. Mr. Simpson, in moving the adoption of the minutes, said the question of the supply of water to Flamborough necessitated, and was receiving, the careful consideration of the Committee. The step taken would, he hoped, enable them to furnish the Department with all the information if desired. The motion was carried.

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BLACKBURN	1,280,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,280,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDÉ (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.



**The Local Government Board and the Supply of Water Gas.**—The "Local Government Journal" says on the above subject: "There seems little prospect at present of any local authority obtaining the sanction of the Local Government Board to loans for the establishment of water-gas plant. To every application which is made, the Board reply that a Departmental Committee was appointed some time ago to inquire into and report upon the extent to which the gas is used, the danger attending its manufacture and use, and the means by which the danger can be guarded against; and that until the report which has been made has been finally considered, they are not prepared to take the responsibility of sanctioning loans for the purpose. It is understood that the delay is partly attributable to the Board of Trade, and that legislation is contemplated."

**Projected New Gas-Works at Portsmouth.**—The Portsea Island Gas Company are proposing shortly to expend a quarter of a million of money upon a very large extension of their works, for which additional capital is to be raised, and an application made to the Board of Trade for a Provisional Order to sanction it. The new works are to be in addition to those at Landport, and are to be erected on a site at Copnor, in the parish of Cosham. They will be available both for manufacturing gas and storing coke, oil, tar, pitch, and other chemical products. The scheme will include the erection of dwellings for the workmen and other persons employed by the Company. The extension has become absolutely necessary owing to the strain put upon the Company during the last ten or fifteen years by the great increase of the borough—the erection of dwellings having gone on in all directions.

**York Streets Again in Darkness.**—Attention is again being called to the absence of electric light in York streets, to which reference was made in the "JOURNAL" last week. Alderman R. H. Vernon Wragge, who is a member of the Electric Lighting Committee of the Corporation, has written to the "Yorkshire Herald," under date of Nov. 2, as follows: "Last night, Market Street and Spurriergate were in pitch darkness. On Tuesday last, I drew attention, at the Streets and Buildings Committee, to the previous occasion, about a fortnight ago, and moved the following resolution: 'That in future, when the person in charge finds that the electric light will not be on in any district that night, notice should be sent to the gas-works to light the lamps.' Instead of that resolution being carried, the following amendment was moved and carried in its place: 'That the police be requested in future to report when the electric light fails, the same as gas.' Where the remedy for the darkness comes in by this precious amendment I fail to see; but it gives some idea of the way public business is transacted. Perhaps, after some crime has been committed under the cover of the darkness, our sage rulers will wake up to the fact that it is scarcely meeting the requirement of the case for the Streets and Buildings Committee to receive a report from the police, a fortnight after the event, that the electric light has failed. I am not complaining about the Electric Lighting Committee. Rome was not built in a day, and we cannot expect everything perfect in a moment; but surely, until perfection is attained, failure should be anticipated and provided for."

**A Water Scheme for Kettering.**—A town's meeting at Kettering has confirmed the intention of the District Council to promote a Bill in Parliament for conferring power to carry out an extensive water scheme. According to a report by Mr. Mansergh, the extension consists of enlarging the reservoir at Cransley, and establishing a new one at Loddington; the total cost being estimated at £150,000.

**Bovey Tracey Water Supply.**—As the result of the recent inquiry respecting the proposal of the Newton Abbot Rural District Council to borrow £3000 for the purpose of improving the water supply of Bovey Tracey, the Local Government Board have suggested that, before constructing a new reservoir, the Council should take steps to increase the efficiency of the existing works. A new 4-inch main should be laid to the reservoir, in continuation of the 4-inch main from the springs; and the reservoir should be repaired so as to allow of its being filled to the utmost capacity. No portion of the supply to consumers should be drawn from the main supplying the reservoir. If these works were inadequate, a second reservoir could be provided; but it would probably be sufficient to have one of considerably less capacity than that now proposed. The District Council discussed these suggestions last week, and came to the conclusion that they were inadequate. Steps are to be taken with a view to formulating a fresh scheme. With regard to the supply of water to several hamlets in the neighbourhood of Bovey Tracey, the Local Government Board suggested the employment of a competent water engineer to advise the Council on the subject, in both its geological and engineering aspects. It has been decided to apply to the Geological Survey Department for advice as to the expense of an expert.

**Bude and Stratton Water Supply.**—After an agitation extending over many years, it has been decided to seek parliamentary powers for the provision of a supply of water for Bude and Stratton. The proposed source is a reservoir with an area of about 80 acres, the property of the Bude Harbour and Canal Company. Alternative schemes were proposed for the consideration of the District Council and the ratepayers. Under the first, the Council had the option of purchasing the whole property of the Canal Company for £8000. Under the second, they were offered a lease with the right to take water at the following prices: 3d. per 1000 gallons up to 20 million gallons per annum, 2d. per 1000 up to 30 millions, and 1d. per 1000 for all in excess of that quantity. In order to make the water available, it will be necessary, in either case, to lay mains and construct works, the estimated cost of which is £12,500. The District Council, at a statutory meeting last Wednesday, decided to take steps for the promotion of a Bill for the purchase of the Canal Company's undertaking; and the decision was confirmed by a meeting of the ratepayers held afterwards. It is calculated that the present requirements of the district are 90,000 gallons a day, or 33 million gallons per annum. Mr. J. Treleaven, Chairman of the District Council, laid before the meeting statistics which showed that the annual cost of this quantity of water under the leasing scheme would be £1136, whereas the purchase of the undertaking might be effected at a cost of £1052 per annum. The income from water supply is estimated at £500; and to make up the deficit on the cheaper scheme a rate of 1s. 6d. in the pound must be levied.

RICHMOND'S

"TRIUMPH"



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REALLY  
NEW."

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"A WINTER'S TALE."



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## EDITORIAL NOTES.

## The Boot on the Other Leg.

THE outlook in regard to coal grows brighter each week. So welcome is the news, that readers will not need any apology for our returning constantly to the subject, and reviewing the ground for the faith that is in us. There is, indeed, good reason why the hopefulness of the situation should be emphasized, because outward appearances are not at present truly indicative of the existing state of the market, and it is well that the whole of the gas industry should know how matters stand. Quoted prices, that is to say, do not constitute a trustworthy guide; it is only when one can get behind the scenes a little that the remarkable change that has recently come over the relations between buyers and sellers of coal can be fully understood. How remarkable the change is can best be realized by comparing the situation a year ago with that at present existing. In November of last year, the contractors for coal were, with scarcely an exception, heavily in arrear in their deliveries—so much so that at the end of the month some of the very largest undertakings had not a fortnight's consumption in stock. These contractors were, moreover, actually offering their customers several shillings a ton on those arrears as consideration for their cancellation, though we did not hear of a single case in which such an offer was accepted—for not only was it impossible to keep most collieries to the schedules of their contracts, but impossible also to buy any coal in the market, outside of a few odd cargoes of inferior stuff at famine prices. Later in the winter, every gas undertaking in the kingdom was reckoning its coal stock in terms of days—indeed, of hours—instead of in weeks. There is no need to enlarge on the straits to which coal users were put for coal from last November well on into April. They are only too painfully impressed on the memories of most readers. We merely recall them to say: "Look here upon this picture, and on this."

For what is the situation now? It is in every particular reversed. So far from contractors lagging behind with their deliveries, and pleading every reasonable and unreasonable excuse for their failure to supply, they are at present, in more cases than one, actually ahead of their contract engagements—a state of affairs rarely, if ever before, known during the month of November, and only equalled in curiosity by the fact that coal is now to be had for winter delivery at lower prices than in the summer. (Indeed, "summer prices," as generally understood, have been very conspicuous by their absence this year.) Last November, as we have said, contractors were willing to offer terms for the cancellation of arrears. Now—well, all one can say is that if any companies have such rare birds as contractors whose consignments are behind the schedule quantities, let them cancel the arrears; they will have no further cause to complain of lagging deliveries. The experiment has, we know, been most successfully tried by at least one undertaking whose managers some time since accurately gauged the true inwardness of the situation—which may be shortly expressed by saying that "the boot is on the other leg."

Quoted prices, as we have remarked, are indeed far from representing the real state of affairs. Underselling is going on freely; and although collieries are endeavouring, might and main, to keep up the price by rushing in full contract deliveries, they would be only too glad of more orders. It is a significant fact that in the case of one large provincial gas undertaking, coalowners who did not get in before are making offers at less than the market prices. The truth is that the end of the period during which the coalowners generally have been masters, and very exacting masters, of the market, has come to an end; and, although the advent of cold weather may for a time stiffen the price of house coals, the ruinous prices of gas coals that have ruled during the past many months must very soon give way considerably.

This alteration in the state of the coal trade has come about from two causes—one the increase in supply, the other the decrease in demand. As to the output, new pits and new seams are being constantly brought into working order. One colliery alone that twelve months ago was lying idle is now turning out coal at the rate of nearly a quarter of a million tons a year; and prospecting has been freely carried out under the stimulus of the high prices ruling. It must, however, be noted as a sign of bad omen



for the future, that there is an avowed movement among the miners to restrict the output, in order to maintain those high prices and the consequent high wages. Yesterday week, a meeting of the South Wales Miners' Federation authorized the Executive to issue a notice to the effect that "with a view to prevent the industry being exploited by merchants and middlemen, the Council have unanimously resolved that a general holiday be taken throughout the coalfield by all colliery workmen, on Friday, Nov. 9." In one of the journals of the trade it is said that the coalowners are "not in agreement as to whether the trade will be benefited or not by this artificial remedy to keep up prices." We can only say that those who doubt the fatuity and disastrous consequences of such a policy will soon learn by dear experience.

They must indeed be blind or unreasoning, as nothing is more obvious at the present moment than that the high prices to which fuel has been run up are seriously damaging the very trades upon whose custom the collieries depend for their prosperity. The state of the iron and steel trades is daily becoming more serious for those interested therein; for, while the abnormally high price of iron—Scotch warrants stand at 67s. which in January, 1898, were at 45s. 4d.—is opening wide the door to foreign competition (as witness the falling off in the export trade and the large purchases of American iron by Scotch shipbuilders) and is killing business, yet fuel is so dear that the cost of production is too great to admit of any material reduction in prices without the disappearance of all profits. The longer, then, that coal is, by either artificial or natural means, maintained at its present level, the more serious will be the effect on the iron trade, and the less will be the demand for coal. The closing of the Barrow Hematite Iron and Steel Works—a step which has been taken in consequence of "slackness of orders, the cost of fuel, and the reductions in prices necessary to meet American competition"—should be a warning to coalowners who still need one.

Whether, however, the coalowners learn wisdom or not, it seems only too apparent that the economic ignorance of the coalminers' organization is "proof and bulwark against sense;" and one cannot but look upon the future with some misgivings when the present temper of the men is considered. It may not have attracted the notice of many of our readers, but in Wales, and some other districts, there has of late been a succession of strikes of short duration, or threatened strikes, all having, and achieving, the same object—namely, the forcing of non-unionists into the Union. The masters have preferred selling coal at huge profits to risking a fight. But they, and coal consumers, will pay the price some day; while, as a sign of the times, the men's action is by no means welcome. The inevitable heavy fall in their wages next year will create a situation of no little anxiety.

Apart, however, from the possibility of labour troubles, the outlook for coal consumers is decidedly bright, and a considerable fall in price is certain in the near future. But for the continuance of the abnormal exportation of coal (as to which we give particulars in another paragraph to-day), that fall would have taken place weeks ago, as the home market has been failing for some time. Meanwhile, the best advice we can give to the gas industry is to buy no more coal, and certainly no farther ahead, than is absolutely necessary.

#### The Problem of the British Gas Engineering Profession.

No excuse is needed for returning to the all-important topic of the character of the personality of the British gas engineering profession. We have nothing to withdraw from, or qualify in, our "Editorial Note" of the 16th ult., which has evoked some letters well deserving the publicity we have gladly afforded them, and has also brought us private expressions of approval from representatives of both parties concerned for the satisfactory solution of the problem in the future. We find it desirable, however, to explain that those who are actually suffering, or who may suffer in their own persons, from this "riddle of 'the painful earth'"—the apparent hopelessness of matching reward to deserving—must bear their lot with such patience as they can command. Surely, no assurance is needed to persuade victims of the "slings and arrows of outrageous fortune," that our references to the whole case of the gas engineering profession of this country are inspired by the keenest sympathy for those to whom Fate has denied adequate opportunity for the exercise of their

powers. But the calling of a gas manager is not singular in this respect. It is, indeed, a constantly-recurring theme of poetry and philosophy of all ages and climes.

As practical persons, therefore, let us confine attention to the remediable portion of the evil. We were glad to see one correspondent quoting an earlier "JOURNAL" article dealing with the worst weakness of municipal service. That is certainly a matter ripe for reform, in the best interests of the public as well as of the professions implicated. We are, as a nation, rightly proud of the honourable character of our Civil Service; and, on the whole, the example of this service has been followed in the more numerous local government executive. But, in the latter, the particular kind of skill known as ability to "take the length of the chairman's foot" still possesses inordinate value. There are, of course, numerous honourable exceptions; and this particular mischief is by no means confined to municipal service. In the past, as we are reminded, the calling of gas management has suffered from the low view too frequently taken of the necessary qualifications for this employment by both company directors and municipal councillors. Perhaps in no other avocation are such diverse local opinions entertained and acted upon with regard to the rating and remuneration of holders of appointments of the same general order. In one town of moderate size, the gas-works manager is "a citizen of credit and renown." Able, respected, trusted, he is as honourably identified with his town and its gas undertaking as a man could wish to be. What matters it if he is not one of the very "big men" of his profession? Is their lot so enviable? Not a bit of it. If a gas manager, or any other man, has enough of the world's gear for his needs, and is the right man in the right place, he can regard his career as a successful and creditable one, and himself a happy man in his professional life. On the other hand, a few miles away, perhaps in a larger town, the gas manager has no chance at all. His berth is "no class," as the phrase goes. It is a painful subject; but the facts cannot be overlooked.

How is it that a few well-known undertakings are as colleges for turning out capable, worthy young gas engineers, so that their graduates occupy good posts in all parts of the country, while of others no sound is ever heard in technical circles? As we have already admitted, it is not the largest gas-works that make the best schools of gas management; but we do think that many of these huge establishments are to blame for not doing enough in this way. Whether it is that the head and chief for the time being does not like to have professional brethren too near his throne, or whatever the reason, the truth remains that there are big gas undertakings in this country from which no good man ever emerged for promotion to independent command. The result is that, when an actual successor, or heritor presumptive, for the great man is wanted, there is trouble in finding him. These and other familiar drawbacks to the efficient future manning of the gas profession ought to be removed. Above all, it should be made known among the right sort of young men entering the world of affairs that, with all their disadvantages, gas engineering and gas-works management are not avocations to be despised as unscientific, repulsive, or in any way unworthy of the cleverest and best men, with the right bent, of their generation. This last is our point.

#### Midland Association Meeting—Gas-Meter Union Standardization.

THERE was a resuscitation of the question of the standardizing of gas-meter unions at the meeting of the Midland Association of Gas Managers last Thursday, after almost everybody had thought it had been finally shelved. The President (Mr. J. Ferguson Bell, of Derby) was responsible for this fresh endeavour to arouse interest in the matter; and next to what has already been done by the Committee of the North British Association, his effort will stand conspicuously prominent. We have before acknowledged that everything Mr. Bell takes in hand in connection with his profession he does particularly well; and this is another instance. The compilation of the tables showing the variations which exist in the unions of different makes of meters must have involved an immense amount of labour. Indeed, they are really the soul of his communication; and we venture to think that their study will do more to incite interest in the question than anything that has yet been done. One thing the tables disclose is that the variations in the case of dry meters are of such an insignificant character that the meter makers might, simply by a friendly



compact, conform them without detriment to themselves, and certainly to the benefit of the gas authorities. Wet meters are clearly shown to be the chief transgressors; and in their case a radical reform would be an undoubted advantage. Mr. Bell suggests that the best standard for both wet and dry meters would be the Whitworth thread, and that all connections up to 5-light meters should be of one size. But in seeking the best way of obtaining uniformity, there are several matters which require consideration; and care must be taken that the reformation is not carried (as is quite possible) a little too far. In the discussion, nearly all the speakers agreed with the principle of uniformity; but they did not take kindly to all Mr. Bell advanced or proposed. However, the very terse and plain manner in which he presented his views was effectual in drawing out one of the most readable discussions we have ever reported on the subject.

A number of meter makers representative of the trade North and South attended the meeting by invitation; and some half dozen of them stated the feelings of the manufacturers on the question with such unmistakable clearness, that it will be a sheer waste of time to trouble them again in connection with the matter until the day arrives—if ever it does arrive—when a Committee invested with due authority from the gas suppliers of the country can meet them to actually settle upon a uniform series of unions. Bereft of their argumentative dressing on points raised in the paper, the speeches of the meter makers amounted in sum and substance to this: "If the gas authorities will collectively, through some representative body, tell us what they desire, we are willing to comply." More they could not say; and this has narrowed down the question to one entirely for settlement by the suppliers of gas. They have simply to unconditionally command, and the meter makers will obey. Therefore, if gas suppliers really desire an alteration, let them now distinctly say so. When the project for unification was raised in Scotland, it was sent out with high hopes; but it was dragged wearily about through the country. There was a great deal of favourable talk; but after the talk, supineness—the net result being that our friends across the Border had to take the wanderer home again, and make the best of it they could for their own benefit, aided by the Edinburgh meter makers. If, as the result of Mr. Bell's paper, the matter is revived, let it be in a proper and adequate manner. Let either the Institute or the Institution show that they have the interests of the gas industry sufficiently at heart to bear the small expense and trouble of circularizing every gas company and committee in the country, and ascertain what is the actual feeling on the subject. Then if a majority declare themselves in favour, let a Committee be formed of representatives from the leading gas undertakings and meter manufacturers to decide on a set of unions for standardization, and present it in suitable form for the acceptance of the Board of Trade. Such a Committee, backed and authorized by a majority of the gas industry, would, we think (in view of past action and interest in the matter in that quarter), carry the Board with them. On this point we would call special attention to the remarks of Mr. J. L. Cloudsley in the report of last Thursday's debate. It is unnecessary to discuss here the *pros* and *cons* of the general question. There are arguments both for and against standardization; but the balance is turned well in favour by the weight of convenience alone. If standardization is really required, let there be no more half-hearted trifling with it.

Beyond the paper and debate, only matters relating to the executive work of the Association occupied the members. The choice of officials for the ensuing year was a particularly happy one. Mr. Thomas Glover, of West Bromwich, who is a zealous worker both inside and outside the Association, will be the President, and Mr. Charles Hunt, who was practically the founder of the Association, the Vice-President; and, in the ordinary course of events, he will be called upon to preside over his offspring in the year which sees the completion of the first quarter of a century of its work—work which, in character and degree, stands well in the records of the District Associations.

#### Glasgow Decides for "Light Gas."

It is with much satisfaction that we hail the resolution of the Corporation of Glasgow to apply for parliamentary powers to enable them, in the event of their finding the course expedient, to reduce the standard of illuminating power of their gas from 20 to 16 candles. The Corporation

Gas Committee and their Engineer (Mr. W. Foulis) are to be congratulated upon their public spirit and independence of judgment. Mr. Foulis, as all the world knows, is a pioneer in this line of industrial progress. Everybody does not know, however, although most of his professional colleagues can imagine, how many and varied were the obstacles, overt and secret, to be overcome by Mr. Foulis in thus breaking with the tradition of Scottish gas manufacture. The cannel coal interest, naturally, was against him to a man. It was more difficult to make the first breach in the old rule of the trade than to demolish it altogether, as has now been accomplished. The first reduction of the standard of illuminating power was as a step into an unknown land, where all sorts of pains and troubles might be met with. Any amount of trouble was, indeed, cheerfully predicted for the Glasgow Corporation; but these presages of woe were braved, with the result that nothing came of them. It is only the first step that is difficult and doubtful. Now the Gas Committee are experienced in the matter; and they know that the public will never notice any difference in the character of their gas supply, except that it will probably be cheaper. The case laid before the Corporation by Mr. R. M. Mitchell was conclusive; and not a dissentient voice was raised against the Gas Committee's policy.

It might well be wished that the Glasgow Corporation could now set the example of dropping the old convention of standard illuminating power altogether. They could do it. What Glasgow and the rest of the world wants is coal gas of the calorific power of (say) 600 units per cubic foot. This, with no sulphuretted hydrogen, no ammonia, as little carbonic acid as may be, and not over 16 per cent. of carbonic oxide, is the article that the public would demand, if they knew what is best for them in this regard. How to make this gas and deliver it to the consumer at a good pressure, at the lowest possible cost, ought to be the chief study of gas-works administrators and managers. This is the criterion which emerges from all that has been said and done these years past in the interest of the gas-consuming public. Nothing but national fondness for red tape prevents the free development of the British gas industry along these truly economic and sanitary lines. Gas-engines supplied with this gas would beat electric power, whether generated in bulk or in little, out of sight. It is what gas-fires and gas-cookers and water-heaters need. They certainly do not want a continuance of the existing inequality of gas supplies in different towns. And, of course, it is notorious what incandescent systems of gas lighting require for their fullest development. Marching already towards the future when the luminous-flame burner will be the rare exception, the progress of the systems will make a bound forward when the superstition of carburetted gas is definitely shaken off. If the credit for the invention of the incandescent system of gas lighting cannot be claimed for Britain, we can at least excel all countries in the cheapness of its utilization. Let the people have the benefit of this happy feature of the British gas industry, by freeing the manufacture from every artificial restraint on its capacity for almost indefinite expansion!

#### Mr. James Mansergh and the Institution of Civil Engineers.

The Institution of Civil Engineers provided last Tuesday a great treat to members and that section of the community which is interested in hearing about engineering work, in the Inaugural Address of the new President (Mr. James Mansergh). It has been our painful duty, on some occasions, to write disparagingly of addresses from the Chair of the Institution. Indeed, for that matter, our reverence for the Institution itself, as a professional organization, has not been overwhelming. The very name of "Great George Street" has fallen into disrepute of late years, as suggesting an order of engineering which benefited its practitioners more than the community at large. Time and again, working engineers who wanted to get to closer grips with their speciality than they could do under the shadow of the "big-wigs" of the Institution, split off into sectional societies. The valuable consideration given by the Institution to its rank and file in return for subscriptions was the more or less marketable distinction of the initials indicating the classes of membership. There was nothing more. The "big-wigs" merely played up to one another, and kept all young men at a distance; and no sort of discipline was exercised over the body of members, some of whom had, and have, strange ideas of the



limits of professional etiquette, or even of common fairplay as between man and man. In recent years, however, the composition of the Council of the Institution has submitted to a much-needed change for the better; and the Institution has set its house in order in more than one sense of the term. The credit for this improvement is largely due to the rise of engineers of the stamp of James Mansergh, to whom the old-fashioned practice of Great George Street is abhorrent. Not to labour the point, these engineers, who have more honoured than been honoured by belonging to the Institution, have not only rehabilitated it, they have also redeemed the reputation of English civil engineering before the world.

Mr. Mansergh's address revealed the man. Intensely practical, poignant in every line, without a superfluous word, it is inadequate to merely say that there is no padding or mere rhetoric in it from beginning to end. Yet, astounding to relate, this working engineer brought into prominence a gem of classic Roman literature which vastly impressed the scholarly "Times." This was a fragment of Frontinus, a Water Commissioner for Rome appointed by the Emperor Nerva, and set out with unsurpassable cogency the duty of a public man entrusted with the conduct of any important undertaking. The bulk of the address was devoted to various ancient and modern aspects of hydraulic engineering, and is consequently removed from discussion here. Of general interest, however, is Mr. Mansergh's emphatic declaration of the conditions under which the London Water Companies can alone be expropriated. The desirability of the London Water Supply being placed under the control of a public authority being accepted by Parliament in principle, there is no reason in the world why this should not be done, if it is thought to be worth while, by a competent local authority to be created for the purpose. Only, the property must be paid for, like all others of a similar kind. Mr. Mansergh condemned the harassing and worrying policy of the London County Council in regard to the Water Companies; and his weighty words on this subject will perhaps contribute to the formation of a firm basis for fresh negotiation with the object which, in principle, he commended.

#### Coal and Iron Exports.

THE reports of a falling off in the exports of coal, to which reference was made last week, are not borne out by the Board of Trade returns for October. The total quantity of fuel shipped last month is, it is true, somewhat less than the figure for September (being 5,113,972, as against 5,140,708 tons); but compared with the corresponding month of last year the shipments in October show an increase of 544,927 tons, or 12 per cent. The requirements of Germany and France are at present unabated; and a somewhat serious strike of miners in the latter country will certainly not tend to improve matters. The Baltic is practically closed for the winter; so that the volume of the exports may somewhat diminish. But there is every appearance of its being maintained at a very high figure for some time to come. The increase for the ten months of this year is now almost exactly 2 million tons, as compared with the same period in 1899, which year showed a total excess of no less than 7½ millions over 1898, owing largely to the strike in Wales during the last-named year. The influence that an additional drain on our coal supplies of about 10 million tons a year must have upon the market until the output is correspondingly increased, needs no demonstration.

The falling off in the exports of iron and steel is as noticeable a feature in the returns for last month as the increase in the shipments of coal. The tonnage of metals and articles manufactured therefrom, other than machinery and ships (of which the weight is not given) was only 275,764 tons in October this year, against 370,539 tons in the same period of 1899—a decrease of over 25 per cent.; while the aggregate exports under that heading for the ten months is practically the same for both this and last year, though the first half of this year showed an increase of 306,500 tons over 1899. These returns, following upon those for September, prove how seriously the high prices of iron and steel goods have damaged the trade of the country. In spite of the higher prices, indeed, the value of the exports of metal goods (including machinery) shows a falling off of £307,784 in October.

Not a little of this diminished trade is due to the encouragement given by high prices to foreign competitors. When first we wrote upon the subject of the probable serious

competition to be looked for from American rivals, the organs of the engineering and iron trades in this country were very scornful of the possibility of the Americans capturing English markets. Some of them are now talking about "increasing and well-founded fears of a deluge of American pig iron;" "the necessity of reducing prices to meet American competition;" "plates offered in our markets at prices which English makers are unable to entertain," and so forth. Only the other day, a contemporary waxed wroth when it was suggested in the Daily Press that orders from South Africa were going to the United States because British firms could not undertake them; and we were told that such orders were simply allowed to go because the British manufacturers were too full of work to undertake the contracts. Yet it is now said that, "as work is getting short, competition is getting keen," and the position of manufacturers is steadily getting worse.

No one will accuse the "JOURNAL" of ever imagining that the competition of America or Germany is going to wipe out the industries of this country; we have too much faith in the grit and resource of our countrymen to think that. But it is simply idle and foolish to deny that English manufacturers have leeway to make up in regard to adopting improved methods and machinery; and that the increased cost of production and the inflation of prices in this country have given their competitors a very valuable opportunity, which they have been quick to see and to take. Consumers, as distinguished from producers, have every reason to hail the advent of competition which will prick the bubble of present prices, and will, eventually, by its arousing and sharpening effect, be an advantage to the manufacturers themselves. More immediately, it will be of much assistance in restoring the coal and iron markets to normal levels.

#### The Sad Case of Alderman Higginbottom, of Manchester.

SOMETHING very like a tragedy, in respect of the fashionable "principle" of municipal trading, has occurred in Manchester—the city of the United Kingdom, next to Glasgow, usually held up as the model of this order of municipal enterprise. The Lord Mayor designate (Alderman Higginbottom) has retired from municipal office, and forfeited the penalty of £50 for resigning the position of Alderman, in consequence of the finding of a Special Committee appointed to inquire into certain allegations published by Mr. Norbury Williams, one of the Elective Auditors, relative to the dealings of the Alderman's firm—Messrs. Higginbottom and Mannock, Mechanical Engineers—with the Gas and Electricity Departments of the Corporation. Alderman Higginbottom was Chairman of the Electricity Committee, and a member of the Gas Committee of the Corporation. Mr. Norbury Williams issued an address to the ratepayers of Manchester, in which he not only made specific charges of mismanagement of business against the Electricity Committee calculated to horrify a believer in the "principle" of municipal trading, but also charged the Chairman personally with improper conduct. The Alderman was alleged to be in suspicious relationship with certain companies who supply the Committee with plant; and he was charged with having, as a member of his firm, sub-contracted for the selling of cranes required by the Gas and Electricity Committees. We have had information about all this for some little time, but naturally waited for the matter to come to a head before publishing anything of the affair.

Mr. Williams's attack was met by Alderman Higginbottom with a disclaimer of intentional misconduct, which nobody mistrusted for a moment. The Electricity Committee, however, had taken the wise course of immediately appointing a Special Sub-Committee "to consider and report upon the administration of the Electricity Department;" and the City Council waited for the report. It is a portentous document. The investigation showed that a good deal of the administrative work of the Department never came within the cognizance of the Committee at all. A very lax way of doing business had become customary. Meanwhile, a Special Committee appointed by the City Council to deal with Mr. Williams's personal allegations against the Lord Mayor designate, went into the matters in question. They found, shortly, that there was nothing in the greater number of Mr. Williams's imputations. So far as these related to Alderman Higginbottom's company connections, they did not amount to anything. It was different, however, with respect to the cranes. Here it transpired



that the sub-contracting of Higginbottom and Mannock was "altogether improper," and such as the Committee could not justify, having regard to Alderman Higginbottom's position upon the Electricity and Gas Committees. The Alderman promptly accepted the situation, and took the only course open to him in the circumstances.

The whole result was inevitable, from the precedent facts. It was not a question of whether Alderman Higginbottom's firm had swindled the city, or whether the Alderman had abused his position to secure an unfair commercial advantage over rivals in business. His action was simply illegal, and, as the Committee described it, improper; and he has suffered for it. Mr. Briggs, the retiring Lord Mayor, adds to the burden of Manchester's indebtedness to himself for faithful services rendered, by consenting to serve for another year; and the local statesmen are now left to brood, with what comfort they can find, over this "regrettable incident" of municipal trading. It is not to be wondered at that this is the permanent, serious aspect of the matter which is affrighting Manchester's conscience. Alderman Higginbottom is personally an honest man. Nobody questions the fact; but, as the "Manchester Guardian" has very properly observed, that is the worst of it. If an honest man might do the things Alderman Higginbottom did, what might not another do?

The trouble of this thing goes deeper than the personal sufferer, deeper even than the wound of Manchester's dignity. It may be, as the local newspapers say, that the City Corporation have come through the painful ordeal purified and strengthened; but what about the reputation of the "principle" of municipal trading? There must be many a citizen of Manchester this day who wishes in his heart that the Corporation had no trading enterprises. As Alderman Southern said with truth when his brother Alderman was first put upon his defence, it is difficult enough for any merchant to know when his goods are destined for Corporation use. Where will the Corporation be, if the leading members of an industrial and commercial community are driven from municipal life by this terror? It will be practically impossible to find men in active business to take part in municipal concerns, which will be left to the "professional" element in local politics; and we all know what that means. "Each municipal election shows how difficult it is to obtain the consent of prominent citizens to come forward as candidates." And this is said of Manchester, whose local patriotism is often thrown at the head of heedless London ratepayers whenever the newspapers have nothing better to do! The natural and obvious lesson of the Higginbottom incident—that there is something yet to be said in favour of leaving business affairs to business organizations—has not yet been expressed outside these columns. It will be repeated, however, whenever this subject is ventilated again. A gas or electricity supply company can purchase the supplies they require in the best and cheapest market. A municipal department dare not do so, if it happens to be the Lord Mayor who keeps the leading shop. It is the system which is wrong, as the "Manchester Courier" remarks; but we go to the root of the matter, and declare that the system which needs to be reformed is that of municipal dealings in things which are not necessary to sanitation and town administration. Of course, being Englishmen, and born to compromise matters, our public men do not lay the axe to the root of the tree; but that is what is wanted to prevent any possible recurrence of these municipal scandals.

Among the medals adjudicated by the President and Council of the Royal Society, and approved by Her Majesty, is the Copley Medal to Professor Marcellin Berthelot, one of the foreign members of the Society, for his brilliant services to chemical science. The medals will, as usual, be presented at the anniversary meeting of the Society on the 30th inst.

The current number of the "Contemporary Review" contains an interesting article on "Gas Light," in which is reviewed, with absence of technicality, the progress of this wonderful illuminant from the days of Murdoch down to those of the Welsbach light. The article does not bear the name of the author, who conceals his identity under the pseudonym of "Ex Fumo Lucem."

The recent Ministerial changes include the transference of Mr. Walter Long from the Board of Agriculture to the Local Government Board, in succession to Mr. Chaplin; and the appointment of Mr. Gerald Balfour, the younger brother of the leader of the House of Commons, and a nephew of the Prime Minister, as President of the Board of Trade, in place of Mr. Ritchie, who goes to the Home Office. Mr. Long has been Parliamentary Secretary to the Local Government Board.

## WATER AND SANITARY AFFAIRS.

LAST Tuesday was a memorable—we will not say a red-letter—day in the history of the Metropolitan Water Question. In the afternoon, the Water Committee of the London County Council laid before that body the report given in the "JOURNAL" last week (*ante*, p. 1160), in which they recommended that an attempt should once more be made to obtain power to purchase the undertakings of the Metropolitan Water Companies. This recommendation will, in all probability, be adopted at the meeting of the Council to-day; and, if so, the Parliamentary Committee will be instructed to prepare the necessary Bill, as well as one to prolong the period during which what have come to be known as the "sterilization clauses" shall remain effective, which has already been approved by the Council. As far as the future additional supply of water to the Metropolis is concerned, the Committee do not recommend the promotion of any Bill dealing with this branch of the question. The parliamentary programme of the Council for the next session is thus clearly defined—a Bill to sanction purchase, and another to continue the "sterilization clauses." We do not believe that either will pass; nor, as regards the first, do the Committee themselves appear to be very sanguine on the matter, for they candidly confessed that they "may be unsuccessful." Moreover, they are careful to point out that the expense up to the second reading stage will not exceed £200—a mere trifle in comparison with the heavy expenditure already incurred in connection with this question. But is there any justification for even this outlay? The Committee attempt to justify their recommendation by citing the report of Lord Llandaff's Commission in support of the policy of purchase; but they are careful not to say that the Commission also recorded the deliberate opinion that the Council should not be the purchaser. Consequently, the views put forward as to what should be the basis of the arbitration need not be considered.

Of far greater importance than the proceedings at Spring Gardens were those which took place a few hours later at the Institution of Civil Engineers, in Great George Street, where Mr. James Mansergh, the new President, opened the 82nd session with an address which, for interest in connection with the special branch of engineering with which for nearly forty years he has been associated, is worthy to rank with those delivered by the eminent men in the same line who had preceded him in the chair of the Institution—Simpson, Hawksley, Bateman, Bazalgette, and Rawlinson. It is unnecessary to give here even an epitome of the address, a large portion of which will be found in another part of the "JOURNAL;" the exigencies of space necessitating the omission of the valuable particulars furnished in regard to the most important water-works of ancient times (especially the aqueducts by which Rome was supplied), and some observations on the work of the water-finder. To these subjects, however, we may return on a future occasion. Our present purpose is to deal with debateable rather than with either historical or psychical questions. Attention must, however, be directed to his opening remarks on the effect of prolonged storage and slow sand filtration on the quality of water, and to the labours of Koch and Percy Frankland in the field of bacteriology in connection with its examination; also to the valuable suggestion he threw out in reference to making some change in the law with regard to underground water, which is acknowledged to cause a great deal of hardship, but is difficult to amend.

Probably the most significant portion of the address was that with which it closed, in which Mr. Mansergh dealt with the policy of municipalizing water-works and the bearing of the question upon the Metropolis. As a member of a former Royal Commission, and as the Engineer of the great scheme for bringing to Birmingham a supply of water from Wales, it was to be expected that he would have something to say on the subject. He introduced it by briefly describing, by the aid of lantern slides—an innovation which heightened the interest of his remarks—the water-supply systems of fifteen typical cities in the United Kingdom, Europe, America, and Australia; leaving the details for an appendix. The selection made brought out the striking fact that, out of all the cities whose works were shown (with a partial exception in Rome), in only one—London—is the water supply in the hands of private Companies. This fact the President considered was a



justification for expressing his own views—viz., that all the fourteen places are right, that London is wrong, and that the recommendation of the last Royal Commission as to placing the undertakings of the Water Companies in the hands of "some representative public body" is "in accord with the best official, parliamentary, and public opinion of the day." That the supply of water should be one of the distinctive functions of the responsible sanitary authority of a district is, he submits, a principle the soundness of which is incontestable; and, moreover, it agrees with the recommendations of Royal Commissions and the practice of Parliament during the past thirty years. Why has this principle not been applied in London? Because, in Mr. Mansergh's opinion, of "the wrong-headedness of the London County Council, through endeavouring in every possible way, and with pertinacious ingenuity, to deprecate the value of the undertakings prior to purchase." This is a very strong indictment, and its absolute truth adds force to it. There are certain features of the business of the Metropolitan Water Companies which possibly present difficulties; but Mr. Mansergh has never seen any essential difference between the case of London and that of any other place where a settlement has been come to either by agreement or by arbitration. He acknowledges that the amount of the purchase-money will be very large. This, however, is only a matter of arithmetic, as "no new or unusual principle comes in to complicate the awarding of fair and just compensation as between the parties." But who are to be the buyers? Not the busybodies at Spring Gardens, but a specially constituted authority; and Mr. Mansergh thinks that, with some alteration in numbers, and with power to vary them at fixed periods according to the relative populations of the districts they represent, the Water Board recommended by Lord Llandaff's Commission is "a workable scheme."

After this pronouncement from so eminent an authority, it really seems that the ground is cleared for negotiations with the object of settling for ever this question of the control of the Metropolitan Water Supply. The initial step in this direction, it seems to us, is to determine who are to negotiate. It is scarcely to be supposed that the London County Council will be authorized to do so, if the property to be acquired is not to remain in their hands. Consequently, the first thing to be done will be to constitute the suggested Water Board; the next, to settle the basis on which the negotiations are to be opened. As far as the Water Companies are concerned, their position is just this: They are in possession of their undertakings, and no grave charge of mismanagement has been brought against them. If their property is to be taken from them, they expect to be treated as other similar companies have been dealt with in the past—that is to say, to receive for it a sum which shall have been determined by arbitration under the Land Clauses Consolidation Act, *plus* an allowance for compulsory sale, and fair compensation for future profits. If, therefore, their present income and an allowance for future profits were secured to them upon the rates of London, with a *solatium* for compulsory sale and full compensation to all persons injured by the transfer, a basis of sale might possibly be settled. This, if we understand aright, appears to be the view taken by Mr. Mansergh, for he considers the owner of a water undertaking would have no cause to complain if, on its transfer to a public body, he were assured his annual income, "*plus* all prospective value inherent in his investment." He believes this result is nearly always attained by the ordinary process of arbitration. This being so, the sooner any "false and pedantic sentiment which stands in the way of transfer" is allowed to die out, and the matter is approached on purely business lines, the more likelihood is there that the agitation which has been going on more or less for the past thirty years over the Metropolitan Water Question will be set at rest. Should the municipalization of the water-works of London be one of the early prominent events of the Twentieth Century, the public must not be led away by the notion that their new undertaking will turn out to be a veritable gold mine. The price they will have to pay for it will be a big one, as Mr. Mansergh is careful to point out; and Lord Llandaff's Commission laid stress upon the fact that it would only be by the acquiring authority being allowed to dispense with payments to a sinking fund for the redemption of the purchase-money that the owner would be able, by maintaining the existing charges for water, to pay his way. This fact must not be lost sight of.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1224.)

THE Stock Exchange had a really busy and exciting time last week, such as it has not had for a long while. Too feverish and spasmodic, perhaps, to last; but still—there it was. The opening days were irregular and flattish; all eyes being turned to the West awaiting the result of the American Presidential Election. With the return of the "honest money" electorate, business opened in the street next morning soon after eight o'clock. The boom in the American market then started; and it lasted firmly to the close. Other departments profited to a degree sympathetically; but there was nothing like a uniform advance. Special circumstances existed in some quarters to keep things down. However, on the whole, prices for the week are higher. The Money Market was adverse to a general rise; for concurrently with the outburst of activity, rates hardened, and it was evident that lenders were on their guard, and were not disposed to facilitate reckless plunging. In the Gas Market, business was moderately active, perhaps a trifle more so than the preceding week, but that does not amount to saying much. The tendency, however, was not so good, being all in the direction of easier prices. Only three quotations were actually varied. But they were of important undertakings; and they were all lowered. In Gaslight issues, there was a fair amount of business done; and the ordinary held on tight to its old quotation. But the transactions recorded were all marked on the lower side of the middle figure, or no better than it. The secured issues were very quiet, but firm. South Metropolitan, which had been rather shaky, had to give way; and the closing mark was as low as 127. An unusual number of transactions were marked in Commercial; and prices ruled very steady. Business in the Suburban and Provincial group did not offer any feature of note; but British had a large fall just at the close—the quotation dropping a couple of points. The Continental Companies continued quite devoid of animation. Imperial was rather weaker, and fell a point; but the rest were steady. Nothing occurred among the remoter undertakings that calls for notice. The Water Companies have been more conspicuous; and several changes in value took place. The most noteworthy item is that Grand Junction is about to declare a dividend at the increased rate of 8 per cent. per annum.

The daily operations were: Transactions in Gas on the first four days of the week were moderate; and prices marked were fairly level, with perhaps just a perceptible tendency towards rather easier figures. But the quotations remained unchanged. In Water, however, Chelsea preference rose 2 on Monday, and Lambeth 1 on Tuesday; while New River fell 1 on Thursday. On Friday, transactions in Gas were lighter; but prices gave way. South Metropolitan receded  $1\frac{1}{2}$ , and Imperial 1. In Water, Grand Junction rose  $1\frac{1}{2}$ ; but East London fell 2. Saturday was pretty active. In Gas, British fell 2. In Water, Chelsea rose 1.

### ELECTRIC LIGHTING MEMORANDA.

The First Electric Power in Bulk Company—Nature of the Powers of Such Companies—Their Sliding-Scale—Comparison with Gas on the Power Basis—An Anecdote of Mr. Winston Churchill's.

THE first step was taken last week towards the carrying out of the powers granted by Parliament last session for the generation and supply of electricity in bulk, by the promotion of the Electrical Power Distribution Company. This venture came before the public with a share capital of £300,000, most of which was guaranteed by the Brush and allied interests. The directorate comprises such distinctive names as Raworth, Garcke, and Sellon. The object of the new combination, which is to be managed by Mr. W. L. Madgen, is to back up a number of electric power generation and supply ventures all over the kingdom. If the Company gets to work, it should soon settle the question of the commercial prospects of the idea of dealing with electricity in bulk. It is worth drawing our readers' attention to the peculiar sliding-scale arrangement that was enacted for all these schemes, and accepted by the same contingent of directing spirits for the County of Durham Act. This enactment has already been mentioned in our abstract of the Acts of 1900; but it should be kept in mind whenever any of the schemes to which it is applied is under discussion. Of course, the Press organs of aggressive Municipalism are proffering their condolences to the people of Durham on their ill-fortune in having their electricity supplied by a Company. They are assured that they will have to pay a great deal more for the service than if it had been municipal—blessed word!—in character; and so forth.

We shall not be suspected by anybody of holding a brief for the Garcke-Sellon combination if we undertake to show that in this particular case Parliament has only permitted them to undertake the business upon terms which beat any possible municipalism hollow, so far as the price of the service goes. Writers in newspapers and quasi-technical journals, whose cue it is to cry Municipalize! in and out of season, without knowing one scrap of the merits of any particular case, are bringing the cause they affect into ridicule and contempt. Take this County of Durham scheme as an example. Speaking generally, how can the supply of electricity in bulk to such a region be municipalized?



One might as well talk of municipalizing the North-Eastern Railway. If there is any advantage in this idea of dealing with electricity in bulk—as to which we suspend judgment—to invoke municipalism in regard to it would be to bar it from ever being realized. But see now, as a matter of fact, what this terrible Company have to do. Their statutory powers authorize them to "supply electrical energy in bulk to authorized undertakers." That is the extent of their right to exist. A man must be afflicted with municipalism on the brain to see any harm in that. But perhaps the authorized undertakers are companies too! That is so; but the districts affected must be supposed to know their own business. Newcastle and Gateshead, with about the cheapest gas and electricity supply in the kingdom, provided by Companies, have no quarrel with the principle of private enterprise in these lines.

Now as regards the price to be charged and the dividends allowed to the County of Durham Company, the Act practically concedes what was asked for in the Bill. Metered supplies are to be charged for at the rate of 4d. per unit for any quantity not exceeding the equivalent of 100 hours of supply at the maximum power demanded; falling to 2d. and 1d. per unit for supplies up to and exceeding 200 hours. How these supplies are going to be satisfactorily metered is another story, which need not be gone into now. To this schedule of prices the following condition is attached: The normal maximum dividend is 8 per cent., "Provided that in respect of any year during the whole of which the prices actually charged by the Company shall have been at the rate of  $1\frac{1}{4}$  per cent. or more below the maximum prices stated, such dividend may be increased in the ratio of 5s. per cent. in respect of every complete  $1\frac{1}{4}$  per cent. by which the prices so charged by the Company shall have been below such maximum prices. If in any year the dividend paid by the Company for that year exceeds the aforesaid rate of 8 per cent., the prices to be charged by the Company for the next following year shall be  $1\frac{1}{4}$  per cent. less than the maximum prices stated in the schedule to this Act in respect of every complete sum of 5s. per cent. by which the dividend so paid exceeds 8 per cent." After any period of ten years, both standard prices and sliding-scale may be revised by the Board of Trade.

That is sufficiently sweeping. Eight per cent. dividends are regarded as sufficient remuneration for the undertakers of this blind enterprise; and the sliding-scale is made operative over a couple of years. On the basis of power generation, a unit of electricity is equivalent to about 33 cubic feet of town's gas, in round numbers. It will be necessary therefore to get the average price per unit down to a penny or thereabouts before it will compare on level terms with the ruling gas prices of the district. It is not a very bright outlook for the new Company. And supposing that they get business enough to be able to earn their statutory 8 per cent. dividend, that is the smallest rate of return upon the whole investment which would enable a municipal undertaking to pay interest, sinking fund, and depreciation charges. It is therefore inconceivable how the consumers of electricity in the county of Durham could be better served than they must be by the help of this Company, if it is really to make a living.

An unintentional exposure of the weak point of electric arc open-air lighting is made by Mr. Winston Churchill, in his lectures descriptive of his South African experiences and adventures. He recounts how the first step of his successful escape from prison in Pretoria was made by climbing the fence "in the deep shadow cast by the electric light" from a tree. It is a very questionable recommendation of the light in question, for use where the provision of facilities of this kind is not intended.

#### THE PROSPECTS OF THE AMERICAN COAL EXPORT TRADE.

THOSE English students of political economy who cannot bring themselves to see that the exportation of British coal can ever injuriously react against the home consumer, may be counselled to take notice of the impression that the mere wind of a tentative exportation of American gas coal has already made upon coal consumers throughout the United States. Americans may know nothing about the canons of authoritative political economy, as these are understood in the United Kingdom. Their national tariff system, and their huge internal "trust" organization, may have obliterated from the American mind the very capacity for appreciating the principles of Free Trade; and in this case, American judgment of the potentialities of the creation of an export trade in coal may not be regarded by our classical economists as worth very much. But it cannot be denied that, individually and by industrial groups, Americans who are large consumers of coal look apprehensively on the prospect of the resources of their country being sold away from its shores. They are not afraid of any premature exhaustion of the bituminous coal capital of the continent, which is, indeed, too vast to feel the physical effect of any possible export demand; but they do dread the commercial result to themselves of even a moderate foreign coal trade.

This opinion is probably all wrong; but it is certainly widely held. American gas engineers who have visited Europe this year take the matter very seriously. It is a remarkable thing, to say the least of it, how little the practical man whose business requires him to buy coal largely, regards prophecies of an approaching dearth of the commodity by reason of the ex-

haustion of the most easily-worked beds, the greater cost of working those that remain, and similar topics of the lecture-room. These prognostications may be all true; but they do not touch the spot value of coal. While the theorists talk of coal costing a century hence another 5s. a ton to get from a depth of 1000 feet more than existing mines, the buyer has painful experience of the fact that the turn of the market will pinch him to that extent and more, without the faintest warning. This is the chief reason why the gas managers of two continents remain calm in spite of Jevons and his school, while fearing the power of their matter-of-fact friend the colliery agent.

The two latest numbers of the "Engineering Magazine" have afforded unmistakable evidence of the seriousness with which this question of coal exportation is taken in America. In October, the subject of the world's need of coal, and the ability of the United States to supply it in part, was discussed by Mr. F. E. Seward, an acknowledged coal trade expert. In introducing Mr. Seward's article, the English Editors of the magazine point out that Jevons took the exclusively national view of the basis of his sinister prophecy. He held that, with the exhaustion of native coal, the wealth and power of Britain would decline; but there is a broader view of the matter, which has been forcing itself into recognition more and more during the 35 years that have passed since Jevons prophesied. In this new light, purely local advantages sink into insignificance. The great storehouse of the world's resources is a common one: "The funds of material, of energy, even of human skill and handicraft, are in reality and inevitably a joint possession, which it is the duty and destiny of mankind to utilize and to distribute to the uttermost for the good of all. The New World, which supplied to the overburdened Old World first room and opportunity to labour, then bread and clothing, now opens to the underfed furnaces, mills, and workshops of Europe almost limitless stores of the coal and iron which are the prime material necessities of modern life. These will prove as life-giving and as little to be considered menaces to England's prosperity as were the wheat of the prairies or the cotton of the Southern States."

That is the sound, English view. We do not care where our supplies come from, so that we can buy in the cheapest market. On the other hand, if our natural productions, whether of coal or anything else, sell better elsewhere, there is no restriction upon their exportation. Still, as sensible observers, we are glad to see that the Editors of the "Engineering Magazine" welcome the prospect of the United States coal supply being able to assume a part of the export trade that has hitherto fallen so heavily upon British resources. We really do want all our coal for our own use, and should be very glad to see the Continental and Eastern demand supplied from elsewhere. It is impossible to persuade the home consumer that the at present heavy foreign demand does not raise the price against himself. There has been talk about imposing an export duty of 5s. per ton on British coal sent abroad; but it is only talk. Those who amuse themselves by raising the question of the probable effect of such an impost, know that the discussion is a purely academical one. The discrimination of the probable effect of the willingness of foreign buyers to pay almost any price for the good English coal, is, however, another and a far more profitable study. Can America, for example, do business with Europe in coal at ruling prices? That is the question of the hour, for the Continental coal trade.

For it is abundantly clear that, if any source of gas or other kinds of coal is to come to the support of Europe and the relief of the drain upon England, it must be the American. Germany, France, and Belgium cannot adequately feed the local demand from home-raised coal as it is; and the cry is always for more. And in addition, there are the countries bordering on the Mediterranean. The more these ancient lands rouse themselves to active life, the more coal they will want; and they have none of their own. Where is it to come from? Only from England and the United States. Whether the native consumers of American coal like it or not, the American colliery interest, like our own, must respond to the inducement of the high European value of good coal. The interest of Mr. Seward's article lies in the candour with which he sets out the prospects of American participation in this great and growing European import of coal. Bituminous coal, which alone counts in this connection, occurs throughout the States from the Atlantic to the Mississippi; the quality being best nearest the coast, and falling off as the beds extend to the westward. This geographical peculiarity is fortunate. Already there are coaling-stations for steam vessels on the Atlantic sea-board, as Newport News, whither ocean tramps resort for "bunkers," which is a sure indication that there is "good business" in this new supply.

The chief point made by Mr. Seward is that the bituminous coal-fields of the United States have as yet hardly been more than scratched. Whereas coal has always been high priced in England—originally by reason of the small demand for, and extravagantly costly ways of getting it, and now because the operations of winning and underground haulage are very expensive—in the United States it is as easy to get as clay. The present great and growing demand for American coal finds the deposits in the virgin state; and the collieries can open up the new ground straight off, with the newest and most economical plant and arrangements for saving material and labour. Generally speaking, there is not a coal mine in the seaboard bituminous fields from which the coal has to be hoisted. It is



quarried, and frequently at such levels that the loaded trucks run downhill. The railway companies serving this region some years ago studied the problems of coal transportation with the utmost care; and the result is seen to-day in the scientific arrangements for dealing with the coal traffic. The railways are very substantially made; and over them run trains of 50 trucks carrying 50-ton loads, with 10 per cent. excess weight, hauled by huge slow-steaming locomotives. Such a train moves 2700 tons to market at one trip.

The next factor making for cheapness is the increasing use of coal-cutting machines. The history of machine coal carbonizing in England has been repeated in the American bituminous coal-fields. So long as the colliers worked satisfactorily, the introduction of mechanical coal-cutters progressed slowly; but when labour troubles arose, the machinists had their chance, and took it. The conclusion of every strike saw more coal-cutting machines in use. Among other advantages, the machine does not spoil so much lump coal as the man. Thus there is plenty of bituminous coal on the Atlantic seaboard, and no difficulty about getting it to the tideway. Here, however, the obstacle of high freights has barred the export trade. The small coalowner has been at a disadvantage, in having to bid against other shippers for such freight as might happen to be going. This obstacle is only a temporary one, and will be overcome by a combination of coal shippers who will do as the Standard Oil Company did for oil—build their own fleet of carrying steamers. It has been determined that 7000-ton ships would be the most economical transatlantic coal carriers. They would steam at a speed of 10 knots, which is the cheapest rate for ocean tramps. This would mean a trip across the Atlantic and back accomplished every month.

Taking Gibraltar as the centre of this new trade, a careful estimate fixes the cost of carrying 7000 tons of coal across from the Atlantic States at a fraction over 80 c. per ton for the single trip. If the vessel returns light, so as to double the cost of carriage, it is then only \$1.60, or well under 8s., per ton. This would enable the American producer to get a good price for his coal, and still compete with the English product anywhere in Southern Europe. Of course, it is doubtful how long the rates actually ruling for English coal can be maintained. At bottom prices, Cardiff and the Tyne would still be hard to beat in European ports. The lack of return cargoes would seriously handicap a transatlantic collier fleet. For the present, such a fleet is purely hypothetical. No such ships exist, nor can any American shipyard build them; and there are no docks over there to take them in. Consequently, it must be agreed that Mr. Seward's fancy of a great addition to the American mercantile marine, capable of carrying native coal abroad as the English ships do, is somewhat telescopic in its range.

In the November number of the "Engineering Magazine," Mr. F. Seaton Snowden descants upon the actual facts of the export coal trade of the United Kingdom, which last year accounted for 41,180,300 tons, valued at £23,105,691, besides 12,250,000 tons sent out as "bunkers." Against this, the American exportation was 5,750,000 tons, valued at £3,145,000, apparently inclusive of "bunkers." Thus the United States has a good deal of leeway to make up. British steam colliers, moreover, have for some time been all that Mr. Seward's fancy pictures as coming within the bounds of possibility for American keels, and more. For, following Professor Biles, Mr. Snowden awards the palm for cheap carriage to a 9000-ton craft, which, running 267 miles per day, has actually transported herself and cargo with a coal consumption of 0.036 lb. per mile. A ton of shipping and freight driven a mile by a little over half-an-ounce of coal! Various coal-handling plants are mentioned by Mr. Snowden. He puts the advent of American coal into Europe upon the willingness of those interested in the trade to build ocean colliers upon a sufficiently large scale. If this forecast is reliable, then the result is merely a question of time. In the long vistas of history, it is not so much where a nation or an industry is at a particular date that matters, as the direction in which it is travelling and the nature of the forces impelling it. Judged in this way, the future of the American coal export trade would appear to be bright, in respect of many foreign markets which are now served from England.

In the "JOURNAL" for the 30th ult., reference was made to the approaching home-coming of Corporal Douglas F. Colson, son of Mr. Alfred Colson, of Leicester, who, as may be remembered, has been serving in South Africa with the Electrical Engineers (R.E.) Volunteer Corps. What promised to be a career of great usefulness was cut short by blood poisoning; and Corporal Colson was invalided. He arrived at Southampton in the *Nubia* last Tuesday morning, and, accompanied by his father and brother, reached Leicester in the evening. A large number of the officials, as well as representative workmen of the Gas and Electric Lighting Department, met him at the Midland Station, and gave three hearty cheers as the train drew up, and escorted him to a carriage and pair, decked with the national colours, in which he drove off to his father's residence. There the band of the department was stationed in the garden, and greeted the party with "Home, Sweet Home," "Soldiers of the Queen," &c. Corporal Colson, who was much touched by the kindly greetings, looked remarkably well; but it was noticed that he carried his right hand in a sling.

#### SIR ROBERT GIFFEN ON THE TRADE OUTLOOK.

THE prices of so many of the materials, both raw and manufactured, which are used upon a gas-works, and especially of coal, so very largely depend upon the general condition of the Nation's trade that it is essential—though this necessity is not always appreciated as it should be—that those responsible for the management of gas undertakings should possess a sufficiently intimate acquaintance with the trend of business to enable them not merely to gauge at any time the state of the markets, but to exercise an "intelligent anticipation of events." The first, though sometimes difficult, is at all times a much easier task than the second. Both were essayed by Sir Robert Giffen (whose authority to deal with the subject is unquestionable) in an address delivered at a private meeting in July last, and published in the current number of "The Economic Journal," the organ of the British Economic Association. That address, which is entitled "Our Trade Prosperity and the Outlook," affords most instructive reading, and provides a valuable analysis of the present situation, as well as assistance in shaping a forecast of the future. We can only here do scant justice to its contents.

To bring home to his hearers the extent of the trade revival witnessed during the past two years, and especially during the twelve months ended last June, Sir Robert gave some statistics which, properly appreciated, together may be said to constitute a trade barometer. One of the best tests of the general course of business is to be found in the returns of railway traffic, which are indicative of the volume, as apart from the value, of trade. These returns show an increase of business from 72.8 millions sterling in 1888 to 96.2 millions in 1898, and no less than 101.6 millions last year. The returns for the early months of this year also record an increase, but not by any means at so rapid a rate—on an average only about 2 per cent. for the June half year; and the tendency is for the increase to disappear altogether.

The movements of shipping in the foreign trade afford another test of prosperity; and here the same abnormal activity has been observed during the past year. The clearances with cargoes from the United Kingdom rose from 31.6 million tons in 1888 to 39.5 million tons in 1898, and 43.1 million tons in 1899; the last year showing an increase nearly five times as great as the average increment for the preceding ten years. The consumption of coal—a sure indicator of the state of trade—rose from 170 million tons in 1888 to 202 millions in 1898 (an average increase of 3.2 millions per annum), and to 220 millions last year. That is to say, the output in 1899 was greater than that in 1898 by 18 million tons, an increase almost six times larger than the average growth of production in the ten years from 1888 onwards. This year will probably see a still further expansion of output to something like 235 million tons.

The foreign trade of the country also enormously developed last year, and has gone on expanding until quite recently. The figures concerning imports and exports must not, however, always be accepted as by themselves constituting conclusive evidence as to trade prosperity or the reverse. If, for instance, we obtain 10 millions more for a certain quantity of goods exported in one year than in the preceding, but have to pay 12 millions more for the raw material imported out of which those goods are manufactured, the fact that the value of our dealings with other countries had increased 22 millions sterling could not be taken as an indication of growing prosperity; for it is obvious that we should have made 2 millions less profit in the second year than in the first. A proof of the caution with which the value of our commerce with other nations should be taken as a guide to the state of trade is afforded by the Board of Trade returns for September last. The value of the principal exports during that month was £12,081,000, as compared with £10,910,000 in September, 1899, or an increase of £1,171,000. If, however, the quantities exported this year be valued out at the prices of last year, this increase would disappear, and a decrease of no less than £1,447,000 be shown. Anyone, therefore, wishing to judge of the actual state of our foreign trade must observe quantities as well as values, and consider also the relation of the imports to the exports. Last year both quantities and values rose very much—the latter, however, more than the former. Our imports cost us 15 millions more than in 1898; but we obtained 22 millions more for our exports. It may then be said that we did a larger and more profitable trade with other nations than in any former year.

For this fact the extraordinary demand for coal was largely responsible, as, of the net gain of 7 millions of the increase of export over import values, no less than 5 millions were due to the coal shipments, which rose in value from 18 millions in 1898 to 23 millions in 1899. This enormous and continued development of our foreign coal trade is naturally the subject of much comment by Sir R. Giffen. It may be said, he remarks, "that in the present year we are exporting about 45 million tons of coal at a value of not less than 37 millions sterling; whereas, in 1888, the export was 27 million tons, at a value of 11.3 millions sterling only. The increase in quantity is two-thirds of the former amount, but the increase in value is [more than] twice the total amount exported in 1888, or an increase of over 23 [25] millions sterling in this one article alone, so great is the change in a very few years." The expansion of the national revenue, unless due



to heavier taxation, is proof of greater prosperity. Here, again, the witness to the recent industrial revival is beyond question; the increase, which during the ten years ended March 31, 1899, was at double the rate of the growth of population, being in the twelve months from that date no less than 10 per cent.—namely, from 108.3 to 119.8 millions. Allowing for the heavy sums paid in duty at the close of the financial year, in anticipation of the Budget, the real increase may be put at something over 7 per cent. The annual growth of population is about 1.1 per cent. In this connection, the striking growth in the assessments to income-tax may be observed; the rise in ten years being from 592 to 729 millions sterling.

By whatever means we test the material well-being of the Nation during the past year or so, and especially during the first few months of this present year, it will be seen we get the same answer—that the times have been of abounding prosperity. The question of much importance is: What are the prospects of this great prosperity continuing? The answer to this question is, as already remarked, of serious consequence to the gas industry. No one in the industry wishes to see his country anything but prosperous; what every such one does, however, desire is that trade would be constant in its progress, instead of violently spasmodic. It is the sudden upleap of demand, outstripping production by a wide gap, that so dislocates business, and especially that of gas making, because the demand for coal is one of the first to grow with an expansion of trade. What everyone wants to know, therefore, is: Has the recent spurt of trade spent itself; if not, when will the abatement come?

Speaking, be it remembered, last July, Sir Robert Giffen declared—and the time that has since elapsed has served merely to endorse his opinion—that business had received a check “which is concealed in some of the usual statistics by the rise in values.” This, it is pointed out, as we ourselves have repeated constantly, was bound to follow from the great increase in the prices of coal and iron. The direct effect of this upon trade “is well illustrated by what is happening in gas, an article closely dependent upon the price of coal. The gas companies, enjoying a monopoly, are able to recoup themselves in part by charging more to the consumer. [Whose trade, if he be engaged in business, suffers in consequence.] But other manufacturers are in a different position. Railway companies, for instance, are unable, for various reasons, to advance their charges; and shareholders have to submit to an immediate loss of dividend. Such a loss of profit, when diffused throughout trade generally, diminishes enterprise, and trade is also indirectly affected by the diminution of the accumulation which capitalists are able to make. Whatever may be the exact explanation, it can certainly be affirmed that a rise in coal and iron such as has now taken place is invariably followed at no very long interval by slackness in general trade.”

Other factors working towards an easing down of the rate of commercial expansion are the stringency of the Money Market—the continuance of the Bank Rate at 4 per cent., or over, contrasts strongly with the long spell of a 2 per cent. rate when trade was at its lowest ebb—and the very sensible rise in wheat. Dear food is, *pro tanto*, unfavourable to industrial prosperity, and dear capital inevitably so. The prevailing political unrest in many parts of the world, moreover, tends to discourage enterprise; “the assurance of peace is needed for undertakings requiring a long period to carry through.” The effects of increasing foreign competition must also be to bring down prices; but we must leave till another occasion any comment upon Sir Robert’s views on that side of the question.

The signs, in July last, according to so skilled an observer as Sir Robert Giffen, were, then, that slack water had been reached. Since this date the tide has certainly begun to ebb; and for gas companies a waiting policy is undoubtedly the wisest. To quote Sir Robert’s concluding remarks, “the lesson to all business men is, of course, the need for caution. Heavy commitments in proportion to resources, and undertakings extending over long periods, which are things rather to be avoided at the best of times, unless under special circumstances, are now to be most carefully eschewed. The trade barometer must return to ‘set-fair’ before speculation like that of the last few years can again be entered upon.” Gas management does not at any time lend itself to “speculation” in the commonly accepted meaning of the word; but the warning to avoid “undertakings extending over long periods” is one that should be taken seriously to heart by those responsible for the conduct of gas undertakings. Three-year contracts for coal at 13s. 6d. f.o.b. Tyne, are certainly examples not to be flattered by imitation.

ANNUAL REPORT OF THE HOME OFFICE ON THE OUTPUT, CONSUMPTION, AND EXPORTS OF COAL.

In the leisurely manner that characterizes the actions of our Departments of State, Parts I., II., and III. of the Home Office report and statistics relating to Mines and Quarries for the year 1899 have made their appearance. Part III., which gives full details of the output, consumption, and shipments of minerals, and is the section of most interest to our readers, has only just been published, and we now propose to make such extracts as contain information valuable for purposes of reference to those whose business it is to understand the coal market, and all the

factors that have influence upon it. We may here take the opportunity to say that in every gas company of any magnitude it should be the special duty of some official of proved intelligence (preferably, of course, the manager) to acquaint himself, week in week out, with all the information concerning the coal trade that can be gleaned from all and sundry sources. Coal buying is one of the most important transactions a manager or a board has to carry through, and should be the subject of everlasting vigilance, especially at such a time as the present. We are no believers in cast-iron methods of buying coal—buying, that is to say, always at the same time of year and for the same period. It is policy at times to buy a few months’ requirements only; at others to buy for as long a period as it is possible to obtain contracts for from reliable firms. The returns before us illustrate our point.

The average price of all kinds of coal at the port of Newcastle has ranged from 7s. to 20s. 5d. per ton during the past 27 years; being at the highest price in the first of those years—namely, 1873. The price in the five following years averaged 16s. 11d., 13s. 2d., 10s. 9d., 9s. 9d., and 8s. 7d. per ton. During that period, the buyer who made the shortest contracts made the most profit. In no one of the next ten years (1879-88) did the price rise above 7s. 11d., or fall below 7s. It would, obviously, have been perfectly safe to have made as long contracts as could be negotiated throughout this period; the justification for such a policy being that the price might rise considerably, but could not, in the nature of things, materially fall. As a matter of fact, it did eventually rise; the price averaging 7s., 8s. 4d., 11s. 5d., and 10s. 4d. per ton in the years 1888-91. The buyer who closed a long contract at (say) 7s. 3d. in 1888—conceding 3d. a ton to gain his object—would have done a good stroke for his concern; and, even had the price not risen as it did, he could not have gone far wrong.

From 10s. 4d. in 1891, the price dwindled away steadily, till it got down to bottom again; averaging 7s. 2d. in 1896, and 7s. 4d. in 1897. Since then it has steadily mounted up once more; and the man who at the end of 1897 should have had the pluck and foresight to buy three years’ consumption at 8s. would have had a happy time this past twelve months. The moral of all these figures—the point at which we are aiming—is that there is a certain level below which there is no possibility of a material fall, but above which there is an absolute certainty of a considerable rise in the course of time. It is the gas manager’s business to know that level (which will vary slightly from one period to another, from labour and other causes); to buy all he can when it is reached; to recognize the approach, and to gauge the probable duration, of a period of rising prices; and to regulate the length of his contracts accordingly. Personally, unless driven to it, we would not, from now onwards, buy more than a few months’ requirements at a time until the prices of 1895-97 were once more in view, unless the signs of the times so altered as to make it clear that trade was reviving so rapidly and healthily as to threaten again to overtake with its demands the output of coal.

Such a policy of expediency, whatever else be thought of it, must be admitted to call for the detailed knowledge and constant vigilance which we began by declaring as essential to successful bargaining in the coal market. Believing in that policy, and recognizing the need of complete information to its successful pursuit, pains have been taken during the past months to record in these columns, as we hope in future to record, such facts as it has been thought would prove of value, now or in times to come, to our readers. From this lengthy preface, we pass to the consideration of the Home Office report.

In his introduction to the report, Mr. C. Le Neve Foster, the Editor, remarks that the most striking fact recorded in the mineral statistics for 1899 is the enormous output of coal—viz., 220,094,781 tons, showing an increase of 18,040,265 tons compared with the previous year. This country is now producing twice as much coal as it did in 1870, and probably nearly four times as much as in 1850. Durham and Yorkshire together are now yielding about as much coal as the output of the whole of the United Kingdom half a century ago. The following table summarizes and compares the figures for 1898 and 1899 in groups of coal-fields.

Name of Coalfield.	Coal Raised.		Average Price at Pit's Mouth.	
	1898.	1899.	1898.	1899.
Scotch . . . . .	30'24	31'14	6s. 1d.	7s. 6d.
Northern . . . . .	45'31	46'05	5 11	7 0
Yorkshire, &c. . . . .	46'97	49'72	6 6	7 5
Lancashire and Cheshire . . . . .	25'03	25'11	6 5	7 6
Midland . . . . .	19'79	20'25	6 2	6 11
Sundry small fields . . . . .	4'65	4'62	6 10	8 10
North Wales . . . . .	3'20	3'20	6 9	7 9
South Wales . . . . .	26'72	30'87	7 1	8 10
Irish . . . . .	13	13	8 1	8 2
Total . . . . .	202'04	220'09	6s. 4'22d.	7s. 7'03d

The most striking increase, it will be seen, took place in the South Wales coal-fields. But it should be noted that the output there was seriously affected by the strike in 1898; so that 9'08 million tons of the 13'15 millions increase last year was required to bring the output up from the 1898 to the 1897 figure. But for the labour trouble in Wales, the increase of 18 million tons in the quantity raised last year, as compared with either of the two preceding years, would have been spread about equally over 1898 and 1899. The increase in the average price at the pit's mouth last year, of



1s. 3d. per ton may seem surprisingly small; but it should be remembered that the great upward movement in the market did not take place until the latter part of 1899. Small as that increase appears compared with the rise that has since taken place, it may be noted that it represented a sum of no less than 13½ millions in the cost of the year's output. As Mr. Foster says in his report, "with our present output, a rise of one penny in the price of coal represents nearly one million of money."

With the exception of a small quantity from the Oolite in Scotland, all the coal was obtained from rocks belonging to the Carboniferous Epoch, and mainly from the true coal measures. In the North of England and Scotland, some of the coal seams are geologically older; occurring in strata of the same age as the millstone grit and carboniferous limestone. Some of the coal in Scotland is of still earlier date; being found in the calciferous sandstone at the base of the carboniferous rocks. Owing to the rise in prices this year, this coal is now being re-worked. The thickness of the seams worked varied from 11 or 12 inches to 30 feet; but the "ten-yard" coal of Staffordshire is quite exceptional. In Scotland, seams of cannel only 6 inches in thickness have been worked.

The quantity of coal exported last year (including 12½ million tons shipped for use in steamers engaged in foreign trade) was 55,810,024 tons; leaving to be consumed for all purposes in this country 164,284,757 tons—equal to a consumption of 4.05 tons per head of population. The highest *per capita* consumption of coal previously recorded was 3.87 tons in 1897. In the year 1873, when the last coal "famine" was experienced, the figure was only 3.5 tons per head.

This increase, both of output and of home consumption, in Mr. Le Neve Foster's opinion, proves the urgency which the question of the exhaustion of the coal supply is rapidly assuming; and he calls attention to the practical importance of checking its thriftless use. As Professor Perry pointed out to the British Association this year, the best steam-engines are utilizing only one-twelfth of the energy generated by the combustion of the fuel, while ordinary steam-engines utilize a far less proportion. "Whether," says Mr. Foster, "our coal supply is sufficient to last for some centuries, or whether, as is the opinion of many competent authorities, a serious coal famine will begin to be felt within the lives of the present generation, economy in the use of coal is unquestionably of the utmost importance; and the investigation of the best means of effecting such economy would repay even a large expenditure, whether by the Government or by industrial corporations and technical societies. If the result of such inquiry were merely to effect an economy of 1 per cent. in the consumption of coal, this would mean an annual saving to the coal consumers of this country of 1½ million tons, worth, at last year's prices, about £625,000."

Such an investigation would naturally cover the question of the supply of coal for the Navy; the efforts of the investigators being aimed at discovering some method of burning ordinary coal without the production of smoke or the loss of speed. Our ships would then no longer be dependent upon one class of fuel; the naval coal bills would be lessened; and the danger of the failure of the fuel available for naval purposes would arise only when the total coal supply of the country approached the point of exhaustion.

The Home Office Inspectors of Mines join, it will be seen, in the cry that arose some months ago, but is at present no longer heard, for the appointment of a new Coal Commission. This would, as we have before said, be a wise and useful step; but its results would not be available for a long time to come. There is one, however, that could be taken which would be of immediate benefit, and which would be of great value to the public. That is the obtaining and publication of monthly output returns from the various coal-fields. We get the export statistics within a week after the close of each month; the outputs not until three quarters of the next year have expired. We commend the suggestion to the Home Office. They should not let themselves be beaten by the Board of Trade.

#### PERSONAL.

Mr. W. H. REED, who has for the past six years filled the position of Assistant to Mr. F. C. Cockey, Assoc.M.Inst.C.E., at the Newport (I.W.) Gas-Works, has been appointed Manager of the Whitchurch and District (Hants) Gas Company, Limited.

With reference to the advertisement which recently appeared in the "JOURNAL" for a Secretary for the Hornsey Gas Company, we are informed that Mr. WILLIAM E. ROBERTS, from the Accountant's office of the Eastbourne Gas Company, has obtained the appointment.

Last week Mr. W. EWING and Mrs. EWING were each presented by the men employed in the Hamilton Gas-Works with a gold-mounted ivory-handled umbrella. Mr. Ewing, in accepting the gifts, thanked the workmen sincerely for them, and said that no corporation had better or more earnest workmen than Hamilton. He was proud to have been associated with men who had so ably done their duty; the Hamilton Gas-Works being second to none in the country, for economical working.

Mr. S. W. DURKIN, youngest son of Mr. S. W. Durkin, of Southampton, has been appointed one of the Assistant-Engineers of the Australian Gaslight Company, Sydney, N.S.W. He was

articled to his father, and holds certificates from the Hartley Institution at Southampton, as well as from the City and Guilds of London Institute; and he studied gas chemistry under Mr. Norton H. Humphrys, of Salisbury. He was appointed Junior Assistant at the Southampton Gas-Works at the latter part of 1899; but the Directors very kindly released him from the position last Wednesday, with good wishes for his success, accompanied by an acceptable present. He will leave for his destination on the 23rd inst., under a three years' agreement, and with the united good wishes of all who know him.

The members of the Hollinwood section of the gas workers in the employ of the Oldham Corporation recently had a pleasant gathering, at which about 300 were present, to testify their esteem for Mr. JOHN LOWE, who, on account of impaired health, has resigned the position of Resident Manager at the Hollinwood Gas-Works, which he has held for 26 years. Unfortunately, he was too ill to attend. In the course of the proceedings after tea, Mr. John Chadwick, the Corporation Gas Engineer, presented to Mr. Herbert Lowe, for his father and mother, a testimonial, which had been subscribed for by the employees, consisting of a marble timepiece and two large bronze ornaments for Mr. Lowe, and flower and toilet stands for Mrs. Lowe. He testified to the faithfulness of the service rendered by Mr. Lowe, and expressed his pleasure at the esteem shown for him by those with whom he had laboured. Mr. Lowe, jun., returned thanks for the gifts, and for the sympathy shown towards his father, who, he said, had been in the service of the Corporation for forty years.

Mr. E. ANTONY LEES, the Secretary of the Birmingham Corporation Water Department, is a candidate for the Secretaryship of the Gas Department, which will be vacated by its present worthy occupant, Mr. Edwin Smith, in March next year. The Water Committee are desirous of retaining the services of Mr. Lees, who has made himself a thorough master of the work attaching to his appointment and the department generally. The Committee have been looking round; and they have come to the conclusion that the duties of the office are quite as onerous, responsible, and important as are those of the Gas Secretaryship. They also find that, for corresponding positions in water undertakings of similar eminence, higher salaries are paid than Mr. Lees has been receiving; and consequently they hastened to rectify the matter last Friday by proposing to the City Council that Mr. Lees' remuneration should be increased, by £200, to £1000 per annum—the salary at which the Gas Committee are advertising the vacancy in their department. Of course, there were objectors to the proposal; but they were few—the voting showing 41 in favour, and only 7 against.

#### OBITUARY.

We record with sincere sorrow the death of Mr. ESSEX WHITE LAYTON, after a long and painful illness. Deceased (who was 60 years of age) had filled the office of Secretary to the Buenos Ayres (New) Gas Company, Limited, for a period of 25 years, and was held in high esteem by a wide circle of friends for his ever courteous and genial manner. He was buried at Kensal Green last Friday.

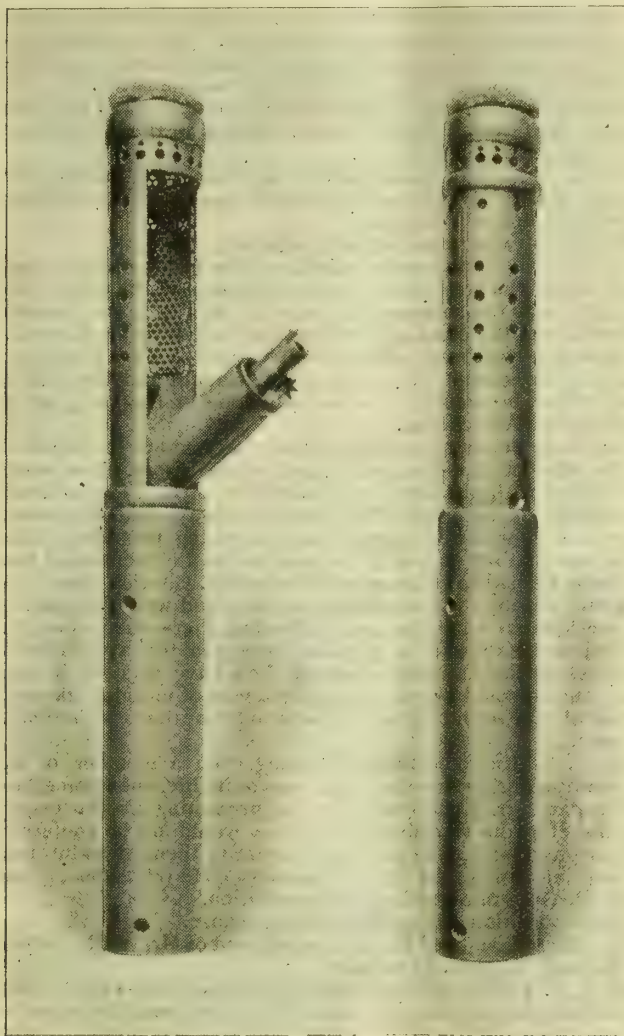
We sincerely regret to record the death, yesterday morning, of Mr. T. W. R. WHITE, the Secretary and Manager of the Sherborne (Dorset) Gas Company—a position he had held for many years. Mr. White was identified with the formation of the South-West of England Association of Gas Managers, of which he was at one time Hon. Secretary. He was twice chosen for its President; the last occasion being in 1896, when he welcomed his colleagues to Sherborne for the third time. He was the last to occupy the presidential chair, as the Association shortly afterwards amalgamated with the Southern District—Mr. White remaining a member. He joined the British Association of Gas Managers in 1868, and was upon the roll of the Gas Institute till his death. The sad event which we briefly record removes one whose kindly disposition endeared him to all with whom he was associated; and general regret will be felt by his professional brethren and fellow-townsmen at his removal from among them. The funeral will take place at Sherborne to-morrow, at three o'clock.

It is with great regret that we announce the death of Mr. AUGUSTUS GEORGE HOUNSHAM, the Secretary of the Monte Video Gas Company, which took place at his residence, Heathside, Hampstead, last Friday, in his 58th year. Mr. Hounsham was the Accountant of the London Gas Company, but relinquished the position, with a retiring allowance, on the absorption of the undertaking by the Gaslight and Coke Company in 1883. Though relieved at a comparatively early age from close attention to official duties, he possessed far too energetic a temperament to allow him to fritter away his time in idleness. Consequently, in 1890 he undertook the secretarial work in connection with the Livesey Testamental Fund and with the formation of the Institution of Gas Engineers, which organization he had the gratification of seeing fairly started. About this time, however, he obtained the appointment of Secretary of the Monte Video Gas Company, Limited, which required the whole of his attention; and he was compelled to relinquish the position. Mr. Hounsham was one of the Auditors of the Commercial Gas Company, the Crystal Palace District Gas Company, and of other Companies. He was often seen at meetings; and his familiar face and vivacious manner will be greatly missed.



## THE FOULGER-GLOVER LAMPLIGHTERS' TORCH.

PERFECTION, as everybody knows, is compacted of trifles. In the long and arduous struggle of the incandescent system of gas lighting against difficulties of detail, it was rightly regarded as a milestone on the road to success when the system was advanced to the hazardous eminence of the ordinary public street-lamp. This promotion forthwith evoked new difficulties, of a character totally different from those which had been met and overcome in respect of interior lighting; and some of them continue to occupy the attention of the ingenious. One of the troubles encountered on the thresh'd of this application of the system was that of ignition. The most obvious expedient available for attacking this problem, and the one which was promptly pressed into the service, was the flash-light. It is unnecessary to recount the various ways by which this familiar device was adapted to the lighting of incandescent street-lamps. They all had certain features in common. First, there was the flash-light itself, which did its duty when it was consuming gas at the rate of about one-third of a cubic foot per hour throughout the hours of non-lighting. This was a vexatious expense, and one that no engineer ever really forgave himself for sanctioning. It was not only a waste of gas rendered necessary by sheer lack of knowing how to dispense with it, but it involved other expenses. The lantern-cock



had to be of an expensive make; and it was a complicated business to provide for the steady maintenance of the flash-light all day, to ensure that it should light the burner when turned on, then go out during the hours of lighting, ultimately to light itself at the burner when the latter was turned off again. After all, the flash-light was an unprofitable servant. It did not improve the mantle, to say the least of it; and if the lantern happened to be leaky and the weather was rough, as often as not the light was out when the lamplighter went his rounds. It always wanted air—which also means dust, and in rural localities insects; and it perished if there was too much of it. Whenever there was an "outage" of this order, several things might happen. The lamp had to be left until the lamplighter had completed his round, when he would have to return with a ladder and light the burner by hand. This was not always a well-managed performance in a gale of wind, and not infrequently entailed the replacement of a mantle—itsself not an easy performance in the dark, with wet, cold hands. The ordinary torch is not a handy implement for lighting an atmospheric burner, even if it can be brought into position immediately over it.

Painful experience of troubles of this kind, led Mr. G. F. L. Foulger, Distributing Engineer to the Gaslight and Coke Company, to scheme a modified pattern of torch for igniting a street-lamp incandescent burner directly, thus dispensing with the flash-light and all its consequential complications. It appears,

at the first glance, a simple mechanical problem to solve; but, as a matter of fact, it is surrounded by such a mass of detail that the solution has been delayed until the present hour. A complete triumph, however, appears at length to have been achieved; and now half-a-dozen licensees are ready to put upon the market the perfected Foulger-Glover torch, for lighting all descriptions of street-lamps, illustrated herewith in its two working positions. One object of the designers was to avoid plaguing the lamplighter with any new-fangled appliance requiring any special study or carefulness in properly using. Therefore, the torch is firstly an ordinary article of the kind, with a colza-oil-lamp in a straight perforated head. In this state it can be used for lighting a luminous-flame burner, just like another. The incandescent street-lamp, however, is modified for torch lighting. To begin with, the cock is simplified to the common lever article, to be manipulated by a push with the end of the torch. Next, the lantern itself is provided, in the bottom, with a round hole slightly larger than the head of the torch, and usually closed by the gravity action of a ball of suitable diameter. When he has turned on the gas, the lamplighter pushes the torch up through this hole until its head (which is finished by an asbestos-cloth washer) touches the reflector in the top of the lantern. Then he pulls a trigger ready to his hand, which communicates with a sliding part of the torch-head, drawing it downwards and releasing the lighted lamp, which pops outward by the impulse of a weak spring, and instantly commands the burner, over the mantle. As soon as the gas is lighted, the reverse action restores the lamp to its vertical position in the torch-head and returns the shutter. It is then a plain, straight torch once more. On withdrawal, the ball runs down a guide and closes the lantern.

One of the incidental advantages claimed for this system of torch ignition is the superior cleanliness of the lantern inside. Being made quite tight at the bottom, dust can be kept out, and is therefore not stuck hard to the glass, as usual, by the condensed water resulting from the first lighting-up of the gas in cold weather. There is also, of course, a considerable practical advantage in having only one pattern and kind of lamp-lighting device in use by the men. We have experimented with the Foulger-Glover torch, and can testify to its efficacy, and harmlessness so far as risk of breaking anything is concerned, even in the least expert hands. A considerable degree of unfair usage does not put it wrong.

The chief recommendation of the principle of abolishing the flash-light, of which this appliance is the embodiment, is the saving of gas. The amount of this can be readily computed. In London, where the gas for public lighting is not high-priced, the saving under this head will amount to £16 or £18 per annum upon the number of street-lamps comprised within every lamplighter's round—assuming that they are all incandescents. This is a substantial sum to work upon; and Messrs. Foulger and Thomas Glover are to be congratulated on the apparently complete success of their endeavour to save it, and to simplify generally the service of public incandescent street lighting. This is one more step towards the attainment of perfection in this service, which is a result well worth straining after.

## NOTES.

## Cheap Labourers' Dwellings in Birmingham.

It is claimed for the Corporation of Birmingham that they have probably attained the "bottom cost" of labourers' dwellings of the particular class aimed at by the provisions of the Housing of the Working Classes Act, 1890. The dwellings are in Milk Street; and, calculated upon the basis of living rooms only, the cost works out at something like £62 per room. But if the sculleries, &c., are included, the cost is reduced to £45 per room inclusive. These labourers' cottages have replaced some of the most insanitary house property in the city. They are distinguished from what are called artisans' dwellings. Unlike the usual "model" industrial buildings, they are only one storey high above the ground-floor; so that the inmates are not "mast-headed." Each floor, or flat, is self-contained, with living-room, one or two bed-rooms, and the necessary offices on the same level. The rooms are of decent dimensions. The upper storey has a balcony, and its own dust-shoot. At the back is a paved space 30 feet wide, which can be used as a playground or otherwise. Good grates and ovens are provided in every house; and the necessary fittings have been put in so that automatic gas-meters may be used by the tenants. The rents average 1s. 6d. per room per week. Mr. J. Tart, of the Corporation Estates Department, was Architect of the settlement.

## Improved Domestic Hot-Water Plumbing.

Some criticism has appeared in the "JOURNAL" with regard to the stagnation of domestic hot-water plumbing practice. It is interesting, therefore, to notice that at a recent meeting of the Institution of Heating and Ventilating Engineers a paper by Mr. Thomas Potterton, of Balham, on the subject of "Range Boilers," was read and discussed. The paper described the ordinary arrangements for procuring a supply and circulation of hot water from kitchen ranges; and proposed an improved form of boiler constructed to better utilize the heat of the fire. The paper is reported in full in the "Ironmonger" for the 3rd inst. With the improved boiler, a large supply of hot water can



be obtained in excess of the domestic wants; and this surplus can be used for general warming purposes throughout the house. A diagram is given of a house near the Crystal Palace fitted in this way; and 200 feet of heat-radiating surface are stated to have been actuated here from the kitchen fire for several years. Other examples of the successful application of the system are cited. Radiators and towel-airers in bath-rooms seem to heat well, on the ordinary hot-water flow pipes. In the discussion, some exception was taken to the idea of joining a heating system to an ordinary household hot-water supply; but the objection did not appear to have any solid foundation. Mr. Potterton was able to point to examples of installations running for six and seven years with complete satisfaction to the users.

#### Keeping Red-Lead Paint and Putty Moist.

The paint and oil expert of the "Ironmonger" lately gave his readers two useful "wrinkles" for shop use. The first referred to the keeping of red-lead paint after mixing, which in the ordinary way is impossible, inasmuch as the mixture of red-lead and linseed oil sets as hard as stone in a few hours. If, however, about one-sixteenth of the quantity of lamp-black is added to the red-lead at the time of mixing, or soon after, the drying of the mixture will be arrested, and the stuff will keep in useful condition in the paint pot for at least a month. This expedient may be useful to remember in cases when a much larger quantity of red-lead paint has been prepared than happens to be wanted. The remainder can thus be put on one side, whereas, in the ordinary course, it would be wasted. The other hint relates to soft putty. As a general rule, glaziers' putty is required to set hard with exposure to the atmosphere; and for this reason it is made with a drying oil. But it is often the case that a non-setting putty is required; and this can be made with white-lead and tallow. The best preparation is 2 gallons of linseed oil, to which is added 1 lb. of pure tallow, and then sufficient white lead added to give the required consistency. This is a putty which will remain soft for ever. When it is necessary to loosen old glaziers' putty from glazed frames, it should be first gone over with nitric acid, which will enable the putty to be scraped away in about an hour after the application.

#### The Composition of Old Roman Mortar.

An interesting analysis and description of a sample of mortar taken from a part of the old Roman wall of London recently uncovered in the Old Bailey, has been given in the "Builder," which has always paid great attention to the composition of the strong mortars for which the ancients were so renowned. The analyses indicate that the proportion by weight of the lime to sand used by the Romans in manufacturing the mortar for the London Wall was about 1 to 4. The conversion of parts by weight into parts by the volume in a case of this description is largely a matter of guesswork; but taking the weight of a cubic foot of stone lime in the lump at 55 lbs., and that of a cubic foot of Thames sand at 103 lbs., then the measured proportion of lime to sand becomes about 1 to 2. Chemically considered, the mortar is good, because (1) the proportion of lime to sand by volume is about 1 to 2; (2) the proportion of silica soluble in sodium hydrate is high; and (3) the proportion of clay and organic matter present is very small. There is, however, nothing mysterious about this Roman mortar. Just as good lime mortar is made to-day, if not better; and we possess in fine-grade portland cement a cementing material much better than anything with which the ancients were acquainted. The Roman mortar in question was made with unscreened river sand, containing many pebbles; and it had been thoroughly mixed, being devoid of those small isolated lumps of lime or lime carbonate which are a result of faulty mixing.

#### Hints on Lighting.

In the "Student's Column" of the "Builder," some sound advice has lately been given on the subject of artificial lighting. Two principal rules are laid down, and their importance insisted upon. The first rule is that the light should be as diffused as possible; and the second is that the best use should always be made of reflecting surfaces. The pity is that, when architectural students become full-fledged architects, they forget all this salutary teaching. Speaking of the light of the electric arc, the writer remarks that the eye judges the intensity of an illumination, not only by the intrinsic brilliancy of the source of light, but also by the number of rays falling on the retina. Hence anything that causes the iris to contract and cut out some of the rays that would otherwise reach the retina, detracts from the illumination. Similarly, anything that makes the light more diffused and pleasanter to the eye increases the illumination. Thus bright naked lights, like the electric arc, are to be avoided. Diffusing globes must be used, notwithstanding the apparent loss of light entailed. For, it is argued, although the globe of an arc lamp may absorb 30 per cent. of the light generated, "yet if the effect of putting it on is to make the diameter of the iris expand 20 per cent., and so increase the area of the pupil of the eye by 40 per cent., then the effect of putting on the globe is to increase the apparent illumination." The value of reflecting surfaces is demonstrated by putting a piece of white paper behind the light source, which more than doubles the light radiation normal to its surface. The writer praises the "Holophane" globes. He says that the modern enclosed arc lamp is very convenient, but its lighting duty is low—not better than 2 watts per candle.

## TECHNICAL RECORD.

### MIDLAND ASSOCIATION OF GAS MANAGERS.

The Autumn General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham. Mr. J. FERGUSON BELL (Derby), the President, occupied the chair.

The proceedings commenced by the HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) reading the minutes of the meeting held at Stafford on June 7; and they were confirmed.

#### INCREASING THE ROLL.

On the proposition of Mr. B. W. SMITH (Walsall), seconded by Mr. H. P. MAYBURY (Great Malvern), the following gentlemen were admitted to membership: Mr. Hubert Pooley, of Stafford; Mr. T. Jowett, of Solihull; Mr. A. J. Harrison, of Sileby; and Mr. H. O. Timmins, of Tipton.

The PRESIDENT thought the Association were to be congratulated upon having four new members; and he had the greatest pleasure in welcoming them.

#### THE NEW PRESIDENT AND OFFICE-BEARERS.

The PRESIDENT said the next duty of the members was to elect the officers for the ensuing year. It was his pleasing privilege to propose his successor in the chair. The gentleman he had to nominate was one who was well known to the members, and who, though he had not been long in the Midlands, had taken an active part and a great interest in the work of the Association. He referred to Mr. Thomas Glover, of the West Bromwich Corporation Gas-Works.

Mr. T. BERRIDGE (Leamington) seconded the motion; remarking that in Mr. Glover they would have a worthy follower of a worthy line of Presidents.

The motion was very cordially adopted.

Mr. GLOVER, in acknowledgment, said he felt the honour very much indeed, as well as the responsibilities of the office. He thought it was the supreme test of one's loyalty to the Association to accept the office of President, because it involved certain duties which had been hitherto well carried out by a long succession of Presidents. So far as circumstances and his abilities would allow, he would do, as he had done in the past, all he could for the Association.

The HON. SECRETARY said he had the honour to nominate for the office of Vice-President a gentleman whose name would be received with unanimity and heartiness. He was practically the founder of the Association, and had always taken an intense interest in its welfare. There was something peculiarly fitting in the nomination, as would be seen when he mentioned that the name he had to propose was that of Mr. Charles Hunt. As he would occupy the vice-chair next year, and would succeed to the presidential chair the year following, there was, as he (Mr. Meiklejohn) had said, a peculiar fitness in the appointment, inasmuch as the Association would then have attained its 25th year; and it would be an appropriate way of marking the completion of that term by placing the founder of the Association at its head.

Mr. J. S. REEVES (Bilston) having been a member of the Association during the whole 24 years of its life, knew something of the part Mr. Hunt had taken in promoting its prosperity; and therefore he was able to say they would not be conferring honour on him so much as doing honour to themselves by electing him later on to be their President. He (Mr. Reeves) had much pleasure in seconding his nomination.

The proposition was carried with applause.

Mr. MAYBURY moved the re-appointment of Mr. W. R. Cooper, of Banbury, as Hon. Treasurer.

Mr. J. T. LEWIS (Wellingborough) said, as this was the first opportunity he had had, he should like to express the regret he felt that their old friend Mr. Peter Simpson was no longer with them to fill the office. This being so, however, he had considerable pleasure in seconding the motion.

The motion was unanimously agreed to.

Mr. COOPER thanked the members for their renewed confidence, observing that it was indeed a great loss not to see the genial face of their departed friend occupying the office.

On the proposition of Mr. A. COOKE (Oldbury), seconded by Mr. J. C. BELTON (Chester), Mr. Meiklejohn was again elected to his office of Hon. Secretary.

Mr. MEIKLEJOHN thanked the members for this fresh expression of their confidence. Referring to a remark of the President as to a suggestion that he (Mr. Meiklejohn) made at a previous meeting in regard to retirement, he said that, when he first accepted office, he set a limit to his ambitions. He limited himself to having £100 in the bank, and 100 members on the roll, and the Association 21 years old. Now the Association was 23 years old; Mr. Cooper would have £100 in the bank at the end of this year; and the four gentlemen whom they had enrolled that day, made the total number of members 96. When he first took office, there were 67 members. The Committee, however, desired him to continue in office; and so he should do the best he could for the Association.

Mr. R. KING (Wolverton) moved the appointment of Mr. P. H. Fletcher and Mr. J. C. Belton as members of the Committee in place of those retiring by rotation.



Mr. PERCY G. WINSTANLEY (Wolverhampton) seconded the motion, which was unanimously carried.

Messrs. W. A. Sapey and W. G. S. Cranmer were also put into office as Auditors.

#### THE FRYER FUND.

The SECRETARY next made an explanatory statement regarding the fund which had been raised in aid of the children of the late Mr. James Fryer, of Market Harborough. He said it would be remembered that, at a previous meeting, it was agreed that the Association should, in connection with this fund, work in harmony with the people of Market Harborough. There had, however, been some difficulty and delay in carrying out the distribution of the money; and the project of working in harmony with the Market Harborough people had not been successful in arriving at a definite issue. He had written several times to the Chairman of the Local Committee, but had had no reply whatever. It was therefore suggested at the last meeting of the Association Committee that, as the money was lying idle, and the children were certainly much more in want of it than the bank, they should at once proceed to distribute the fund independently. At the end of last year, he sent a cheque for £10; and he had since forwarded one for £25. The total raised was about £109 12s. 6d.; so that he had practically £75 still to go. He inquired of Mrs. Charles, the administratrix of the estate, whether it would not be convenient to receive the balance at the rate of £25 a quarter. In reply, Mrs. Charles thanked the subscribers very heartily on behalf of the children; and, as to the suggestion that £25 should be paid quarterly, she said it would be most gratefully accepted. Mr. Harris, of Market Harborough, had informed him that the difficulty had been simply due to a little misunderstanding, and that there would be no trouble in realizing the fund from the Market Harborough people for the children.

Mr. A. T. HARRIS mentioned that he was instructed by his Chairman, who was a member of the Local Committee, to say that there would not be the slightest difficulty in obtaining the money from the Market Harborough people, in accordance with the terms of the agreement.

The PRESIDENT said the Committee had decided to leave the matter in the hands of the Secretary; and they could not do better.

The PRESIDENT then read the following paper on

#### THE STANDARDIZATION OF GAS-METER UNIONS.

There is no recognized standard for gas-meter unions; and hence at the present time great diversity exists between the unions on similar sized meters by various makers. Although the subject has for some time been under consideration, and more than once before the various Associations, who remitted it to the parent Societies, no definite steps have yet been taken to standardize meter-unions, though all are agreed as to the desirability of interchangeable unions, on all makes of wet and dry gas-meters.

It is well known that considerable trouble and unnecessary expense is incurred in changing meters, because manufacturers up to the present have each their own particular size of unions; and it seems to me desirable that some united action should be taken by this Association, rather than that it should be left to individual efforts. Such is the object of this short paper. I would also suggest that similar sized meters should be made as near as possible to standard dimensions, both as regards height and distance apart of inlet and outlet connections.

The meter manufacturers inform me they are agreeable to supply any union upon which a general agreement among engineers has been arrived at as the best and most suitable standard to adopt. Consequently, I have ventured to bring this subject once more before the Association, in the hope that some agreement may be the result, as it is quite time the question was definitely settled, especially as so far back as 1891 the Standards Department of the Board of Trade, in their revised regulations as to gas measuring standards, stated: "It is desirable that the screw-threads of all pipes, connections, or caps, and linings on gas-meter standards should agree in diameter, and in the number of threads per inch with the sizes approved by the Department."

The mere fact of the Standards Department of the Board of Trade going to the trouble and expense of preparing a proposed set of standards for gas-meter connections, is of itself evidence that those in authority are of opinion that the present multiplicity of unions for similar sized meters should be abolished, and interchangeable standards adopted. It is surely a question that Engineers, in conjunction with the meter manufacturers, should themselves decide; and, if necessary, the Standards Department of the Board of Trade could afterwards be approached with a view to legalizing the standards agreed upon.

The objections raised against any changes are that it would cause additional expense, and some inconvenience, and possibly for a time some little confusion. But I venture to think the gain would ultimately much more than compensate for any loss; and, if any change is to be made, the sooner steps are taken the better it will be for all concerned. Further, there is a probability that the Standards Department may at any time re-open the subject, and compel uniform interchangeable unions on all gas-meters; and now that there are so many three, five, and ten light coin meters being ordered for prepayment consumers, it appears an

opportune time to meet the difficulty, and try to arrive at some definite conclusion by united action.

This subject is again brought before your notice, not with a view of introducing another set of standards for meter connections, but with the idea of facilitating the introduction of interchangeable standard unions. I have collected and tabulated the particulars and sizes of unions on wet and dry gas-meters as usually supplied by the principal meter manufacturers; and they are given under Schedule A (p. 1206). It will be noticed that the chief dimensions of boss, cap, and lining of meter connections are given for sizes from 3 to 100 lights, both wet and dry meters, and under letters A to L, which represent the twelve principal meter makers, as it appeared to me best to avoid introducing names. The upper part of Appendix A refers to sizes of unions on dry meters; and in this case the variations are not so great as in wet-meter unions. The first five, A to E, are all Edinburgh makers; and as they have agreed to introduce interchangeable unions, I have not tabulated the differences which now exist between them. With reference to the other makers, they all vary more or less; but the variations, it will be noticed, are generally so slight that it would not be a difficult matter to bring all makers of dry meters into line. At present, with few exceptions, they are all exactly the same number of threads per inch; but the diameters and heights of caps vary.

I find, upon making a comparison of the principal outside dimensions of dry meters by various makers, that the height, breadth, depth back to front, inside diameter of connections, and distances between centres of inlet and outlet do not vary much; and, in fact, with little alterations, they might very easily be all made to agree. So much then for dry meters. But, upon comparing the principal dimensions of wet meters, the differences are very much greater; and the same applies to the unions. It will be seen that the number of threads per inch vary along with the outside diameters—in fact, the variations are so considerable that a new standard for wet-meter unions is essential.

As already mentioned, the Edinburgh meter makers have decided, in order to meet the views of the North British Association, to introduce an interchangeable set of unions for dry meters, which comes into operation on the 1st of January, 1901, in order, I suppose, that the new century may begin with unanimity of gas-meter unions, any way so far as the Edinburgh manufacturers are concerned; and I am only sorry they stopped short at dry meters.

It is well known that a movement towards standardizing meter-unions has been in progress in Scotland for some time back, for which credit must, I think, be given to Mr. J. Napier Myers, of Saltcoats, for his praiseworthy perseverance in this matter.

By the kindness of the Edinburgh meter makers, I am enabled to give (see Appendix B) a table showing the sizes of unions for dry gas-meters agreed upon by the Edinburgh makers. In each case the unions used by the leading London makers were taken into account, and the new sizes of interchangeable unions to be adopted were carefully considered, with a view to meeting various makers, and keeping the past in mind, so that the repaired meters would not, in many instances, require new unions. It is a genuine effort on the part of the Edinburgh meter makers to meet the difficulty; and I have nothing but praise to bestow upon the proposal. But it does not altogether meet the difficulty.

I have already mentioned that the Standards Department of the Board of Trade proposed a set of standard sizes for both wet and dry gas-meters, which will be found in Table C; and in this case it would appear the sizes of existing unions were taken into account. However, the new standard proposed was so strongly objected to that the Standards Department did not proceed any further than printing and circulating same, and nothing more has been done up to the present time.

Personally, I think the best and only recognized standard to adopt is the one already in use in all gas-works; and I therefore venture to propose for your consideration that the sizes of unions on wet and dry gas-meters be the Whitworth gas thread, both as regards threads per inch and diameters. Sir Joseph Whitworth's gas thread is universally considered to be based upon the soundest principles of construction and design; and it is hardly likely to be improved upon. Also, in this case, there would be no difficulty in obtaining absolute standards for reference from Whitworths' at any time.

The introduction of gas cooking-stoves and fires necessitates the abolition of 2-light meters, which are found much too small for general use in England. It is usual now in a number of towns to fix 5-light meters as the smallest size for quarterly consumers, reserving 3-light for prepayment consumers; in only some instances are 5-light coin meters used. This being so, I have taken no account of the unions of 2-light meters, for which, if necessary in those districts where rich gas is supplied, I suggest the same sized unions as those on the 3-light meters. Further, it appears to me, besides standardizing the unions for various sizes of meters, it would be an advantage to introduce, so far as possible, uniformity in the diameters of the unions. My idea is to make the unions of two, three, and five light meters, both wets and dries, of the same size— $\frac{3}{4}$  inch. A number of unions on 3-light dry meters are now almost  $\frac{3}{4}$  inch; and it seems to me  $\frac{3}{4}$  inch is too small, especially when taking into consideration that meters should, whenever it is possible, be fixed just inside the outside wall nearest the gas-mains, so as to avoid having upon private premises long lengths of piping conveying unmeasured gas. This means perhaps a long length of piping put after the

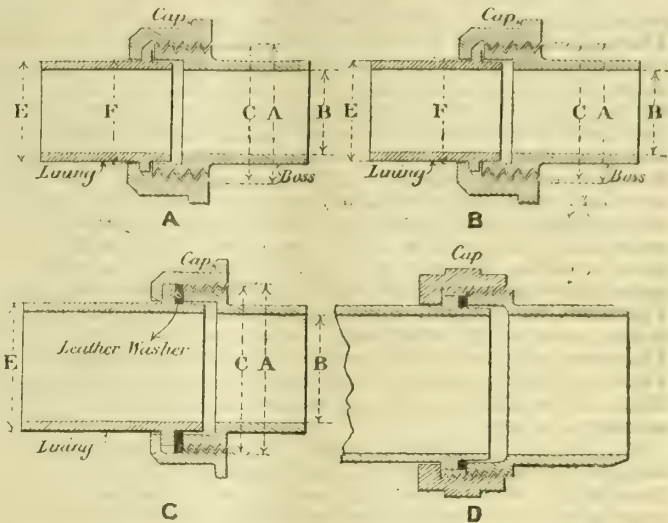






APPENDIX-B  
TABLE OF SIZES OF UNIONS FOR DRY GAS METERS  
AGREED UPON BY EDINBURGH METERMAKERS

SIZE OF METER	SIZE OF CONNECTING PIPE OR UNION OF METER.				
	CAP		BOSS		CAP
NUMBER OF LIGHTS	MEAN DIA. OF EXTERNAL SCREW A.	NUMBER OF THREADS PER INCH.	MEAN DIA. OF INTERNAL SCREW C.	NUMBER OF THREADS PER INCH.	INTERNAL DIAMETER OF F.
3	1.00	20	0.98	20	0.75
5	1.17	12	1.16	12	0.87
10	1.48	11	1.46	11	1.11
15	1.48	11	1.46	11	1.11
20	1.83	11	1.82	11	1.50
30	2.08	11	2.05	11	1.85
40					
50	2.26	11	2.24	11	1.87
60	2.46	11	2.44	11	2.05
80	3.01	11	3.00	11	2.40
100	3.01	11	3.00	11	2.40
150	FLANGED		CONNECTIONS		
200	"		"		
250	"		"		
300	"		"		



which are the diameters at top and bottom of threads of ordinary gas-tube.

Perhaps those who object to any change will consider for a moment what would be the result if makers of gas-fittings all adopted different threads and diameters for their various fittings. Why, it would be simply unendurable; and there is no apparent reason why interchangeable unions should not be used on all gas-meters.

If a new standard was agreed upon when meters were brought off for repairs, new unions could be added, and the additional cost would probably not exceed 1s. for a 3 or 5 light meter. All new unions might for a time be stamped "S," to distinguish them from those at present in use.

This is a question that requires careful deliberation; and in order that the members of the Association may have the benefit of the experience of meter manufacturers, I have invited representatives from the chief meter makers to be present, several of whom promised to attend. If it meets with the views of the members, I would suggest that the question (after, I hope, a full discussion) be remitted to the Councils of the Institution of Gas Engineers and Gas Institute, with a request that they will take the subject into consideration, and determine a standard for gas-meter unions.

Discussion.

The PRESIDENT said that several gentlemen who were practically acquainted with the manufacture of gas-meters were present; and he would first invite them to give their views, after which the members could discuss the question.

Mr. JOHN G. GLOVER (Messrs. T. Glover and Co., Limited) was first called upon. He said that, although he had not had an opportunity lately of speaking to his co-manufacturers of meters, he thought they would all be deeply grateful if they could get a decided answer from gas engineers throughout the kingdom as to what they really did want. The President had spoken about changing the unions of all meters. Now here they had room for reflection. The President had named a price of 1s.; and this no doubt would pay for altering the bosses. But, for the sake of illustration, supposing they had a meter in the room, they had got to take the meter down, they had to bring it back again, and they had to alter the unions that were attached to the connections in the present position. This to his mind, taking the cost of altering the bosses and the connections, would mean not 1s., but something nearer 5s. They would have to send a man up to do it; and what with the labour, the caps, lining, and bosses, they would find the cost nearer 5s. than 1s. To put it in a plain way: Supposing they imagined there were (he did not say there were) 5 million meters in existence, and the change meant 5s. per meter, this would represent a million pounds or more to alter the connections. To his mind, there was no necessity for this. If the gas industry and the Presidents of the various Associations would follow Mr. Bell's example, and tabulate these things the same as he had done, they would find that two-thirds of the meters that were in existence at the present day were interchangeable, and only about one-third were not. In his opinion, there was no need to introduce a new standard. If they could find two-thirds—if even they could find more than one-half that were interchangeable—then he should say adopt that as the standard; and this would save the gas companies a large amount of money. They, as meter makers, would be only too grateful if the gas industry put in their way fresh trade and more trade; but, to his mind, it would be waste of money. They would be very surprised indeed if gas managers condemned every union, every cap, lining, and boss that was in existence, and say they were going to have standards. He should be very grateful if they would get the Government to say it should be done, because it would put in the meter makers' hands a large new industry, which he hoped would be remunerative to them. The President had referred to Mr. Chaney. Might he (Mr. Glover) be allowed to say that he had certain people in front of him who went back as far as Clegg, and who told him, when he (Mr. Glover) was a boy, what happened when that grand old master of the gas industry, Clegg, started making meters. He

APPENDIX-C  
STANDARD SIZES FOR THE CONNECTING PIPES AND  
FITTINGS USED WITH GAS METERS, PROPOSED BY STANDARDS

DEPARTMENT OF THE BOARD OF TRADE.							
SIZE OF METER	SIZE OF CONNECTING PIPE OR UNION OF METER.						
	CAP		BOSS		CAP		LINING
NUMBER OF LIGHTS	MEAN DIA. OF EXTERNAL SCREW A.	NUMBER OF THREADS PER INCH.	MEAN DIA. OF INTERNAL SCREW B.	NUMBER OF THREADS PER INCH.	MEAN DIA. OF EXTERNAL SCREW C.	NUMBER OF THREADS PER INCH.	INTERNAL DIA. OF CAP D.
2	0.98	18	0.70	0.94	1.8	0.50	0.70
3	0.98	18	0.70	0.94	1.8	0.50	0.70
5	1.15	12	0.85	1.10	1.2	0.50	0.85
10	1.45	11	1.10	1.40	1.1	0.60	1.10
15							
20	1.85	11	1.40	1.80	1.1	0.60	1.40
30	2.05	11	1.60	2.00	1.1	0.70	1.60
40							
50	2.25	11	1.85	2.15	1.1	0.70	1.85
60	2.45	11	2.10	2.35	1.1	0.80	2.10
80	3.10	11	2.40	3.00	1.1	1.00	2.40
100	3.10	11	2.40	3.00	1.1	1.00	2.40
150	3.70	11	3.10	3.55	1.1	1.20	3.10
200	FLANGED		CONNECTIONS				
250	"		"				
300	"		"				
400	"		"				
500	"		"				

APPENDIX-D  
TABLE OF PROPOSED SIZES OF UNIONS FOR WET  
AND DRY GAS METERS.

SIZE OF METER	WHITWORTH STANDARD GAS THREADS.				
	BOSS		CAP		LINE
NUMBER OF LIGHTS	SIZE OF SCREWED CONNECTION	DIAMETER AT TOP OF THREADS.	DIAMETER AT BOTTOM OF THREADS	NUMBER OF THREADS PER INCH.	HEIGHT OF CAP.
3	3/4	1.041	0.949	14	0.60
5	3/4	1.041	0.949	14	0.60
10	1	1.309	1.192	11	0.80
15	1	1.309	1.192	11	0.80
20	1 1/4	1.850	1.533	11	0.80
30	1 1/2	1.882	1.765	11	0.85
40	1 1/2	1.882	1.765	11	0.85
50	1 3/4	2.160	2.042	11	0.90
60	1 3/4	2.160	2.042	11	0.90
80	2	2.347	2.230	11	1.00
100	2	2.347	2.230	11	1.00

outlet of the meter; and it is well to commence with piping of ample size.

My suggestions are 3/4-inch connections for 3 and 5 light meters, 1-inch for 10 and 15 lights, 1 1/4-inch for 20 lights, 1 1/2-inch for 30 and 40 lights, 1 3/4-inch for 50 and 60 lights, and 2-inch for 80 and 100 lights; thus reducing the sizes of unions for meters of 3 to 100 lights to a series of six—all unions to be screwed Whitworth gas threads, and the diameter of union boss to be as in Appendix D,



introduced a certain thread, which was taken up by Crosley. The connection now was Messrs. Parkinson and Co.'s; and they introduced the wet meter thread, because dry meters were not known in those days and the dry meter standard was taken from the old Clegg unions. They found the dry meters made in the South were pretty well all the same; but in Scotland they would find that one maker had perhaps as many as half-a-dozen different threads. Now without wishing to make an advertisement for himself (he believed they were there for the one purpose of benefiting the gas industry), he should like to say that he represented a firm who in a very few months' time would have made a million meters; and the whole of the unions were the same, and were in uniformity with other large firms in the South. Therefore, he thought, when he said that two-thirds of the meters made would interchange, he was well within the mark. This being so, he would try, with all respect, to impress on the President the importance of adopting the standard of the two-thirds of the meters in use, and so save the gas industry a large amount of money.

Mr. D. MACFIE (Messrs. James Milne and Sons, Limited) thought it must have required some courage on the part of the President to have revived this question, which seemed to have gone asleep; but it was a question that was always cropping up. The President had contributed tabulated information which had never hitherto been before any Association in this connection; and it would be very valuable, and must be considered authoritative. Indeed, the President was to be thanked for getting such a large body of information before the meeting and the gas industry, because it ought to do much to help forward the cause the President had at heart—showing, as it did at a glance, what the real differences were. It was quite true, as Mr. Glover had suggested, that the differences might have been exaggerated in the past. He (Mr. Macfie) agreed with him, and thought they had been exaggerated. But he did not agree with him that one maker might have half-a-dozen different couplings. He did not think any meter maker could have so many, and carry on his business in a proper fashion. He believed all meter makers took steps to correctly fit their own sets of unions, whether they agreed with other makers or not. There was no doubt they all desired to help forward this question; but, at the same time, it could only be effectively settled by getting practical unanimity among all the Associations throughout the country. This could best be done by having the question discussed by Associations such as this, and by representations being made to the parent societies. After that it would be time enough to approach the Standards Department of the Board of Trade, and memorialize them to adopt such a standard as the gas industry might agree upon, or such a standard as the one they (the Board of Trade) already had, and which at one time they proposed to legalize. It seemed to him that it was not so much a matter of what standard should be adopted, as that uniformity and interchangeability should be secured; and he thought this could be attained without such a drastic change as the President had suggested. For the practical difficulty came in as to whether they could always adopt iron-tube thread both in diameter and in pitch. It would be quite possible to devise a series where they would have iron pitch thread, but not necessarily of the diameter of the iron thread, which might be in some cases not quite practicable in the proportions of the unions. Take copper tube, which was largely used for hot-water heating, that tube was always screwed iron pitch; but in each size, the internal diameter always being the same, they could not have the external diameter of its screw the same, because of the varying thickness of the metal. But it was usual to make the screw of iron-tube pitch irrespective of the external diameter of the tube. These screws were the same—that was, of iron-tube pitch—while the external diameters differed. His acquaintance with the steps taken by the North British Association might be an excuse for his referring to their discussion of the question. The President had very properly alluded to the paper read by Mr. Myers some years ago; and in that paper he (Mr. Myers) submitted a range of sizes utilizing iron screw threads somewhat on the lines now suggested by the President. He (Mr. Macfie) found the President and Mr. Myers practically agreed so far as adopting iron-tube thread was concerned, which was the thread that naturally appealed to those who were daily accustomed to its use. Mr. Myers suggested that 1 and 2 light meters should have screws as  $\frac{1}{2}$  inch pipe by 14 threads; 3 and 5 light light meters,  $\frac{3}{4}$  inch by 14 threads; 10 and 15 light meters, 1 inch by 11 threads; 50 light meters,  $1\frac{1}{2}$  inch by 11 threads; 80 and 100 light meters, 2 inch by 11 threads. This was practically the same suggestion as the President made to-day; but Mr. Myers in his paper referred to 1 and 2 light meters. He (Mr. Macfie) supposed that very few members present ever saw or used a 1-light meter; and such meters had practically ceased to be made even in Scotland. Two-light meters were, however, usual; and thousands of them were made throughout Scotland every year. When they sought to abolish, not only 1-light (which everybody would agree upon), but 2-light and 3-light unions, and begin with 5-light ones, he thought perhaps this was going too far. Some makers had properly abolished the 2-light union, even on the 2-light meter, and now sent out 3-light unions on 2-lights. But anything beyond this was, he thought, attempting too much. Following up Mr. Myers' paper, steps were taken to provide a set of gauges on these lines; but no sooner had these been made than it was discovered that some years before a set of standards

had been prepared for the approval of the Board of Trade. Mr. Chaney, of the Standards Department, reported that these standard unions had been made in 1888; and it was intended to legalize these standards. This stopped progress in connection with the North British Association movement; and ultimately the Gas Institute (if not also the Institution of Gas Engineers) was approached with a view to taking common action, on the ground that the adoption of standard meter-unions applicable to the United Kingdom was needed. The matter was brought up at the Belfast meeting of the Institute, and was referred to the Council. The Council of the Institute considered it desirable that application should be made to the Board of Trade. Before taking action, however, a circular was sent to all kindred Associations asking for their views and co-operation in the matter; but the result did not appear to have been very encouraging. Several Associations discussed the matter; but the Council of the Gas Institute ultimately intimated that, as the subject seemed to have been dropped, they felt it was unnecessary for them to take any further action. This was the position in which they were to-day; so that the paper and discussion appeared like the beginning of a new agitation. No one wished the agitation anything but success. At the same time, it could only succeed when practical unanimity had been attained. If this was the result of the President's paper, he thought he should be congratulated; but it was not such a small job after all. He had referred to the attempt which the Scotch meter-makers had made in the interval, seeing that a standard had not generally been approved throughout the country. These makers had practically adjusted such differences as existed in dry-meter unions. The differences were very small; but differences that did exist had been eliminated. The set of unions which the President had tabulated was practically interchangeable throughout the country, and this practically met the case. He was far from saying that the set of unions was anything more than an accommodating set. It at all events met the local difficulty; and it attained the end the President had in view. He was quite sure that the Edinburgh makers, as well as the makers in the South, were only waiting to be told what they had to do, and they would be quite willing to meet any reasonable desire on the part of the gas industry.

Mr. J. L. CLOUDSLEY (Messrs. W. & B. Cowan, Limited) thought the President was to be congratulated on the very excellent table he had prepared, and which would be studied with great profit when it appeared in the report of the meeting. He was glad that Mr. Glover and Mr. Macfie had entered so fully into the details of this question; and therefore he (Mr. Cloudsley) did not think he need detain the meeting by dealing so minutely with it as they had done. But a practical course suggested itself to him; and it was this—that the question might be more effectually dealt with if a Committee representative of large and small gas undertakings in the United Kingdom were appointed. They would investigate it with authority; and he was quite sure a recommendation from such a Committee to the Board of Trade would soon settle the whole matter. The Board of Trade were only too ready to adopt whatever the majority of the gas industry desired should be carried into effect; and if they did issue a standard, they would certainly allow some years in which to carry it out—the same as was done when the Sales of Gas Act was introduced. Ten years were then allowed before gas-meters were stamped. In the same way, if a certain standard was adopted for meter-unions, they would grant some years before it was necessary that all unions should be changed. This would, in some measure, meet the difficulty which had been pointed out about the expense. He believed Mr. Glover said that at present uniformity existed in the majority of cases; and he (Mr. Cloudsley) might add that all meter makers were endeavouring as best they could to arrive at uniformity.

Mr. W. CARMICHAEL PEEBLES said this was, of course, a question which interested meter makers to a large extent. He thought Mr. Macfie struck the keynote of the whole question when he said that it was from the gas industry and not from the meter makers that the decision must come. The meter makers would be only too pleased to fall in line with any suggestion from the gas industry. If they could get to uniformity of couplings, the meter makers would not have to keep such a large stock of different sizes; and they could more easily deliver the orders received from stock, which was, of course, a very important matter. It would help to keep down the cost of manufacture, and so secure getting meters at a uniform price. He, however, thought Mr. Bell was a little unhappy in the suggestion as to the Whitworth thread. He (Mr. Peebles) believed there was really no such thing as a Whitworth standard for gas threads. There was what was known as the Whitworth screw. But if they took ordinary wrought-iron pipes and the couplings for them, they would find little differences existed. These were, however, got over by the gas-fitter using his dies and screwing down the pipe; but it would never do for a gas-fitter to go and start on a gas-meter coupling in such a way as that. Certainly he thought the number of threads as used for iron pipes quite good for meter couplings; but they could not get the dimensions in the couplings which pipe threads would require. For example, a three-light meter had a  $\frac{3}{4}$ -inch connection. Now, a  $\frac{3}{4}$ -inch wrought-iron pipe measured about 1 inch full outside. A three-light coupling measured about  $1\frac{1}{8}$  inches, which would need to be screwed not  $\frac{3}{4}$  iron-pipe thread, but 1 inch—viz., eleven threads. Now eleven threads was, he thought, too coarse a pitch for that size. He



thought the present dimensions of couplings quite good in their proportion. They only required adjustment, and perhaps the number of threads brought to the iron screw pitch. The suggestion to bring two, three, and five light meters in a line with regard to size—viz., to make all sizes with 5-light couplings—was not a necessary one, as an inch pipe on a two-light meter was a little bit ridiculous. Take, for instance, the No. 5 union-jet burner passing 5 cubic feet of gas per hour. It had two little pin-holes less than a  $\frac{1}{32}$  inch diameter, and a two-light meter passing 6 feet per light—that was 12 feet, or doubling its capacity (say) 24 feet per hour—would supply two to four of these burners. Eight little pin-holes, and a 1-inch pipe to feed them! Then such large couplings would cause—in coupling up and disconnecting—a very great strain upon the light materials of which two or three light meters were made. He had gone into this question of meter-unions with the Scotch makers; and he believed the standards to be adopted would overcome the difficulty which the North British Association of Gas Managers wished to remove. These new couplings would be introduced by the Scotch makers on Jan. 1, and would, he believed, be interchangeable over the whole country so far as dry meters were concerned.

Mr. W. CHESHIRE (Messrs. Parkinson and Co.) said it was true, as had been pointed out, that the large majority of the meters in the South of England were made on a uniform standard. If also it was true, as Mr. Macfie and Mr. Peebles had pointed out, that the Scotch makers had agreed on a uniform standard of dry meters which would run with all the dry meters all over the kingdom, then they had something like uniformity, because all the wet meters of his firm ran exactly with the dry meters. Therefore, they were getting a good way towards the desired point—if the Scotch sizes were taken as the standard, and they would run with the dry meters of the South. At any rate, it was true they did find in practical experience that they had very little trouble on this account to contend with. They occasionally had to make meters with special connections to suit certain customers; but it was not a great trouble to the makers. He felt with other speakers that the hints and suggestions thrown out in the paper would be a little too drastic. It would mean such a sudden, sweeping change that it would be a very expensive matter; and, as they were so near uniformity, the less alteration they had the better it would be for all concerned. The paper was certainly full of interest, and had been very carefully worked out; while the tables were unique. They would be exceedingly valuable; and he sincerely hoped this ventilation of the subject would lead to some tangible and good result. The meter makers wanted more than anyone to get uniformity. It would save them trouble, and be more satisfactory for all concerned.

Mr. J. NASMITH (Messrs. J. & J. Braddock) said that, if a standard were adopted, the meter manufacturers would be able to make their unions of one size, and therefore would be able to make them in quantities and by special machinery. He did not, however, see that they would lose very much by the present state of things, or that they would gain very much if a universal standard was adopted. A good deal had been said by those in the trade about the difficulty and expense. It appeared to him, however, that this was proceeding upon the assumption that, as soon as ever a new standard was adopted, all couplings at present existing should be altered to that standard, and the whole of the money be expended at once. This did not appear to him to be at all necessary. What seemed to him would be the most sensible course, if a new standard was adopted, would be to make all new meters with unions of one standard; and when they were put into position the old couplings could be taken away, and new connections made to the service-pipe. In this way they would, at any rate as far as new meters were concerned, have the standard in course of operation. Then when old meters came in for repairs, the unions could be entirely changed; so that, when they came out again, they would be fitted with the standard unions. By this means, though the process would be an expensive one, the cost would be spread over a number of years; they would gradually work down those 4 or 5 millions which Mr. Glover at present estimated were in use. This appeared to him to be the only way of meeting the difficulty, unless gas engineers were prepared to spend large sums of money at once. He did not agree with the idea that, if a standard was to be adopted, it should be any other than the Whitworth thread. There was no difficulty about making Whitworth standards, and making a thoroughly good joint; and it seemed to him, however large the change might be, it was not a larger change than was made when the Whitworth thread was first adopted for nuts and bolts. He could remember during his apprenticeship that they used to get old bolts even ten or twelve years after the Whitworth thread was introduced. They used to get nuts and bolts that did not fit, and were not interchangeable; and, as a matter of fact, they got them now. Mr. Peebles had used it as an argument that they did get couplings that were not interchangeable on all screwed iron pipes. It appeared to him (Mr. Nasmith) that the Whitworth thread was very well thought out. It had certain well marked advantages of its own. It was a strong thread, and one not easily crossed. Therefore if a new standard was to be introduced, then he contended the Whitworth standard was the only one which should be adopted. The question had resolved itself into one for gas engineers to settle; but in settling it they must take into account the cost of making the change. But he agreed, although he favoured the Whitworth thread, that if there were already existing

threads used by two-thirds of the makers, or in two-thirds of the meters made, it would be far better not to take a standard of that type (the Whitworth) to supersede one that was already largely in use—that was to say, not to take, as a standard, one, however superior it might be in many respects, that was only partially in use. In the much-maligned North, where all these changes were said to occur, there were many towns that had already adopted a standard union, and everybody who made meters for those towns had to make the union of that standard. It appeared to him that the North had had standards of its own, and had worked to them with pretty good fidelity; but the trouble had arisen through the intervention of people from other parts of the country who had come into the district. But it was a fact that the meter makers of the North were making four or five different sizes of unions to suit different people's ideas. In one case they were told to make the meters with an A union, and in another with a B union; and the advantages to them as manufacturers would be considerable if there was only one standard. It seemed to him to be only common sense to take as a standard the sizes of threads which were used by the greatest proportion of the people to-day. It did not matter to the meter makers what standard was taken, provided they made it one standard, because then the manufacturers could adjust their machinery and make that standard just as easily as any other. But it would not be wise to adopt a standard which would knock out the two-thirds for the sake of the one-third. The President's tables formed a long step towards the adoption of a universal standard.

The PRESIDENT expressed his obligation to those gentlemen who had so far taken part in the discussion, and remarked that all that gas engineers wanted was uniform and interchangeable unions. They did not care what size was adopted, or how it was done, so long as it was carried out. He then invited the members to discuss the paper.

Mr. T. GLOVER (West Bromwich) said several gentlemen who had spoken thought the tabulated statements and recommendations in the paper would be a good step towards national standardization as against local standardization. They had heard the meter makers' point of view; and he would now approach it from the gas manager's point of view. Anyone who had had charge of a fittings department knew the difficulty which existed where they had to buy fittings for a large number of different makers' meters. In one department of which he had charge at one time, they had no less than a dozen different makes of meters; and the first thing they had to do when a man was called upon to change a meter was to refer to the books and see what make it was. Then the difficulty was to go and look round the stores to see if they had a meter of that size and shape in order to change it. If there was no such meter, then it meant making two joints, which took a full hour's time. This very frequently occurred. He was unable to see how the Board of Trade would ever interfere with the unions employed, as it was not a matter that touched the consumers or the public. He hoped the members would not go away alarmed by what his namesake had said. He (Mr. Glover) did not think the change was going to cost anything like the amount mentioned. If ever the Board of Trade did interfere, they would not say: "You have got to change your meter-unions within a given time," because it had nothing whatever to do with the consumer. He thought they might settle this question themselves; and Mr. Nasmith had given them the cue. He said that in the North, where they were pretty cute, many towns had adopted their own set of unions; and this he (Mr. Glover) thought was the key of the whole situation. If they had two-thirds of one maker's meters fixed, and they decided to spread their orders, and give other makers a chance to supply, they could say to these makers: "We give this order on condition that you supply unions uniform with those we have already adopted;" and if any manager approached any of the meter makers under such conditions, they would be only too ready to take the orders. This would settle the question so far as gas managers were concerned. They could do a great deal by adopting the best standard they knew of for their own towns.

Mr. J. T. LEWIS (Wellingborough) thought they were all agreed as to the wisdom of having meter-unions that were interchangeable; but some of them did not see the necessity for the drastic change proposed in the paper, as their meters had unions of the same size. At Wellingborough some time since, they decided to give out some orders to meter makers in Scotland. When the first meters came, it was found that the unions did not fit, or would not interchange with the meters already in existence, so they settled the matter so far as they were concerned by setting up standards of their own. Now they simply said to the makers: "We shall be pleased to give you orders for meters, providing the unions are made of the same sizes as those we are now using." This was done at once; and now he never had the slightest difficulty. At the same time, it would be a great advantage if they could have a standard which would be interchangeable, and could be used everywhere. It therefore appeared to him that the most feasible and proper thing to do would be to adopt as the standard the union which was most generally in use. This would soon bring the meter makers into line. One speaker had referred to the coupling-up of meters direct to iron pipe. In his case, many were fixed in that way.

Mr. G. HELPS (Nuneaton), while agreeing that there were advantages in standardizing unions, said he could not see that



they were very great. It might be that the experiences of others were different from his own; but he was only speaking of his individual experience. Some people connected up with compo.; others with iron. His own experience had been in favour of the former. With compo. it was an easy matter to change one meter for another; and if the unions had to be changed, the cost of making a joint would not be much. When iron connections were used, he could see there would be a bigger advantage in having a standard than where compo. alone was employed.

Mr. S. MEUNIER (Stockport) spoke of the benefit which a common standard would confer on the meter makers. It would, he said, be very nice from the makers' point of view to have standard unions. They would be able to make them in quantities; and as they had been told once or twice during the discussion, they would put down special machinery, and so save money. But why should gas managers help them to this, if they were not going to get a reduction? At Stockport, by having a standard of their own, they were able to get all they wanted without bothering the Board of Trade or anybody else. At the same time, it was very nice and useful to have standards for nearly everything with which they were connected, because they saved time and trouble. Still he would like to suggest to the meter makers that, if the President was successful in obtaining a permanent standard, they should give the gas industry part of the benefit by making a reduction in prices.

Mr. P. H. FLETCHER (Evesham), while recognizing that it was right to have meter connections of a certain size, said he did not think there was any difficulty in getting them. In his case, the connections were all of one size. He could not agree with Mr. Helps that it was not a big matter to change a meter when they had to make new lead connections. For instance, supposing the change had to be made at dusk; and they had not a fitter handy. Therefore it was desirable the meters should fit. But he had not found any difficulty in getting meters of a certain standard.

Mr. JONES (Brierley Hill) stated that the Association two years ago unanimously agreed that it was desirable a standard should be fixed upon. He would therefore propose that it be remitted to the Committee to deal with the question as they thought best, with the view of carrying the decision into effect. There was no doubt about the utility of a standard being adopted.

Mr. W. A. SAPEY (Tamworth), remarking that they had heard a good deal about two-thirds of the meter-unions being of one standard, said he could not see why the makers of those two-thirds and the makers of the one-third should not come together, and get up a standard themselves. He thought if gas managers would generally adopt the standard of the two-thirds, the makers of the one-third would soon come up to it.

Mr. HUBERT POOLEY (Stafford) also supplied some information as to the work of the North British Association in this direction. He thought the only practical issue of their work was that, if gas engineers chose to use a standard union, the meter manufacturers would make it. Unfortunately, however, there were towns in the United Kingdom that had their own standards already. These were the principal towns; and they would probably be the greatest stumbling-block to a general adoption of a standard.

Mr. J. M'COLL (Halesowen) seconded Mr. Jones's motion.

The PRESIDENT, in closing the discussion, said he was fully persuaded, that, if the meter makers would take the question up, and arrange among themselves for interchangeable unions, it would be to their benefit. The present condition of things frequently meant delay to the gas manager, and additional expense to the meter manufacturer.

The motion was unanimously carried.

Mr. T. BERRIDGE (Leamington) proposed a vote of thanks to the President for his paper. While it had interested him (Mr. Berridge) considerably, he was in the happy position of not experiencing trouble like many others. In the town where he was before he went to Leamington, they had 14,000 to 15,000 meters; and at Leamington they only had two makes, which had to fit one another. Therefore, he did not see where all the trouble came in.

Mr. MEIKLEJOHN seconded the motion; and, on his request, the representatives of the meter manufacturers who had spoken were coupled with the President in the resolution.

The proposition having been unanimously agreed to,

The PRESIDENT briefly acknowledged it.

On the motion of Mr. LEWIS, seconded by Mr. B. W. SMITH, the President and officers were heartily thanked for their services during the past year.

This concluded the business proceedings; but, before separating, "high tea" was served to the members.

## AMERICAN GASLIGHT ASSOCIATION.

The Annual Meeting at Denver (Col.).

Recent issues of the "American Gaslight Journal" which have reached us furnish an account of the proceedings at the twenty-eighth annual meeting of the above-named Association, which was opened in the Brown Palace Hotel, Denver (Col.), on the 17th ult., under the presidency of Mr. George G. Ramsdell, of Philadelphia. At the commencement of the proceedings on the first-named day, there were about 120 members present. The gathering, we learn, was truly representative of the American gas industry, inasmuch as delegates were in attendance from all points of the compass. The first business was the reading of the Council's report, the chief feature of which related to the election of new members. They recommended for honorary membership M. Th. Vautier, who presided over the International Gas Congress in Paris, and held the position of President of the Société Technique du Gaz en France for two years in succession, and the addition of 36 active and 12 associate members to the roll. The report was adopted. The Secretary and Treasurer (Mr. A. E. Forstall, of Montclair, N.J.) then read his annual reports, which showed the Association to be in a prosperous condition; next came the report of the Trustees of the Educational Fund, setting forth the good work which is being accomplished under the auspices of the organization. Mr. Alten S. Miller followed with the report of the Research Committee on the Edgerton standard; and this was succeeded by the nomination of office-bearers. The result was as follows:—

*President.*—Mr. E. G. Pratt, Des Moines, Iowa.

*First Vice-President.*—Mr. W. R. Beal, New York.

*Second Vice-President.*—Mr. Alten S. Miller, New York.

*Third Vice-President.*—Mr. Rollin Norris, Philadelphia.

*Secretary and Treasurer.*—Mr. A. E. Forstall, Montclair.

The next item on the programme was the delivery by the President of his Inaugural Address, the text of which was given in the "JOURNAL" for the 30th ult. (p. 1087). Mr. Ramsdell's discourse was very well received—the applause being frequent. After the constitution of some Special Committees, Dr. Auer von Welsbach was elected an honorary member of the Association. Then followed many sorrowful and eloquent tributes to the memory of Mr. George Treadway Thompson, whose death, at the early age of 31, was recorded in the "JOURNAL" last week; the result being the passing of a resolution expressive of the regret felt by the members at the loss the Association had sustained by his removal. Mr. Rollin Norris read the report of the Research Committee on the Harcourt standard; and a discussion followed on the two reports on these subjects. The President subsequently nominated Dr. E. G. Love, of New York, as one of the American representatives on the International Committee, arranged for at the Paris Congress, to draw up "a set of conditions for the regulation of the photometry of incandescent gas-mantles." Another Committee was appointed to award the Beal Medal; the members being Messrs. Alex. C. Humphreys, W. H. White, and Emerson M'Millin.

The reading and discussion of papers then commenced. The first paper to engage attention was by Mr. A. H. Barret, Engineer to the Louisville Gas Company, who dealt with the subject of "Inclined Retorts." He gave, without elaboration, a clear account of what his Company had done; and the results achieved appear to have given satisfaction. A long and spirited discussion followed. Mr. A. E. Forstall read a short paper describing the repair of a broken 30-inch outlet-pipe from a gas-holder; and this brought the opening day's business to a close.

The first thing of special interest in connection with the second day's proceedings was the naming of Boston as the next place of meeting, after which the Association settled down to listen to an interesting lecture, by Dr. E. G. Love, on "The Theory of the Incandescent Gas-Light." A short paper, entitled "The Removal of Tar from Water Gas," read for Mr. W. C. Morris by Mr. Alten S. Miller, followed. The next paper was on "Gas Advertising," read by Mr. Frank W. Frueauff, the Secretary of the Denver Gas and Electric Company. Mr. Henry L. Doherty afterwards advocated with such vigour his scheme for the formation of a National Bureau of Advertising that the Association consented to appoint a representative on the General Committee which is being formed from other Associations to give the scheme practical effect. The paper by Mr. W. C. Anderson, of Norristown (Pa.), on "The Use of Cards for Records and Accounts," brought out a very entertaining discussion, an important contribution to which was made by Mr. Walton Forstall. The next matter was a short paper on "A Blue Glass Pyrometer." The report of the Committee on the President's address followed; and as a sequel thereto a motion to appoint a Committee of three, to report next year on a standard system of keeping accounts, was adopted. Then came the paper by Mr. A. E. Forstall, on "Governmental Control of the Price of Gas," which is given on succeeding pages. Unfortunately, time did not permit of a full debate upon it. The paper set down for Mr. J. H. Walker, of Milwaukee, was not read, owing to his inability to be present. The report of the Committee on Final Resolutions, read by Captain W. H. White, wound up the set proceedings, and closed the technical session of a meeting which, our contemporary says, "lacked nothing from any standpoint, so far as professional interest and its advancement are concerned."

Among the Mayors of the new London boroughs elected last Friday we notice the following: Hampstead, Sir Henry Harben, a Director of the New River Company; Marylebone, Mr. E. Boulnois, M.P., Chairman of the West Middlesex Water Company; and Paddington, Mr. John Aird, M.P., a Director of the Gaslight and Coke Company, and Chairman of the Cagliari Gas and Water Company. In the Provinces, Alderman S. Lennard, the new Mayor of Leicester, is Chairman of the Gas Committee. Mr. G. Gummer, the Chairman of the Gas Committee of the Rotherham Corporation, whose term of office as Mayor expired on the 8th inst., was re-elected.



## GOVERNMENTAL CONTROL OF THE PRICE OF GAS.

By ALFRED E. FORSTALL, Montclair (N.J.).

[A Paper read at the Annual Meeting of the American Gaslight Association.]

At the last meeting of the Western Gas Association, there was read, under the title "Public Control of Rates," a paper which the author (Mr. George M'Lean, of Dubuque, Iowa) stated was devoted "to the proposition that it is unjust and inexpedient on the part of public service corporations to oppose the principle of public control."\* As the writer held very closely to the subject, and did not advance any heretical opinions, the tone of the discussion that followed his reading of the paper was rather a surprise to at least one of those present, as he obtained from it an impression that the general opinion of the speakers was that it was best not to acknowledge the existence of any such right of public control, and to avoid as far as possible any mention of the subject, for fear of stirring up trouble.

This might be a very proper course of action if it were true that the right of public control in some form did not actually exist, and if it were possible, by keeping silent, to prevent the subject from being agitated by others. But nothing was advanced in the discussion to show that either of these assumptions can be maintained.

As far as the existence of the right of public control of rates in some form is concerned, one of the speakers in the discussion made the point that there was no doubt that State Legislatures had this power of control, since gas companies were created by legislative authority, and the creature was always subject to the control of the creator. There can also be cited many examples where such control has been exercised by State Legislatures, such as the fixing of the price to be charged in New York City, and, as a later example, the action of the Maryland Legislature at its last session fixing the price of gas in Baltimore. Moreover, in many of the States the Legislature has given to the municipal authorities the right to regulate the prices charged for gas within the limits of their jurisdiction. The Legislature cannot delegate to others a right that it does not itself possess; but it does not seem that an effort has been made to contest the validity of the right so conferred, even in those cases where, in the exercise of this privilege, the municipal authorities have set a price that has been disputed—the fight in every such case being waged upon the reasonableness of the price prescribed. It would, therefore, seem as if the right of public control of price did exist, and had been well established by decisions of the Courts.

Turning now to the idea that a policy of silence and inaction on the part of gas men is advisable—because if they do not agitate the subject of public control of rates, others will not—can this opinion be held in the face of existing conditions? There is, entirely apart from anything we may do, a strong movement throughout this country in favour of municipal ownership—an extreme form of public control of gas and electric light properties. Several of our members who have attended the annual meetings of the League of American Municipalities, have come away surprised and alarmed by the sentiment in favour of municipal ownership of public service franchises evinced there by men who are sincere in their belief in the benefits to be derived by the community from such ownership. To the efforts of these men, who have united themselves into organizations such as the Association for the Public Control of Franchises, and the Franchise Tax and Municipal Ownership League, both of New York City, are added those of the politicians, who, though they have taken up the cry of municipal ownership from expediency rather than conviction, must, nevertheless, be reckoned with. And even if the out-and-out advocates of municipal ownership as a remedy of universal application for the cure of most of the present ills of the body politic were to be silenced, the subject would still be kept alive by men who, while endeavouring to approach the matter without bias in either direction, are carefully studying this question with a view to reaching a decision based upon the merits of the case as shown by such study. In this class is the National Civic Federation, whose objects are "To provide for the study and discussion of questions of national import affecting either the foreign or domestic policy of the United States, to aid in the crystallization of the most enlightened public sentiment of the country in respect thereto, and, when desirable, to promote necessary legislation in accordance therewith."

This Federation is organizing a national conference, to be held in December, to discuss the subjects of "Industrial Arbitration," "Taxation," and "Municipal Ownership." The Municipal Committee of the Reform Club of New York, which is carrying on an extended investigation of the practical working of municipal ownership, both in this country and abroad, is another example of this class. Thus, whatever our policy may be, the question is being, and will continue to be, agitated by others. Moreover, this policy of inaction is not a new one. In 1883, the President of this Association for that year, taking as his text the existing gas situation in New York City, called attention to the good results that had been obtained from the system of public control adopted in England, and advised action looking to the securing of a similar system in this country. In 1886, a Special Committee of the Western Gas Association, appointed to investigate the question of Gas Commissions, made a majority report in favour of the formation of such Commissions in such

States as possessed a sufficient number of gas companies to prevent the cost of the Commission from being too burdensome upon the individual companies. No action followed either of these attempts to rouse the owners of gas properties to an appreciation of the direction in which lay their true interests. The policy of inaction is, therefore, at least 17 years old. Has it improved the situation, or prevented the continuance of agitation? On the contrary, the agitation has increased as the years have gone on, and has been still more intensified in the last two years by the outcry against the formation of the so-called "trusts," with the consequent demand for the publicity of the accounts of incorporated companies.

The right of public control of the price of gas exists; and inaction on our part will not prevent either its application or the discussion of the form in which it shall be applied. Would it not be well for us, therefore, to recognize the trend of events, and, instead of obstinately resisting that which we cannot prevent, endeavour so to guide legislative action as to secure a system of control that shall be to our advantage as well as that of the public? Otherwise it is practically certain that we shall have forced upon us, sooner or later, either municipal ownership or a system of control worked out without our aid by men who, though sincere, have no special knowledge of the various conditions affecting the industry which they propose to regulate. It is certainly to the interest of all that gas engineers and managers should take a part in the formulation of the laws made to control the business with which they are familiar; and their aid would doubtless be welcomed by those who are sincere in their desire to work out the best possible solution of the problem of public control of gas companies. Imperfect though it may be, any system carefully thought out by a representative body of gas men would be preferable to the present liability to control applied with an entire absence of system, under which regulation is limited to action reducing the price of gas, taken by Legislatures or city councils, as the case may be, without any examination of the cost of production or of any of the other conditions which must be considered to enable the fixing of a fair price, with the result that the price so fixed is unreasonably low, and the Courts must be appealed to to save the company affected from having to carry on its business at a loss.

The writer does not feel himself competent to formulate a system that would be applicable to our conditions. Still, as a basis for work for others, it may be well for him to describe briefly the most important systems devised and applied for the regulation of gas companies, in this country and abroad.

In the city of Paris, the price of gas, and the conditions under which it shall be supplied, are regulated by a concession granted to the Gas Company by the Municipal Authorities. This concession is a contract between the Municipality and the Gas Company, entered into in 1855, modified in 1870, and continuing in force until 1905. The price and quality of the coal gas to be supplied are fixed for the whole term of the contract; the price being subject to revision at intervals of five years in case successive commissions of experts, appointed and working under rules specified in the concession, find that there have been made during the interval new discoveries in the art of manufacturing gas, by the employment of which the cost of manufacture can be sufficiently reduced to enable the Company to lower the price. Out of the gross profits for each year, the Company is allowed to pay the interest on its bonds, a specified dividend (13½ per cent.) upon the capital stock, and to set aside sinking funds which will enable it to pay off both the bonds and capital stock at the expiration of the concession. The net profits remaining after these deductions are made are divided equally between the Municipality and the Company. As part of its operating expenses, the Company must pay to the Municipality a sum of \$40,000 per year as a return for the grant of the exclusive right to lay pipes for the distribution of gas within the limits of the city, and a royalty of 2 centimes per cubic metre of gas sold (equal to about 11·3 cents per 1000 cubic feet). The Municipality is furnished with gas for street lighting and for use in public buildings at half the price charged to private consumers. Finally, at the termination of the concession, the Company surrenders gratuitously to the Municipality the pipes used for distributing the gas.

Under this system of regulation, no reduction of the price of gas has been made in thirty years, since none of the several Commissions appointed have been able to report any new discoveries in the art of manufacturing coal gas of sufficient importance to warrant a reduction in price, although they have emphasized the fact that the economies rendered possible by good management and increase of business had materially reduced the cost of the gas made by practically the old methods. But these points of good management, and consequent increase of business, not being taken into account in the agreement, and the city being unwilling to forego any portion of its share of the profits, the price of gas still remains what it was in 1869. As this is 30 centimes per cubic metre for lighting and heating, and 25 centimes per cubic metre for motive power (equal to about \$1·70 and \$1·41 per 1000 cubic feet), for gas of about 13-candle power, it can be easily seen that the gas consumers of Paris are paying much more than their share of the taxes. The Municipality's half of the net profits has averaged, of late years, about \$1,500,000. This system of fixed price, fixed initial dividend, and division of the excess of profits between the Municipality and the Company does not, therefore, secure cheap

\* See ante, p. 21.



gas, and is defective from the consumer's standpoint, when the concession runs (as in this case) for a long term of years. And while the Gas Company pays large dividends, it really profits very little from the high price of gas, for the reason that its business cannot be increased as it could if the price were reduced; and it is probable that the same amount of money could be earned with gas selling at a lower rate. This example may be taken as fairly illustrating the system of governmental control of the price of gas in vogue upon the Continent of Europe.

In Great Britain an entirely different system prevails; the control of the supply of gas resting in the hands of the General Government—the municipalities possessing only the power of inspection necessary to ensure the fulfilment of the conditions imposed by the Government when the gas supply is in the hands of a company, and being themselves subject to Government regulations when the supply is in their own hands. After trying several plans—among them that of fixing a maximum price and a maximum dividend—the system known as the "sliding-scale" is now generally applied to statutory companies, as those companies which secure from Parliament the right to carry on the gas business are called. The distinctive feature of the sliding-scale system is that neither a maximum price nor a maximum dividend is imposed. In their stead, a standard price and standard dividend are specified; and for each increase of 1d. in the price of gas above the standard, the rate of dividend must be decreased  $\frac{1}{2}$  per cent., while for each decrease of 1d. below the standard price the rate of dividend may be increased by  $\frac{1}{2}$  per cent. The standard price and the standard rate of dividend are fixed by a Committee of one or other of the Houses of Parliament specially appointed in each case, after an exhaustive hearing on both sides, as represented on the one hand by the gas company applying for the Act, and on the other hand by the local authorities of the district which the right of supply is to cover. Once fixed, the standards have not been disturbed so far as the capital raised under them is concerned. The same Committee fixes the candle power and purity of the gas—these, with the arrangements for inspection, being usually covered by standard clauses—and the amount of capital stock and of bonded indebtedness that can be issued and incurred. All issues of stock or bonds must be sold by auction, after due advertisement, at a price at least equal to the par value and greater than a reserve price which must be named in a sealed letter which must be sent to the Government Department known as the Board of Trade before the date set for the sale. The combined total of capital and borrowing powers granted is usually sufficient to provide for the estimated needs of the company during a period of from 10 to 15 years, though a recently appointed Committee advised that this period be shortened to five years. When the money so provided has been exhausted, the company must apply to Parliament for power to issue further capital, for which a new standard price and dividend may be fixed. The net earnings can only be applied to the payment of dividends at a rate equal to, or lower than, that corresponding to the price charged for gas, and to the formation of an insurance fund, to the credit of which can be placed each year a sum not greater than 1 per cent. of the paid-up capital, until the total amounts to one-twentieth of such capital. If the profits are sufficient to provide for a dividend at the statutory rate and one of a lower rate is paid, the difference between the amount paid and that which might have been paid may be carried to a reserve fund, which can be built up until it amounts to 10 per cent. of the nominal capital. The fund so formed can be drawn upon to make up the dividend to the statutory rate in years when the full amount has not been earned.

The premiums received from the sale of stock or bonds at prices above their par value are not to be considered as income, but must be applied to new construction as non-interest bearing capital. The accounts of the companies must be kept in the form prescribed by the Board of Trade, and are audited by auditors appointed by the same body, to see that they are correctly kept and the expenditures properly divided between operating and construction accounts. Returns, giving in detail the cost of manufacture and distribution, the profit earned, and the amount of new capital issued, must be made to the Board of Trade by each company, and are published annually as a public document. Although the sliding-scale legislation does not expressly guarantee to a statutory company the exclusive right to the sale of gas in its district, Parliament has not since 1860 authorized more than one company for any one district; so that, in practice, the exclusive right of supply follows the obtaining of an Act of Parliament.

By leaving the rate of dividend which may be paid unlimited, except by the amount to which the cost of gas can be reduced, this system encourages and rewards good management; the economies resulting from which are divided between the stockholders of the company and its consumers. At the same time the requirement that all securities be sold at auction, combined with the necessity of securing parliamentary sanction for the raising of the money required for each period, keeps the capital account at a low point; while the Government audit of the accounts ensures that no operating expenses shall be carried to capital account on the one hand, and, on the other, that no entirely new work shall be paid for out of earnings. This keeps the capital account from being either weighed down by the payment of unearned dividends, or lightened for the benefit of future consumers at the expense of those of the present day.

The Massachusetts Board of Gas and Electric Light Commissioners constitutes the only organized attempt at Government control of the gas business in the United States. This Board is composed of three Commissioners, appointed by the Governor, and exercises general supervision over all the gas and electric light companies in the State. Every gas company is required to make an annual return to the Board setting forth, according to a prescribed form, its operating expenses and income, the amount of its authorized capital, and its financial condition upon a specified day; and these returns are published in the annual report of the Board. Upon the complaint of the mayor or select-men of a town in which a gas company is located, or of 20 customers of the company, either as to the price or the quality of the gas supplied by such company, the Board must, after notification to all the parties concerned, give a public hearing to both the company and the complainants, and may, after such hearing, order any reduction in the price or improvement in the quality of the gas that it deems just and proper. No other gas company shall be allowed to lay pipes in any town in which a gas company already operates without obtaining the consent of the proper local authorities; this consent to be granted only after a public hearing of which due notice is given to all parties interested. An appeal from any decision given in such cases by the local authorities may be made to the Board, which, after a hearing, shall render its decision; and this decision will be final. Gas companies must keep their manufacturing records and books and accounts according to forms prescribed for the purpose; but there is no official audit to make certain that the accounts are properly kept and the items properly classified. The Massachusetts legislation also provides that all new issues of stock and bonds must be for specified purposes, and cannot be made until the Board of Gas Commissioners has voted, after investigation, that such issue is reasonably requisite for the specified purposes for which it is authorized. New issues of stock can be offered proportionately to the stockholders of a company at a price fixed by the Commissioners as the market value of such stock; this market value to be determined by taking into account previous sales of the stock and other pertinent conditions, and to be always more than the par value of the stock. Any stock not taken by the stockholders shall be sold at auction.

In some points this legislation is similar to the English system; but in others it differs very radically from that system. The principal difference is in regard to the regulation of the price of gas and rate of dividend. The Massachusetts plan is practically that of a maximum price and maximum rate of dividend, with a price which is not fixed for any definite period, but is subject to readjustment at any time, and the disadvantage that the rate of dividend is fixed merely by custom and precedent, and not by law, and is, therefore, not an absolutely certain one. The relation between price and rate of dividend must, in justice, be made to depend upon the results that can be obtained by average management; and the best possible management cannot secure any larger returns than are possible under average management. Therefore, there is no incentive to extra exertion; and the public loses the benefit of the share of the results of such extra exertion which it might obtain. Another difference which does not show on the face of legislation is the varying attitude adopted by the auditors in the one case, and the commissioners in the other, towards the question of the proper application of the profits. As stated, the English practice requires all extensions and new construction work to be paid for entirely out of capital. The Massachusetts Board has, in several of its decisions fixing the price of gas, taken the ground that it is right and expedient that part of the cost of extensions should be paid out of income, with a view to lightening the capital burden of the future. A further difference is found in the regulations governing the issuing of new securities. In England, Parliament authorizes the issue of an amount of securities which is estimated as sufficient to furnish all the new capital necessary to enable the company to provide for the expected increase of business for a period of 10 or 15 years; and these securities, once authorized, can be issued in such amounts and at such times as are judged best by the managers of the company. The Massachusetts law apparently requires the issuing of stock in smaller amounts, and the immediate application of the proceeds of such issues to previously specified objects. The systems are alike in that, while neither specifically guarantees the right to an exclusive franchise, each does in its practical application, refuse to authorize competition in the supply of gas. They are also very similar in the regulations bearing on the sale of securities.

The question is, of course, open to argument; but it would seem as if the method of providing for all extensions and new construction by new capital was more just than that of paying for part of these extensions out of income, and thus making the consumers of the present day pay more for gas than would otherwise be necessary, in order that the consumer of the future may benefit from an abnormally low capital account. All that should be required of income in this connection is that it provides a proper depreciation fund, so that the future will not be burdened by capital the plant equivalent of which has disappeared. It would also seem as if the Massachusetts regulations were needlessly and harassingly strict as regards the authorization of new capital, and that they do not afford the incentive to secure the very best possible results that is furnished by the sliding-scale system.

Altogether, the English legislation seems to afford the best



results to both consumer and company. By the exercise of a little ingenuity and thought, we should be able to adapt its salient and essential features to our political conditions, and thus offer to the sincere advocates of organized public control, who recognize that gas companies possess some rights that should be respected, a system that they can accept and for the adoption of which they can work. With their aid, it should be possible for us to free ourselves from the unsystematic public control to which we are now subject, with its attempts at regulation of prices by competition and arbitrary legislative action. This consummation is, at least, one earnestly to be desired and well worth striving for; and the labour of bringing it about is worthy of being undertaken by our Association.

### FLY-WHEELS FOR GAS-ENGINES.

At the Meeting of the Manchester Association of Engineers on Saturday week, the 27th ult., Mr. Archibald Sharp, B.Sc., Assoc. M.Inst.C.E., of London, read an interesting paper on "Fly-Wheels." In the course of it he discussed the scientific principles underlying the design of these wheels, both for steam and gas engines, and described several examples of the most advanced practice. Among the improved types referred to was one of the author's design, which he remarked was specially suitable for gas-engines. The wheel had a rim and boss of cast iron, and tangent spokes of mild steel. It had numerous spokes, instead of a small number of heavy arms, so that the unsupported length of rim was small, and the bending stresses were reduced to a minimum. In building the wheel, an initial tension was put on each spoke by screwing up the nuts at the ends; and an initial circumferential compression was thereby put on the rim. The tangent spokes were fastened to the hub by frictional grip alone. The spokes were made in pairs—the middle of each pair being wrapped about half-a-turn round the hub—and lay in a spiral groove, the sides of which were inclined at a very small angle, so that any desired amount of wedging action could be obtained. The rim was free from cooling strains, and, as it left the sand very true, need not necessarily be turned on its outer surface. The spokes were lighter than ordinary cast-iron arms; and thus a saving of dead-weight was effected. It was easily built, and should not cost much, if anything, more than a solid cast-iron wheel of the same character; where it was possible to slightly increase the diameter of the fly-wheel without inconvenience, it should cost less.

In the course of the discussion on the paper, Mr. Atkinson, referring to the practice of Messrs. Crossley Bros. in connection with fly-wheels for gas-engines, observed that the increase of power and stroke in the larger engines necessitated a greater diameter of fly-wheel; and for convenience of carriage by train, it became necessary to make the larger wheels in more than one piece. A good deal of thought had consequently to be devoted to considering how such wheels could best be joined. They overcame this difficulty by an invention of Mr. William Crossley's, in which the wheel was parted right down the diameter, carefully planed, and put together; and on the top of the junction steel plates were carefully fitted upon slightly dovetailed joggles. Bolts were used for the inside. They had to make fly-wheels very much heavier than those used with steam-engines, and quite realized the effect of a heavy wheel on the governing; but the connection between fly-wheels and governors was very different in the case of a gas-engine from that of a steam-engine. One of the best methods of making fly-wheels to contain a large amount of energy was by getting a plain cast-iron wheel, with (say) a trough section of rim, and simply winding it with wire. Such wheels had been very successfully made in America; and they would be as cheap as it was possible to make a wheel. The great objection, however—and it was one which had really prevented them from adopting it—was that they could not take such a wheel to pieces and put it together again without great trouble. Mr. Sharp, in his reply, stated that while the gas-engine was much worse off than the steam-engine for steadiness during its revolution, the two types were practically identical as regards governing under variable loads. At all events, the difference, if any, was not very great.

**The Tresenreuter Light.**—The form of incandescent gas-light, working by means of gas and air under high pressure, which has been patented in this country by Herr G. Tresenreuter (see *ante*, p. 1026), has, we are informed, been very favourably reported upon by an expert who holds a high official position in Germany. He states that it can be applied at trifling cost to any ordinary gas-bracket; and a small water-motor may be used to provide the necessary pressure. The burner itself presents a very ordinary appearance, and is screwed on to the bracket in the usual manner. No glass chimney is needed. The light is of an agreeable golden colour, though ordinary mantles are used; and its intensity is stated to be about 350 candles. This, however, may be increased by the consumption of more gas to as much as 1000 candles. The necessary power may, of course, be obtained from any convenient source; and a 1-horse motor will, it is said, suffice for an installation of 120 burners. The cost of the light is estimated at one-eleventh that of an electric arc light of considerably lower intensity.

### INSTITUTION OF CIVIL ENGINEERS.

#### EXTRACTS FROM

#### THE PRESIDENTIAL ADDRESS OF MR. JAMES MANSENGH.

Delivered last Tuesday.

There has been considerable discussion for some time as to whether this year 1900 is the last of the Nineteenth Century or the first of the twentieth; and notable personages among "all sorts and conditions of men" have expressed emphatic opinion one way or the other. My predecessor, judging by certain expressions in his address delivered twelve months ago, holds, I think, the same view as I do myself—that we are still in the Nineteenth Century. I may therefore fairly claim, if I complete my term (with his permission, and by your kindness and confidence), to be the first President of the Institution of Civil Engineers in the Twentieth Century—a great distinction, for which I tender you my very sincere thanks.

Having decided that I would deal to-night only with that special branch of engineering to which my time for nearly forty years has been devoted, it occurred to me naturally to look back to the addresses of those of our Past-Presidents who had preceded me in the same line. These are: James Simpson, in 1854; Thomas Hawksley, in 1872; John Frederic Bateman, in 1878; Joseph Bazalgette, in 1884; and Robert Rawlinson, in 1894. I find that all these gentlemen commenced their addresses with references to many departments of engineering practice and their respective progress—occupying, however, the greater part of the time with matters directly bearing on the provision of water for town supply, and the collection, conveyance, and utilization of sewage.

Mr. Simpson, in 1854, referred to the general introduction of iron pipes for water distribution and of systematic filtration. Mr. Hawksley, in 1872, dealt with the important subject of rainfall, and the obtaining of its accurate registration as providing the prime factor in ascertaining the capability of supply of any given drainage area, with the flow off watersheds of varying form and geological structure, the losses by evaporation, and the discharge by floods. He also referred to the water "wants" of the people, the regulation of fittings, the kind of water best suited to residential or industrial towns, and to the quality from different characters of source—emphasizing, I think, his preference for rivers. Mr. Bateman, in 1878, went into much detail on the rainfall question—illustrating his remarks by reference to specific cases—and discussed fully the question of the quantity flowing off the surface, or percolating into the ground, under diverse geological conditions, the volume of floods, and the dry-weather discharge. He referred eulogistically to the work of that indefatigable collector of rainfall returns, George James Symons, whose death during the past year many of us most deeply deplore. Symons was a good and loyal friend a genial and interesting companion, and the sort of enthusiast in his work that is certain sooner or later to command success. In 1884, Sir Joseph Bazalgette did not enter into any such technical details as his predecessors, for his work had not been so much that of a water-works engineer; but he collected a mass of most useful information with respect to the water and gas supply of a large number of towns all over the world, with many other interesting statistics. Ten years later, Sir Robert Rawlinson dealt shortly and in a general way with the subject, especially referring to London and its main sources, the Thames and the Lea, as only requiring to be preserved from pollution to furnish the raw material for a good and wholesome water supply.

Bearing all this in mind, and feeling that I could add very little of importance to what Mr. Hawksley and Mr. Bateman had said on the points they specially dealt with, I think it will not be inappropriate that I should say something upon one or two departments of our work in which our knowledge has advanced, or our practice been varied, since the last of my famous predecessors occupied this chair in 1878. Of these, the most valuable and practical gain has undoubtedly been our enlarged insight into the very important work done by the ordinary sand filter, which at that time was not expected to do more than remove from the water the suspended matter visible to the naked eye.

In the session of 1882, a paper was read in this room on "The Analysis of Potable Water," by Charles W. Folkard, in which he said, talking of the purification of water: "Filtration is another remedy put forward as infallible by those who have not grasped the subject. How can filtration affect substances dissolved in water? And as for the minute organisms found in putrescent bodies, they could pass a thousand abreast through the interstitial spaces of ordinary sand as used for this purpose." During the discussion which followed, I well remember the late C. Meymott Tidy quoting the following words from the paper: "The germs which cause or accompany disease are endowed with the most persistent vitality, and are capable of withstanding heat, cold, moisture, drought, and even chemical agents, to a marvellous extent," and then exclaiming, in his most emphatic and dramatic manner, "But where are the germs? No such thing as a typhoid germ has been discovered. One could no more analyze a water for the germ of typhoid than one could analyze the brain for an idea."

In the years which have intervened since this discussion, germs, whether known simply as micro-organisms or as bacilli, bacteria, &c., have come very much into evidence, and have to



be taken account of as potent agents for good or evil which cannot be ignored. The specially interesting thing about them to the water-works engineer is that, notwithstanding their minuteness, they are, whether we like it or not, almost entirely removed from water in the ordinary working of a sand filter.

Many of these organisms are known to be perfectly harmless; but some are believed to be the direct causes of disease, such as typhoid and cholera. With regard to the latter, we need not trouble much, because at the present day cholera is always brought to this country from across the sea, and the precautions taken at the ports are so effectual as practically to prevent its ever getting up into the interior; and if that be so, its bacillus can never reach the rivers to infect the water which may be taken from them for town supply below. It is, however, much otherwise with typhoid, which is always prevalent in some part or other of the country; and therefore it is of importance to prevent its organism getting into the water for which year by year increasing communities, both urban and rural, are crying out.

On the question of purity—which means, according to the now generally accepted opinion, the absence from the water, as delivered to its consumers, of any such pathogenic organism—the responsibilities of the water engineer are daily becoming more onerous and exacting. We are thus nowadays constantly confronted with the problem as to what assistance we can hope to obtain from the chemical and bacteriological examination of water respectively. Now, the chemical examination which has been before the public in its present form for over thirty years, enables the skilled analyst to ascertain not only the amount of each mineral ingredient present in a sample of water, but also to determine the amount of carbon and nitrogen contained in the organic matter which the water holds in solution or suspension. From these data, he is able to diagnose, with more or less accuracy, whether, and in what degree, the water has been contaminated with animal or vegetable substances.

The signal service rendered by the chemical methods in detecting sewage contamination is, it may be said without exaggeration, conspicuously reflected in the diminished mortality from typhoid and cholera in this country. There are, however, many waters—often available in very large volume—which are contaminated to such a slight extent only that they differ but very little in chemical composition from waters obtained from unimpeachable sources; and the question has forced itself upon practical men, in view of the ever-increasing demands made by the growth of population, whether such waters must be wholly avoided, or whether they cannot be rendered suitable for domestic purposes by submitting them to some simple process of purification, such as storage in large reservoirs, or filtration through fine sand. Water engineers were, moreover, encouraged in the belief that moderately polluted waters might in this way be rendered reasonably safe and wholesome by the circumstance that such treatment sufficed to make them satisfy the popular demand for clearness and palatability.

But inasmuch as the changes effected in a water by sand filtration are, from a chemical point of view, quite insignificant, the nature of the services rendered by this method of treatment remained completely obscured, and were not revealed until comparatively recently, when the introduction of the now well-known bacteriological methods of water examination have enabled an entirely new interpretation to be placed upon such processes of purification. These new methods were brought to a high state of perfection some seventeen years ago by Robert Koch; and it was in the year 1885 that Percy Frankland first applied them to the investigation of the character of the purifying processes as actually practised by the London Water Companies. This investigation brought out the reassuring and totally unexpected fact that the processes employed were often successful in removing 98 per cent. of the bacteria present in the original water. These inquiries were also instrumental in placing these and other purification processes on a sound scientific basis. Thus among the several London Companies dealing with the same unfiltered water, those achieved the best average result who stored the water for the longest period, and filtered it at the slowest rate through the greatest depth of sand. The effect of storing water in reservoirs as affecting its bacterial purification has also been brought out very markedly by means of these methods; and modes of treatment which were adopted for quite other purposes have since been found to possess remarkable purifying powers, as, for example, Clark's softening process, which removes 99 per cent. of the bacteria present.

The importance attributed to such examination is based on the suspicion that most natural waters may at any time contain bacteria capable of producing disease; and although the greater majority met with are doubtless perfectly innocuous, we require a guarantee that any harmful forms which may be present should be prevented from reaching the consumer. This, in the present state of our knowledge, can be secured only by submitting the water to processes which effect the removal of all bacteria, irrespective of their harmful or harmless nature; and we therefore estimate the value of the process according to the efficiency with which it does this. Whether we are right in so doing is a question upon which I am bound to say I have always had a slight misgiving.

We have learned, without any doubt whatever, that these micro-organisms are ubiquitous, universal, all-pervading; they swarm in their myriads in air, earth, and water, in our food, and

in our bodies. We are, however, still groping very much in the dark as to the work they are designed to do in the great economy of Nature. We are accustomed to talk of the majority of them as being simply harmless. May it not be wiser to assume that they are actively beneficent? Further, in removing from the water we drink in London 98 per cent. of those found in the river, in order to capture a stray typhosus or a Loeffler's bacillus (neither of which has ever been found in the raw water), may we not be doing more harm than good?

However, this is taking a pessimistic view of the position, which need not much trouble us, for the health statistics of this enormous community prove conclusively that the risk of harm arising either from the presence in the water of so-called pathogenic organisms or the removal of the harmless is so small that it may be calmly disregarded. A word of warning may, however, be spoken with regard to water obtained from elevated and sparsely populated moorlands; for the danger is, in my opinion, greater if such water becomes infected, especially if not passed through impounding reservoirs, than if it were taken from a large river. I remember a very serious epidemic of enteric fever which occurred at Bangor in 1882, due, it is believed, to the fouling of a small mountain stream high up above Bethesda. Every house upon such a watershed should be under constant, vigilant, and intelligent supervision.

I ought not to pass on to some other subject without saying that, in speaking of pathogenic organisms like typhosus, I am voicing, I believe, the opinions of the majority of investigators in this branch of science all over the world. But I am aware that these opinions are now the subject of acute criticism by some physiologists and pathologists, who regard the whole theory of disease-producing germs as a scientific chimera. Their opinion, they say, is supported by a large number of facts and inevitable inferences; one of the most important being that the identical microbes which are regarded as the cause of specific diseases are constantly found in perfectly healthy persons. I am, of course, not competent to offer an opinion of any value upon these rival views; the scientists must thrash the matter out. But we water engineers must not relax our efforts to provide pure wholesome water for those who entrust us with its supply.

I have not left myself time to speak at any length of alterations in water-works methods since 1878; but I should like to say just a few words about the coming into fashion of the stone dam in impounding reservoir construction. Although Mr. Bateman made many such reservoirs in his time, I believe he never built one with a dam of stone; and I think I am right in saying that the Vyrnwy was the first Mr. Hawksley had to do with. In 1878, I built a small one on the River Wyre, in front of a low weir of Sir Robert Rawlinson's, for the Lancaster Corporation, about 57 feet high above the river, across a narrow gorge, where I could give the wall a curve in plan of only 100 feet radius. In such a situation, the structure could obviously be made lighter than (say) the Rankin type section for a long straight wall.

There is great comfort in building a dam of masonry as compared with making an earth bank; but we should not allow fashion to run away with us, and so build in stone when earth and puddle would answer the purpose equally well at much less cost. I think where we get 100 feet of water behind a dam, it ought to be built of stone; but it is essential, in my opinion, that such a structure should be founded on an unyielding base of sound rock from side to side of the valley. With anything less than this, there may be unequal settlement, owing to the varying weight of the wall, likely to induce fracture. I do not think it is good work to tie a stone wall into the side of an earth valley.

I cannot say that I much admire the American practice of building a composite dam—i.e., part of its length in earth and part in stone—as they are now doing at the New Croton reservoir in New York, which I saw four years ago, and have previously done in many smaller works. They seem to trust in Providence or good luck over there to an extent we dare not do here. In such cases, the core or water-tight barrier in the earth bank is not puddle, as we should make it, but a thin stone wall joined on to the end of the true stone dam. I am not sure that such a core may not be made from end to end of an earth dam, if very special precautions are taken, by well rolling the bank, to ensure that unequal settlement or surging does not take place. I have never yet ventured to try it; but if I do not get nervous as I grow older, I may some day.

Mr. Hill's wall across the outlet of Thirlmere into St. John's Beck is about 50 feet high above the stream bed, and is a very picturesque structure. The Vyrnwy dam is an exceptionally heavy wall, splendidly put together, about 85 feet high above the river; and the granite wall built across the Meavy, on Dartmoor, by Mr. Sandeman, is about the same height, and is a really handsome piece of masonry. I am proud to have been associated, as Consulting Engineer, with this work, for it has a special interest, in that it completes the scheme initiated by Admiral Drake over 300 years ago for the supply of Plymouth. I have not seen Mr. Deacon's wall, built with Aberthaw lime, near Merthyr, nor Mr. Watson's at Gouthwaite, on the Bradford Nidd scheme, and have only sighted the Swansea Cray reservoir works from the railway.

In mentioning these and the three main dams varying from 122 to 128 feet high above ground and the lower submerged wall I am building on the River Elan, I have, I think, named nearly all, if not quite all, the masonry dams of any pretensions in this country. The highest of these is 40 feet lower than the New Croton,



which is not erected, as at first intended, at Quaker Bridge, but 2 miles higher up the valley. I have just received some photographs of this work which represent the wall as being built in horizontal courses of roughly-squared stones—a method which I do not approve. What we want in such a wall is ample weight and good vertical bonding; and this can be secured by building in stones of from (say) 2 to 6 tons in weight, practically as they come from the quarry, and surrounding them with smaller stones and good concrete well rammed in so as not to leave any interstices. We are getting in the Elan walls very nearly 50 per cent. of solid blocks to a little more filling; and the whole structures will weigh, when complete, from 157 to 160 lbs. per cubic foot, and will practically be monoliths. In one of them we have built 100 feet high in two eight-month seasons, and cannot discover by careful examination, or with the level, the slightest indication of settlement.

#### ANCIENT WATER-WORKS.

This section of the address was devoted to an interesting description of ancient water-works, particularly of those of Rome; and we may take an early opportunity of reproducing it.

#### THE LAW OF UNDERGROUND WATER.

In a case which came before Committees of both Houses of Parliament a few sessions ago, the "law of underground water" was described by one of the leading Q.C.'s as "simply silly." This was a strong expression to use, but was not inappropriate as applied to the circumstances of the particular case. Shortly put, the facts were these: The Nottingham Corporation had been pumping for a good many years from certain wells sunk in the pebble beds of the red sandstone, as had also several other local authorities in the immediate neighbourhood; the consequence being that the water-level had been permanently depressed in the wells, a stream called the Dover Beck had had the upper part of its course shortened by several miles, and land in the valley had been seriously depreciated in value for lack of moisture. A few years before this fight, the Newark Corporation had been authorized by Parliament to spend £60,000 upon new works; the water being obtained from a successful well sunk in the same beds at Farnsfield, 4 miles the other side of Dover Beck, and  $5\frac{1}{2}$  miles from the nearest Nottingham well at Papplewick.

The Nottingham Corporation now came to Parliament seeking powers to sink three new wells—viz., at Woodborough and Oxton, closely adjoining the Dover Beck, and one 10 miles away to the north, at Boughton. On the new sites they had put down trial borings, so that both the Newark Corporation and the landowners had ample warning of Nottingham's intentions; and the former at once consulted their Engineer (Mr. Henry Rofe), who advised his clients to deposit a Bill asking Parliament to protect them by enacting that within a radius of 4 miles of the Newark well no public body or company should be allowed to sink and pump water to be sent away outside the district—that is, for example, to Nottingham. This was undoubtedly a wise thing to do, as it raised a most important issue in the directest possible way, and was an act of simple self-preservation; for, as the law now stands, the Corporation would have had no redress whatever if pumping at the new Nottingham wells had drawn away their water altogether. The landowners would also have been in a similar distressful condition; and they resolved at once to petition against the Nottingham Bill. It is manifest that it ought not to be possible that this unjust state of things could result automatically from the operation of the law, and that some reform is urgently needed.

As regards overground water, no such anomaly exists, for no public body may abstract water from a surface stream (other than a large river at a low level) without compensating the owners below, either in money or in water; but having made that compensation, they are assured of the water they are taking for supply. Further, no riparian owner may pollute a stream as it passes through his estate, or take water so as to reduce its volume, except for fair and legitimate user upon that estate.

The law of underground water, as it stands, was originally settled, as everybody knows, by a decision of the House of Lords on an arbitrator's award in the case of *Chasemore v. Richards*, in 1859; this being a dispute between the Corporation of Croydon and a millowner on the River Wandle—the latter contending that the pumping at the water-works of the former was diminishing the volume of the stream which he utilized for driving a wheel at his mill. The decision was that there was no right in underground water, unless it could be proved that such water was flowing in a defined and locatable underground channel—a proposition palpably very difficult to substantiate. It could certainly not have been proved either by the Newark Corporation or the landowners who opposed the Nottingham Bill of 1897. Their only hope, therefore, of escape from ruin was to appeal to Parliament not to pass the Nottingham Bill, or in the case of Newark to pass the Bill, which would have operated not only against Nottingham, but also against any other great body desiring to take water away from the Dover Beck district.

As a matter of fact, the Committee of the first House (the Commons) struck out the two offending wells of Nottingham and sanctioned the Boughton, and gave Newark protection, not over the 8 miles circle they asked for—which was a rather large order!—but only within the limits of their parliamentary district of supply. The Lords Committee afterwards struck out this

protection; and meanwhile the Nottingham Corporation had purchased the right to a zone of protection, 4 miles in diameter, round their Boughton well, having fortunately to deal with only one landowner; and this agreement was approved by the Committee and scheduled to the Act.

At our conference in 1897, I made some remarks on this subject; and I raise it again now, because I realize the serious responsibility which an engineer assumes in advising public bodies or companies to spend large sums of money upon well-sinking and pumping machinery for obtaining water to which their Act gives them no legal right such as is given by an Act for the taking of overground water.

In March of this year, Mr. Shiress Will, Q.C., read a paper at the Surveyors' Institution, which set out in a very clear, and, I believe, exhaustive form, all the important cases bearing on this question since *Chasemore v. Richards* up to the present time;\* and in his reply upon the discussion which followed, he said: "I agree with Mr. Richards (who had previously spoken) as regards the hardship inflicted by the existing law in many ways; but I confess that such study as I have been able to bring to bear on the matter convinces me that the law could not with justice be altered in that respect."

I have also given my non-legal mind to a similar study, but feel incompetent to do more than suggest that, by some addition to the Standing Orders of Parliament, Committees may be instructed and empowered to deal with the cases coming before them in what I think would be a reasonable and sensible manner. Some of the cases I have been engaged in have been very interesting and instructive, and have shown that Committees have realized the injustice which may arise out of the law as it exists.

Thus, in 1882, the London and South-Western Spring-Water Bill was introduced, for the purpose of obtaining power to take water from the chalk near Carshalton, just above certain large springs which come out about where the chalk dips under the tertiaries. The result of the Company's operations would, undoubtedly, have been the drying of these springs, and consequently the diminution of water in the Wandle, into which river they ultimately flowed. The Wandle millowners presented a petition in opposition, and the promoters objected to their *locus*, on the ground that they were intending to take only underground water, to which no one had any right. After hearing Mr. Baldwin Latham—whose splendid observational and deductive work in this and other chalk districts is so well known and so highly appreciated—and other witnesses, on the question of a defined channel leading to these springs, the Committee gave the opponents their *locus*, and the promoters, feeling that they could not fight the case on its merits, withdrew their Bill.

In 1884, the Croydon Corporation promoted a Bill for two wells in the same area, one of which would have had, in degree, a similar effect on the Wandle as that just referred to. Again the millowners opposed; and the Committee, having satisfied themselves that serious injury would be done by the pumping from this well, and practically none by the other, struck out the first and sanctioned the second. Similarly, in the Nottingham case I have already referred to, Parliament protected the Newark Corporation and other authorized purveyors of water obtained from wells in the pebble-beds, not by giving them a zone of protection, but by striking out the two Nottingham wells which, under the common law, would have greatly intensified the injury already caused by over-pumping in the neighbourhood.

Thus, in these cases the common sense of Parliament has prevented injustice being done by getting behind the law of the land; but, to use an expressive colloquialism, "this is not good enough." Common sense is not equally and universally distributed, even among the peers and elected representatives of the kingdom; and Committees ought, in my opinion, to have their minds led into the right track, and their hands strengthened to do the right as between all parties.

What I suggest, then, is that when a public authority or a private company promotes a well-conceived Bill for procuring underground water for public supply, and when it can be shown that the source is a proper and rational one under all the circumstances of the case, Parliament, in sanctioning the spending of public or private money (public especially), should at the same time reasonably safeguard the property thus created. This might be done by giving them a zone, having a diameter to be determined after hearing competent evidence, within which no other well should be sunk for the obtaining of water for public supply outside the area so defined.

On the other hand, all persons within the area should be protected somewhat on the following lines—viz.: (1) Those who have spent money in sinking wells or otherwise obtaining water, should, if such water is taken away by the pumping operations of the authorized body, have a similar quantity supplied to them free of cost. (2) Those who have not so spent money, should be supplied at a price to be based upon the cost at which they could, but for the abstraction of the water, have procured it for themselves.

Of course, these are mere suggestions requiring elaboration; but if it were known that such powers would be granted, and such obligations imposed upon promoters, only sound and well-considered schemes would be submitted, and, on the other hand, unreasonable oppositions would probably be materially reduced.

\* See "JOURNAL," Vol. LXXV., p. 737.



The settlement of a few cases on these lines would also have the effect of rendering the law of underground water as simple and understandable as is that dealing with surface or over-ground water.

The question of "support" from underground water, complicated as it is by the fact that in many cases it is impossible to pump water without also withdrawing "ground," is a very difficult one, interesting both to the engineer and the architect; but I will confine myself to what I have said on the "law" as bearing on public water supplies.

#### DIVINING FOR WATER.

The President next, at the suggestion of a gentleman whose opinion he said he could not disregard, offered some observations on the above subject, dealing mainly with the investigation conducted by Professor Barrett, a few years ago, at the request of the Council of the Society for Psychical Research. This portion of the address is deferred to some future issue.

#### TYPICAL CITY WATER-WORKS.

In thinking over what I should say to-night, it struck me that it might not be uninteresting to compare the water supply arrangements of a few representative cities in the United Kingdom, Europe, America, and Australia, which should form a permanent record in our Minutes of their condition at the end of the Nineteenth Century. With this end I have, with considerable labour and the kindly co-operation of the persons best qualified in the different places to furnish me with reliable information, collected what I believe to be the facts of each case; but time will admit of my doing little more to-night than putting these facts in graphic form upon the screen—if such an innovation in a Presidential Address may be permitted—leaving further details for an Appendix. After being at work some time on this, I found that Sir Joseph Bazalgette's address of 1884 contained a long statistical Table of a much more comprehensive character, to which mine may be considered a postscript up to date, so far as it deals with the same points.

The cities I have selected are London, Liverpool, Manchester, Birmingham, Glasgow, Dublin, Paris, Berlin, Vienna, Rome, New York, Chicago, Boston, Philadelphia, and Melbourne; and in respect of these there will be found in an Appendix the following particulars—viz.: (1) Outline plans showing the sources and aqueducts therefrom to the cities. (2) Plans to the same scale in each case of the districts of supply. Diagrams showing (3) the comparative areas of these districts; (4) the relative populations; (5) the relative growths of population during the last twenty years; (6) the total quantity supplied daily; (7) the total capital cost; (8) the capital cost per head; (9) the cost per 1000 gallons delivered; (10) the daily supply per head; and (11) the cost per head delivered.

I now want to call your attention to the striking fact that, out of these fifteen cities (with a partial exception in Rome), in fourteen the water supply is administered by the public authority as directly representing the ratepayers and water consumers, and in only one by the directors of private companies. This fact I feel I may fairly take as a justification for expressing my own views upon the general question of the proprietorship of water undertakings, and of the London case in particular. Shortly, then, I think the fourteen places are right and the fifteenth wrong, and that the recent recommendation of Lord Llandaff's Commission as to the acquiring by some representative public body of the undertakings of the eight London Water Companies is in accord with the consensus of the best official, parliamentary, and public opinion of the day.

I am not speaking without some experience in this matter. In 1876, I was (as I am still) Engineer to the Stockton and Middlesbrough—now Tees Valley—Water Board, who in that year succeeded in passing through the two Houses of Parliament an Act for the compulsory acquirement of the undertaking of the Company bearing the same name; and for the last ten years I have advised the Birmingham Corporation, who in the previous session, after getting a Purchase Bill through the first House, agreed with the local Water Company without further contest in the second.

In the Stockton case, the Committees decided that the Company should be paid full statutory dividends in perpetuity, or, if a capital payment were preferred, the amount of such dividends multiplied by 25 years' purchase; also a sum for prospective value and compulsory purchase, to be settled by arbitration failing agreement. No agreement was come to; and an arbitration ensued in 1878, under which the Company received an addition of nearly 40 per cent. to the authorized dividends capitalized—an award eminently satisfactory to the shareholders. Although at the time the price was considered very high, it has never been complained of as an improvident purchase by the ratepayers or water consumers, being, in fact, only 26½ years' purchase of the net income; and no reasonable people in the district would prefer that the transaction had not been accomplished.

In the Birmingham case, the price agreed with the Company was such that the Corporation had been able, between the date of purchase and the introduction of the Bill for the Welsh scheme in 1892, to lower the water charges on two occasions; and it was estimated that the reimposition of rates similar to the Company's, coupled with the natural increase in revenue, would pay interest on the capital outlay of the new great gravitation works.

These two notable cases occurring together, gave great encouragement to the growing feeling of many local authorities in favour of purchasing the works of water companies supplying their districts; and many transfers have taken place in the meantime—some by agreement, and some by direct parliamentary compulsion. I have been concerned in a number of these cases; and, with possibly one exception, all the transfers have been made on terms fair and advantageous to the sellers. Wherever I have been sole Arbitrator or Umpire, my anxiety has always been to give the owners who were being dispossessed of their property the reasonable benefit of any doubtful point; and I am sure that in this way substantial justice to all parties can be, and practically is, always done.

The soundness of the principle—that the purveying of water to the public should be one of the distinctive functions of the responsible sanitary authority of any district—is really incontestible, notwithstanding the persistent and ever-enduring conservatism of some of my best friends, who hold the view that it is something akin to sacrilege to attempt to lay hands upon the property of shareholders in any water company trading either with or without parliamentary sanction. If they are right, then all the great intelligent and energetic business cities in this country are in the wrong; for practically all of them have bought out one or more water companies prior to taking upon themselves what, in my opinion, is their most important public duty. If they are right, the Duke of Richmond's Commission was wrong in 1869; for that very capable body advised the purchase of the London Water Companies. If they are right, Parliament was wrong in approving the Birmingham Purchase Bill of 1875, the Stockton and Middlesbrough Bill in 1876, the Sheffield Bill in 1888, and scores of others. If they are right, Lord Llandaff's Commission was wrong in recommending only last year the purchase of the undertakings of the eight Water Companies supplying Greater London.

In this matter, I wish to be distinctly understood. I have the greatest admiration for the enterprise which years ago provided water for hundreds of towns in this country when there were not in existence public bodies able or willing to perform the duty. I sympathize with their struggles in the early years, when the dividends crept slowly up from nothing to 2 or 3 per cent.; and I think that most of them were righteously earning the full 10 per cent. they were dividing under the General Act, when the unscrupulous greed of a corporation prompted the laying of unholy hands upon their property. Here my sympathies end, and my common sense comes in; and allow me to say, in parentheses, to the younger of my audience that if common sense is not one of the most important accomplishments of an engineer, then my fifty years' experience of active work has taught me very little.

I can quite understand the owner of a family estate objecting strongly to being compelled to sell any part of it for a railway or a reservoir, the construction and user of which will interfere with the amenity and privacy of his residence and grounds; and I can realize how hard it may be when *force majeure* of any sort compels a man to part with old plate or jewels or pictures associated with the memory of his fore-elders. The circumstances would, however, be very special to enable me to believe that any such sentiment can attach itself to the possession of, or the parting with, shares in a water company. This possession brings the owner in (say) £500 a year; and if the result of the transfer of his water company to a public body is to assure him of a similar annual sum *plus* all prospective value inherent in his investment, I cannot for the life of me see where he is hurt, and why such a tremendous grievance should be made out for him by his expert advisers, to whom I have previously referred. I cannot but think that nine out of ten common sense businessmen would say: "Assure me of all the active and dormant value of my present investment in some other shape, and then you may take it, and welcome." As I believe that this is the result attained by the ordinary process of arbitration in ninety-nine cases out of a hundred, I do think it is high time that this false and pedantic sentiment, which stands in the way of transfer, should be allowed to die out.

But I want to carry this matter of the taking over of water undertakings by public bodies a little farther—I am speaking, be it remembered, only of water, because I deem it of great importance, and have little sympathy with municipal trading in general. There is a clause in the Public Health Act, 1875, No. 52, which provides that no public body shall compete with a company having statutory powers within their district, so long as that company are "able and willing" to supply water proper and sufficient for all reasonable purposes, &c. This provision is very frequently an obstacle to any action being taken, because the question as to whether a company are "able and willing" is one that cannot be settled without a costly arbitration, which may or may not result in the company being found in default when all the circumstances of their position are taken into account.

Now I think the time has come when this enactment should either be repealed or so modified as not to hamper an authority anxious to acquire a company's works, and at the same time to deal fairly with the shareholders. I would suggest that the fact of a company being, or not being, able properly to supply water should not have any bearing whatever upon the question of purchase, but that a public authority should be empowered to acquire any water undertaking upon giving reasonable notice—



provided that authority are willing to pay such a price as may be determined by a competent arbitrator or arbitrators, either to be agreed upon between the parties or appointed by some Government Department.

The present method of obtaining powers to purchase by means of a Bill in Parliament is very costly, uncertain, and open to many contingencies and objections. The result depends in great measure upon the preconceived views of the Chairman or other strong members of the Committees, or the force of the advocacy on one side or the other. There are no settled principles or Standing Orders to guide them; and consequently there is no consistency in the decisions of the two Houses in one session or of the same House in two sessions upon the same case. It thus happens that a public authority may be encouraged, or even put under obligation, by a Committee in one session to promote a Purchase Bill in the following session, which they may do at enormous cost, only to find that the Committee appointed to consider the Bill holds entirely different views from its predecessor, throws out the Bill, and much time, labour, and money are lost. After a large experience in the work of Parliamentary Committee-rooms, I am convinced that no more upright and independent tribunals exist. But I am equally certain that, for lack of uniformity and consistency of practice, serious mistakes are not unfrequently made; and for these reasons I contend that, in such an important public matter as that I am dealing with, the procedure should be simplified on the lines suggested.

The question of buying out the eight Companies who provide water for the people residing in the City and County of London and districts outside—a parliamentary area of 620 square miles—has been debated, to my knowledge, for over thirty years. As I have already stated, the Duke of Richmond's Commission advised the purchase in their report of 1869; and in 1880 the matter assumed a very practical form, when, by instructions of the then Home Secretary (now Lord Cross), Mr. E. J. Smith completed provisional agreements with all the Companies. The negotiator was a very able man, and had in the main arranged very fair terms, which might probably have been improved to the satisfaction of everybody, but that unfortunately the Liberals, who were then in opposition, made a party cry of the matter; a large Committee, presided over by Sir William Harcourt, with Mr. Chamberlain as his right-hand supporter, disapproved of the terms, about which the newspapers had befogged the public with misleading interpretations; the agreements fell through; poor Mr. Smith died; and the Conservative Government was deposed. Thus ended ignominiously, by reason of political jealousies, a praiseworthy attempt to negotiate in a friendly spirit an important business transaction, the completion of which would have saved over twenty years of bitter and costly contest; and we are to-day very little forwarder than we were in 1878.

Of recent years, a settlement with the Companies has been delayed, owing mainly, in my opinion, to the wrong-headedness of the London County Council through their endeavouring in every possible way, and with pertinacious ingenuity, to depreciate the value of the undertakings prior to purchase. For myself, I have never seen any essential difference between the London case and scores of others which have been settled either by agreement or by arbitration. The aggregated amount of purchase-money will, of course, be very great; but that involves merely arithmetic, and no new or unusual principle comes in to complicate the awarding of compensation fair and just as between the parties.

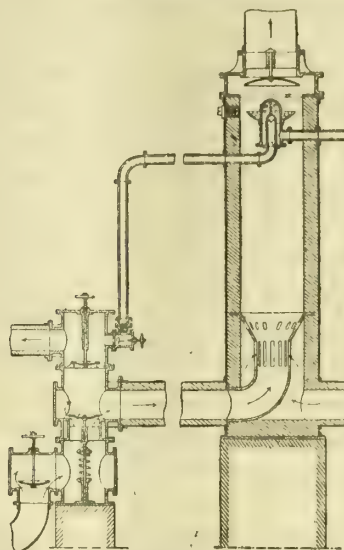
Lord Llandaff's Commission of 1899 have recommended that the Companies' undertakings should be purchased, and the water supply afterwards administered by a permanent Water Board of thirty members, constituted of representatives from the six counties of which Water London embraces parts, the Conservators of the Thames and Lea, and the Borough of West Ham—the Local Government Board appointing the Chairman and Vice-Chairman. With some alteration in the numbers, and in the power to vary them at fixed periods according to the relative populations of the districts they represent, I think this is a workable scheme.

**The Drummond Light.**—In the course of Professor Lewes's Cantor Lectures at the Society of Arts on "The Incandescent Gas-Mantle and its Uses," which have just been printed in the "Journal" of the Society, he gave Drummond the credit of being the first to show that a piece of dense lime could be raised to intense incandescence by the heat of the oxy-hydrogen blow-pipe flame. All the leading text-books on Chemistry likewise attribute this discovery to Drummond. Mr. J. Paul de Castro, however, points out, in a letter to the "Journal" of the Society, that the fact was established by the experimental work of Sir Goldsworthy Gurney, who lived between 1793 and 1875, and was described in his "Course of Lectures in Chemical Science," where an illustration is given of the apparatus he designed and constructed for the purpose. Mr. de Castro quotes the following paragraph from the "Dictionary of National Biography," which, he says, places Gurney's claim in a still clearer light: "He [Gurney] discovered the powerful lime-light known as the Drummond light, because first used by Thomas Drummond (1797-1840) in his trigonometrical survey of Ireland in 1826-7. But Drummond, in a letter to Joseph Hume, the Chairman of a Committee of the House of Commons on lighthouses, stated that 'he had no claim to the invention of the light, for he had it from Mr. Gurney in 1826.'"

## REGISTER OF PATENTS.

**Compressing Air and Gas.**—Gobbe, E., of Jumet, Belgium. No. 23,765; Nov. 28, 1899.

This apparatus for use in compressing air and gas mainly consists (as shown) of an explosion-chamber constructed of a sheet-metal cylinder, lined with fire-resisting material protecting the metal from the action of heat. The explosion-chamber is connected at its lower part with two pipes, through one of which air is conducted into the explosion-chamber, while the other similarly supplies the chamber with gas. At the top, the explosion-chamber communicates with a chimney of sufficient height to ensure an adequate draught, for which purpose it may be connected with a mechanical suction appliance, or simply with a steam-jet extractor. At the base of the chimney is arranged a valve kept open by its own weight, and adapted to descend but a little distance below its seat. At the extremities of the air and gas pipes respectively, there are provided



delivery-valves and suction-valves, which, by means of springs, are raised a short distance above their seats. Regulating-valves enable the amounts of air and gas admitted to be controlled or varied as required, so as to obtain a suitable mixture for explosion in the explosion-chamber. The air and gas meet after passing through a tuyere, provided with a number of perforations, which serve to agitate the air and gas to thoroughly mix them; while an igniter situated near the top of the explosion-chamber receives compressed gases from collectors. The flame produced in this igniter passes through a number of small perforations of a fire-resisting piece forming the cap of the igniter, which is fitted with a perforated dish or "basket" adapted to receive incandescent charcoal or the like for starting the apparatus.

**Combined Gas-Motors and Compressors or Blowers.**—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 24,494; Dec. 9, 1899.

This invention relates to combined gas-motors and compressors or blowers, in which the pistons of the compressing cylinders are driven direct by the pistons of the gas-motor cylinders, or, at any rate, so driven as to complete their strokes together.

A specially suitable application of this invention (the patentees point out) is to blowing engines, for compressing the air used for blast in a blast-furnace, and driven by the gas from the furnace itself. Such gas has a very low thermal value; and it is of importance that the residual burnt gases left in the combustion-chamber of the motor-cylinder at the termination of an exhaust-stroke, should be scavenged out and replaced by pure air. The object of this invention, therefore, is to take scavenging air from the compressing cylinder, utilizing mainly the air left in the cylinder in its clearance spaces, so as not to materially reduce the volume of air delivered by the compressor.

The main feature of the invention consists in a method of scavenging in which a volume of air is conveyed from the compressor to the motor-cylinder by a pipe, provided with valves, one at each end, which are automatically closed, except at the termination of an exhaust-stroke, when they open to permit the passage of air for scavenging the motor-cylinder. To effect this, the combined engine and air-compressor has the air-compressing piston driven direct by the piston of the motor, and has also the combustion-chamber of the motor in communication with the compressing cylinder, at certain periods, by a pipe, provided with automatically-worked valves.

**Internal Combustion or Explosion Engines.**—Heys, W. G.; a communication from J. J. Heilmann, of Paris. No. 11,247; June 21, 1900.

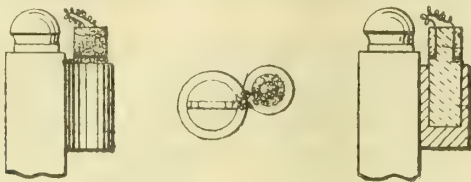
This invention relates to a type of explosion motor (operated by gas or petroleum) having cylinders containing two pistons each, between which the explosive effort takes place. It consists in an arrangement of parts and means by which the explosive shock upon the pistons is transmitted to a crank or cranks, with the best equilibrium among the parts in movement, and with the least shock or jar upon the frame; and in means for ensuring a constant lubrication of parts—enabling also their easy examination while at work.

**Self-Igniting Gas Mediums.**—Archer, D. J., of Toronto, Canada. No. 11,517; June 25, 1900.

The object of this invention is to prevent the coalescing (caused by heat) of the atoms of platinum black in powder form used to cause the gas to ignite, and to render the platinum wire employed therewith incandescent in the shortest possible space of time after the gas has been turned on.



The illustrations show a side elevation of an ordinary gas-burner with self-igniting gas medium attached thereto, and a vertical section and plan through the medium, showing its construction.



It is well known (the patentee remarks) that platinum black will occlude a large quantity of oxygen from the air, and that, if a stream of hydrogen be directed upon it, the chemical combination of the two gases takes place with sufficient energy to raise the temperature of the platinum black until it becomes red hot, or is sufficiently hot to render incandescent a platinum wire held against it, and which, being situated where the air and gas mix, ignites the gas. It has, however, also been found that repeated heating of the platinum black causes the atoms to coalesce; and when this has occurred, they are not in a finely-enough-divided condition to occlude oxygen at the ordinary temperature and cause the combination therewith of hydrogen gas with sufficient rapidity to render the platinum wire incandescent when in the path of the gas. To overcome these defects, the patentee claims to have invented the following process of manufacturing self-igniting gas mediums: Bone-ash is heated sufficiently to remove all impurities from it, and after cooling it is thoroughly mixed with water so as to make a paste that can be easily worked, in the proportion of one-third bone-ash to two-thirds platinum black. This mixture is put into a mould, so as to form a pellet, preferably with a hole through the centre. When the pellet is in the mould, it is dried or baked in a gradually rising temperature, until it is hard enough to be handled without damage. It is then removed from the mould and put into a flame and heated to a red heat. When it becomes red hot, the pellet is removed from the flame, and allowed to gradually cool off in the atmosphere. By mixing the platinum black with the bone-ash, and treating the compound in the manner described, it is said that the atoms of platinum black are prevented from coalescing, by the atoms of the bone-ash; and thus their efficiency to occlude oxygen from the air will not be impaired.

#### Gas Lamps and Lanterns for Exposed or Inaccessible Positions.—Himmel, G., of Tuebingen, Württemberg. No. 11,615; June 26, 1900.

This invention relates to the employment of incandescent gas-lamps elevated on masts or poles and in other inaccessible positions for illuminating open spaces. It formed the subject of one of the papers presented to the recent International Gas Congress in Paris.

As is well known, the patentee remarks, some gas lanterns or lamps have to be lowered at intervals for the purpose of being cleaned, and of enabling the burners to be examined. It is therefore necessary that the lantern or lamp should be removable from the gas supply or admission socket, which is rigidly attached to the pole, and, by an automatic horizontal displacing device, should be capable of being brought out of the way of the gas-supply socket, so that no impediment prevents the lantern being lowered. This device for automatically displacing the lantern vertically out of the way of the gas-supply socket also allows of the automatic insertion of the lamp in the gas-supply socket when the lamp or lantern is again drawn up to the top of the pole. The socket is provided with a cock-plug, by means of which three different positions can be obtained—that is to say, three distinct gas-supply passages may be opened or closed, according to whether the lighting, or only the permanent flame, or both of these and the pilot-flame are to burn. The adjustment of the cock-plug takes place by means of a draw-bar from the ground, or from a staging or basket situated on the pole. Beneath the lantern a gas-supply cone is fixed to the pole, which cone, after the lantern has been drawn up, is inserted in the socket by means of the horizontal adjusting device, and supplies gas to the lantern from its different holes or bores—that is to say, to the lighting flame, the permanent flame, or the pilot-flame, according to the position of the cock-plug.

One form of the invention is shown in the engraving, in which figs. 1 and 2 show the device for automatically connecting the lantern with the gas-pipe on a mast or pole. Figs. 3 and 4 are vertical and plan views of the inserting device. Fig. 5 is a section of the socket-casing and cock-plug, as well as the supply-cone situated on the lantern or lamp. Fig. 6 is also a section of the socket-casing with the plug and cone seen from the front. Figs. 7, 8, and 9 show the different positions of the plug.

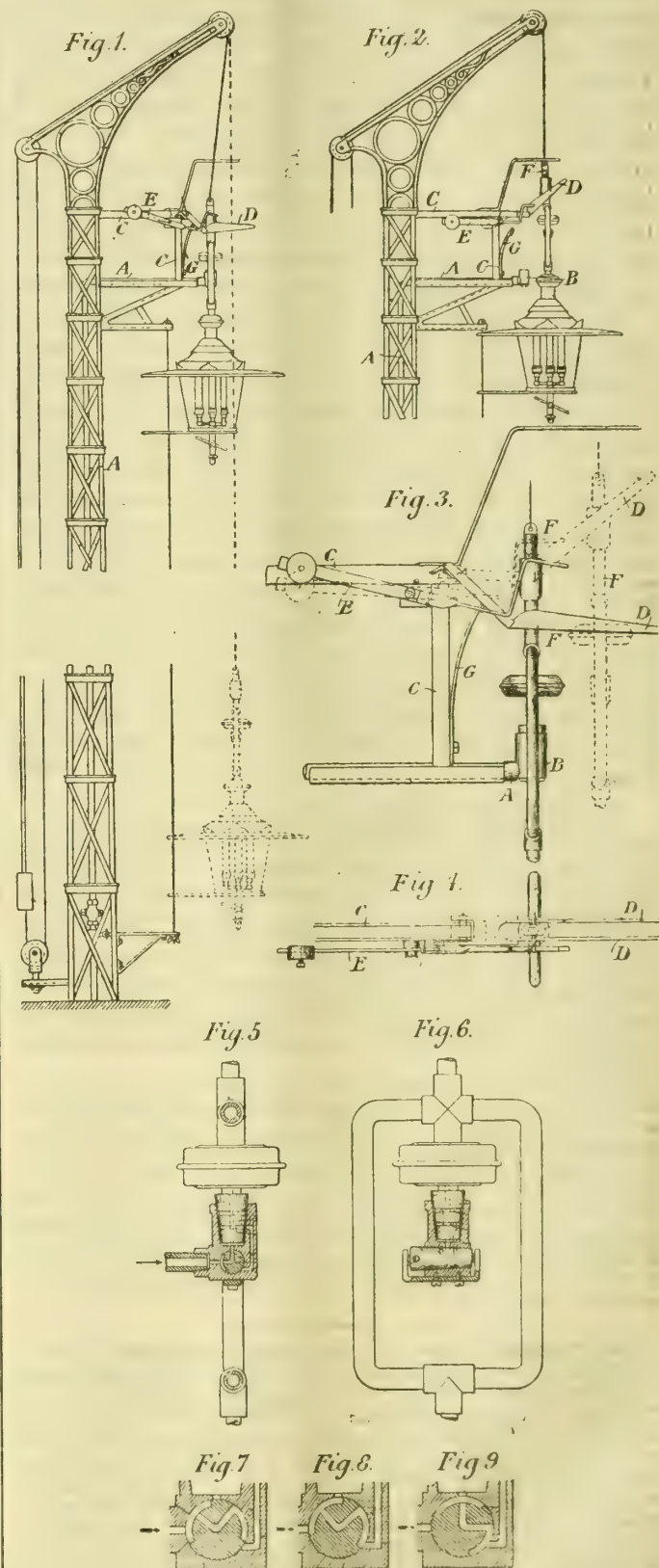
The supply of gas to the lamp takes place through a pipe A and a socket or nozzle B, from whence the gas passes to the lamp through a cone or plug and a lyre-shaped suspension-frame. When the lamp is drawn up by means of the cord shown, the following arrangement is employed, in order to obtain an exact and automatic insertion of the cone in the gas-supply socket, which latter is rigidly connected with the mast or pole. An elbow-frame C, connected with the standard, is placed on the frame carrying the gas-pipe. On this elbow-frame a forked bell-crank is pivotally mounted by pins; and on the front end of the lever A D is mounted, while on the rear end (in proximity to the pivots) is another small elbow-piece. A double-cranked lever E, pivoted on a screwed pin, is also mounted on the elbow-frame C, being held in a given position by means of a counter-weight arranged on its rear arm, and the front part of the said lever being bent in a double right-angle form. When the lamp is in a position for use, and its lyre-shaped frame carries above in the centre a suspension-tube F provided with a guiding-hub from which the lantern is carried by the suspension cord, the fork-shaped lever D and the double-cranked lever E occupy the position shown in full lines in fig. 3. The guide-socket or hub of the lamp lies between the two arms of the fork D, and one of the two cross-pins (fig. 4) rests upon part of the double elbow-lever E, and holds it firmly in the position shown in full lines in fig. 3—the two cross-pins being arranged on the tubular-piece F above the socket.

If, then, the lantern, for the purpose of being lowered, is drawn up a little from the fork D, the lever E, in consequence of its weight, alters its position, and assumes the position shown in dotted lines in fig. 3, and is

held fast in this position by encountering a pin fixed on the frame C. By this drawing up of the lamp, the cone comes out of the socket B. The plug must have been previously brought into the position shown in fig. 9, by which the admission of gas to the lamp is prevented.

In the lowering of the lamp or lantern which then follows, the pins rest on the arm of the fork, and it is pressed back until the pins come underneath, whereupon it is again automatically returned by the spring G into the position shown in full lines in fig. 3.

When the lamp is again drawn up to the top of the pole (to bring it into its position for use), the upper cross-arm of the lamp-frame first turns the fork-piece D upwards, until it occupies the position shown in dotted lines in fig. 3. The elbow-piece of the forked lever then rests



against a projection formed on the inner side of the lever E, and projects laterally therefrom, preventing the forked lever from turning back. The latter remains stationary in the position shown in dotted lines; and the pins attached to the suspension-tube F slide down the upper surface of the inclined fork D, which then occupies such a position that the cone is automatically inserted in the socket B, and there fits tightly. Before, however, the cone is finally seated in the socket, the pins encounter the elbow-piece of the lever E, and turn it, whereby the lateral projection of the lever is depressed, the bent piece is disengaged from it, and the fork lever drops until it encounters the end of the spring G, and is stopped by it. Thus the lamp which has been lowered, when drawn up again into position, is automatically conveyed into the correct place.

When the lamp is lowered from its highest position into its position for



use, the cone (as already described) enters the supply-socket B, and fits tightly therein—being attached to the lyre-shaped suspension frame of the lamp. The plug then, by means of a cord communicating with the ground-level (or a basket or platform on the pole), is brought into the position in which the supply of gas is turned on for the lighting of the permanent and the starting flames (fig. 8), by which means, if the igniting flame be lit by a spirit light or a platinum wire device, both the permanent and also the lighting flames are ignited. In the position of the plug shown in fig. 8, the gas flows through the main pipe into recesses, whence it partly passes through the central passage of the plug to the lighting flame, and partly through a passage connected with one recess into a second recess, which, in turn, is connected with two passages in the casing of the socket, which lead to the permanent and the starting flames respectively through openings provided in the cone, with which the pipes to the permanent and lighting flame are connected. As soon as the permanent and the lighting flame are ignited, the plug is again turned, either into the position shown in fig. 5, in which gas is conveyed both to the permanent as well as to the lighting flame, or, in case the lighting flame is to be extinguished (for instance, in the day time), it is brought into the position shown in fig. 7, in which all the connections except to the permanent flame are shut off. Thus, as long as the lamp is in the position for use, it is always only necessary to effect a change of the cock from the position shown in fig. 5 to that in fig. 7, or *vice versa*, in which either the permanent and the lighting flame or the former alone are kept burning. When the lamp has to be lowered to be cleaned, the plug is brought into the position shown in fig. 9, in which all the passages are closed.

**Pressure-Regulators for Gas-Burners.**—Ackermann, F., of Nordhausen, Germany. No. 13,563; July 27, 1900.

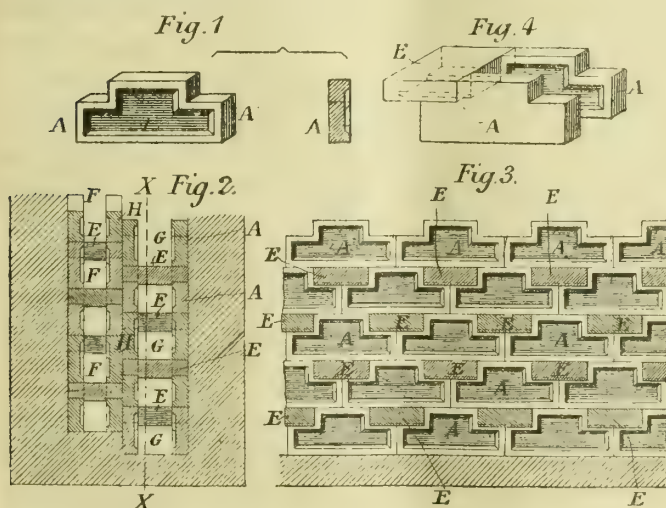
This gas-pressure regulator consists of a conical needle-valve projecting from a plate or cup (of suitable weight) arranged within a cylinder or extension in the gas-supply pipe. The cup has sufficient free space in the cylinder for the desired quantity of gas to freely pass to the burner, when the pressure is normal. When, however, the pressure increases, the cup will be raised and the needle pressed upwards into the passage according to the pressure of the gas and the weight of the cup, so that an equilibrium is established. Since the needle is a conical valve—i.e., increasing in section towards the bottom—it is evident, that the outlet orifice will be reduced in proportion to the height to which the cup is raised, thereby reducing the quantity of gas issuing from the burner in proportion to the increased gas pressure.

The weight of the cup is empirically fixed according to circumstances, so as to correspond to the normal pressure. It can, however, be replaced by a spring arranged between the base-plate upon which the gas-pressure acts and the top of the cylinder—the spring power being previously regulated or chosen.

**Regenerative Furnaces and Bricks Therefor.**—Gibbons, W. P. & G. B. A., and Masters, E., of Dudley. No. 16,256; Sept. 12, 1900.

This invention refers to the construction of the gas and air passages of regenerative furnaces, and in bricks for forming the vertical walls of the passages.

Fig. 1 is a projected view and a cross-section of one of the bricks referred to; fig. 2 is a cross-section of a part of the gas and air passages of a regenerative furnace constructed according to this invention; fig. 3 is a sectional elevation on the line X of fig. 2; and fig. 4 is a projected view of a portion of the same.



The bricks for the vertical walls of the passages are made (fig. 1) with an indented panel on one face, corresponding with the outline shape of the brick, so as to reduce its thickness and weight and the thickness of the division-walls, without reducing their strength. Each brick A has an upwardly projecting rectangular lump, the length of which is about half that of the brick, leaving two equal rebates at either side to receive the cross-tiles E, which form struts to keep the walls the proper distance apart, and "being heated by the waste gases, give up their heat to, and split up, the incoming gas and air when the furnace is reversed."

In building the air and gas passages F G, the bricks A are laid in courses end to end (see figs. 2 and 3), and the rebated cross-tiles E are laid in the rebates between the lumps, so that there are cross-tiles and lumps alternately. In the wall H, between the air-passage F and the gas-passage G, the panelled bricks are placed back to back (see fig. 2), and

are so arranged—as is usual with other bricks—that the joints of the bricks in one course miss the joints in the other course, so as to prevent by-passing of the gases.

## APPLICATIONS FOR LETTERS PATENT.

- 19,310.—STEVENS, A. A., "Gas-engines." Oct. 29.  
19,337.—M'DONALD, D., "Acetylene gas generating apparatus." Oct. 29.  
19,363.—EHMANN, C. P., "Incandescent gas-burners." Oct. 30.  
19,365.—BINGHAM, C., "Acetylene generators." Oct. 30.  
19,368.—LEVETUS, E. L., "Acetylene generators." Oct. 30.  
19,370.—RYDILL, G., "Socket filters, and appliances for fixing the same firmly to the ends of taps, valves, and pipes made capable to resist internal or external pressure for water, steam, gas, or air." Oct. 30.  
19,377.—CROSSLEY, W. J., and ATKINSON, J., "Gas-producers." Oct. 30.  
19,452.—DAW, F. W., "Chimneys for illuminating burners." Oct. 30.  
19,475.—JONES, P. C., "Incandescent gas-burners." Oct. 31.  
19,482.—CROSSLEY, W. J., and ATKINSON, C. J., "Internal combustion motors." Oct. 31.  
19,534.—METROPOLITAN GAS-METERS, LTD., and FORSTER, J. D., "Pre-payment gas-meters." Oct. 31.  
19,535.—WINKLER, H., "Incandescent gas-burners." Oct. 31.  
19,568.—LOISEAU, R. T., "Employment of compressed air or gas for transmitting force or motion." Nov. 1.  
19,604.—WISE, W. L., "Gauging the temperatures of substances which become luminous or incandescent when heated." A communication from E. F. Morse, J. D. Cox, and F. F. Prentiss. Nov. 1.  
19,648.—PURSER, H. E., and GLOVER, F. T., "Tubing for the delivery of liquids or gas." Nov. 2.  
19,697.—GUIMARAES, J., "Gas-lamps." Nov. 2.  
19,760.—HARVEY, E. C., "Gas heating and lighting appliances." Nov. 3.  
19,772.—BOWLEY, J. W., "Lamps." Nov. 3.  
19,776.—MALLOL, J., "Incandescent gas-burners." Nov. 3.  
19,778.—SMITH, A. D., MACDONALD, W. D., and ROLLS, C. S., "Burners." Nov. 3.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Paris Gas Company's Coal Contracts.

SIR,—I have read in the "JOURNAL" for the 30th of October your remarks in reference to some contracts made for three years for Durham gas coals by several gas companies, the Paris Company among the number. I had noticed, as others had done, the statements made by the Newcastle papers; but we did not trouble to contradict them, as it seemed to us that the readers of those papers were in a position to estimate their real value. But as you have reproduced them, and your readers may be misled thereby, I beg to inform you that they were incorrect. I cannot say anything as to the other companies, but I can assure you that the Paris Gas Company have not made any coal contract at 13s. 9d. per ton for a delivery of 100,000 tons per annum during three years. We have not entered into any contract for Durham coal since the beginning of May; and the prices paid were lower than those stated in the articles you have read. It is not at a time like the present, when everything justifies us in reckoning upon a fall in prices, that we should agree to pay such high rates. It has been a matter of surprise to me that the Newcastle papers should have given publicity to statements the accuracy of which they could have easily verified.

A. BOISTIERE,

Chief of the Coal Department.

Paris Gas Company, Nov. 8, 1900.

## LEGAL INTELLIGENCE.

### SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Nov. 8.

(Before the MASTER OF THE ROLLS and Lords Justices COLLINS and STERLING.)

Welsbach Incandescent Gas-Light Company, Limited, v. United Chemical Works.

Mr. NEILL applied *ex parte* that an appeal by the defendants from the order of Mr. Justice Day, made in Chambers, granting an injunction restraining infringement pending the trial, might be marked "urgent." The defendants began manufacturing, advertising, and putting their mantles on the market in March last. The plaintiffs knew all about it in April, for they actually threatened and proceeded against customers of the defendants.

The MASTER OF THE ROLLS: Have you been put under terms not to go on selling the mantles?

Mr. NEILL: Yes, and not to advertise. The learned Judge also enjoined the defendants against representing that their mantles were not an infringement of those of the plaintiffs.

The MASTER OF THE ROLLS: This is one of the many actions which the Welsbach Company have had to bring to prevent their mantles being infringed?

Mr. NEILL: Yes. The writ was issued in August, and an interim injunction obtained in the Vacation; but when the summons was heard by Mr. Justice Farwell, he declined to continue the injunction, on account of the delay and of the attack on the validity of the patent. The plaintiffs then stopped the action, commenced a fresh one, and took out a summons in Chambers, which came before Mr. Justice Day, in respect of the same mantles, the same infringement, and the same parties. One of the reasons for asking that the matter should be marked "urgent" was that, owing to the defendants having been allowed to go on manufacturing and selling without let or hindrance from the plaintiffs, they had built up a considerable trade, and had large orders on hand. If the



appeal was not heard soon, their trade would be seriously damaged. He applied for leave to serve short notice of appeal for Monday next.

The MASTER OF THE ROLLS said they would take the case on Tuesday morning, after anything part heard.

#### Friday, Nov. 9.

Mr. NEILL to-day stated that plaintiffs were advertising in the daily papers the injunction granted by Mr. Justice Day, with these words at the bottom: "Any sale or use of the 'Guaranty' mantles will render all concerned liable to proceedings for contempt of Court for breach of the said order." Under these circumstances, he asked that the order should be suspended over Tuesday. The plaintiffs were also going round to defendants' customers and threatening them, the result of which would be to destroy their trade.

The MASTER OF THE ROLLS: You have an undertaking in damages. The more they ruin your trade, the more the damages will be.

Mr. NEILL said it was a very serious matter to the defendants.

The MASTER OF THE ROLLS: We will grant you an injunction *ex parte* restraining them from doing what you are complaining of now over Tuesday.

Mr. NEILL: And from representing to our customers that mantles in their possession are within the purview of the order of Mr. Justice Day?

The MASTER OF THE ROLLS: Yes. Of course, the defendants will give an undertaking in damages too.

#### Stealing Gas at Swansea.

At the Swansea Police Court last Thursday, William Evans, of No. 20, Wychtree Street, Morriston, was summoned for wilfully and fraudulently preventing the gas-meter at his residence from registering the correct quantity of gas consumed on the 31st of October. Mr. W. Smith, who prosecuted on behalf of the Swansea Gas Company, said the case against the defendant was a very bad one, and it was necessary that it should be followed up by the Company for their protection. The proceedings were taken under section 38 of the Gas-Works Clauses Amendment Act, 1871; but it was competent for the Company to have made a more serious charge against the defendant. They did not wish to unduly press the case, being only desirous of showing that this fraudulent trick could not be carried on with impunity by dishonest people. Mr. Smith then proceeded to show the Bench, by means of a model, how Evans got his free supply of gas. From the "slot" meter in his possession, the inlet and outlet pipes had been disconnected and some india-rubber tubing employed to join the pipes; and as the gas obtained by this means did not pass through the meter, it was never recorded. On Oct. 31, an inspector of meters called at defendant's residence and found an escape of gas. On removing an old straw hat from the top of the meter, he discovered the cause of the leakage, and also Evans's ingenious plan to defraud the Company. The matter was duly reported to the General Manager (Mr. Thornton Andrews), and Evans admitted his guilt. Mr. Smith called evidence bearing out his statement; and the Bench imposed a fine of £4, inclusive of costs.

#### Unlawful Use of Water for a Vessel.

At the Bristol Police Court, a few days ago, Charles Lamey, master of the ketch *Cornflower*, was summoned for using, not being a person supplied with water by the Bristol Water Company, water from the pipe of another consumer. Defendant, who was away at sea, was represented by a friend. Mr. E. Gerrish appeared for the Company, and said that Messrs. Durnford, contractors, were engaged on some works on the Grove, Prince Street, and had applied to the Company, and received permission, to take water from a stand pipe for the purposes of their work, at a certain rate. Defendant was the master of a ketch which traded, he believed, between Bristol and Devonshire. The boat arrived in Bristol on the 13th of October; and about 5.30 the next afternoon defendant was seen to take buckets of water from a hose which led from Messrs. Durnford's supply, to the vessel. A constable who was on duty noticed the occurrence, and went to defendant. The latter stated that he had permission to take the water; but he could not have had this unless it was from the Company. They supplied shipping with water at certain rates, and the present prosecution was taken under the Water-Works Clauses Act, 1863, which made defendant liable to a penalty of £5. One of the water police said that at 5.35 on the afternoon of the 14th of October he was on the Grove, and saw defendant on his ketch. There was a small india-rubber hose leading from the pipe of Messrs. Durnford to the vessel. Defendant was filling buckets at his end, and was emptying them into the ship's breakers. Witness spoke about it to Lamey, who said he had the watchman's permission; but the watchman denied having given it. He said he had filled three breakers. Mr. Ernest Abbott, Chief Inspector for the Company, said the defendant was not supplied by them with water, but Messrs. Durnford were. The defendant's representative stated that the vessel had brought in a cargo for Messrs. Durnford, and the crew were working for them in unloading, and he thought they could use the water as workmen for Messrs. Durnford. The Bench fined defendant 20s. and costs, or 21 days.

**Further Gas and Water Powers for Mansfield.**—The Mansfield Town Council, at a special meeting yesterday week, resolved to promote a Bill in the next session of Parliament for the purpose of making further provision with respect both to the gas and water undertakings, and to sanction the purchase of the works of the Mansfield Woodhouse Gas Company, Limited.

**Georgetown (British Guiana) Gas Company.**—At the half-yearly meeting of the Georgetown (British Guiana) Gas Company, last Tuesday, the following report of the Directors for the six months to June 30 was, on the motion of the Chairman of the Company (Mr. Charles Gandon), adopted without discussion: The loss on the revenue account amounted to £200 19s. 3d., which has been written off the reserved fund; and there are no funds available for the payment of interest on the debenture bonds, dividends on the share capital, or Directors' fees. The proposals for the sale of the works, referred to at the adjourned meeting in May last, have not, so far, resulted in anything definite; but negotiations are still pending.

## MISCELLANEOUS NEWS.

### IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. T. H. G. NEWTON in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting, and also the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 30th of June last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year was 3534 million cubic feet; the quantity made in the corresponding half of 1899 was 4538 million cubic feet—a decrease of 1004 millions.

The decrease in the quantity of gas made at Vienna, owing to the surrender of the entire supply in the inner districts, amounted to 1305 million cubic feet. Therefore, excluding Vienna from the comparison, it will be seen that the other stations of the Association exhibit an increase in the production of gas of 310 million cubic feet—giving an average rate of increase of 10·6 per cent.

The total number of lights on the 30th of June last was 2,258,335; at the close of the corresponding half year, the number of lights, including over 600,000 in the inner districts of Vienna, was 2,651,088—the net decrease being 392,753.

During the half year under review, 27 miles of new mains were laid, making the entire length of mains in use on the 30th of June last 1655 miles; being 303 miles less than on the 30th of June, 1899, when the length of mains was 1958 miles. This figure included 343 miles of mains in the inner districts of Vienna, and 22 miles of mains at Essegg and Neutra, which stations, as the proprietors were informed in the last report, have been transferred to a new Hungarian Company. The number of consumers on the books of the Association on the 30th of June last was 191,445, as compared with 226,014 on the 30th of June, 1899—a decrease of 34,569; the loss of consumers in the inner districts of Vienna being 56,000. The decrease in the sale of gas at Vienna equally affects the receipts for gas and the profit for the half year, both of which exhibit a diminution.

There was an increase in the gross cost of coal of 1s. 6·18d. per ton; but, owing to the improved value of the secondary products—coke, tar, and ammoniacal liquor—the net cost of coal for the half year under review was 6·22d. per ton less than in the corresponding period of 1899.

The plant and mains at all the stations were maintained in a due state of efficiency.

Owing to the large increase in the consumption of gas at nearly all the stations of the Association, considerable expenditure has been incurred for enlargements and extensions.

At Aix-la-Chapelle, where the staff had outgrown the office accommodation, the remodelling and enlargement of the premises in the Jülicherstrasse were taken in hand, and satisfactorily completed. In order to deal with the increased volume of gas produced at this station, a new purifier-house was commenced. The purifiers to be erected therein will be supplied from the disused Erdberg works at Vienna.

At Antwerp, the anticipated increase in the consumption, owing to the considerable reduction made in the price of gas, has been realized; and new purifiers and an installation of water-gas plant of a capacity of 1½ million cubic feet per day are in course of construction.

At Berlin, an additional installation of inclined retorts was commenced on the Gitscherstrasse works. The installation of hydraulic stoking plant on the Schöneberg works was completed, with satisfactory results.

At Mariendorf, very considerable progress was made with the erection of the new gas-works and new meter manufactory. During the half year under review, it became necessary to lay a considerable length of mains of a large diameter. For this purpose, the Directors have utilized mains taken from the inner districts of Vienna; and a large saving has been thereby effected. In anticipation of the expiration of the Association's lease of the premises in the Leipzigerplatz, used as a show-room, the Directors rented other premises in an equally good position at a much lower rent.

A contract with the Commune of Rudow, a suburb to the south-east of Berlin, was concluded for fifty years—until 1951.

At Brussels, the removal of the offices from the Rue Marcq to the Chaussée d'Ixelles was effected without inconvenience; and material advantage has already resulted from the change. It was decided, as the premises in the Rue Marcq were no longer required for the Association's business, to dispose of them. The increased consumption of gas at this station had almost reached the maximum producing and storage capacity; and it became urgently necessary, to meet the still growing demand, to considerably enlarge the plant. At the Forest works, an installation of water-gas plant of a capacity of a million cubic feet per day was commenced, together with a new set of purifiers of an area of 5400 square feet. At the Koekelberg works, a new retort-house was erected. Hitherto, all the coal required at this works has had to be carted either from the railway or from barges, at a very heavy cost. The Directors have now succeeded in getting a direct connection with the railway, the outlay on account of which will soon be recouped by the saving effected in the cost of transport of the coal delivered on to the works. A piece of land was purchased in the Boulevard Léopold II. in Molenbeek—one of the suburbs supplied by the Association—with a view to the erection thereon of a show-room.

The erection of an electric light station at Woluwe St. Pierre for the supply of the Communes of Woluwe St. Pierre and Auderghem and the Avenue Tervueren was completed. The Directors took advantage of an opportunity of purchasing the electric-lighting works, cables, and concession of the Ixelles Electric Light Company for the sum of £56,000; and the business was transferred to the Association on the 23rd of March last. The Association will supply from this works the whole of the Commune of Ixelles, and also the neighbouring Commune of Molenbeek, where the Association had entered into obligations to supply electric current.

At Flushing, it became necessary, owing to the extension of the works, to provide additional room for the storage of coal; and a piece of land adjoining the works was purchased for this purpose. Progress was made with the new three-lift gasholder; and, at the end of the half year, it was approaching completion.

At Frankfurt, to meet the increased demand for gas, additional retort power was provided upon the Bockenheim works. The enlargement of the offices in the Obermainstrasse was completed.

At Vienna, the arrangements for continuing the Association's business in the outer suburbs, with the gas-works situated in these suburbs, were completed. The Directors have made all arrangements for dismantling the works no longer in use; and they have succeeded in making use at their other stations of a large quantity of the plant. They have also sold



several plots of land and other property on favourable terms. Considerable extensions have been planned for the Baumgarten works—one of the three works retained for the supply of the outer districts. Extensions were also necessary at Floridsdorf, which is a Commune situated on the north side of the Danube, quite independent of the Vienna Town Authorities. The contract for the supply of gas to Floridsdorf has been extended for a period of thirteen years—until 1919. At the close of the half year, negotiations were in progress for the conclusion of contracts with various neighbouring Communes.

At Komotau, one of the new stations recently acquired in Bohemia, an electric-supply works was completed and put in action.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme, showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 30th of June last, payable free of income-tax, on and after Tuesday, the 13th inst.

The CHAIRMAN, in moving the adoption of the report, said that, on no previous occasion had he ever moved, or from the vice-chair had he ever seconded, the adoption of the half-yearly report with more thorough and unqualified satisfaction than, under the circumstances, he did that day; for the proprietors would remember that this was the first occasion on which the Inner City of Vienna had contributed nothing to the profits of the Association, while the dividend recommended was the full dividend of 10 per cent., fairly and squarely earned in the half year, and without recourse to the dividend equalization fund. More on this head he would postpone, and would give now the shortest possible review of the occurrences since the close of the half year. The report referred to the extension of the contract with Floridsdorf until 1919, and stated that, at the end of the half year, negotiations were in progress for the conclusion of contracts with various neighbouring communes on the same bank of the Danube. He was glad to add that, since the close of the half year, three contracts for thirty years each had been concluded with the communes of Bisamberg, Stammersdorf, and Strebersdorf. At the moment, realization of their assets at Vienna was the matter there which most largely had the attention of the Directors; and he was pleased to say that this realization progressed satisfactorily in regard both to plant above ground and below, and to land and houses. Since they began to remove the mains on the 31st of May, considerably more than half of them in value had been taken out; and they had found welcome homes at other stations when not needed at Vienna. This was also true of plant not required for the works at Baumgarten and Floridsdorf; and, as an instance, he might mention that the 200 feet holder at the Tabor works was being re-erected at Berlin, with a saving to the Association of more than £10,000 on what such a holder would have cost them at the present inflated prices of engineering plant. At Berlin, a contract for fifty years was concluded with the suburb of Buckow. The new meter-works at Mariendorf were completed; and already there were calls for their extension. At Brussels, the decision of the Board to sell the premises in the Rue Marcq had been carried into effect. The estimates of the Board at the commencement of the year for extensions and alterations during the year were no less than £350,000 more than they were the previous year. Now as he viewed extensions within the area of their operations, when judiciously made, as a most profitable outlay of capital, this was a matter for sincere congratulation. Though slightly out of order, he might mention here that, in seeking new fields for the employment of the proprietors' capital, the Board had not been without success since the close of the half year, in that they had acquired the contracts for supplying gas to a portion of the City of Prague and the whole of four of its suburbs, with works at Lieben. A feature of special importance and noteworthy in this transaction was that the right to supply gas to private consumers was *in perpetuo*. He might say here that four of the Directors—Mr. Lucas, Sir James Carmichael, Sir Charles Jessel, and Mr. Birchenough—had visited Prague; and he (the Chairman) was satisfied that the prospects of the Association there, when Imperial Continental methods were introduced, would prove satisfactory. Now what was the position in which the Association was left with the loss of the Inner City of Vienna? They learnt from the report that, from this cause, the output of gas had fallen from 4538 million cubic feet to 3534 millions; being a decrease of 1004 million cubic feet, or nearly 23 per cent. on what it was in the corresponding half year when the Inner City of Vienna was included in the accounts. He might tell the proprietors, for the sake of comparison, that their present output was the same as that of the first half of 1888, which, of course, included the output both of Amsterdam and Vienna. The report also stated that the present output was increasing at the rate of 10½ per cent. per annum; and he might supplement the statement by this—that the rate of increase was well reflected in the profits; so that the Association ought to recover what they had lost in output, if not also in profits, in a very few half years, and he did not personally know any reason why they should not do so. Had there been anything abnormal at the moment in the cost of the manufacture or the distribution of gas—as, for instance, in the net cost of coal—this would have been an element which would have at once masked the real position of their future prospects. But, as it was, no one in the room should have any more difficulty than he had in seeing that—greatly due to the prevision of the Directors, and the consequent provision made by them—the prospects of the Association were based on a foundation as secure for the future as they had long been in the past.

Mr. J. HORSLEY PALMER, in seconding the motion, said there was no doubt the half year had been a critical one for the Directors; and they were most fortunate in being able to place such a report as the present one before the proprietors. Individually, he certainly thought they would have had to draw upon the fund which the proprietors were told was placed on one side after the sale of the Amsterdam works especially as a dividend equalization fund. But so elastic were the operations of this great Association, and so able had been the management of their officers on the Continent, that the profits of the half year not only enabled them to pay a 5 per cent. dividend (after having written off adequate amounts on account of wear and tear at all the stations), but also to carry to the contingency fund upwards of £18,000. When they considered that they had lost such a profitable station as Vienna was, he thought that was a very remarkable result.

Mr. ST. JOHN B. ROSCOE remarked that it was rather difficult for the proprietors to put questions when they had only just had the accounts read to them. To enable the proprietors to criticize the figures, they ought to have the accounts before them for a day or two; and he asked whether they could not be sent out before the meetings as in the case of most other companies. He also inquired whether, in the case of terminable contracts (which he thought most of their contracts were), a sinking fund was set apart to replace the capital which was expended; so that, at the end of the contract period, the capital thus sunk was not lost, but would be in the coffers of the Association. He believed, in the case of the Vienna contract, it was thought, when the contract was not renewed, that a considerable loss had been caused to the Association by the loss of the capital which had been sunk; and, of course, if a sinking fund had been set aside, such an idea would not have arisen.

Mr. R. S. GARDINER said that, after such a report as had been read, supplemented as it was by the remarks of the Chairman, which must have conveyed to everyone present the extraordinary vitality of this great undertaking, and must have convinced the proprietors of the initiative taken by the Directors in every desirable direction to further and advance the prosperity of the concern, he did think that, from the proprietors' side of the table, there should be at least some slight expression of what must have been a very welcome surprise to find that they had done so remarkably well in this half year, which, if the Association were ever to have a critical half year, would have been the one—viz., the half year in which they were to feel the full effect of the loss of such an important station as Vienna. He wished as an individual proprietor to voice what he could not help thinking must be felt, and must be heartily appreciated, by the proprietors at large—that the management of the undertaking was in such good hands, and that, owing to the wise and prudent manner in which the Board had provided for the one misfortune that had recently befallen the Association, its effects had been minimized, and they were able to look forward to, after a comparatively short space of time, not a disappearing, but an increased prosperity for the undertaking. The proprietors, he felt confident, appreciated to the full the amount of anxiety, time, and care that must have been required in the management of the undertaking, which had become so complex in its many branches, and in the many directions in which the Directors were profitably utilizing the proprietors' money.

The CHAIRMAN said that Mr. Gardiner's remarks might be taken as an answer to the question and difficulty of the honourable proprietor who spoke first. He might, however, tell him that he had only to apply at the office of the Association to see the accounts in anticipation of the meeting; but it would not be convenient to adopt the course which he proposed in regard to them. Within the last two or three years, he (the Chairman) had explained at great length the principles on which provision was made for the falling in of stations. The inner district of Vienna was their largest. Under the circumstances, as Mr. Gardiner would well know, it was the most difficult to provide for of any station they had; and he (the Chairman) claimed that they had provided for the falling out of this station in as efficient a way as well could be made.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. J. HORSLEY PALMER, a dividend of 5 per cent. was declared for the half year on the £3,800,000 stock, free of income-tax.

A hearty vote of thanks was next passed to the Chairman and Directors on the motion of Mr. GARDINER, seconded by Mr. P. J. HARDING.

The CHAIRMAN, in responding, assured the proprietors that the vote had never been more deserved than on this occasion. He then moved a vote of thanks to the officers, remarking that gas companies operating in this country could have little idea of how much a Company carrying on business abroad had to thank their official staff for. The Directors might be here, there, and everywhere on the Continent, but they could not be so daily; and they had to leave important matters constantly to their staff abroad. He was always glad to move a vote of thanks to them for their fidelity in the discharge of their duties.

Mr. C. PRIGG seconded the motion, which was unanimously agreed to. This concluded the proceedings.

## THE DEVONPORT CORPORATION AND THE GAS-WORKS.

### The Proposed Purchase Scheme.

So far as can be seen at present, the proposal that the Devonport Corporation shall promote a Bill next session for the purchase of the undertaking of the Devonport Gas Company is not regarded with much enthusiasm. Few of the candidates at the recent municipal election made any reference to the subject; while the apathy of the general body of ratepayers amounts to positive indifference. All this may be changed when the question actually comes before the Town Council and the ratepayers for their formal assent to the parliamentary proceedings. In the meantime, a significant admission is made in an obviously inspired paragraph which appeared last week in one of the local papers. According to this communication, the principal object of the Corporation in taking steps to purchase the Company's undertaking is to "safeguard the borough's interests in the Company's Bill." The inference is that if the Company are prepared to concede terms which the active spirits of the Corporation regard as satisfactory, the purchase scheme will not be persisted in. This is the more likely because the Corporation have several considerable undertakings on hand, including the erection and equipment of electric light plant; and a number of the ratepayers are already taking fright at the imminent prospect of largely increased rates. On the other hand, there is unquestionably a difficulty over the lighting of the district of St. Budeaux and Penryn, recently added to the borough. When before Parliament with a Bill for the inclusion of these districts, the Corporation sought to conciliate the opposition by, among other things, undertaking to light the roads and streets. They have not been able to satisfactorily redeem this promise. It has been discovered that electric light is a luxury which cannot be afforded for rural lanes and suburban streets; while the Gas Company declined to undertake the business unless the Corporation would bear the cost of laying the mains, a considerable length of which would be for the present, and probably for many years to come, almost entirely unremunerative. An arrangement which would remove this cause of dissatisfaction would



go far, with many ratepayers and members of the Town Council, to settle the fate of the purchase scheme. That an arrangement is not impracticable is shown by the fact that since the original proposal as to the laying of the mains was rejected, the Company have made more than one offer to meet the Corporation and discuss the subject, and have, in writing and in conversation with representatives of the Corporation, suggested alternative terms upon which the lighting of these suburbs might be undertaken. Mr. A. Bennie, the Chairman of the Company, was interviewed by a representative of one of the newspapers last week, and among other things discussed was this question of the supply of gas to St. Budeaux and Penryn. He pointed out that in any case the laying of the mains would have to be postponed until the completion of a new bridge, now in course of construction, to give better means of access to St. Budeaux. "When that is done," he said, "the Company will be ready to supply gas on equitable and easy terms. Up to the present," he added, "the Corporation have not really asked what the terms are; but there is no suggestion that a penny more shall be charged than is charged in the old portion of the borough."

Of course, there are other questions which are likely to arise between the Company and the Corporation, in the event of a parliamentary fight. The matter of the street lighting, which the Corporation wish to take into their own hands with a view to the adoption of the incandescent system throughout the town, appears capable of adjustment. The lamps are now the property of the Company, and the lighting and maintenance are undertaken by them at an inclusive annual charge per lamp. Mr. Bennie has publicly stated that the Company have no objection to the transfer of the lamps and the lighting to the Corporation; and the heads of an agreement for this purpose have already been arranged. As regards the financial proposals of the Company, it is too early yet to say anything. In the local papers there has been much criticism of the Company, some of it based on misconceptions, while the rest appears to have for its object the depreciation of the property in the hope of thereby aiding the municipalization project. In the speech reported in the "JOURNAL" last week (p. 1157), Mr. Bennie replied to some of this criticism. Further explanation was given a few days ago in the interview to which reference has already been made. One of the charges brought against the Company was that the cost of the extension of the works has been placed to revenue instead of to capital account. It is 56 years since the Company obtained their Act of Parliament; and as no increase of the capital has been sought since then, the inference seems to have been drawn, at a venture, that the works were being added to at the expense of the consumers. Mr. Bennie gives this charge an emphatic denial, and, moreover, says that there are arrears of dividends amounting to £60,000 which the shareholders have not drawn. Until within the last few years, Devonport has grown very slowly; and Mr. Bennie contends that, independently of the arrears of dividends, the Company have spent nothing more upon plant than was perfectly justifiable. That the policy of the Company has not been detrimental to the consumers is, he says, proved by the fact that there is only one town west of Bristol in which gas is sold at a cheaper rate than in Devonport. On the subject of municipalization, Mr. Bennie naturally takes a strong line. In his opinion, the town is getting into a woful financial mess. He told his interviewer that it would really be an act of charity to the gas consumers to prevent the town acquiring the undertaking. The price the Corporation would have to pay would be such that they could make no profit for many years. They only wished to have the undertaking as something to fall back on. They would bleed the gas consumers when they wanted money; they would look on it as a nest from which they could extract eggs to pay for any extravagance of their own. He noticed that Mr. Bellamy had advised the Corporation. If municipalization was so good for Devonport, why not for Liverpool with her great means? Had Mr. Bellamy given the same advice to Liverpool? And why had not Plymouth done it, and Torquay, Brighton, Exeter, or Bristol? These Corporations were at least as progressive as that of Devonport. They had an example in Devonshire of the other plan, for at Teignmouth the gas was supplied by the town, and there, apart from the high cost, they had a state of indebtedness gradually getting worse.

In this manner Mr. Bennie carries the war into the opposition camp. The Devonport Gas Company have, he says, no intention of meekly losing their business, which is now more prosperous than ever; and certainly there is no sign of meekness or surrender in the attitude of the Chairman. Indeed, the Company have already made their arrangements for meeting the expected attack in the Parliamentary Committee-rooms; and Mr. Balfour Browne, Q.C., Mr. George Livesey, and Mr. Corbet Woodall are to be among those who will appear in their behalf. The latest proposal from the Corporation has taken the form of a request that permission may be given to experts appointed by the Corporation to inspect the Company's works, and examine their accounts for the past ten years, with a view to enabling the Town Council to make an offer to purchase the undertaking on the basis of converting the dividends into annuities for the shareholders. It is considered improbable that the Company will listen to this or any other offer for the purchase of the works.

#### GAS AND WATER SUPPLY OF SOUTHPORT AND BIRKDALE.

At the Meeting of the Birkdale District Council last Tuesday, Mr. Wells, in accordance with notice, moved—"That the Clerk be instructed to write to the Southport Corporation to ask upon what terms and conditions they would be willing to cease the supply of gas to Birkdale after due notice—to expire (say) five or seven years hence." Before doing so formally, he proceeded to give a few particulars in reference to the gas supply of Birkdale. He explained that in 1865 the Southport people had gas-works of their own, and applied for powers to supply gas within a six-mile radius. Birkdale opposed this application, and, under the Public Health Act, obtained powers to lay down their own mains—Southport agreeing to supply gas at a certain price for three years. In the meantime it was the intention of Birkdale to erect gas-works of their own; and a Company was formed for the purpose. In 1870, Southport applied for parliamentary powers to buy up the Birkdale mains, and practically to absorb Birkdale in that particular matter. The Local Board successfully opposed it; and at the same time obtained a Provisional Order to erect gas-works. In some way or another, this fell through. An agreement was entered into between the Directors of the Company to the effect

that if Birkdale would not go in for gas-works of their own, and would let their Provisional Order drop, Southport would supply them with gas under a co-operative arrangement on equal terms with themselves. This arrangement was continued until 1881, when gas was supplied to the district at exactly the same price as it was to the Southport customers. He afterwards went on to explain the provisions of subsequent Acts in reference to the right of Birkdale to lay their own mains; Southport paying them 4½d. per 1000 cubic feet on all gas supplied to private consumers for the privilege of the supply. In 1873, the maximum price was raised to 4s., and the illuminating power was lowered from 20 to 18 candle power for three years. This, he believed, was principally owing to the high price of coal at that time. The illuminating power still remained at 18 candles. In 1876, Southport again sought powers to include Birkdale, and to increase the maximum price to 4s. 6d. per 1000 cubic feet; and owing to this, they were allowed to make as much profit as they could, if the price did not exceed 4s. 6d. The gas question had been a sore point with them for a number of years; and the secret of the whole thing could be traced very easily. Southport might want to convey their gas through Birkdale to Ainsdale; and, of course, if they wished to do this through the Birkdale mains, it was their duty to increase the size of them, and to pay for it. In 1895, they laid a trunk pipe-line which gave Birkdale another good supply; and up to the present they had had all they required, if the illuminating power was equally good with the pressure. Mr. Bellamy's latest test showed a power of over 20 candles; and this, they all agreed, was very satisfactory. In reference to price, he pointed out that Southport had made a profit of £16,256, which was equal to 11d. per 1000 cubic feet of the gas sold, or 1s. 2d. in the pound off the rates in Southport. Birkdale contributed one-sixth of this sum, or, in other words, £2700 a year. He thought the time had now come when they should consider the question of providing their own gas, which they could manufacture at 2s. per 1000 cubic feet, with as good an illuminating power as they had at present. They would also have a considerable profit from the undertaking.

The motion was carried.

Subsequently, the meeting was made special, when the following resolution was submitted: "That the Council approve and confirm, or otherwise, the minutes of the General Purposes Committee of Oct. 17, 1900, containing the report of the Sub-Committee appointed by the Council, for promoting a Bill in Parliament constituting a Joint Water Board for Southport, Birkdale, and the West Lancashire rural district, and to acquire the undertaking of the Southport Water-Works Company, on the basis of the Sub-Committee's report." Mr. Hughes moved an amendment to the effect that the minutes be not approved, inasmuch as, when that Council succeeded, with the Southport Corporation and the West Lancashire Rural District Council, in Parliament, early this year, in causing clause 28 to be inserted in the Southport Water Act, 1900, the understanding was that the three Councils—viz., Southport, Birkdale, and the West Lancashire Rural District—were to join in promoting a Bill for constituting a Joint Water Board, with mutual responsibilities to acquire the undertaking of the Southport Water-Works Company; and the appointment of the Birkdale Council's Sub-Committee to confer with the Committees of the two other Councils was on the basis of this understanding. Further, that, inasmuch as the West Lancashire Rural District Council had withdrawn from any liabilities of such Board, if and when constituted, and sought to obtain representation thereon with special advantages as to water supply in their district, and to be recouped by Southport and Birkdale any costs they might incur in promoting the Bill should it be rejected, the Birkdale Council declined to promote the Bill, or to proceed further in the matter of the formation of the Board on the basis proposed in the report. In moving the amendment, he read the clause in reference to the promotion of the Board. It set forth that if the Board purchased the undertaking, the arbitrators or the umpire should determine the sum to be paid by the Board to the Company, not taking into account the powers of the Company to raise additional capital under the provisions of the Act, except in so far as money that should at the time of transfer have been actually expended by the Company on work was concerned. He objected to the action of the Southport Corporation in going behind the backs of Birkdale to make an agreement with the West Lancashire Council, and also to that Council being admitted to representation on the Board without responsibility or liability; and he said that, although he was agreeable that there should be a Joint Board, it must be based on equitable lines. Mr. Davey seconded the amendment. After some discussion, the Law Clerk pointed out that if the amendment was carried it would not prevent the Committee from attending the meeting of the Board the next day, and trying to come to some arrangement. It was thereupon carried unanimously.

On the same evening, a meeting of ratepayers was held in the Cambridge Hall, Southport—the Mayor (Alderman Griffiths) presiding—for the purpose of passing a resolution authorizing the Town Council to proceed with a Bill in the ensuing session for the purchase of the undertaking of the Southport Water Company, conjointly with the Birkdale Urban District Council and the West Lancashire Rural District Council, or either, and the formation of a Joint Water Board. The Mayor moved the formal resolution, and said he believed the ratepayers of Southport were unanimous in their approval of the proposal to acquire control over the water supply. He pointed out that, should any disagreement occur, Southport would have power to proceed either alone or with only one of the other Authorities interested. The motion was seconded by Mr. Hulme, who said he was sure it would be to the interest of the borough that they should have the water supply in their own hands. The Very Rev. Dean Cahill asked if the scheme would involve any considerable increase to the rates. The Mayor said they could not tell until they knew the price they would have to pay; but he was hopeful that it would not. They must remember they were proposing to purchase a valuable undertaking, and they would have to be prepared to deal fairly and equitably with the shareholders. Should any loss occur on the first few years' working, he hoped Parliament would allow them to meet it from the profits of succeeding years; after which he trusted they would be able to reduce the charges. The motion was carried unanimously.

The Walker and Wallsend Union Gas Company have decided to call up all their unissued electric lighting capital, and raise £25,000 of the additional capital sanctioned by their Act of last session.



## THE PROPOSED EXTENSION OF THE CARLISLE GAS-WORKS.

## The Gas Committee to Reconsider the Matter.

At the Meeting of the Carlisle Corporation last Tuesday, the Gas Committee reported that they had considered the recommendations of their Engineer (Mr. C. B. Newton) and of Mr. Corbet Woodall upon the proposed extension of the gas-works plant (*ante*, p. 965) and had come to the conclusion that, instead of introducing water gas, the coal-gas manufacturing plant should be extended upon Boustead's Grassing. Mr. Newton estimated that the cost of these extensions would be £33,000. The Chairman of the Committee (Mr. Corbett) moved the adoption of their recommendation, which it appeared had been carried by a majority of one. He said he had been one of a deputation who had visited towns in which water gas was used, and though he had been pleased with what he had seen, yet the adoption of water gas would be beset with many risks. It was said to be somewhat dangerous to health; sanction to borrow the money to meet the cost could not be obtained from the Local Government Board; and if they spent £13,000 upon its introduction, they would at the end of five years be bound to spend £33,000 upon the extension of the coal-gas plant. He confessed that he had at first thought that a small installation of water-gas plant would have tided them over the present difficulty; but seeing that it would not suffice for more than two years, he could not support a proposal to have an installation of the kind. If they put down, as the Committee had proposed, plant to make 500,000 cubic feet of coal gas per day at a cost of £33,000, they would be in a position to double the output at an expenditure of £5000. So that they would be able, at a cost of £38,000, to produce a million cubic feet of coal gas per day. This was £8000 less than would be necessary for about the same quantity of gas something like half of which would be water gas. They would also be able to borrow the capital required; and provision could be made for further extensions. Mr. R. Foster seconded the motion. Mr. Collin regretted that the Committee had come before them with divided opinions. The Council should almost refuse to vote on so great a scheme until the Committee were unanimous. The manufacture of coal gas could not be increased upon the present site, and that at Boustead's Grassing was impossible, because it would soon be the centre of much residential property. Let them, therefore, adopt the simple, easy, and direct plan of mixing the gases and look out for a new site. Mr. Phillips moved, as an amendment, that the question be referred back to the Committee for one month, to see whether they could not come nearer unanimity. Mr. Atkinson seconded the amendment; remarking that the Committee seemed to be at sixes and sevens with regard to everything. Mr. Lightfoot opposed the adoption of the Boustead's Grassing site, and expressed his intention of moving an amendment to this effect. He said the conduct of the Committee was becoming a scandal to the city, and he had felt inclined to move that, having forfeited the respect of the Council and the city, they be respectfully requested to retire. Mr. Phillips said he would accept Mr. Lightfoot's amendment as to the unsuitability of Boustead's Grassing as an addition to his own. In the course of further discussion, this site was generally condemned; and Mr. Phillips's amendment, on being put to the meeting, was carried.

## SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards conducted a sale of gas and water stocks and shares. The first lots offered consisted of a new issue, by the Directors of the Ilford Gas Company, of £5000 of "C" stock, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, and entitled, in view of the dividends paid by the Company since 1897, to 6 per cent. per annum. It was sold at £105 and £105 10s. per £100 of stock. A small quantity of 5 per cent. preference stock of the Brentford Gas Company was next offered, and was sold at £134 per cent., *cum div.* from the 1st of July last. A new issue of £3000 of 4 per cent. perpetual debenture stock of the Epsom and Ewell Gas Company was placed at £97 10s. per £100. Some £20 fully-paid shares in the British Gaslight Company, Limited (last dividend 10 per cent.), fetched £28 apiece. A parcel of fully-paid £5 shares in the Goring and Streatley District Gas and Water Company, Limited, fetched £2 each. Some £5 shares in the East Cowes Gas Company (£1 paid) realized £2 5s. per share. The last lots submitted consisted of "D" water and gas stocks of the Barnet District Gas and Water Company, which fetched £140 per £100 of stock. The following day, Mr. J. R. Tait, of Rugby, carried out the instructions of the Executors and Trustees of the late Mr. Peter Simpson to offer for sale a plot of freehold land and a number of shares, the estate of the deceased. Some £10 shares in the Alliance and Dublin Consumers' Gas Company fetched £19 10s. each; £285 original stock in the Great Wigston Gas Company, £441 10s.; £350 new ordinary stock in the same Company, £393 18s.; 20 £10 6 per cent. "C" preference shares in the Aldershot Gas and Water Company, £13 17s. 6d. per share; 10 do., £13 10s.; 30 £10 shares (fully paid) in the Newent Gas Company, £8 10s. per share; eight 4 per cent. mortgage debentures of £50 each in the same Company, £49 15s. and £50 per share; six £20 shares (fully paid) in the Monte Video Gas Company, Limited, £9 each; 12 £20 5 per cent. debenture bonds in the same Company, £16; 38 £10 shares (fully paid) in the Rugby Gas Company, £30 15s. and £31 per share; 62 do. (£8 10s. paid), £26, £26 10s., and £27 per share. On the same occasion, 24 £3 fully-paid shares in the Southam Gas Company were sold for 49s. each. Last Wednesday, at the offices of the Newcastle and Gateshead Gas Company, Mr. Robert Mack offered for sale £25,000 of the ordinary stock of the Company. It ranks for a standard dividend of 7 per cent., subject to the sliding-scale, under which, while the price shall remain at 2s. 3d. per 1000 cubic feet, the authorized rate of dividend payable will be 8½ per cent. per annum. The stock was put up in £100 lots, and realized prices ranging from £206 5s. to £209 each; the total amount produced being £51,801 5s., or an average of £207 4s. 1d. On the 5th inst., 19 shares of £10 each in the Huntingdon and Godmanchester Gas Company were submitted to public auction by Messrs. Dilleys and Son, and realized from £19 10s. to £21 5s. per share. Last Thursday, Messrs. Alexander, Daniel, and Co. sold by auction, at Bristol, £15,000 of Bristol water-works 7 per cent. maximum consolidated ordinary stock. The highest price for £100 of stock (reserve £160) was £165; the lowest, £164—the average working

out at £164 4s. The total amount realized was £24,630. At a sale recently conducted by Messrs. Clowes and Nash, at Norwich, 30 shares of £20 each, fully paid, in the British Gaslight Company, Limited, with the accruing half-year's dividends, were disposed of for £39 and £39 15s. each. Some ordinary shares of £10 each, fully paid, in the Norwich Water Company, with the accruing half-year's dividends, were sold at prices ranging from £17 to £17 10s. apiece. Some 3½ per cent. perpetual debenture stock was sold at the rate of £108 per cent. Messrs. Beaumont and Glover, of Wakefield, lately sold £100 of original 5 per cent. stock (1852) of the Barnsley Gas Company for £190. At a sale at Leicester last Tuesday week, thirty £5 fully-paid shares in the Ibstock Gas Company, Limited, realized par value. At a sale of miscellaneous shares at Leeds the same day, some £5 shares in the Mirfield Gas Company realized £12 16s. each.

## REGULATION OF LONDON STREETS.

## The Opening of Roads by Gas, Water, and Electric Light Companies.

The Conference convened in June last by the London County Council with representatives of the City Corporation and Vestries and District Boards of the Metropolis, with reference to regulations in connection with streets and street traffic, was resumed at the County Hall, Spring Gardens, last Wednesday—Mr. W. H. Dickinson, the Chairman of the Council, presiding. The Committee appointed at the conference held on the 29th of June (*ante*, p. 36) reported as follows: "Several Local Authorities have urged that some remedy should be found for the frequent opening up of public ways by water, gas, electric light, and telephone companies. We consider that this constitutes a great evil, and is the occasion of much annoyance to the public generally, and frequently of loss to tradespeople, and therefore should, as far as possible, be prevented. We suggest that the Local Authorities should have more power of control, and that subways should be constructed, when practicable, under the streets, in which the pipes, &c., could be laid. We accordingly recommend—'That the conference do express the opinion that in all new leading thoroughfares subways should be constructed in which the water and gas mains, pipes, &c., could be placed.'" Mr. H. Clarke asked the members to permit him to incorporate the following with what they had passed at their former meeting: "That this meeting is of opinion that the time has arrived for concerted action on the part of the Local Authorities of the Metropolis to remedy the inconvenience, annoyance, and loss of time and money now caused by the operations of the gas, water, telephone, and electric lighting companies, in laying down, renewing, maintaining, and repairing their mains, pipes, services, and wires." The Chairman thought they had better take the recommendation of the Committee first, and then have a separate motion. The recommendation was accordingly put and agreed to. Mr. Clarke explained that his motion was moved by a member on the previous occasion, and it appeared to have miscarried. He then formally moved it. Mr. R. A. Robinson seconded the motion; remarking that it was really the Local Authorities who should endeavour to have more control over the Gas and Water Companies in breaking up roads at inconvenient times. Mr. W. N. Blair (Surveyor to the St. Pancras Vestry) said it seemed to him that they would get no farther by passing the resolution, unless they stipulated that the statutory powers of the Companies be restricted or put under regulations made by the Local Authorities. All the Companies had power to open the roads. Some were restricted by statute to do this in certain months in the year, and in all cases they were required to give notice to the Local Authority. The Chairman then put the motion, and it was carried by 7 votes to 5.

## A CRITICISM OF AN ELECTRICAL ENGINEER'S ESTIMATES BY A GAS ENGINEER.

In 1897, the Bridgwater Corporation obtained a Provisional Order for electric lighting; and they were advised by Mr. W. H. Trentham. After considerable agitation throughout the town, the Council came to the conclusion, by a very narrow majority, to apply for £20,000 to carry out a scheme. The result was a Local Government Board inquiry last Friday week by Colonel A. C. Hepper, who was deluged with a mass of evidence sufficient for a scheme of a more pretentious character. There was great opposition; and no less than three barristers were engaged. Mr. F. E. Weatherly supported the application, Mr. Holman Gregory represented the significant number of 900 opposing ratepayers, and Mr. Honoratus Lloyd was entrusted with the defence of the Gas Company's interests, in conjunction with Mr. W. A. McIntosh Valon, who had been consulted by the Company. We have not room to follow the large bulk of evidence tendered both for and against the scheme; but the opposition was particularly keen. The interesting part about the evidence was the dexterous way in which Mr. Valon handled Mr. Trentham's figures; and if we give the substance of his evidence, it will serve the two-fold purpose of conveying information about the scheme and about its criticism. One of the contentions of the Company's Counsel was that it would be an injustice to take from them the revenue from public lighting, and at the same time render them liable to contribute substantially to any deficit which might occur on the electric light undertaking.

In the first place, Mr. Valon set himself to prove that Mr. Trentham's original estimate of £14,248 for the installation should be increased to £21,657 according to the tenders received, and that it should be further raised to (say) £25,000 to cover the work proposed to be done. The cost of the buildings Mr. Trentham put at £1400, which Mr. Valon (who hereafter we will call the witness) considered should be at least £2500, having himself allowed £3500 for a similar works; Mr. Trentham estimated for two steam-boilers, two steam-dynamos, steam and exhaust pipes, and feed heaters. These he bracketed together, and put against them an aggregate sum of £4000. The tenders against this, however, were boilers £2498, and dynamos £2944. It seemed to witness that no allowance was made for steam and exhaust pipes and feed heaters. Unless this had been included with the boilers, he calculated that an additional sum of £500 would have to be added. The next item in



Mr. Trentham's estimate was £1540 for booster, switchboard, battery, and crane. The price proposed to be accepted for the switchboard was £538, for the battery £966, and for the crane £149—together £1653. To this Mr. Valon added the cost of the booster (say) £750, which raised the estimate of £1540 to £2403. Private consumers' mains and connections Mr. Trentham estimated at £1117; but witness put it at £1500. The next item in the estimate was for public arc and street lamps and mains, only £5191. The lowest tender received for this was £8302 out of nine competitors—the highest being £11,564. Mr. Trentham, however, proposed to further lower the £8302 by reducing the size of the feeders for public lighting, and placing the cables in creosoted wooden troughing, instead of being armoured; and he generously suggested that the Gas Company should be invited to sell their lamp-posts at 20s. each, so as to permit of a still further deduction from his estimate—bringing the £8302 down to £7070. Witness did not take any of these matters into consideration, as he regarded some of them were problematical; and the £8302 was certainly not more than sufficient to lay down mains in a proper manner and of proper size, and to provide the necessary attachments for the work proposed to be done. Witness therefore thought the cost of the installation, estimated by Mr. Trentham at £14,248, should fairly be raised to £21,657; and this without making any allowance for contingencies.

Coming to the estimated profit and loss account, Mr. Valon stated that Mr. Trentham placed the cost of coal at 0.6d. per unit, or £290. On reference to surrounding towns before the rise in the price of coal, witness found the average cost per unit was 1d. The £290 would therefore have to be increased to £486 16s. 11d. Oil and waste, Mr. Trentham took at £42. The average of the towns referred to was 0.19d. per unit, or £91 2s. 8d. Mr. Trentham put the driver, stoker, man and lad, and supervision at £373. In the towns mentioned, witness found that the average of wages for workmen, management salaries, and general establishment charges (which were not included by Mr. Trentham) came to 1.15d. per unit, or £559 17s. 5d. Witness took this figure; but, in his opinion, it should be considerably increased, seeing that the works, if started, would be a considerable time before they got into full swing; and beyond this fact the smallness of the concern increased in proportion the cost per unit. Repair and maintenance, at 2 per cent. on the increased capital outlay, would amount to £402 14s. 4d., instead of £290. Then Mr. Trentham did not add anything in his estimate for rates and taxes; but Mr. Valon supplied the deficiency by adding 0.1d. per unit, or £48 13s. 8d. The total therefore of witness's estimated expenditure was £1743 5s., to which had to be added interest and sinking fund on capital outlay, which he took at the same rate as Mr. Trentham—viz., 25 years at 5½ per cent., or £1245 5s. 6d. The annual charge was £2988 10s. 6d., which equalled 6.2d. per unit—certainly not a high estimate. The receipts, as shown by Mr. Trentham's report, were: Revenue from private lighting, 47,600 units, at 4½d., £892, and for public lighting £1100. This amount of £1100 was equal to 3.88d. per unit on 68,043 units. The total number of units between public and private lighting came to 115,643. Meter-rents were calculated at £34—making the total receipts £2026. Witness showed that the increased expenditure would create a deficiency

of £962 10s. 6d. per annum, instead of a balance of profit shown in Mr. Trentham's statement of £43, which was more than wiped out by the omission of rates and taxes. The price of current had been put by Mr. Trentham at 4½d. per unit for private lighting. If this were raised to 6d. per unit, the additional revenue would be £297 6s. 8d.; and this was the only amount he could legitimately add to his receipts by increasing the price per unit to 6d. If the public lighting was correspondingly increased, then, in witness's view, it was clear that the additional amount so paid must be a charge against the rates. It was therefore plain that the deficiency of £962 10s. 6d. could only be reduced by £297 6s. 8d. by increasing the cost of current to 6d. per unit—bringing down the deficiency to £665 3s. 10d. But this deficiency would, for some long time, be considerably more than this—that was to say, until such time as the whole of the works now proposed to be put down by Mr. Trentham came into full use, which, in any case, would be a matter of years. Witness knew of no single electricity works in any town of the size of Bridgwater which had been working for three years and showed a profit; nor did Mr. Trentham give any information as to the situation of such towns—the works mentioned by him being mostly large places, such as Manchester and Liverpool.

Proceeding to deal with the question of public lighting, Mr. Valon stated that he found Mr. Trentham depended mainly on this to give him the greater part of his receipts as against expenditure—the report allocating to private lighting 47,600 units, and to public lighting 68,043 units. Witness thought the latter should not be depended upon as a reliable income to cover the expenditure and the instalment of electric light; and he went further by stating that the substitution of electricity for gas would be a retrograde movement, and one totally against the present experience of lighting authorities throughout the country. Mr. Valon called to mind what had taken place at Liverpool, Birkenhead, Newcastle-upon-Tyne, Bradford, Huddersfield, and Tunbridge Wells, and to Sir William Preece's recent advice against the substitution of incandescent gas lighting by electric glow lamps at Maidstone. The cost of two 8-candle power burners in each lamp at Bridgwater, with a mean power of 14 candles, would be for electricity, at 4½d. per unit, together with lamp renewals, cleaning, repairing, &c., £4 15s., as against which Mr. Valon states the Gas Company offered to provide "C" Welsbach burners with a mean power of 50 candles for the sum of £3 2s. inclusive. Incandescent gas lighting could therefore be supplied in Bridgwater at less than two-thirds the cost of electricity, with the additional advantage of obtaining nearly four times the illuminating power. Much more of interest was put forward by witness; but what we have stated here is sufficient to show how completely he was able to prove the unsoundness of Mr. Trentham's estimates, and the different complexion his revised figures placed upon the scheme. The criticism may be useful in similar cases.

The Epsom District Council have resolved to apply to the Local Government Board for sanction to the borrowing of £2000 to meet the cost of water-works improvements.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1198.

Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.								GAS COMPANIES.							
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p. c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p. c.	18-14	..	5 7 2	500,000	100	June 1	5	People's Gas & 2nd Mtg. of Chicago Bonds	103-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb.	101-103	..	4 17 1	851,070	10	Oct. 12	7	River Plate Ord.	103-103½	..	6 10 3
200,000	5	May 16	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p. c. Deb.	99-101	..	3 19 8
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	260,000	10	Sept. 28	8	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	135,000	Stk.	Sept. 14	10	Sheffield A.	284-289	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	209,700	"	"	10	Do. B.	284-289	..	4 3 8
60,000	"	June 14	5	Do. 5 p. c. Pref.	187-142	..	3 10 5	447,427	"	"	10	Do. C.	282-287	..	4 4 0
159,375	"	Sept. 14	7	Do. 4 p. c. Deb.	118-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p. c. Ord.	127-130	-1½	4 2 0
220,000	Stk.	"	10	Brighton & Hove Orig.	220-230	..	4 6 11	1,520,000	"	July 12	3	Do. 8 p. c. Deb.	94-97	..	3 1 10
226,320	"	Aug. 29	5	Do. A. Ord. Stk.	150-160	..	4 7 6	380,940	Stk.	May 16	5	Southampton Ord.	110-115	..	4 6 11
1,009,500	Stk.	Sept. 28	10	Bristol, 5 p. c. max.	117-118	..	4 4 9	70,825	"	July 12	4	Do. 4 p. c. Deb.	117-122	..	3 5 7
420,000	20	Sept. 28	5	British	37-39	-2	5 2 7	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p. c.	112-117	..	5 2 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c.	24-26	..	4 12 4	250,520	"	June 14	4½	and B. 3½ p. c.	80-85	..	5 5 11
79,000	10	"	9	Do. 7 p. c.	19-21	..	4 5 8	61,550	"	"	4	Edmonton 4 p. c. Deb.	111-115	..	3 9 7
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	82-83	..	6 17 2	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	6	Do. 4 p. c. Deb.	98-100	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	5 10 4								
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	138-142	..	5 9 1	WATER COMPANIES.							
50,000	50	Nov. 2	12	Do. 6 p. c. 1st Mort.	55-55½	..	4 12 8	780,404	Stk.	June 28	11	Chelsea, Ord.	303-308	+1	5 11 5
550,000	Stk.	Oct. 12	12½	Commercial Old Stock.	200-210	..	4 12 10	150,000	"	"	5	Do. 5 p. c. Pref.	157-162	+2	3 1 9
236,425	"	"	9½	Do. New do.	139-138	..	3 5 3	160,000	"	"	4½	Do. 4½ p. c. Pref. 75	143-148	..	3 0 10
288,287	"	June 14	4½	Do. 4½ p. c. Deb.	175-180	..	5 0 0	175,785	"	Sept. 28	4½	Do. 4 p. c. Deb.	143-148	..	3 0 10
800,000	Stk.	May 31	9	Continental Union, Ltd.	170-175	..	4 0 0	1,720,560	Stk.	Oct. 12	7	East London, Ord.	193-198	-2	3 10 8
200,000	"	"	7	Do. 7 p. c. Pref.	—	..	—	654,740	"	June 14	4½	Do. 4 p. c. Deb.	147-152	..	2 19 3
51,600	Stk.	"	11	Croydon A 10 p. c.	—	..	—	797,687	"	"	9	Do. 8 p. c. Deb.	98-100	..	3 0 0
178,400	"	"	11	Do. B 7 p. c.	—	..	—	700,000	50	June 14	8½	Grand Junction 4 p. c. Deb.	110-113	+1½	3 10 10
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p. c.	117-122	..	4 6 1	810,000	Stk.	Sept. 28	4	Kent	130-135	..	2 19 3
60,000	"	"	5	Do. 5 p. c. Pref.	130-135	..	3 14 1	708,000	Stk.	Aug. 30	14	Do. New, 7 p. c. max.	300-305	..	4 11 10
486,090	"	July 27	11	European, Ltd.	19-20	..	5 10 0	160,000	"	"	7	Lambeth, 10 p. c. max.	200-210	..	3 6 8
354,060	10	"	11	Do. £7 10s. paid.	14-15	..	5 10 0	1,043,800	100	Sept. 28	10½	Do. 7½ p. c. max.	293-298	+1	3 10 6
14,993,075	Stk.	Aug. 15	4½	Gas-light 4 p. c. Ord.	98-100	..	4 8 0	406,200	100	"	8	Do. 7 p. c. max.	205-210	..	3 16 2
2,600,000	"	"	8½	Do. 3½ p. c. max.	92-94	..	3 14 6	850,000	Stk.	June 28	4	Do. 4 p. c. Deb.	127-130	..	3 1 7
3,799,785	"	"	4	and 4 p. c. Con. Pref.	114-117	..	9 8 5	500,000	100	Aug. 15	14	New River, New Shares	407-412	-1	3 8 0
3,799,785	"	June 14	8	Coke 3 p. c. Con. Deb.	94-96	..	9 2 6	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb.	128-133	..	3 0 2
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13-14	..	5 14 4	902,300	Stk.	June 14	7½	South-Ord.	203-208	..	3 12 1
3,800,000	Stk.	May 16	10	Imperial Continental	207-213	-1	4 14 4	126,500	100	"	7½	wark 7½ p. c. max.	188-193	..	3 17 9
473,600	Stk.	Aug. 15	3½	Do. 3½ p. c. Deb. Red.	100-102	..	3 8 8	489,200	"	"	7½	and 5 p. c. Pref.	155-160	..	3 2 6
75,000	5	June 14	6	Malta & Medn., Ltd.	42-52	..	5 14 3	1,019,585	Stk.	Oct. 12	4	Vauxhall 4 p. c. A. Deb.	128-133	..	3 0 2
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105-108	..	4 12 7	1,155,066	"	June 14	10	West Middlesex	278-283	..	3 10 8
250,000	100	"	4½	Melbourne 4½ p. c. Deb.	104-106	..	4 4 11	200,000	"	Sept. 14	8	Do. 4½ p. c. Deb.	140-145	..	3 2 1
541,920	20	May 31	3½	Monte Video, Ltd.	103-114	..	6 1 9								
667,946	Stk.	Aug. 30	9½	Newcastle & Gateshead	210-215	..	4 6 1								
299,855	Stk.	June 28	8½	Do. 8½ p. c. Deb.	104-107	..	3 5 6								
150,000	5	May 16	8	Oriental, Ltd.	7-7½	..	5 6 9								
185,000	5	"	8	Do. New, £4 10s. pd.	52-62	..	5 15 9								
15,000	5	"	8	Do. do. 1879, £1 pd.	12-12½	..	4 11 6								

† Next dividend will be at this rate.



**ELECTRIC LIGHTING NOTES.**

The Mayor of Keighley laid the foundation-stone of the electricity works for the borough last Friday. For the works the Corporation have obtained sanction to borrow £34,600. It is expected that a supply of electricity will be available by next Easter.

At Bury St. Edmunds, last Tuesday, the electric lighting scheme for the town was advanced another stage by the completion of the battery; and the current was switched on by the Mayoress (Mrs. T. Shillitoe). The whole of the work, from the buildings to the mains, has been carried out by Mr. F. Hastings Medhurst; and the total capital expenditure has been £15,000. The lights connected are equivalent to 1950 8-candle power lamps; and others, to the extent of 1000, are to be added. About 5000 yards of cables have been laid for the supply of private consumers; none of the streets being lighted by electricity.

According to the latest Consular report, the progress of electric lighting, and other applications of electricity, still continues its onward course in Wurttemberg. The Stuttgart works, driven by steam, produce 1500 kilowatts, including reserve power; the normal capacity of the accumulators, including reserve, being 695 kilowatts. No fewer than 36,703 incandescent lights and 560 arc lights were installed up to the beginning of the present year. The total horse power amounts to 1340. It is proposed to increase this by 400 kilowatts by the utilization of the water power at Marbach. The Stuttgart street trams are also driven by these works; the overhead system being the one in use.

Paignton is to enjoy the benefit of electric lighting on unusually advantageous terms. The District Council have obtained a Provisional Order, but have taken no steps to carry it into effect. Mr. Paris Singer, a wealthy local resident, of scientific tastes, has now come forward with an offer to relieve the Council of the risk and cost of providing electric lighting for the centre of the town, and to give the District Council the option of purchasing the undertaking within any reasonable time for the amount of his outlay. As this virtually means that Mr. Singer takes all the risk and the town has the option of reaping the profit, if any should result, the Council are naturally disposed to close with the offer.

The people of Dudley have great hopes of their electricity undertaking, for which £33,000 has been borrowed, and an additional £10,000 has been asked for free wiring purposes. The main thoroughfares were illuminated for the first time on Monday last week; the current being "switched on" by Mrs. Dunn, the wife of the Chairman of the Corporation Tramways and Electricity Committee. The tramways have been supplied with current for two or three weeks; and the consumption for this purpose, Alderman Dunn smilingly states, has far exceeded expectation. Perhaps he will not smile when the working statement of the tramways is presented to him. Anyway he believes the time is not far distant when the generating station will have to be enlarged.

On Monday night last week the principal main thoroughfares of Dudley were illuminated by the electric light. The sum of £33,000 has been borrowed to carry out the scheme, and an additional £10,000 is to be obtained for the free wiring of houses and business premises for electric light purposes. For private consumption, the cost will be 6d. per unit,

for two hours per day, and 1½d. per unit for the remaining 22 hours. It is estimated that electric lighting in Dudley will require 270,000 units a year. The inauguration of the lighting was celebrated at a gathering of the members of the Town Council and their friends at the newly-erected power station at Springsmire. After some appropriate remarks by the Mayor (Mr. Edward Grainger), Alderman G. H. Dunn (the Chairman of the Tramways and Electric Lighting Committee) remarked that the generating station was not completed, but so far the work of installation had been very satisfactory to all concerned. He believed that the time was not far distant when they would have to enlarge the power station. Subsequently Mrs. Dunn switched on the current, and the main thoroughfare was illuminated.

The Electric Lighting Committee of the Ryde Corporation presented a report at the meeting last Friday, in which they recommended that they should be empowered to instruct Messrs. Kincaid, Waller, and Manville to obtain tenders for carrying out the electrical works according to the plans already received from them, and approved by the Local Government Board; and further that, on receipt of the tenders, they should be authorized to instruct the Finance Committee to make arrangements for obtaining a loan for carrying out the works. Mr. Barton, in moving the adoption of the report, explained the course the Committee had taken, and claimed that they had acted in good faith in opposing the Company, believing that the Council were behind them. Whether he stood alone or not, he distinctly believed that the town had made as great a mistake now as when they refused to purchase the gas-works. But, as the thing was dead, he was not going to oppose the Company for the sake of doing so, but would now help to make the electric light a success. Alderman Marvin seconded the recommendation. Alderman James moved, as an amendment, that the matter be referred back to the Committee. Mr. Thirkell seconded the amendment. Alderman Groves said he had refrained all through from voting on this matter. It had been insinuated that he held different views now from what he did once. He acknowledged that he had. He still believed that a town should carry out its own lighting and watering; but the startling figures of £30,000 to £35,000 decided him not to support the proposal that Ryde should enter on such a speculation. The amendment was carried with two dissentients.

**Leeds and Harrogate Water Schemes.**—News comes to hand that the Harrogate and Leeds Corporations will not encounter each other before Parliament over their new water schemes; friendly conferences having led to an agreement to join hands in the exploitation of the watershed upon which both municipalities have had their eyes. But the terms of the arrangement have not yet been disclosed. The watershed in question has an extent of 26,000 acres—the valley of the Burn having 17,500 acres, the Laver 7000 acres, and the Skell 1700 acres. Of this, Harrogate sought to take 3000 acres; but to this Leeds demurred—the Corporation having been keeping records of the rainfall on the watershed for some years past. Both Corporations will proceed with their Bills in the ensuing session of Parliament.

# CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Junr., Deputy-Chairman.

J. T. WESTCOTT, M.E., Manager.

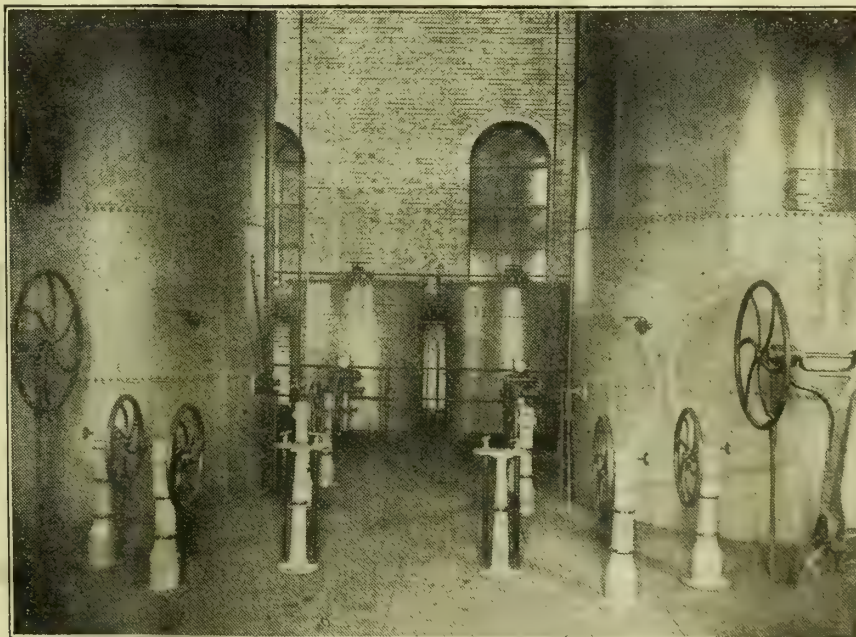
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.  
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.



## LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

The Finance Committee of the London County Council have prepared the following special report on the Water Committee's purchase proposal (see *ante*, p. 1160), to come before the Council to-day:—

It devolves upon us to report upon the financial bearings of the Water Committee's proposal for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies. The Water Committee are not at present submitting a detailed scheme of purchase, but are merely asking the Council to "decide the broad question of maintaining the policy of purchase." We have in former years reported to the Council generally upon the financial conditions involved in the proposal to purchase these undertakings, so far as it appeared possible to us to consider them. Since our last report, however, the Royal Commission on the London Water Supply has issued its report, which specially deals with the question of purchase in its financial aspects; and this report has already been considered by the Council. We cannot do better than remind the Council of the main conclusions at which the Commissioners arrived on this matter.

If purchase of the Water Companies takes place under the usual arbitration terms, and with the usual requirement of a sinking fund when a public authority is the purchaser, the result of a just and fair arbitration will be that the water charges must be raised for the period during which the proceeds of the Chamberlain's fund fails to cover the sinking fund required from the purchaser, or that rates-in-aid must be levied to make up the deficiency of the existing water charges. Having regard to the prospective requirements of supply in Water London, we are of opinion that it is desirable that the undertakings of the Water Companies should be acquired and managed by a public authority. But we must add that, if the purchasing authority is required to provide a sinking fund to redeem in 60, or even in 80, years the money borrowed to furnish the purchase-money and to increase the water supplies, then the administrative advantages we have enumerated will be accompanied by a deficit in the income, which can only be met by increasing the water charges or coming upon the ratepayers. If Parliament thought fit to dispense with a sinking fund, we think that a purchaser would be able, by maintaining the present water charges, to pay his way, and that the growth of the water revenue would render it possible to reduce the charges for water sooner than such reduction could take place under the management of the Companies through the attainment of their maximum dividend and the payment in full of their back dividends. Further, that reduction would extend to the New River district, in which no reduction is obligatory so long as the Company subsist with their present rights.

The Council will observe that the Commissioners, after careful consideration of the financial question, recommend purchase, and record their opinion that, apart from the question of a sinking fund, there might not only be no charge on the rates, but that the water consumers might obtain a reduction of the charges for water sooner than under the present system. We note that the proposed instruction to the Parliamentary Committee includes the preparation of "the necessary Water (Finance) Bill," which we presume will be upon the lines of the Bill approved by the Council in 1898.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The last meeting of the Dumfries Gas Commission was not of an edifying nature. The investigations into the affairs of the late Treasurer (Mr. Herries) is being conducted by Mr. M'Lintock, C.A., of Glasgow; and one of the members, who had been primed with information received outside, insisted that a minute of the Committee meeting should be read. When the minute was read, it was found to contain nothing except a statement that the new Treasurer had been examined by the Committee; and that the Committee had given instructions as to the conduct of the inquiry by Mr. M'Lintock. The new Treasurer, it transpired, was exonerated by the Committee from any blame in the affair. This was almost a matter of course; for he could not be held responsible for the method of book-keeping in use when he was appointed. He is doing his best to get it altered. But the situation was this—that members of the Commission were getting information from the man in the street as to what the Committee were doing, but could learn nothing from the Committee themselves. It is, no doubt, a little annoying to a town councillor to find that outsiders have more information than he has; but he ought to remember that the outsider has no responsibility, whereas he has, and that in such a delicate matter as the formulating of a claim upon the estate of a deceased official to make up for a delinquency, it is better to proceed cautiously. It would have been a more correct attitude for this gentleman to have preferred to know nothing until the Committee were prepared to report, rather than to discuss with anyone information which might turn out to be altogether erroneous. There was another incident at the meeting which does not fill the reader with respect for the business capabilities of at least one member of the Commission. According to the narrative which was given in the presence of the gentleman, and not contradicted, he owns a house in English Street, the tenant of which complained that the gas supply was bad; that the proprietor would do nothing; that the tenant ordered a new service pipe to be laid, at her own cost (about £2), which was done; and that the Commissioner then averred that his old service-pipe had been stolen. He was assured that the old service-pipe was not interfered with, which statement he disputed; and he also complained that his property had been entered upon and torn up without notice to him. The same gentleman had a further complaint, to the effect that another house of his had been entered without his permission, and a gas-meter fixed up in it, from which there was now an escape of gas so bad that he would require to call in the sanitary inspector. It was explained to him that gas-meters were put in at the request of tenants, the consent of landlords not being required; and that in this instance it was the fittings in the house, and not the meter, which were leaking. It is really matter of wonder that such a man as this should receive the suffrages of his fellow citizens; for it cannot be said that, in either of the matters referred to, he was acting in the public interest.

The municipal elections are over, and town councils are settling down to their work for the year. I scarcely think that there will be any effect

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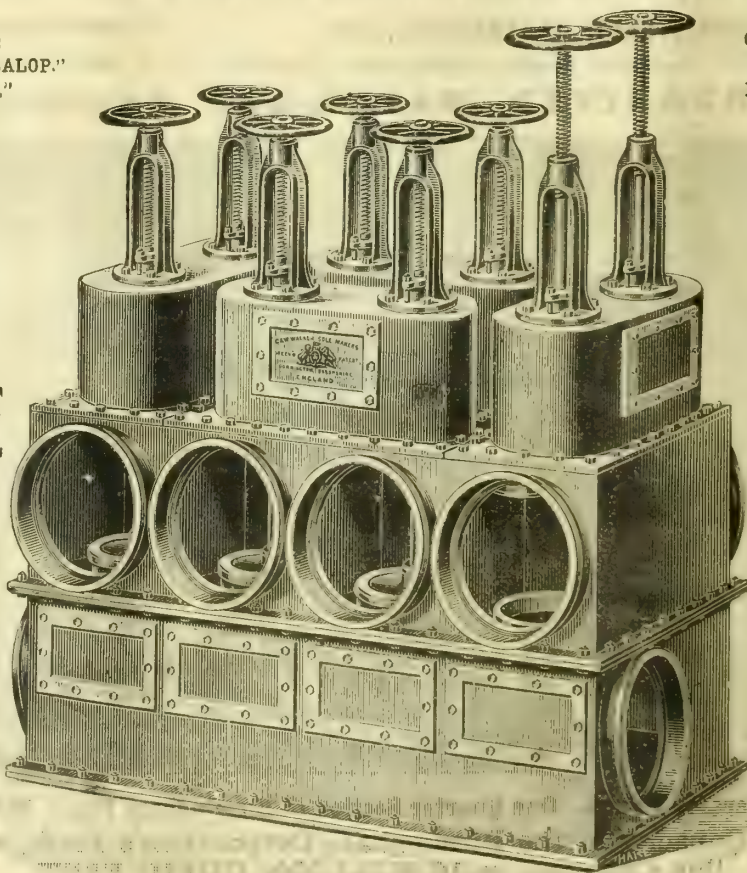
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upon gas supply following the election, except in Dundee, where, I observe, the "Dundee Courier" claims that an inquiry into the gas supply must now be held. There have also, since the election day (Tuesday), been letters in the newspapers, by leading members of the Corporation, making and contradicting statements which are of little concern to anyone but themselves. The best inquiry would be for the members to read up the minutes and study them; and they would find how they or their predecessors dealt with questions relating to the gas supply. They would then learn something not to the credit of the public men of the town. I do not know that any further inquiry is necessary, or would be profitable. If there were any charges of malversation, it would be different; but unless there be some covert meaning in what has been said, we are happily spared that degradation. The only approach to a charge involving reputation which I have seen, was a remark that the coal contracts were nearly all placed with Dundee coal merchants; the insinuation being that coal would be obtained cheaper if outside competition had been allowed. I would not be surprised if it were true that Dundee coal merchants have been preferred to others; for Dundee is a very parochial place. But even so, there could not be much difference between Dundee merchants' prices and the prices sent in by outside offerers. All this will, or should be, found in the minutes. It is high time that this Dundee scare were at an end. It appeals to me as little more than a newspaper flare-up; and it has possibly, if that surmise be correct, served its purpose. If the intention be to alter the policy of the Gas Commission, the agitation will go on. In this case, there will be further damage to public reputations, of which there has already been more than is desirable; and my task of writing upon an unpleasant subject will not have ceased, as I would fain hope it has.

At a meeting of the Cupar District Committee of the Fife County Council, on Tuesday, there was under consideration a claim by the Kettle Gas Company for compensation in respect of damage to gas-pipes by a road-roller. The Committee resolved to offer the Company £5 in full discharge of their claim. In a similar claim by the Auchtermuchty Gas and Water Company it was resolved to deny liability, on the ground that the Company have no right to lay their pipes where they are, whatever that may mean.

The "Dalkeith Advertiser" this week contains the following: "In connection with the statement made by Bailie Chisholm at the ratepayers' meeting on Thursday last, and with the certificate of Mr. John Hunter, County Analyst, to the effect that the illuminating power of the gas was equal to 15·9-candle power, the Dalkeith Gas Company on Monday issued a statement, signed and declared by Mr. A. Bell, the Manager, before a Justice of the Peace, that the power of the gas regularly supplied in the town was from 24 to 25 candle power. The Gas Company further declare that Mr. Hunter had refused to say anything of the place and conditions under which his analysis was made. In reply to this, a statement signed by Mr. Hunter was distributed in the town stating he had told Mr. Bell that if he was going to question his results he would be prepared to defend himself, and to absolutely defend any report he had given upon gas or anything else." Now, Bailie Chisholm's remarks at the meeting of ratepayers consisted of a long denunciation of the Dalkeith

Gas Company. In 1893, he said, he collected statistics upon the subject of public lighting; and he then found that Dalkeith was one of the most expensively lit towns in Scotland. At that time he proposed that they should acquire the gas undertaking, under the Burghs Gas Supply Act; but his suggestion was lost by one vote—on the motion of Dr. Lucas, who was a Director of the Gas Company. If, he said, they had adopted the Gas Act then, consumers would now be paying about half what they are; and by this time they would have had a good part of the purchase-price paid off. Dr. Lucas's argument in 1893 was that the Gas Company were about to introduce the oil process, and to manufacture gas of 30-candle power for 1s. 4½d. per 1000 cubic feet. The price of 16-candle power gas at present was 4s. 5d. per 1000 feet. The cost of coal had absolutely nothing to do with the raising of the price of gas by 5d.; it was raised in order that the Company's usual dividend of 15 per cent. might be kept up. The customary dividend was 15 per cent.; but in 1889 the Company paid 30 per cent. Well, these statements had their effect; and Bailie Chisholm was returned by a larger vote than any of the other municipal candidates. The report of Mr. Hunter is a serious matter. The Company should not lie still under it, but should compel a full disclosure of the circumstances of the analysis. We have seen, before now, how surreptitious tests of gas have broken down; and I expect that, if the circumstances were known, Mr. Hunter's would share the same fate.

A proposal is being considered for the lighting of Clachnaharry, a suburb of Inverness. There is a difficulty in the matter, in respect that the Caledonian Canal comes in between the two places, and the gas supply does not, as yet, extend to the west side of the canal. In a report on the subject to the Town Council, the Gas Manager (Mr. J. Thomson) says that a jointed pipe might be laid along the bridge; but in this case the gas supply would be interrupted when the bridge was opened to allow ships to pass. Another method considered was the tunnelling of the canal; but this operation might interfere with the stability of the canal works. The suggestion Mr. Thomson made was that when the canal is emptied for repairs, a 3-inch gas-pipe should be sunk into the masonry of the bridge on both sides, and should cross the bed of the canal. By being sunk in the masonry, the pipe would not be liable to be damaged by passing vessels. The cost of the whole scheme would be £470; and there would be an annual revenue from public lighting alone of £28. When the subject came before the Town Council this week, someone suggested that they should supply the place with acetylene gas; and it was resolved to ask Mr. Thomson to report upon other methods of lighting than by coal gas.

It is announced that the Directors of the Cairn Table Gas Coal Company, Limited, have had before them the accounts of the Company for the year ending Sept. 30, which showed a credit at the balance of profit and loss account of £12,396; and that the Directors have resolved to pay a dividend at the rate of 2½ per cent., to write off £500 for depreciation of plant, to place £500 to reserve fund, to award the Directors a bonus of £241, and to carry forward £296.

So far as any question of note affected the municipal elections in Arbroath, it was that of the water supply. The enlargement of the wells is completed; and it is known that the supply which can be obtained

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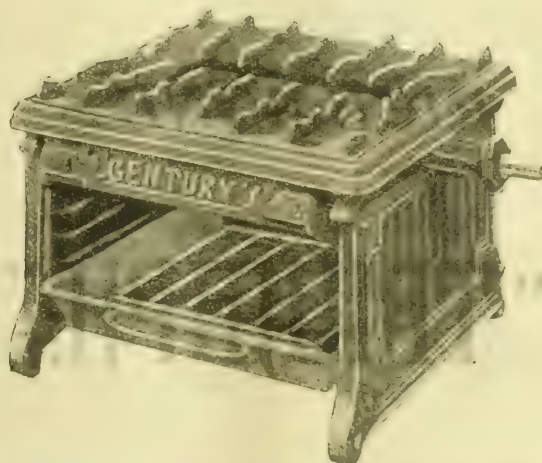
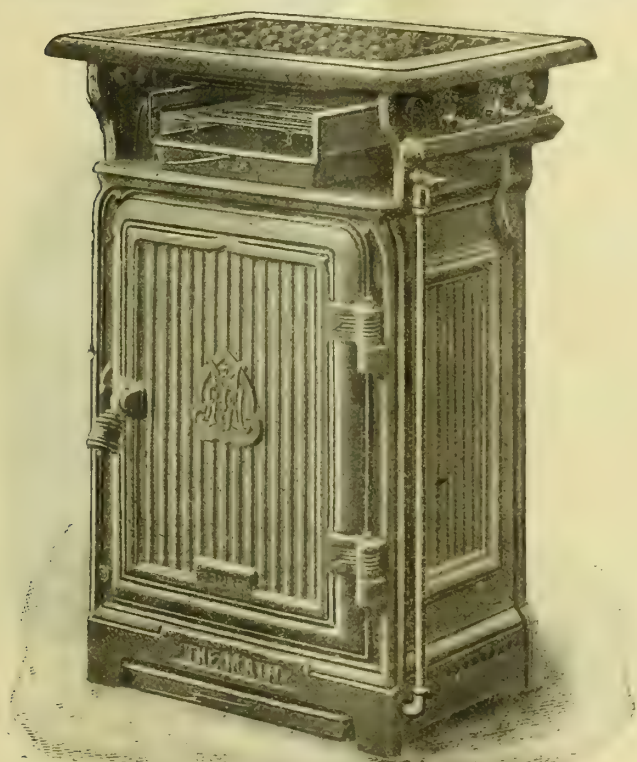
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from them is not more than 12 gallons per head per day. But the full significance of this fact was not pressed upon the attention of the electorate, who are still largely in ignorance of the alarming state of the water supply of the town. It will dawn upon them some day that they have been throwing away money—some £8000 or £10,000—in searching underground for water, when there was abundance to be had in the rising grounds in the neighbourhood. Meantime, the elections have gone against the advocates of a gravitation scheme.

Last night Mr. Robert Wilson, the Treasurer of the Water Department of the Glasgow Corporation, delivered a lecture upon "The Glasgow Water-Works," under the auspices of the District Council of the National Registration of Plumbers. Mr. Wilson gave the following items of information: The aqueduct which conveys the water is 12 feet by 9 feet. The new track is  $23\frac{1}{2}$  miles long, of which  $22\frac{1}{4}$  miles are completed. The whole is expected to be finished next summer. The present delivery of water is 51 million gallons per day. When the new aqueduct is completed, it will be possible to carry 110 million gallons per day. The cost of tunnelling through rock is from £27,000 to £30,000 per mile. The new reservoir was estimated to cost £130,000; but on account of difficulties encountered in the formation of the embankment—it being necessary, in some places, to go so far down as 200 feet—the actual cost was £316,000. The area supplied is 11 miles by 15 miles, and contains a population of 1,032,000. Last year the revenue was £212,000, of which £65,000 was derived from rates on houses, £125,000 from manufacturers, and £19,000 was the public water-rate. The capital expenditure had been £3,840,000. Of this sum, £1,014,000 had been repaid; the rate of repayment being £60,000 a year. The entire capital should be repaid by 1950. In 1862, the water-rate was 1s. 4d. per pound; it is now 5d. Then the manufacturers were charged 1s. per 1000 gallons; the price is now 3½d.

It was stated at a meeting of the Edinburgh and District Water Trust this week that six out of the ten years allowed for the completion of the Taller augmentation works have now elapsed; that the progress has been exceedingly slow; and that the works cannot be finished by 1905, the time fixed by Act of Parliament. It was resolved to apply to Parliament for a Provisional Order, extending the time for the completion of the works by five years, and giving the Trustees additional borrowing powers to the extent of £200,000. The borrowing powers at present amount to £1,150,000.

The Bondholders' Committee of the Pernambuco Water Company, appointed on the 29th of August, 1892, are prepared to pay the holders of certificates issued by the Committee in exchange for bonds the sum of £2, less income-tax, in respect of such certificates. The payment is in full discharge of the coupon due July 1, 1899, in conformity with the agreement entered into with the Company on Nov. 23, 1898. Messrs. Knowles and Foster are prepared to pay the holders of the "A," "B," and "C" certificates 2 per cent. on the face value of such certificates, less income-tax. This payment is to be in full discharge of interest due July 1, 1899, in conformity with the above-named agreement between the Committee of Bondholders and the Company.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 10.

**Sulphate of Ammonia.**—Until near the end of the week, the market remained in a weak condition; but at the close it had recovered—the quotations being £10 11s. 3d. to £10 12s. 6d. per ton f.o.b. Hull and Leith, and £10 15s. to £10 16s. 3d. per ton f.o.b. Liverpool. Considerable sales were made by makers at £10 10s. and £10 11s. 3d. per ton f.o.b. Leith; but now there are no sellers at this price. Consumers have not had a large share in the buying; the bulk of it having been done, it is understood, for "covering" November sales. In the forward position, too, more interest has arisen; but the firm attitude of makers still hinders business. London, Beckton terms, is still quoted £11 5s. per ton over spring months; and the same price is asked, ordinary terms, f.o.b. other ports, though speculative sales have been made abroad at substantially below the equivalent of £11 5s. per ton.

**Nitrate of Soda** is firm in all positions; and spot quotations remain at 8s. 4½d. to 8s. 6d. per cwt. according to quality.

LONDON, Nov. 10.

**Tar Products.**—There is a brisk demand for benzol, unexpected increasing quantities being used for gas enrichment; and, large as it is in this country, it is much greater in Germany and in France. It is stated by the Directors that the whole of the benzol produced at the Paris Gas-Works is being used in this way. The demand for naphthalene is good; and the several new applications of this article are likely to put it on to a higher platform of value for some time to come. Carbolic is said to be weak. But there is a good demand; and there are buyers at the lower quotations. Creosote continues plentiful, pitch is moderately firm, anthracene weak, and creosote and heavy oils are still quoted at unprofitable figures.

Business during the week has been marked at: Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 2d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 85s.; salts, 65s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is only in moderate odour. There are, however, one or two urgent buyers, which looks as if foreign business is in a restricted channel. The value may be taken at about £10 10s. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The outlook in the coal trade of this district continues to indicate the probability of weakening prices in the not very distant future; but the only question which is at present at all necessitating serious attention is with regard to the forward contracts for engine fuel. For some time past there has been keen competition

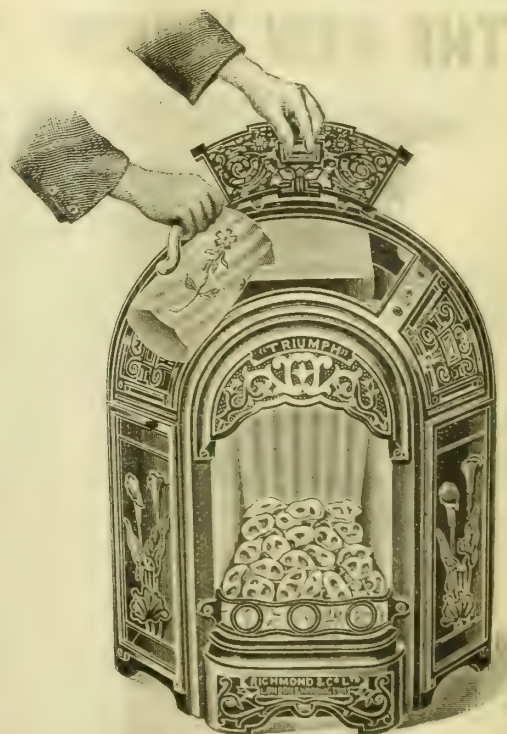
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here with slack coming in from other districts—Yorkshire more particularly; and several meetings of the Lancashire Coal Sales Association have been held to consider the position. There are one or two very important renewal contracts for large quantities of slack to be settled very shortly; and an effort is being made to decide upon some basis for tendering. A few contracts have already been settled at 1s. to 1s. 6d. per ton under current rates, on the basis of about 9s. at the pit, for the better qualities of slack. What will be done with regard to the more important contracts to be settled very shortly, has not yet been decided; but a basis of something like 2s. 6d. per ton over the prices taken last year is under consideration. The current list basis for the better qualities of Lancashire slack remains at 10s. to 10s. 6d.; but inferior sorts are to be bought at under this figure, and slack from other districts also continues to compete at below local quotations. The better qualities of round coal are still moving off fairly well, with no very appreciable accumulation of stock. Common round coals are being disposed of without much difficulty for inland and shipment, although there is a lessening pressure of requirements. At the pit, the better qualities of house coal remain at about 16s. 6d. to 17s. 6d. per ton, seconds 15s. to 15s. 6d., common 14s. to 14s. 6d., steam and forge coal 12s. 6d. to 13s., while 16s. to 16s. 6d. are about the average quoted prices for good steam coal, delivered at the Mersey ports. Merchants, however, report they are able to place orders at as low as 15s. 3d. to 15s. 6d. The makers of the better qualities of foundry cokes are still holding firmly to their recent quotations; and at a meeting recently held, the decision was come to that no necessity had so far arisen for any reduction in prices—the average basis being 28s. to 30s. at the ovens. The lower qualities, for furnace purposes, however, are not in so strong a position, owing to the slackening off in the iron trade; and it is reported that many coke-ovens are being put out, as relatively better prices can be realized on the slack. Ordinary furnace cokes are now quoted at from 15s. to 15s. 6d. per ton upwards at the ovens.

**Northern Coal Trade.**—The coal trade is rather more active in this district; and there is a very full export for this season of the year. The tendency of prices is still on the whole towards ease, but not so markedly as it was a week or so ago. Best Northumbrian steam coals are quiet and plentiful at from 16s. 9d. to 17s. per ton f.o.b.; second-class steams being 16s. to 16s. 3d., and steam smalls from 8s. 9d. to 9s. There is now a much fuller delivery of gas coals; and the demand is very near its highest point. The price quoted varies from 16s. 3d. to 17s. per ton f.o.b. for best Durham gas coals; but comparatively little is being sold, as the amount of coal left free is limited. In the coke trade, there has been some reduction of the production, and thus the fall in the price has been checked. Best Durham coke for export is quoted from 24s. to 27s. per ton f.o.b. Blast-furnace coke is about 23s. per ton at the Teesside furnaces. Gas coke is still quoted at 24s. to 25s. per ton f.o.b.

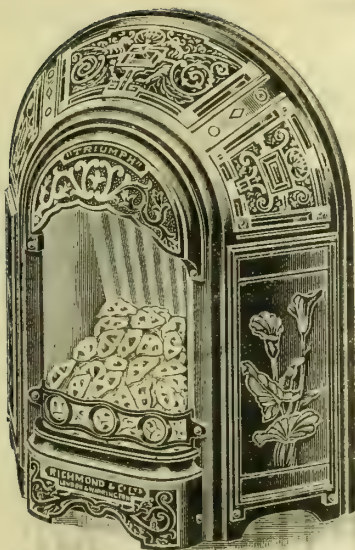
**Scotch Coal Trade.**—The view of the coalmasters upon the fall in prices came out last week, and was to the effect that buyers were holding up orders for the purpose of allowing stocks to accumulate, and so lead to lower prices; but it was expected that, when those held-up orders came in, prices would again harden. The general view is that orders are being held up, not temporarily, but until prices come down. Every

possible shift to do without coal is being made; and if the miners continue working, stocks are certain to accumulate. During the week prices have gone down still further. The quotations are: Main 13s. 6d. to 13s. 9d. per ton f.o.b. Glasgow, ell 14s. 6d. to 15s. 6d., and splint 15s. 9d. to 16s. The shipments for the week amounted to 226,344 tons—an increase of 20,236 tons upon the previous week, and of 63,239 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,427,930 tons—an increase of 2,100,883 tons upon the same period of last year.

**The Norwich Corporation and the Water-Works.**—At a recent meeting of the Norwich Town Council, the Law Committee presented a report on the subject of their proceedings in connection with the suggested acquisition of the undertaking of the Norwich Water Company by the Corporation. They recorded that, in reply to a communication sent to the Secretary of the Company, they were informed that the Directors were unable to enter into negotiations for the sale of their property. As this closed the door to friendly interviews, the question arose as to the advisability of the Corporation promoting a Purchase Bill. The Committee considered this, and advised that nothing should be done in the matter next session. Mr. L. J. Tillet moved a resolution to this effect. Mr. Searles proposed, as an amendment, that a deputation from the Council should interview the Directors of the Company, with the object of seeing whether anything could be done to open negotiations. On being put, however, only the mover and seconder voted for it, and the Committee's report was then adopted.

**The Gas-Meter at the Rotherhithe Baths.**—At the final meeting of the Rotherhithe Vestry, held last Wednesday, the Baths and Wash-houses Committee submitted a report in reference to the gas-meter at the baths, which, it was stated, had for eighteen years registered only one-tenth of the quantity of gas consumed, owing to the dial indications being at fault (see *ante*, p. 797). The Committee stated that some years ago they expressed surprise at the small bills, and had the meter tested; but it was certified to be quite correct. No further notice was taken of the matter until the South Metropolitan Gas Company sent in a bill for £2947 for the arrears, and asked for a cheque, but offered to take the amount in instalments. The Committee, on the order of the Vestry, consulted Mr. Macmorran, Q.C., as to their liability in the matter, and they received from him the opinion that the Vestry could not require the Overseers to levy a poor-rate to meet the claim. Such a rate would be retrospective, and therefore liable to be quashed if any ratepayers appealed against it. He therefore could not advise the Vestry to pay the claim, except in obedience to a *mandamus* or order of a competent Court. The views of the Local Government Board might be obtained as to raising a loan to meet the claim; but he doubted if such sanction would be given. As the result of this opinion, the Committee recommended that the Clerk be instructed to inform the Company that the Vestry had no power to levy a retrospective rate to meet the claim, and that, therefore, they could not admit any liability in the matter. The recommendation was unanimously adopted.

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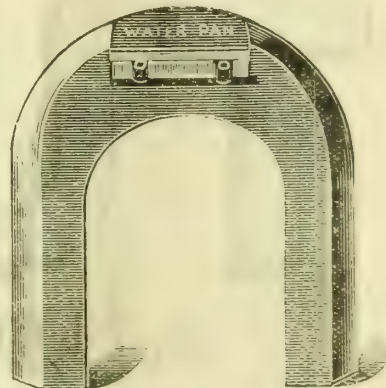
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**Gas Workers' Wages in Lincoln.**—At the meeting of the Lincoln City Council last Tuesday, the Gas Committee reported that they had raised the wages of their workmen, and that in future ordinary stokers would be paid 5s. 3d., and leading stokers 5s. 4d. a shift, and that the purifiers' wages would be 21s. per week.

**Oriental Gas Company, Limited.**—At the meeting of this Company to-morrow, the Directors will report that during the year ending the 30th of June last the business made satisfactory progress. The revenue from the sale of gas was larger than that for 1898-9; and the profits arising from the disposal of the residual products also exhibited a proportionate increase. The balance of the profit and loss account (after payment of the interim dividend of 3½ per cent. and income-tax in June last, and after appropriation to the reserve fund) is £15,859, out of which the Directors will recommend the payment of a dividend of 4½ per cent., free of income-tax; making a total dividend of 8 per cent. for the year, and leaving a balance of £2359 to be carried forward.

**Incandescent Gas v. Electric Lighting at Guildford.**—At a recent meeting of the Guildford Town Council, the Lighting Committee reported that they had made an inspection of the various streets where improved lighting was reported to be necessary; and extra incandescent gas-lamps were ordered. They did not consider the experimental lamp fixed by the Electric Supply Company in North Street to be satisfactory; and therefore they recommended the Council not to proceed further in that direction. In the course of the remarks made upon the report, incandescent electric lighting was regarded as not being well suited for the public streets, while satisfaction was expressed with the incandescent gas-lamps all over the town. On the same occasion, a proposal to light the town clock by electricity, at an estimated annual charge of £30, exclusive of the cost of the installation, was, on the recommendation of the General Purposes Committee, abandoned, on the ground that the cost would be greater than was commensurate with the benefit to be derived.

**Gas Poisoning in Belfast.**—Last Tuesday morning, a serious case of gas poisoning was discovered in a spirit-grocery establishment in Belfast. The premises were rather late in being opened, and the neighbours, suspecting that something was wrong, endeavoured to effect an entrance. In doing so, by means of a window, they perceived a strong smell of gas, which escaped as soon as there was sufficient ventilation. Two men were found lying in bed unconscious. In another apartment a woman was found in a like condition. Medical assistance was promptly summoned, and, under careful treatment, the woman recovered, as well as one of the men. The other had to be removed to the Belfast Royal Hospital. It appears that the gas had escaped by being only partially turned off in the bedroom occupied by the men. The last reports in regard to the man in the hospital were that he was progressing satisfactorily. Another case occurred on Wednesday, when Sarah Pennington, a young woman in service at Osborne Park, was found lying in an unconscious condition in her bed, having been overcome by an escape of gas. She was removed to the hospital, where everything was done to restore her. She remained, however, in a critical state all day; but the opinion of the medical staff was that she would recover.

**New Water-Works for Tenby.**—The Tenby Town Council agreed to instruct Mr. James Mansergh to prepare plans, specifications, and estimates for filter-beds, and to ask the Local Government Board's permission to borrow £3000 to cover the cost.

**The Vulcan Incandescent Light Syndicate, Limited,** has been registered with a capital of £10,000, in £1 shares, to manufacture and deal in incandescent light mantles, burners, glassware, lamps, and accessories, &c. The offices of the Company are in Manchester.

**The Gainsborough Gas Purchase Loan.**—At the meeting of the Gainsborough Urban District Council on Monday last week, the Gas Committee requested permission to increase the gas purchase loan from £85,500 to £86,761, and recommended that the offer of the bankers to lend the additional sum of £1269 at 4½ per cent. be accepted. Mr. Cooper explained that the extra money was the result of costs sprung upon the Committee since the first loan was requested. The permission was granted.

**Public Lighting by the Incandescent Gas System in Mid-Cheshire.**—A parish meeting of the inhabitants of Winnington, near Northwich, was held last Tuesday for the purpose of considering the advisability of adopting the Lighting and Watching Act. In the main streets of the township, Messrs. Brunner, Mond, and Co. have for many years maintained 45 lamps free of cost. Estimates were submitted for lighting the remainder of the district with 28 Welsbach incandescent lamps by the Northwich Gas Company. Messrs. Brunner, Mond, and Co. also undertook to have Welsbach burners placed in all their lamps at their own cost, to hand them over to the Parish Council, and to supply the gas for £45 a year. The total estimated cost of lighting the district is £222 10s. 6d. per annum. The Act was adopted, and it was decided to levy a rate of 2½d. in the pound, which will realize £217 16s. 8d.

**New Water Supply for Shadwell (Yorks.).**—About two years ago, the need for a new water supply for the township of Shadwell, near Leeds, forced itself upon the inhabitants; and a contest began as to whether it should come from Wetherby or from Leeds. The Wetherby District Council, some of whose members are shareholders in the Wetherby Water Company, in the first instance claimed in Parliament the right to supply water to Shadwell as a portion of their territorial area. Pressure was brought to bear on the Leeds Corporation by residents to include the township in the Leeds area of supply; but the application of Wetherby was successful, notwithstanding influential opposition by Leeds. The District Council next applied for an Act to enable them to supply the water by a series of wells. This was opposed by the Corporation, on the ground that the wells were within the radius of their Eccup reservoir. Subsequently, the contending parties came to terms, under which Shadwell was allowed to have Leeds water. This was turned on on Saturday, the 3rd inst., in the presence of a numerous company, by Mr. J. W. Bannister, Chairman of the Shadwell Parish Council. Mr. J. M. Sagar-Musgrave worked hard in the interests of his fellow residents in Shadwell to secure the improved supply; and to him and to Alderman Cooke, Chairman of the Water Committee of the Leeds Corporation, is largely due the credit for a very satisfactory solution of a vexed question.

# JOSEPH AIRD

## GREAT-BRIDGE.

### STAFFORDSHIRE.

# TUBES

## AND FITTINGS

## GAS, STEAM, WATER GALVANIZED-TUBES, &c.

## LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.



**The Chairman of the Bradford Corporation Gas Committee a Little Exercised.**—In the speech of the Mayor (Mr. W. C. Lupton) at the annual meeting of the Bradford City Council last Friday, there appeared a statement which, in the mass of other subjects dealt with, almost escaped notice; but it is too good to miss being recorded in these columns. The Mayor said the Parliamentary Bill of the past year was undoubtedly the heaviest one that had been promoted by Bradford. The undertaking of the North Bierley Gas Company had been acquired. Whether the price given was satisfactory or not to the city he was not prepared to say; but he believed Alderman Aykroyd, the Chairman of the Gas Committee, was a little exercised in his mind about it, and inclined to think that—for the present, at any rate—the Corporation should be very careful in any further projects for purchasing any other of the large gas undertakings in the locality.

**The Scarcity of Coal in Russia.**—A report from our Commercial Agent at St. Petersburg on the present scarcity of coal in Russia is published in the "Board of Trade Journal." It appears that the demand for coal and fuel of all kinds is still increasing daily in Russia; and as prices are rising accordingly, the authorities have further enlarged the measures designed to develop the home supply. The period during which the railways are authorized to import coal free of duty has been extended to July next; and there is every probability of further indefinite extensions, for the increase of the Russian mines does not keep pace with the growing requirements. The production during the first six months of the present year shows no improvement. The estimate for the current year is over 10½ million tons from the Donetz basin, a little over 4 millions from Poland, and over ½ million from other places; giving a total of about 15½ million tons, which, it is calculated, will be less than the quantity required for consumption by upwards of 1½ million tons. The owners of the collieries in the Donetz basin reported lately to the Minister of Agriculture that they proposed increasing their yield to nearly 13 million tons next year, and in 1904 to over 16 millions. But it is believed in the meantime the demand will augment by 50 per cent., and that in 1905 it will be over 24 million tons; so that "the present crisis is no crisis at all, if the word is used in its ordinary sense, as implying but a temporary duration of an abnormal state of affairs." Moreover, the native supply of coal has to overcome the obstacle of the defective transport, which has hitherto proved quite insufficient to cope with the demands of distribution. The iron industry suffers most heavily from the present scarcity. A new feature in Russia, as elsewhere, is the importation of American coal, of which one cargo has arrived at Kronstadt. Representatives of some of the railways have been sitting at Kharkoff to discuss the use of anthracite and semi-anthracite. The value of peat as a fuel is also being urged. New peat coke-works have recently been opened on the St. Petersburg-Moscow line, where a process, hitherto in use only in Oldenburg, is to be employed in producing coke, tar, aniline dyes, and the like, from peat. The figures show that during the first six months of the present year the total production of coal in Russia was 7,686,848 tons. Of this bulk the Donetz basin yielded 5,338,710 tons; Poland, 1,964,391 tons; the Urals, 203,120 tons; Central Russia, 146,997 tons; and the Caucasus, 33,630 tons.

**Slough Gas Company.**—The half-yearly general meeting of this Company was held on the 1st inst.—Mr. R. Martin in the chair. The accounts presented showed that the revenue in the six months covered by them was £4123; the expenditure, £3024. The net profit was £1098; and the statutory dividends were declared.

**Yeovil Water Supply.**—The Yeovil Town Council have spent £12,000 upon a new storage reservoir, but have no water to put into it. Springs which were acquired last year under parliamentary powers, and which it was thought would supply water by gravitation to the reservoir, are now found to be practically on the same level.

**Gas Profits and Rates Question in Manchester.**—At the meeting of the Manchester City Council last Wednesday, the minutes of the Gas Committee were adopted without discussion. The only items of special interest in connection with the Committee's proceedings related to the acceptance of tenders for four new purifiers which are required at the Bradford Road station, and also for supplementary supplies of coal and cannell. The last item on the agenda was the motion by Alderman Gibson to the effect that the present system of subsidizing the rates out of the profits of the gas undertaking is wrong in principle, unjust in practice, inimical to the best interests of the ratepayers, and ought to be abolished. This proposal had, as our readers are aware, figured on the paper at two previous meetings; and on both occasions discussion of the question was adjourned. On Wednesday, Alderman Gibson was for the third time compelled to ask that consideration of the matter should be postponed to a future meeting; the hour being so late that there was not sufficient time to adequately deal with the matter that day. The motion will therefore probably come up for discussion at the December meeting of the Council, when, it is hoped, a definite decision will be arrived at.

**Teignmouth District Council and the Gas-Works.**—The management of the gas-works continues to be made the subject of bickering among members of the Teignmouth District Council. At a meeting of the Council last Tuesday, Mr. Hutchings pointed out that the income from the undertaking in the September quarter was only £716, or £110 less than in the corresponding quarter of last year, while they had purchased more coal. It seemed to him a very serious state of things, though it possibly arose in part from the use of inferior coal. Mr. Banbury, Chairman of the Gas Committee, said 526,000 cubic feet of gas had apparently been lost somewhere. Possibly mistakes had been made in reading the meters; but the matter would be thoroughly sifted. Mr. Harris considered that much of the failure was due to a lack of proper book-keeping in the office. They could not tell where they were, and no business could succeed that was conducted in that way. Mr. Jarvis contended that Mr. Hutchings was only calling attention to these things because his vessels were no longer used to carry coal for the gas-works. Mr. Hutchings denied this, and said that sufficient justification for his action was to be found in the fact that in less than twelve months 900 tons more of coal had been placed in the gas-works, and yet there was this serious falling-off in the revenue. Mr. Banbury remarked that the Gas Manager had most uphill work, for whatever he did was opposed. The Gas Committee would further consider the matter.

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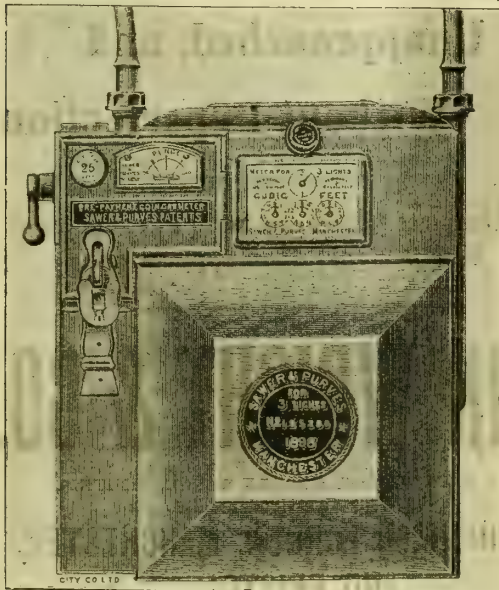
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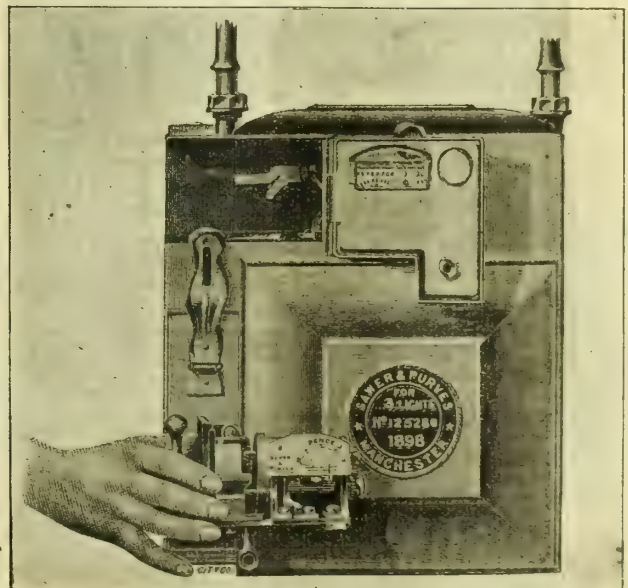
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**A Coke-Barge on Fire in the Thames.**—Early last Wednesday morning, it was discovered that a fire was raging on the barge *Gamecock*, lying in the Thames off the South Metropolitan Gas Company's wharf at East Greenwich. The barge was laden with coke, which suddenly burst into flames; and the firemen found it necessary to order the river float to get to work on the burning mass. The fire was not extinguished until the barge and its contents were greatly damaged.

**Mishap to a Tynemouth Reservoir.**—An unfortunate mishap has occurred to one of the first works of the Tynemouth Corporation as the water authority of the borough. Since the Font supply was decided upon, preparations have been made to bring the water to the town; and a reservoir has been constructed at Moorhouses, about a mile north of Preston Colliery. Unfortunately, the discovery has been made that there are workings underneath the reservoir, which is well advanced; and a pit shaft has been exposed.

**Darlington Objects to Water Gas.**—At a meeting of ratepayers hurriedly called for last Thursday to oppose the introduction of water gas into the borough, the following resolution was unanimously passed: "This meeting of ratepayers, being of opinion that the introduction of water gas for lighting purposes will be dangerous to life and detrimental to health, ask the Town Council not to confirm the resolution to erect water-gas plant; but, if anything is positively needed to meet the growing wants of the town, they urge the addition of a gasholder."

**The Buckley District Council and the Gas-Works.**—At the monthly meeting of the above-named Council last Wednesday, the principal business was to deal with a recommendation of the Lighting Committee: "That this Council purchase the gas undertaking from the Buckley Gas Company, Limited, at the price of £4250, subject to property, works, and siding being freehold, and to the confirmation of the Local Government Board." In deference to the views of one or two members who thought there was no reason to complete the negotiations so quickly, it was suggested that a special meeting be held a week hence to hear the views of Mr. T. Newbigging on the matter. This was agreed to, and it was also decided that a further meeting should be held on the 21st inst., to come to a final decision on the matter.

**The Price of Gas for Motive Power at West Bromwich.**—At the meeting of the West Bromwich Town Council last Wednesday, the Gas Committee reported that they had resolved to amend the existing scale of charges for gas by making the price to all consumers of a million cubic feet and upwards per quarter for motive power purposes 1s. 9d. per 1000 cubic feet, as from the commencement of the current quarter. Considerable discussion ensued; some objection being made to the proposal. Mr. Bushell said the average cost of gas in the borough was 2s. 2d. net per 1000 feet; and if the resolution of the Committee was approved, they would be selling it at less than cost price. He wished to disclaim any responsibility for the resolution, which he formally moved. Mr. Wilson, in seconding, said the gas in the holders did not cost the Committee 1s. per 1000 feet; and he argued that it would pay them to supply it at 1s. 9d. simply because they produced it when their plant would otherwise be idle. The report was adopted by 16 votes to 6.

**Water Supply in Dunedin.**—The existing water supply in Dunedin (New Zealand) is about to be considerably extended, by carrying the mains to the suburban districts on the higher levels. The Colonial Government have just sanctioned a loan for this purpose. At present the residents in these suburbs are dependent upon tanks, &c., for storing the rainwater, and in dry seasons these are liable to prove ineffectual for their wants.

**Explosions of Gas.**—Owing to interference with a chandelier in a house in Victoria Terrace, Longsight, Manchester, a large escape of gas occurred, which recently caused an explosion, injuring two ladies and a little boy, and doing serious damage to the house and furniture. One of the ladies—a Mrs. Trenbath—on recovering, explained that she discovered a smell of gas, and, in order to avoid an accident, turned the gas off at the meter, and opened the window. Afterwards she is said to have attempted to find out with a lighted match where the escape was, with the result above stated. She was standing on a step-ladder at the time, and was thrown violently to the ground, and received burns of a severe nature. A serious leakage of gas from the main took place last Saturday night in Great Brickkiln Street, Wolverhampton, and filled the cellars of three houses. Owing, probably, to a lighted match being thrown down, the gas in the street ignited, blew up the pavement for 30 yards, and set fire to the woodwork in the lower portion of the houses. A section of about 50 yards of electric cable under the pavement was destroyed.

**Huddersfield Corporation Undertakings.**—The retiring Mayor of Huddersfield (Alderman G. W. Hellawell) last Friday addressed his colleagues on the municipal work of the past year. Reviewing the operations of the different departments, he said there had been substantial progress in the supply of electricity. A large reduction last year in the price charged led to an increase of consumers; the numbers being in 1899 1010, and in the present year 1282. The profit for the year ended December last was £9040, or 7½ per cent. upon the capital employed; and the net balance was £2828, which had been placed to the depreciation and reserve fund, which now stood at £5684. The gas-works had yielded a total income of £95,357, of which £26,082 was gross profit, allocated as follows: Interest, £13,369; redemption of capital, £2641; to the relief of the rates (equal to 3d. in the pound), £3433; carried to reconstruction account, £6639. The gas consumed for the year ended March 31 last was 580,065,000 cubic feet, against 539,475,000 cubic feet in 1899—an increase of 7½ per cent. There were 5114 penny-in-the-slot meters in use, from which had been collected £6123 in copper, weighing 13 tons 13 cwt. An increase of wages and a week's holiday (exclusive of Bank Holidays) to the stokers had cost £300 per annum. Owing to the increased price of coal, gas supplied for stoves, engines, and public lighting had been advanced from 2s. to 2s. 3d. per 1000 cubic feet. The incandescent system had been adopted for public lighting nearly all over the borough, and had given general satisfaction. The Water Committee had reported that the quantity of water in store at Blackmoorfoot was 323 million gallons, compared with 388 millions at this time last year. The total population served with water by the Corporation was 153,080, against 152,255 last year. The income from the water-works for the year was £53,095; and the profit £5453.



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## EDITORIAL NOTES.

## A Plea for the Promotion of the Fittest.

THE address delivered to the students of Glasgow University last Friday by Lord Rosebery—Lord Rector to the University and "Orator to the Nation"—contained many words of wisdom that might with advantage be studied and remembered by all engaged in the every-day business of life, whether in positions of command or of those of the rank-and-file. One portion of the address is indeed of especial interest to "JOURNAL" readers, as therein Lord Rosebery laid stress upon two points to which attention has been recently called in these columns—the shortage in first-rate men, and the need for using those we have while they are in the first prime of their powers and energy. It is true that we have referred more particularly to the falling short of the supply of men of the first class in the profession of gas engineering, whereas Lord Rosebery had in mind both the administrative departments of the Government and the commercial undertakings of the country as a whole. That, however, only renders the more interesting the coincidence of his addressing himself to the subject at the present moment. It may, further, provide some poor consolation to those engaged in the gas industry, as showing that the difficulty is not confined to their profession, but is, in the opinion of a very acute observer of men and matters, one to be faced in the immediate future by the nation at large.

Of one thing, said Lord Rosebery, we can at least be certain in regard to the century whose dawn is now close at hand, and that is "that it will be a period of keen, intelligent, almost fierce, international competition, more probably in the arts of peace even than in the arts of war." To this fierce competition in trade the nation is (speaking broadly) as yet but partially accustomed. The rise of other industrial powers of the first magnitude has not made its effects sufficiently felt to bring about the adjustment of methods and policies necessary to enable our industries to completely hold their own. We have yet to fully realize that it is with the keener and more developed intelligence of humanity, stimulated by the struggle for an economic existence, and enhanced by training, that we have now, and in an ever-increasing degree, to vie. "This conflict," to put into Lord Rosebery's words our previously declared opinion, "we have no reason to fear, if we choose to rouse ourselves. We have the best natural material in the world. But it is doubtful if we are sufficiently alive to the exigencies of the situation. It is, perhaps, well to revel in a sunburst of prosperity and of high wages. It may be well to owe much of that prosperity to an unbounded exportation of coal, of which we have a large but limited supply, and which is vitally necessary to us as the element of existence. It is well to be convinced that we are the finest fellows on earth, and supreme on the seas. If that be the truth, it is comfortable enough; but the mere exhilarating impression is scarcely sufficient."

There is, as Lord Rosebery added, no disparagement implied in this contention for self-examination, this pointing out of the difficulties of the tasks before us. It is but a warning against "the heedless self-confidence of strength" which is so characteristic of us as a nation—leading us to under-estimate our tasks, and to pay dearly for our lack of foresight, even though we ultimately "muddle through somehow." The English people have been too prone to construe literally the second half of that wise saying of Balthasar Gracian's, that "what is easy ought to be entered upon as though it were difficult, and what is difficult as though it were easy." That is, they have not only entered upon the difficult task with as high a spirit and courage as if it were easy, but have believed it actually to require no special preparation or effort.

The point is, then, that if we have in future to contend with a competition directed by those whose intelligence is being continuously developed and sharpened, we must make sure that the intelligence of those who have to contend for our industrial existence is as rapidly developed, and as wisely trained, for the task to be undertaken. Our educational methods must be looked to and adjusted to meet the exigencies of the future. We must take stock of ourselves and, when we find, remove the "weaknesses and abuses and stagnation" that most surely exist. This is a lesson that should be taken to heart not merely by the



nation as an entity, but by each individual industry. Who will make bold to say that it is not much needed to be learned by those with whom we are most concerned—the responsible heads of the gas undertakings of the country? Which is the truth: That first-rate men are becoming non-existent in the profession, or that the need of discovering and selecting them, and them only, for responsible office is not fully appreciated by the powers that be? Has the fact that the gas industry has to encounter competition which is growing daily closer and fiercer been adequately realized, or is it true that there are still directorates that affect to believe or act as if it can be safely and wisely ignored?

We would ask yet another question: Is Lord Rosebery's account of what happens in the commercial world recognized as strictly accurate by those who know the inner working of some gas undertakings of the first magnitude? (We say nothing about other industries, though we think the description of our general business methods somewhat flattering. If it be not, foreign competition will not long do us injury.) He said: "A business in these days can 'live but a short time on its past reputation. . . . A 'business house in the present day looks over its managers 'and its agents, and considers whether they continue to 'be efficient. It surveys its methods, and compares them 'with those of its rivals. It discards those which are 'obsolete, and adopts all improvements. If it does not 'do this, it is doomed.'" Has that fact penetrated to all the supreme councils of the gas industry? Speaking of our national apathy and self-satisfaction, Lord Rosebery said: "This fatal complacency is so ingrained that some 'despair of a remedy until we are awakened by a national 'disaster." That sentence needs but verbal amendment to make it fit institutions of less magnitude than the British Empire. Lord Rosebery's address was evidently designed to put the nation in a mood of self-questioning. We have attempted to indicate some of the questions which it suggests to us, and which are surely worth the answering by the profession whose true interests we have at heart.

#### The New Bill of the Gaslight and Coke Company—Retirement of Mr. Trewby.

LAST Friday's "London Gazette" contained the Parliamentary Notice of the intended application by the Gaslight and Coke Company for further capital powers. The new Bill will differ from the old ones in proposing a different standard price for gas and sliding-scale to be applicable to the calculation of dividends payable on the fresh capital. Particulars of the subject-matters of the notice appear elsewhere. New provisions are indicated, having for their object the creation of a redemption fund to be used and applied by the Company for the purpose of effecting a reduction in the aggregate amount of the capital of the Company entitled to dividend. These later proposals—obviously intended to show respect to the recommendations of the Powers of Charge Committee—will receive the respectful attention they deserve. It is never too late to mend; and nobody will wish to be hard on the belated repentance of the Horseferry Road in this regard. Nothing more can be said about this part of the London Gas Question until the text of the Bill appears. Then everybody will be free to form an opinion on the merits of the new legislative scheme of the Company.

Meanwhile, a serious criticism on that part of the affairs of the Company which a Parliamentary Committee have already confessed their inability to touch—the quality of the administration and management—has been published by the "Engineer" as an editorial article. It cannot, therefore, be truly said that the strictures on the Horseferry Road on these accounts emanate from a small or an uninstructed section of the public or the Press. Everybody, outside the oligarchy, who looks into the matter comes to the same judgment. It is, in gas, the parallel to the scandal of the old South-Eastern and Chatham and Dover Railway Administration. Who must die, or retire, before a new broom will be brought into play?

The question is an apposite one just now, by reason of the fact that Mr. G. C. Trewby is retiring from the high position he has held so long, with such personal honour, in the Company's service. The lamented death recently of Mr. Trewby's right-hand man, Mr. Randall, makes, with this additional change, a big sweep of the Company's headquarters engineering advisers. The immediate question of who is to succeed Mr. Trewby, although deeply interesting and a matter of enormous importance, is overshadowed

by that of what the new man will be able to do when he is appointed. It does not matter who dances on the public platform, while the same hands pull the strings. The general Court of Directors have been appealed to, even remonstrated with, in the endeavour to stir in them a sense of the responsibilities of their office. In vain. They seem perfectly satisfied with things as they are. The largest gas undertaking in the world continues to be run by a set of professional Directors, with fortnightly Board meetings, and as a side-show to any number of other concerns, big and little. Consequently, the shareholders have to put up with less dividend than they would otherwise receive; and the public pay much more for gas than they ought. The proprietors will be lucky if they do not suffer still more before the slate is clean. If the Directors wish to impress Parliament with a sense of their solicitude for the interests of the undertaking and the public, they will now informally agree to a self-denying ordinance, and put the Administration of the Company into commission. This could be done without any alteration of the law. All that would be required would be to make choice of some Administrator in whom the world has confidence, give him a free hand and all the Directors' fees; and let a legal number of the Board remain to register his decrees. This appears to be practically what is done now, so far as the working of the Board is concerned; with the notable difference that the present heads of the business are hopelessly discredited. This "quasi-Department of State" is, in the eyes of the public, like the War Office itself at the present time; and nothing short of root-and-branch reform will satisfy public feeling in regard to it.

#### Coal Miners and Coal Prices.

THE action of the South Wales Miners' Federation in initiating a policy of output-restricting holidays, to which reference was made last week, has been, we are glad to observe, promptly repudiated and protested against by the representatives of the coalowners on the Sliding-Scale Joint Committee, which met this day week. At that meeting the owners' delegates handed the men a resolution declaring that they (the owners) were "unanimously of opinion "that the principle involved in such a stoppage of work "was unsound and the action illegal, and would not achieve "the object which the workmen's representatives had in "mind; the course followed—so far from assisting the "trade—being calculated to damage it both temporarily "and permanently." On the men's side, however, no signs of repentance or appreciation of the true results of their action were apparent; their representatives, in fact, requesting, and obtaining their request, that the Coalowners' Association would fix a day for the discussion of the wisdom of their adopting in conjunction with the miners a fixed policy of maintaining prices by restricting output.

The men, we read, declared that the matter was one which had better be "tackled" at once, "so as to demonstrate the "power of the miners to those who were endeavouring by "artificial means to influence the market for their own selfish "ends." What a magnificent example of the pot casting aspersions at the kettle! Who would think that the whole aim and object of these preachers of unselfishness was to force the public to pay extortionate prices for coal in order that they might pocket abnormally high wages? The "artificial means" by which the wicked buyers of coal are seeking to influence the market for their own selfish ends is, if you please, that of "keeping back contracts in the "hope that prices will come down!" What an unheard-of atrocity! One has scarcely patience to consider such childish but dangerous nonsense. No wonder that the men who can use these arguments fail to see that if it be only possible to maintain the rate of wages by reducing the amount of work done, the total earnings will not be benefited even temporarily, and will be seriously damaged permanently. But, as we have said, these men appear to be impervious to reason, and will have to buy wisdom, as they will not learn it.

The action of the Welsh miners is, indeed, an omen of serious trouble to come. We have often expressed, and see no cause to banish, the fear that the prolonged spell of extraordinarily high wages now being enjoyed by the coal miners will have the effect of making these men completely dissatisfied with the rates of pay ruling in more normal times, and that they will, in fact, decline to go back to the lower rates without a struggle. The situation certainly invites discussion as to the wisdom of the policy of granting unlimited increases in wages according to the selling



price of coal. The sliding-scale works very smoothly so long as the slide is upwards and a man's earnings are increasing from (say) 30s. to 45s. a week. But when the slide is downward, and the family that has got itself used to spending 40s. a week (and how many would save even the five shillings?) has to draw in to the extent of half a sovereign in the weekly expenditure, the advantage of the system is not so obvious to the miner.

It may be urged that the sliding-scale system is one of profit-sharing, and for that reason commendable. But the business of coal mining and selling is not one in which a bonus calculated according to the selling price of the article produced can be said to be consciously earned by the workman; and such a bonus is, therefore, no real inducement to improved working. The question as to whether, or to what extent, a miner's wage should vary with the selling price of coal, is a difficult one to determine; but it will be much in evidence in the near future. As to the present, it is happily true, as Mr. Livesey points out in a letter to "The Times" (reproduced elsewhere), that there is no prospect of the action of the Welsh miners having any effect in checking the downward movement in the price of coal. Apart from this action, there is, indeed, every cause for expecting an increasing output. Employment in the iron and steel trades is steadily becoming more precarious—the percentage of unemployed at the end of October showing a sensible increase in those trades, and also, on the average, in all others, as compared with either last month or last year. There will, therefore, be undoubtedly an influx of labour into the coal mines, with a consequent increase in output. It is worth noting, also, that the output in Prussia—one of our biggest customers of late—has increased by nearly 9 million tons in the first three quarters of this year, as compared with that period of 1899. Another item of foreign news bearing on the coal situation is from St. Petersburg, and is to the effect that the iron trade is so depressed in Russia that nearly all the works have had to reduce their production.

The evidence of the approach of a considerable fall in coal prices may, in fact, be said to accumulate from day to day. The latest proof that we can lay before our readers is that Yorkshire gas coal has been bought for delivery to a Suburban Gas Company for just over 16s. a ton—which is lower than was the f.o.b. price of gas coal not so long since. We may therefore expect soon to see gas itself marked down again in some parts of the London district.

#### The Meeting of the Southern District Association.

THOSE British gas managers who have been tempted of late years to adopt a pessimistic view of local technical societies, may take example and draw encouragement from our record of the proceedings at last Thursday's meeting of the Southern District Association. The gatherings of this Association, as of others, have occasionally caused the judicious to grieve over a small attendance and an indifferent programme. This time, however, the able and popular Honorary Secretary (Mr. J. W. Helps) was happily successful in procuring a sufficient and attractive list of three papers, which promised ample technical matter for a long November afternoon. And they were thoroughly appreciated. This consideration will doubtless be regarded by the authors as good payment for their trouble in writing their several papers, which were all, in their manner, excellent. The absence of the President of the Association (Mr. D. Irving, of Bristol) was regrettable, both in regard to the fact and also for its cause—the illness of his respected chief, Mr. W. Fiddes. To return, however, to the meeting. It is gratifying to find that a promise of ample and suitable mental fare is yet a sufficient attraction for a large number of the members of a District Gas Managers' Association. Secretaries and ordinary members should mark the fact, and take its lesson to heart. Another lesson of Thursday's success is that there must everywhere be a reserve of good material for instructive and interesting papers in any body of working gas technicians, which unfortunately lies hidden away, mainly because of the reticence characteristic of English men of affairs. The men who do things, and do them well, hate to talk about them, as a rule; and the most difficult of the duties of Secretaries of Technical Societies is that of penetrating through this crust of personal modesty, and drawing out the good stuff that lies beneath it.

Mr. G. P. Lewis's paper on purifier construction turned out to be a suggestive criticism of the water-sealed and

dry-jointed patterns of this order of gas-works plant, to which was added a short excursus into the chemistry of the purification process. Of course, one does not wish to criticize with "all severities" a little technical memorandum of this kind, prepared in good-natured compliance with a request of the Secretary. It is not, therefore, with any other intention than that of offering a little hint for the guidance of future writers on this or kindred subjects, that we remark that, for a necessarily short paper, Mr. Lewis attacked too much. The design and construction of purifiers; the ways in which labour in purification may be economized; the simplification of valves and connections—there is plenty of material for any number of short papers on the structural aspects of purifying plant alone, to say nothing of the chemistry of the process, which is another story. By the way, what an admirable paper might be written for a technical society on "The Hydraulic Seal" in Gas Engineering: Its Uses and Abuses." Many suggestive observations are to be found scattered through the discussion on Mr. Lewis's paper.

Mr. F. G. Cockey's paper descriptive of exceptional difficulties encountered, and overcome, in the construction of a concrete gasholder tank at Newport (Isle of Wight), is a model of its kind. Remarkably well written, terse, clear, and comprehensive, it will be an indispensable memoir on the subject, to be got by heart by all students of gas-works construction. Certainly, no future handbook on gasholder tank construction will be complete without it. Speaking critically of the considerations mentioned by the author as determining his choice of concrete in preference to a steel tank, it can hardly be agreed that they justify his selection—that is to say, it is not to be allowed to go forth without demur that a steel tank cannot be made stiff enough to resist any unavoidable ground pressure without much additional expense. Rolled joists are not dear; and where there is rotten ground to be negotiated, the argument for avoiding all risk by going in for steel throughout is very strong. If Mr. Cockey had decided in this sense, he would have escaped much worry; his faithful contractor, whose staunchness in trouble deserves honourable recognition, would have kept his money; and the Southern District Association would have gone without a valuable communication.

Mr. A. W. Onslow's paper on incandescent gas lighting by means of high-pressure gas had all the advantages of "actuality." Indeed, it might almost be styled "topical," so active is the movement in this direction at the present time. On all hands, with the drawing-in of the winter days, people with shop work to do and highway authorities are rushing after high-power incandescent gas-lamps, which have the advantage over electric arc lighting of being available at short notice, wherever a gas-pipe goes, and a source of small power is available. Knowing all this, however, it nevertheless came with something of a shock to hear that Mr. Onslow, being at the Woolwich Arsenal in the exceptional position of gas manufacturer and consumer on a large scale, has already gone the length of burning gas at the unprecedented pressure of 54 inches of water. He told his story in a plain, matter-of-fact style, which deeply impressed his audience. Just imagine it for a moment! At a period when the idea of supplying gas for high-power lighting at a pressure of 8 inches of water, or thereabouts, is being handled gingerly by a few "advanced" gas engineers in the ordinary line of business, here is a technician pure and simple, who has no other obligations than those of making 350 million feet of gas yearly at the lowest cost, and lighting 25,000 men to their work as cheaply as possible—and he puts a smith's blower on a service-pipe, and with no other appliances runs the burner pressure up to 54 inches. He expresses himself as ready to go to 180 inches of pressure, if he can get burners and mantles strong enough to stand it. Of course, there must be an economic limit to this daring; but that will have to be ascertained. Nobody knows anything about it yet. This question belongs to an entirely new department of gas lighting that is only just being opened out. The gas company engineers and managers who listened to Mr. Onslow last Thursday could say nothing to his point, for the simple reason that their studies and practical experiences have not hitherto lain in this direction. They will have to pick up the subject quickly, however, with electric light, municipalized and otherwise, dazzling the world around them. If, with all these leads, the gas managers of the United Kingdom allow the new opportunity of usefulness to their generation and industry to slip,



they will deserve all the hard names that a business world, innocent of the somniferous influence of statutory protection, has ever applied to their order. Such a breezy person as Mr. Onslow—a Gas Engineer with neither a board of directors nor a municipal committee to reckon with—is infinite refreshment in a stuffy environment of dividends, and gas profits, and “ordinary gas-works routine.” It was worth a long journey to hear him on Thursday, and to handle a model blower he had with him—a toy which, as he said, was capable of creating a blaze of light in the meeting-room. And he would have done it, too, if there had been the smallest facility for the operation! That is the spirit we should like to observe more frequently in the gas engineer of to-day.

#### The “Corner” in Oil and its Results on the Gas Industry.

ONE of the most valuable lessons taught by the year’s “tightness” in coal is that of the folly of relying upon carburetted water gas as a second string for the British gas manager’s bow. We welcomed the advent of carburetted water-gas manufacture into the United Kingdom in the capacity of an auxiliary to the ordinary coal-carbonizing plant. It was talked about for many years before it came, and it was demonstrated that the prospects of its coming depended altogether upon the price at which the necessary oil supply could be obtained here. The time came when the requisite proof of the reduction in the price of gas oil seemed to be completed. At the first meeting of the Incorporated Institution of Gas Engineers, Mr. G. C. Trewby (the President) dealt in his Inaugural Address with this aspect of the question of carburetted water gas. At that period—May, 1891—although the price of oil in this country was admittedly too high (3d. per gallon for Solar distillate) to enable carburetted water gas to be made here in competition with ordinary coal gas, there was just an economic possibility of using it as a means of enrichment. This was also the period when cannel coal was being advanced in price; and the gas companies, led by the example of Beckton, were attracted by the promise of being able to show the cannel coal merchants a Roland for their Oliver, in the shape of carburetted water gas enrichment at a cost of about 1s. 10d. per 1000 cubic feet for 25-candle gas. When Mr. Trewby made himself responsible for this estimate, he had taken pains to learn what were the prospects of getting even cheaper gas oil; and he made public the assurance he had personally received “from a gentleman who is fully qualified to speak on the question of the petroleum industry,” to the effect that the supply might be regarded as unlimited. He certainly believed then that, as the demand for the material for gas making increased, the price would come down.

All over the country, after this, gas managers began to think hopefully of this possible “second string.” It was introduced in many works favourably situated for getting the oil at a low cost for carriage, sometimes with the express object of reinforcing the coal-gas plant in respect of the bulk of the output—not merely for carburetting. The oil did become cheaper for several years; and we, among others, fell into the delusion that this effect was traceable to the ordinary operation of the economic “law” of supply and demand, in cases where the supply is practically unlimited. It became a commonplace of gas politics that coal prices would never be able to affright the poor gas manager again, because the course of the oil market would be independent of that for gas coal. Probably the careful student of these pages might be able to disinter from not very old volumes of the “JOURNAL” several articles setting forth this view with conviction. Alas! for confidence in the “law” of supply and demand! We should not like to say how much more gas oil is bought and sold now as compared with the volume of trade in those years of hope; but at least one thing is certain—the price of the commodity has gone up to a figure at which it would never have wormed itself into the British gas manager’s young affections, if it had always been so in the early ‘90’s.

During the past year or two, those gas companies who had equipped themselves with auxiliary carburetted water-gas plant have been pretending very hard that they liked it. The oil always grew rather dearer, instead of becoming cheaper; but still they clung to their acquired taste for its gaseous product, and refused as long as they could to be disillusionized. Then, when the pinch of scarce and dear coal came, they hugged themselves with the fond belief that now their superior husbandry would become

manifest. “Let the galled jades wince; their withers ‘should be unwrung!’” And they began to look out sites for more carburetted water-gas sets. But they reckoned quite without their hosts. The magnates of the oil market calmly informed their customers for the gas-making varieties of the commodity that the prices must be increased. Why? Because of any heightened cost of the raw material, or of freights? Not to any notable extent. Everything has, of course, grown dearer of late—everything, that is, which has much to do with coal or iron. But it is not pretended that oil has cost sensibly more to get to British ports. It ought to be cheaper, if the recent opening of a long length of Caucasian pipe-line possesses any economic significance. No; the advance in the price of oil is a deliberate “squeeze” on the part of the controllers of the situation. They have the effrontery to tell the buyers of gas oil that these victims of inflated coal prices can afford to pay more for their oil also; and they mean to make them do it. There is no political economy or fair dealing in the matter; it is sheer “cornering.”

It has come to this: There is no knowing what to expect as regards the course of oil prices from knowledge of the opening of new pipe-lines, the exploitation of new fields of supply, or anything else. There must somewhere be a hierarchy, which holds the market in the hollow of one hand, which can within wide limits be opened or shut at will. If we had suspected this eight or nine years ago, we should have counselled the exercise of the greatest care by gas managers everywhere in weighing the advantages of auxiliary carburetted water-gas plant, and, among other things, the charging of the capital cost to a seven years’ suspense account. The oil cornerers have spoilt the prospects of carburetted water gas for this country. They may have acted in this sense intentionally, out of a desire to keep their oil for other markets. That is best known to themselves. The movement in favour of carburetted water gas in England during the past decade is not to be regretted. Still less are those who took part in it to be blamed. On the contrary, the movement came just in time to prevent the distress into which dear cannel would otherwise have plunged most of the gas undertakings of the kingdom. Now it would appear that the preventive has served its turn, and threatens to become a burden. The need for enrichment of common coal gas is passing away. The South Metropolitan Gas Company resisted the fashion of carburetted water gas until the day for it had gone. Now it stands confessed a remedy that has everywhere grown worse than the disease it was to have cured. True, many gas companies are as slow in giving up a practice as they are in adopting a new one; but the fresh leaf has been turned in all the carbonizing books, and the entry on account of carburetting materials of all kinds will grow smaller every day. The cheap gas of the future will be made without oil; and the oil merchants seem to be quite willing to have it so.

#### Gas Prices at West Bromwich.

A VERY interesting polemic has been going on in West Bromwich over the prices of the municipal gas supply. It appears that some time ago—not very long—the Corporation Gas Committee were desirous of encouraging the day demand for gas; and accordingly they made the handsome offer to local manufacturers of a sixpenny reduction on the charge for all gas above a certain quantity used in the production of motive power. The ordinary price of town’s gas was at the time 2s. per 1000 cubic feet; so that the prospective users of large quantities of gas for power would get it for 1s. 6d. per 1000 cubic feet. It was exceedingly awkward for the Gas Committee that, almost as soon as this arrangement had been put into force, the rise in coal prices compelled them to increase the price of gas all round. What they did, however, under this compulsion was to increase the price by 2d. only to the ordinary consumer, while putting up the price of power supplies from 1s. 6d. to 2s. per 1000 cubic feet, which looked very like withdrawing the whole of the inducement offered to the manufacturers to change from steam to gas power.

Naturally, the alteration was a subject of complaint, both inside and outside the Corporation. It was claimed that the increase in the price necessitated by dearer coal ought to have been made equal all round. At their last meeting, the Town Council conceded the justice of this view by making the price of power gas, for quarterly quantities of 1 million cubic feet and upwards, 1s. 9d. per



1000 cubic feet; while retaining the other supplies at the advanced price of 2s. 2d. per 1000 cubic feet. Very remarkably, this correction was strongly opposed by Mr. Bushell, the Chairman of the Gas Committee, who spoke almost passionately against it at the Town Council meeting. We are tempted to ask whether Mr. Bushell was the Chairman of the Committee at the time when the original remission of price was made in respect of power gas. His point now is that, even at the price of 1s. 9d. per 1000 cubic feet, the gas will be sold to a particular class of consumers under cost price. This proceeding he stigmatized as commercially unsound. The opposite view was upheld by Mr. Wilson, an equally eminent and able local man of business, who argued that it would pay to sell power gas at the figure named, because it would be made at a time when the plant would otherwise be idle. Even at the advanced price of coal, it only costs 1s. 2d. per 1000 cubic feet to put gas into the West Bromwich holders; so that there is plenty of margin between the actual cost and the price charged for power gas. The difficulty here is chiefly one of definition. What is the cost price of gas? Mr. Bushell's position is, in its essence, unassailable. No corporation product ought to be sold at under cost price, because to do so is to benefit pecuniarily one man at the expense of another. But, on the same ground, no corporation product ought to be sold above cost price, and the so-called profit appropriated to the relief of the rates.

If the question is one to be argued on this high plane of municipal ethics, well and good. In the present case, however, to do so appears to be a trifle late in the day. This should have been done when the original departure from uniformity of charge was made. Thereafter, the issue was lowered to one of practical politics and ordinary commercial good faith. Corporations must keep their word in the spirit as well as in the letter. To make a bid for non-existent custom, and then run word, is not business, nor even common honesty. It is idle, in the circumstances, to pose the question of the fairness of giving a discount for power gas consumed in large quantities. Some gas undertakings do; others do not. It is usually done, if at all, where the uniform price of gas is distinctly high, and the object is to get down to a lower uniform rate. In West Bromwich, gas is not high priced for any class of consumption; but if the extensive use of gas-engines in the borough can be encouraged by offering a concession of 5d. per 1000 cubic feet to manufacturers, it would be extremely difficult to make out a convincing case, on strict ethical grounds, for denying the community such a boon.

## WATER AND SANITARY AFFAIRS.

THE liability of frail humanity to occasionally fall into wrong-doing is a weakness which calls more frequently for pity than punishment. It is deliberate persistence in wrong-doing that is reprehensible. And this is precisely the present attitude of the London County Council on the Metropolitan Water Question. Notwithstanding the unequivocal terms of the report of the last Royal Commission, the Council last Tuesday, by a majority of 28, decided to promote a Bill to sanction the purchase by them of the undertakings of the Water Companies. This conclusion was come to on a report by their Water Committee in which, as pointed out last week, they candidly confessed that the course they recommended might be unsuccessful. The general opinion is that it will be; for even one of the Council's own organs admits that it is "one thing to introduce Bills and quite another to pass them." Moreover, when the Chairman of the Committee was asked the plain and straightforward question whether he conscientiously believed there was "a ghost of a chance" of such a Bill as was proposed being passed, he preferred to remain silent. Consequently, it may be expected that the £25,000 estimated to have been fruitlessly spent on this matter will be increased by another £200. Mr. Stuart thinks the money has been well laid out; but we doubt whether the rate-payers will be disposed to agree with him. We shall probably hear something from them at the election early next year. Two reasonable propositions were submitted by the Moderates—one, that the Council should promote a Bill to give effect to the main principles of the report of the Royal Commission; the other, that no more money should be spent on Bills, but that the Government should be pressed to legislate on the subject next session. Both,

however, were rejected. The Committee's recommendation was sharply criticized during the debate to which it gave rise. Mr. Whitmore predicted failure if the Council were so "perverse" as to adopt it; while a Progressive was bold enough to confess that he failed to see much use in "knocking their heads against a brick wall," and with a touch of resignation he likened himself to "a lamb being led to the slaughter." The action of the Council may be regarded by the "thick-and-thin friends" of that body, as the "Pall Mall Gazette" calls them, as a firm determination to maintain their policy of purchase; but others will look upon it—to quote our contemporary's language—as "pigheadedness."

The first Mayor of the new borough of Marylebone—Mr. Edmund Boulnois, M.P.—had not a great deal to tell the proprietors of the West Middlesex Water Company, of which he is Chairman, at their half-yearly meeting last Tuesday. The talk about the possible purchase of the water undertakings does not lead the Directors, any more than those of the other Companies, to sit with folded hands waiting to be bought up. He consequently emphasized the statements in the report as to the progress of the works. Only half-a-mile is unfinished of the new 42-inch main from Hampton to Barnes; while two new filter-beds have been completed at Barn Elms, and a third will, it is expected, be ready by the end of the year. These works have been undertaken solely with the view of making the supply more efficient in quantity and quality. A constant service of water is now afforded in 83,200 out of the 86,247 supplies connected on the 30th of September. Building is going on so fast in the north-west of London that the Company's limit will soon be reached. However, they will be in a position to meet the increased demand for water, as they are one of the three Companies engaged in carrying out the Staines reservoirs scheme, with which great progress has been made; one of the two large reservoirs now in course of construction, the combined capacity of which will be 3300 million gallons, being nearly completed. Referring to the action of the Water Committee of the County Council alluded to in the preceding paragraph, Mr. Boulnois stigmatized it as "a wanton proceeding," and expressed the belief that the House of Commons would summarily reject any Bill which was not based upon the recommendations of Lord Llandaff's Commission. Apart from the prospect of another tussle with Spring Gardens, the only cloud over the Company at the present time is their dispute with the Official Auditor (Mr. Allen Stoneham) to which reference was made in the "JOURNAL" for the 6th inst., and another difficulty which has arisen in connection with the payment made to the Chamberlain's fund in respect of the first issue of debenture stock under the Company's Act of 1894. The Directors are naturally anxious to get these two matters arranged, as, until they are satisfactorily settled, no further dividend can be declared. However, for the past half year the proprietors receive one at the rate of 10 per cent. per annum; and it may be hoped that the existing obstacle to its continued payment will be speedily removed.

Apart from the various projects connected with the supply of water which will come before Select Committees next session in the form of Private Bills, the number and scope of which will be definitely known in the course of the present week, indications are not wanting that Parliament will be asked to deal with two matters which are recognized as of primary importance to all who have the management of water undertakings. We refer to the control of watershed areas and the law as to underground water. Both the County Councils Association and the British Association of Water-Works Engineers now have this matter under consideration; and the outcome of their combined deliberations will probably be the submission to the Local Government Board of some scheme as a basis for legislation. We need not again enter into the merits of the first question, which has already been dealt with in the "JOURNAL." With regard to the second, when a leading Queen's Counsel characterizes the existing law in regard to it as "simply silly," it would seem that the time has come to set about altering it. A good deal of attention has been bestowed upon this subject of late—Lord Robert Cecil discoursing upon it at the Temple, Mr. Shiress Will following at the Surveyors' Institute, and quite recently Mr. Mansergh at the Institution of Civil Engineers. As is perfectly well known, the law, as it at present stands, does not recognize any right in underground water, unless it can be proved to be flowing in a defined channel. This



it is somewhat difficult to do. The operation of such a law inflicts hardships in many ways. Mr. Shiress Will freely admits this; but, notwithstanding all the study he has given to the matter, he cannot see how the law is to be altered with justice. The Lawyer having, on his own confession, got into an *impasse*, the Engineer tries to extricate him by applying his "non-legal mind" to the solution of the difficulty. Mr. Mansergh suggests that, by some addition to the Standing Orders of Parliament, Committees might be empowered to deal in a reasonable and sensible manner with cases coming before them. He thinks that parties obtaining parliamentary powers in respect of water supply should be allowed a zone, having a diameter to be determined after hearing competent evidence, within which no other well should be sunk for procuring water for public supply outside the defined area; while those within the area should be protected somewhat on the following lines: That those who had spent money in sinking wells or otherwise obtaining water should, if such water were taken away by pumping operations, have a similar quantity supplied to them free; and that those who had not spent money should be supplied at a price to be based upon the cost at which, but for the abstraction of the water, they could have procured it for themselves. Here are two very simple propositions, which merit the consideration of those who contemplate initiating proceedings with the view of amending the existing law on this troublesome subject.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1287.)

THE revival of activity in the Stock Markets was well maintained last week. The feverish characteristics had abated; and there was a marked disposition to settle down into good, steady business. Not that the week was altogether unchequered, and symptoms of a slight check now and then appeared; but they acted as no more than a wholesome break to prevent the pace from being made too fast. After the settlement, the tone ruled very firm, and business continued active to the close. With the sole exception of the Funds (which were troubled with some misgivings as to what the Government may propose as to ways and means), prices pretty well all round had a nice advance; railways in all parts being conspicuously in front. The Money Market was firm at the opening, and discount rates were disposed to harden; but greater ease set in later. There was a good demand for short money for the Stock Exchange and other lines, after which the market was quite slack. In the Gas Market, business was quiet, taken all round. On one or two days, things looked as if they might quicken up a bit; but the promise died away to nothing. The tendency, too, was deadly dull to a degree; and the prevailing weakness was such that stocks fell away directly they were touched. Only one issue had a real advance, and that was rather a partial recovery from the excessive drop it had had in the preceding week. In Gaslights, the ordinary had to give way at last, after a long struggle to maintain a par quotation. On Thursday, it touched 97; but the final mark was half a point better. The secured issues were quite featureless. South Metropolitan was also decidedly flat. On Wednesday, it was marked as low as 125; but the closing figures were better. Commercials were steady, and hardly touched. The Suburban and Provincial group were little dealt in; but British recovered a point. The Continental Companies were as much neglected as the rest, and no stronger. Both Imperial and Union had to recede. Among the remoter undertakings, Buenos Ayres and River Plate were a little lower; but Bombay came out better on *ex div.* adjustment. The Water Companies were quiet, and without any change in quotations; the market not taking fright at the outrageous resolution of the London County Council to attack them again in the next session of Parliament.

The daily operations were: Business in Gas was almost stagnant on Monday, and prices were weak. South Metropolitan fell 1, and Union preference 2. Little more was doing on Tuesday; and Gaslight ordinary relapsed 1. The flatness of Wednesday produced a fall of 1 in Imperial. Thursday was the busiest day of the week, but no stronger. South Metropolitan fell 1, and Buenos Ayres and River Plate  $\frac{1}{4}$  each. Friday was quieter. British rose 1; but Gaslight ordinary dropped 1. Saturday was much as usual; and quotations closed unchanged.

### ELECTRIC LIGHTING MEMORANDA.

Electricity in Bulk for the West Riding—The Scheme—Report on Polyphase Systems, by Mr. S. E. Fedden—The Systems Approved.

NOTIFICATION has been given of the intention of a strong local combination to seek parliamentary powers next session for the supply of electricity in bulk throughout the southern, or manufacturing, portion of the West Riding of the County of York. The area of the selected region is 1800 square miles, and the

population about 2½ millions. It is divided up, for the purposes of local government, among 17 boroughs and county boroughs, 119 urban districts, and 22 rural districts—altogether, 158 local authorities. Of these, only eleven have works yet established and supplying electricity—some on only a very small scale, and none on a scale sufficiently large to attempt general power supply. Three other authorities have works in progress; while in 18 other cases Provisional Orders have been obtained and are not put in force. The limitations of municipalism in electricity supply could not be more clearly exhibited than they are in this preliminary statement. Obviously, if it is expedient that the district in question should have a general supply of electricity for power and other purposes, only such an organization as is now preparing to get to work can provide it. Besides, all the legitimate claims of existing interests are to be satisfied. The Company will be prepared to act only upon the lines laid down by Sir James Kitson's Committee. Mr. A. G. Lupton, of Leeds, is the Chairman of the Company; and he has explained in the local newspapers that the idea is to deal with authorized undertakers wherever possible, and to supply manufacturers with power. He does not anticipate any opposition from local authorities! Sanguine gentleman! As if local authorities, when inspired with the "sweet reasonableness" that prevails (say) among the present majority of the London County Council, would not oppose a Syndicate of Archangels organized to bring in the Millennium by strictly statutory methods!

Whether or not this West Riding Company will be able to do business with the electricity-supplying local authorities of the neighbourhood, they ought to be able to try crucially the economic and industrial experiment of supplying power on the large scale to manufacturers. The Company propose to put down, in the first place, four main generating stations, each calculated to serve a district with a radius of 8 miles. These will probably be located at Wath-upon-Deane, between Barnsley and Rotherham, at Methley, on the River Aire below Leeds, at Mirfield, and at Shipley, near Keighley. One would be disposed to remark of this list, that if a scheme of the nature of that contemplated might be expected to succeed anywhere in the kingdom, it should be here. All that convenient colliery sites and adjacent manufacturing centres can contribute towards the realization of such success is assured in advance. The Board of the Company have a perfectly free hand to equip the undertaking with the best plant to be had in the world for the intended purpose. This enterprise, at least, does not savour of the "tied house" system. The Company's Electrical Engineer is Mr. A. H. Gibbings, late of Bradford, who has already proved his mettle. We shall see how the undertaking fares. Those gas undertakings that lie in the scheduled area will have only themselves to thank if the Company, when they get to work in a couple of years' time or so, find in the towns a great demand for electric light as well as power.

Mr. S. E. Fedden, Chief Engineer of the Sheffield Corporation Electric Supply Department, has recently made the round of the industrial Continent, by the instructions of his Committee, in order to gain information with regard to technical matters. The example is greatly to be commended. The ratepayers of most towns are pretty sick of paying for Corporation "deputations" to travel ostensibly in search of knowledge—and to see the more "picturesque" sides of life. It is the purest delusion that a party of miscellaneous shop-keepers can serve any useful purpose by going about, at the ratepayers' expense, to look at gas-works, or electricity works, or any other technical show. It is, therefore, high time that our democratic municipalities recognized another limitation in this respect, and sent their professional advisers abroad while they remained at home to receive the resultant reports. They should remember that it was long ago recognized as true that, in order to bring home the wealth of the Indies, a traveller must take the wealth of the Indies out with him—in his head. Mr. Fedden's report is published in full in the "Sheffield Independent" of the 12th inst. It is worth reading on all accounts, and especially as a presentment of Continental electrical engineering viewed in a particular light.

Mr. Fedden's point was "phase" systems of generating the alternating current. He looked at many things; but the "phase" was his main attraction. He did not find any cheaper electric lighting on the Continent than he left behind; and it does not appear that electrical power from town mains at 2½d. per unit is a very wonderful discovery. Speaking of German lighting generally, Mr. Fedden remarks that, in many places where gas is used for street lighting, they are only waiting for the concessions to expire before adopting arc lamps. He is fain to admit, however, that these same streets are now well lighted by incandescent gas. A little deeper and a further inquiry might have taught him that where both systems of lighting have fair play, it is difficult for electricity to compete with incandescent gas, even at German rates. It is interesting to learn from Mr. Fedden that the immediate future for electric power appears to belong to high-pressure alternating currents of the polyphase type. Polyphase motors commend themselves by their solid construction, and the simplicity of their design. All the incidentals, such as switching and controlling gear, have been greatly improved of late years. Consequently, Mr. Fedden feels reassured in his opinion as to the desirability of changing over the monophase system existing in Sheffield to polyphase. He declares roundly that this is the up-to-date practice. But it will be remembered that there have been other electricians in England who denied this proposition.



## THE ROMANCE OF GASLIGHT.

MENTION was briefly made last week of the pleasing fact that the current number of the "Contemporary Review" contains an excellent article on "Gaslight," in which a simply worded, but interesting, account is given of the rise and latest developments of gas lighting. It is not often that the technical critic, who is nothing if not a specialist, can unreservedly applaud the work of a "popular" writer on his own subject. Even such careful writing on engineering matters as that of Smiles occasionally tripped. The "Contemporary" Reviewer, however, as the "Ironmonger" well says, tells the Romance of Gas in language as accurate as it is plain. It is not our intention to reproduce any of the substance of this article, as we are no friends of the fashion of picking out the tit-bits of current literature, and thus destroying the value of the original. Besides, there could not be, in the nature of things, anything in it strange to gas technicians. Suffice it to remark, therefore, that the subject is treated in the manner which is known as the method of evolutionary philosophy; the thread of development from Murdoch to Auer von Welsbach being firmly traced. It is very striking how completely this method of treatment reduces to order and sequence the historic steps of the progress of gas lighting. Now that the tale has been so interestingly told, in so accessible a publication, it is to be hoped that the great world of general readers will know more about the subject than heretofore.

It is impossible to peruse a narrative of this kind without allowing the mind to wander, after the book has been laid down, upon the bewildering thought of the consequential results of those great conquests of individual enterprise—gas lighting, steam railways, the steamship, the electric telegraph. The motive power that drove men to start all these ventures was the simple need of daily bread. They and their successors in business worked from this compulsion first and last; yet what widespread incidental and consequential effects have their operations brought in their train! Murdoch might have made a living at simple millwrighting; and Winsor might have been a stock-jobber, like many another. Here is the fatal shortcoming of Communism. But for the insistent pressure of the individual need, who would trouble to bring to the service of the world anything new, which the world, for its part, invariably protests that it does not want?

This is pure Individualism. On the other hand, it is necessary to be upon one's guard against the error of Carlyle's "Great Man" theory of the world's progress. Murdoch and George Stevenson were men of their time. They heard the voice of the age in which they lived, while others were deaf to the particular message they appropriated and acted upon. If they wrought better than they knew, they were also in some sense agents, instruments, interpreters. The vast developments originating in their tentative pioneer work, are not their property. If they had not happened to do what they did, others would have done something very similar—perhaps better, perhaps worse. It is the commonest observation that the individual inventor is not the only requisite element in the composition of the general results appearing as a successful invention. Indeed, his share in producing the general result may easily be, and generally is, exaggerated. Most inventors, who have gained fame and wealth by their operations in one line, demonstrate their limitations by making colossal mistakes in other directions. Even when they can hardly be said with fairness to have blundered, they get into "No thoroughfares"—as Murdoch with steam road travel.

One of the most profitable of studies for young engineers is that of ancient inventions, especially those that came to nothing. The instruction lies in ascertaining why they failed. Murdoch soon abandoned the motor-car enterprise, and so did his contemporary Trevithick. Herein they showed wisdom. To-day, when the endeavour is being made to revive this ancient enterprise, it is usual to blame repressive legislation, and the influence of the rival interests of horse-breeders and railways, for the blight that came upon it after the rather more than experimental successes of Goldsworthy-Gurney and Hancock. Yet a closer investigation of the conditions and the circumstances will bring the conviction that, whatever may have been its motive, the repressive legislation which diverted mechanical engineering from applying steam traction to common road vehicles was beneficial. The Metropolitan Railway is the real development of Hancock's steam omnibuses from Paddington to the Bank. No great success could have rewarded the motor-car inventors of Murdoch's day or later without a radical, and even yet impossible, alteration of the roads. The metal rail is the only road upon which a mechanically-driven carriage can do its best. Whether, after all this time, the modified success which is alone possible for motor-cars on common roads will be enough to satisfy the amateurs of the enterprise, is matter for speculation. Unquestionably, however, the concentration of the attention of the mechanicians of the early part of the century upon the larger possibilities of railway working proved much more fruitful than would have been any amount of devotion to road motors.

Coal gas was one of those discoveries which provide unlimited scope for the operations of the financier, the engineer, the chemist, and the man of business. It never needed a legislative check, similar to that put upon the motor-car enterprise; it would have been impossible to prevent its expansion by any such means. Never having been checked, it has always been growing and developing. Gas lighting, the other uses of gas, the

ordinary operations of gas-works, are very different now from what they were twenty, fifteen, or even ten years ago. A modern gas-works is a box of machinery, compared with the simple factory of the seventies, with nothing much more mechanical about its equipment than a wheelbarrow. This is one reason why gas engineering is so much more interesting now than it used to be, and why there is so much more in it. And together with the increasing complexity of the works equipment, there has come about a greater simplicity, so to speak, or at any rate uniformity of product. The gas industry has grown out of the age of ignorance of its elements which furnished opportunities for charlatanry. During that period of its existence, almost anything might be credited as possible. Hence all manner of fancy gases made their appearance, only to deceive the public, and sometimes even those who, from their technical standing, should have known better. The gas-works is no longer a house of mystery, but a place where heavy materials are handled and worked up with the greatest economy and efficiency.

What developments may be expected in the future? That is precisely what no man can hope to predict of any industry. Developments will come; but all experience teaches that they are not likely to be foreseen. Some people hold that inventions and improvements of all kinds of industries can be made to order—that the want has only to be diagnosed, and its supply can be arranged for. This is not true—or true to only a very limited extent. In the first place, it is not possible to be sure that the recognized want is really so. The World of Nature is not like the political world, in which a scheme clamoured for with sufficient persistence can usually be obtained—only for it to be discovered, afterwards, that it was not what was wanted at all. Thus, the politician demands the ballot, or universal manhood suffrage, not because these things are desirable in themselves, but because he hopes they will redound to his advantage. When this hope is disappointed, the charm of the arrangement vanishes. The arcana of Nature is not to be forced in this spirit. The way in which we may be looking for an inlet is, as often as not, a blind aspect. We may find it expedient to try another, apparently hopeless, line of attack, and be astonished to discover that it leads somewhither. Only, it is at least certain that these new conquests are no more to be mapped out from a base of observation, distant in time and detached in interest, than their fresh consequential effects are to be discerned or controlled. The endowment of the civilized world with the boon of organized artificial light, distributed everywhere, available in any quantity, at all hours, was one of the most potent aids to the material and intellectual advancement of the human race that could have been asked for by the wisest of their species, at a period when it had not been offered to the world. No man did ask for it, as a matter of fact. Not one of the sages of the Eighteenth Century, the Age of Reason, perceived the need of it. The Lockes and Humes and Benthamites never suspected how vastly public lighting, in the broadest sense, would assist in the culture of the human understanding. It came, when it did come, as an accident of the enterprise of a few people who wanted to turn a little money honestly in a new way.

Such is the complex nature of real Progress in material civilization. Rooted in selfish aims, it brings greater blessings in its train than the schemings after the universal good of the purest philanthropy. Plunging blindly into the unknown, it yet compasses ends that the profoundest prescience never conceives. Every development seems as a starting-point for new outgrowths; and the reward of endeavour is never finality, but encouragement to effort incessantly renewed.

## AMALGAMATION OF METER FIRMS.

UNDER the title of "Parkinson and W. & B. Cowan, Limited," a Company has just been registered, to take over the respective businesses of Messrs. W. Parkinson and Co., of London and Birmingham, and Messrs. W. & B. Cowan, Limited, of London, Edinburgh, Manchester, and Sydney. The nominal capital of the Company is £450,000. It is not intended to offer any portion of this to the public, as all the capital to be issued has been taken by the present proprietors.

The following gentlemen, who have been actively engaged in the management of the two businesses in the past, will form the Board of the new Company:—

William Cowan, *Chairman*.  
William Coulson Parkinson.  
William Henry Cowan.  
John Leslie Cloudsley.  
Joseph Hepworth.  
Frederick Richard Smith.  
William Cheshire.  
William Wallace Parkinson.  
William Wark (of Sydney).

The firms above named are two of the oldest in the meter trade; Messrs. W. Parkinson and Co. being the successors to Mr. Samuel Crosley, the original manufacturer of gas-meters.

The business will be continued under the same management, and carried on upon similar lines to the present; and it is believed that the combined experiences of the two firms will prove of advantage to their numerous customers in all parts of the world.



## HIGHER LIFE FOR WORKING PEOPLE.

WE have recently devoted some considerable space to the consideration of a book treating of the same subject as is indicated by the title of the work before us\*—namely, how best to advance the welfare of the working classes. That book (Dr. Gilman's "Dividend to Labour") received our warm commendation mainly because it dealt in the results of practical experiments much more largely than in theories of arm-chair philosophers and the specifics of political quacks. This work, on the other hand, we must write down as of correspondingly little value, because it is a collection of proposals which bear impressed upon them the stamp of the unpractical political amateur. The resemblance between the two books, therefore, is one only of purpose, not of achievement.

It is but fair to say that the author appears to be aware of the unsatisfactory character of some of his proposed methods for securing the solution of "some pressing social problems, without injustice to Capital or Labour;" for, referring to his plan for not merely alleviating but finally remedying the trouble arising from time to time from the insufficiency of work to keep everyone employed, he says he expects that the proposal "will prove to be a stumbling-block to most readers . . . but that, in justice to the general subject, a study of this portion of it he felt bound to make, and bound to offer some mode of dealing with this, the greatest problem of all. . . . He is," he adds, "quite aware that the plan proposed will appear far-fetched, and to be (to use a colloquial phrase) 'too large an order.' It seems to him, nevertheless, that any scheme designed for the same purpose must be liable to the like criticism." But why, in the name of goodness, make a proposal simply for the sake of making one, if that proposal—or any other with similar design—be obviously impracticable? If Mr. Stephens really wanted to write a useful book (and from his preface we gather that he had some higher purpose than that of mere book-making), why introduce into it a suggestion which he was perfectly well aware did not stand a ghost of a chance of being adopted?

One would have thought that if every conceivable scheme for effecting a certain purpose were seen to be open to the vital objection of being unacceptable to the majority of people—who, be it remembered, have a say in the putting of schemes into practice—it would have occurred to the author to ask himself whether the difficulty was not one really incurable in any community working upon business principles and governed by economic considerations. The condition of affairs in which the supply of labour exceeds the demand, must exist at intervals in every industrial country where trade is subject to violent fluctuations; and no attempt to artificially prevent such a condition from ever coming about can, we firmly believe, possibly succeed. Mr. Stephens, however, thinks differently; and the following is, briefly, the precious scheme he outlines.

The country, he suggests, should be districted and a Labour Organizing Board appointed for each area. A record of all unemployed persons should be kept; and when the number seeking employment within any district exceeded on an average for six months (say) 7500—unconnected with any strike or lock-out—this Board should "be bound to take steps to organize employment as directed in the Act." This, it is suggested, they should do by "a rightly organized system of Home Colonies"—a plan selected as complying with the requirements of "not invading ground at present occupied by industrial forces," of "obtaining new ground for itself," and of being self-supporting. As the Colonies abroad have succeeded in fulfilling these requirements, and also in relieving the congestion of the labour market in this country, what, it is asked, is there to prevent Colonies at home from being "equally successful in the same directions?" Mr. Stephens is such an obviously well-meaning man, that we do not here like to say all we might. But has he really never asked himself how it is, if there be "new ground" in this country, unoccupied at present and capable of supporting tens of thousands of persons solely by means of its own as yet undeveloped resources, that his fellow-countrymen have been such lunatics as to overlook the fact, and emigrate to the Colonies abroad to seek employment and fortunes? He points to the Deer Forests of Scotland as affording wide scope for the employment of labour, and declares that "we know at least that throughout England there is area ample enough to employ the labour of many hundreds of thousands of new hands for generations to come." But he does not attempt to show that labour could be profitably employed in these places; while he admits that any scheme to be adopted must be self-supporting. Mr. Stephens showed the best judgment when he foreshadowed for his proposal the criticism of being "too large an order." It is certainly one that no Government will make, nor the country ever sanction. The solution of this social problem is, says Mr. Stephens, "merely a question of organization." In such fashion do some people rush in where statesmen fear to tread.

Sentimentality and impracticability, in fact, are writ large over all the chapters of this book. That dealing with the Poor Law and its reformation, for instance, contains the suggestion that habitual casuals "should be sent to a special Labour Colony, and made as far as possible to maintain themselves by

their work." This sounds all very well; but then the habitual casual will not work—that is just what he will not do. So, unless he is made a convict, and work thereby forced out of him, how much further will the proposed reform carry us? The same chapter also contains the suggestion that the working classes should be led to overcome their dislike to the workhouse, and should be taught "that, indeed, a loss of self-respect (if any) is suffered more by accepting help from private individuals, to whom they have rendered little or no service, on whom they have no claims of any kind, than by accepting assistance from the nation, to whose social arrangements they have throughout their life contributed their part, and on whose surplus wealth, which they as workers have helped to create, they may be said to have a claim to a reasonable extent in case of absolute need. They should be reminded that, as members of the working class, they have, while they prospered, paid their share directly or indirectly of the national taxes, and are fairly entitled to benefit in their distribution. They should be told, in short, that the Poor Law fund is one from which they need have no more scruples in drawing, in case of necessity, than from any other fund to which they may have contributed in their better days when insuring against the future." Was ever sorer stuff written? The sentence we have italicized appears to show that the author regards the Treasury as a sort of Slate or Goose Club with an annual sharing-out! And these are the doctrines that are to introduce "Higher Life for Working People." Well, high living and low thinking are not infrequently coupled together, and teaching more calculated to lower the self-respect of the poor we cannot conceive.

After this, we are quite prepared to find (as we do) that the author advocates the eight-hour day for everyone, is a strong upholder of Trade Unions—which make their members more intelligent workmen!—and has a scheme of his own for providing old-age pensions, which scheme (in the opinion of its author) "is free from many of the objections which the Select Committee on Old-Age Pensions felt bound to make to the schemes in general laid before them." The proposals of one who undertakes to solve, in the space of a few pages, a problem that has baffled all the leading experts in finance, deserves some notice, and the pretensions of their author to deal with questions of political economics can be thereby judged. His idea is, briefly, to provide an annuity (to commence at any time after the age of 55) equal to the amount accumulated by means of contributions of 12s. per annum from each wage-earner who may choose to join the scheme, plus 6s. per annum each from the employer and from the State. Mr. Stephens only estimates that 3,000,000 workpeople would subscribe. They would, of course, be the more thrifty ones, who would merely prefer to entrust their money to the State rather than to a Friendly Society; and the real problem would remain absolutely untouched. The annual cost to the State, on the basis of 3,000,000 subscribers, would be £750,000; but this, as well as the cost of administration, would, according to Mr. Stephens, fall from Heaven. For, he says, there would be a revenue from the subscribers and their employers—he assumes that all workpeople are employed, and that none work on their own account—equal to £2,250,000 per annum, while "the State's contribution of £750,000 would meanwhile [no annuities would become payable until twenty years after the commencement of the scheme] be only a book entry. Thus in twenty years the State would have in hand £45,000,000 to be applied"—to providing Old-Age Annuities? no, "to the reduction of the National Debt!" Did anyone ever read such nonsense in a book supposed to have been written for a serious purpose? Putting aside the absurd remark about "the reduction of the National Debt," what a financier must he be who talks about the State's contribution as being "only a book entry." It certainly would (like all other transactions) be a book entry; but it would, of course, involve an entry in the Budget of a corresponding amount, to be raised by taxation. Does Mr. Stephens think a gas company accumulates a reserve fund at no further cost to the shareholders than a book entry? We do not think we need more closely examine this "practical scheme."

In conclusion we may add that Mr. Stephens is in favour of profit-sharing—the one point whereon his views are, in our opinion, sound. We have, in fact, to say that Mr. Stephens has, with the best intentions, failed entirely to produce a work of any value to those who wish, within the bounds of reason and practicability, to forward the best interests of the working classes.

**Velocity of Light.**—At the meeting of the French Academy of Sciences on the 5th inst., M. Perrotin read a paper on the above subject; a re-determination having been made by Fizeau's method. The distance between the two stations was nearly 12 kilometres; and the mean result of about 1500 observations by two persons was 299,900 kilometres per second.

**Society of Arts.**—The opening meeting of the new session (being the 147th since the foundation of the Society in 1754) will be held to-morrow evening, when an address will be delivered by Sir John Evans, K.C.B., F.R.S., Vice-President and Chairman of the Council. For the meetings previous to Christmas, the arrangements include a paper on the 12th prox., by Dr. Frank Clowes, Chemist and Superintending Gas Examiner to the London County Council, on "The Treatment of London Sewage."

\* "Higher Life for Working People." By W. Walker Stephens. London: Longmans, Green, and Co.; 1900.



USE OF THE HYGROMETER IN STUDIES OF VENTILATION.

An interesting turn has been given to the study of the ventilation of interiors by those observers who have in these later days drawn attention to the importance of the temperature and the degree of humidity of the atmosphere of inhabited rooms, as affecting the health and comfort of the occupants. Sir Benjamin Baker has recently declared that, so long as it is "taken cold," a very high proportion of carbonic acid can be inhaled by human beings without distress. The Board of Trade regulations as to the relative amount of humidity permissible in the air of certain kinds of factories have served to exhibit the importance of this consideration. The late Surgeon-General Pringle, who was very interested in gas cooking and heating appliances, used to make a great point of the necessity, in all circumstances, of preserving the proper and natural degree of moisture in the air of warmed rooms. The same subject is also beginning to engage attention in the United States, where recently Mr. J. H. Kinealy expounded the elements of the matter in a technical periodical published in the interest of domestic sanitation.

Following Mr. Kinealy's paper, which may be characterized as a fresh breaking of old ground in this study, we begin by considering the origins of the total moisture in the air of rooms. This quantity is the sum of three different sources of atmospheric moisture—the product of the combustion of the gas or other illuminant used for artificial lighting; the portion brought in by the inflowing air; and that which is emitted by the bodies of the occupants. The first quantity can be averaged, according to the author, at 50 grains of water per cubic foot of ordinary town gas. This estimate requires some explanation. Mr. Thomas Wills, in 1878, stated the production of aqueous vapour by burning coal gas at 372 grains per cubic foot. In Mr. H. O'Connor's "Gas Engineer's Pocket Book," the production of aqueous vapour by a coal-gas flame is put at 440 grains per cubic foot. No authority for the statement is given.

That this question of the effect of moisture in the air of inhabited rooms on the health and comfort of the occupants has not been overlooked by gas engineers, is conclusively established by the treatment of the subject at the hands of Mr. Norton H. Humphrys, in his "Chemistry of Illuminating Gas," p. 29. The author refers to the early lectures, on the chemistry of coal gas and its combustion products, of Dr. Letheby (1871) and Mr. Henry Aitken (1878). These contributions to the study of the subject are duly recorded in the "JOURNAL" for those years. It is true that Mr. Humphrys himself dismisses as unimportant the question of the formation of water by the gas used in lighting an apartment; but this opinion does not refer to the investigation of the matter as a point of scientific interest.

Mr. Kinealy, passing on from the consideration of the gas-combustion water, next discusses the proportion of water brought into interiors in the air from without. This is equal to the number of cubic feet of air, measured at the outside temperature, which enters during a given period, multiplied by the weight in grains of the moisture per cubic foot. This is a quantity that varies from day to day and hour by hour. Its determination raises at once the generally-neglected problems of the use of the hygrometer. The usual method of ascertaining the relative humidity of the atmosphere is now by readings of the wet-and-dry-bulb thermometer, the indications of which were first reduced to a system for this purpose by Mr. Glaisher. It is by no means obvious how these readings are to be interpreted in terms of the dryness of the air; because, of course, a thermometer indicates conventional degrees of temperature, and nothing more. The following conversion table is given on the authority of Mr. Glaisher in Box's "Heat." Assuming that the difference of simultaneous readings of the dry and wet bulb Fahrenheit thermometer is designated "degrees of cold," we get for ordinary atmospheric variations—

Dry Bulb.	Degrees of Cold.											
	1	2	3	4	5	6	7	8	9	10	11	12
	Degrees of Humidity, Saturation = 100.											
32	87	75										
42	92	85	78	72	66	60	54	49	44	40	36	33
52	93	86	80	74	69	64	59	54	50	46	42	39
62	94	88	82	77	72	67	62	58	54	50	47	44
72	94	89	84	79	74	69	65	61	57	54	51	48
82	95	90	85	80	76	72	68	64	60	57	54	51

With these constants at hand, we can proceed to give their meanings to the indications of the hygrometer. It must be borne in mind, meanwhile, that air showing upwards of 85 per cent. of the limit of its capacity for carrying moisture at the ascertained temperature feels "damp." About 65 per cent. of moisture is moderately dry; at 50 per cent. on the same scale the air is dry; at 35 per cent. it would be called "very dry;" and at 25 per cent., "extremely dry."

So supreme is the effect of temperature on the relative dryness of an atmosphere, that when the outside air is at 30°, and saturated with moisture, if it is brought into an apartment indicating a temperature of 70°, its relative humidity at once falls to 8·5 per cent. If saturated air at 30°, 40°, 50°, and 60° is similarly brought into a room heated to 70°, their relative humidity will fall to 25·5, 36·5, 51·6, and 72 per cent. (Kinealy). These figures show how completely the question of dryness and dampness is a

matter of temperature—the original degree of saturation, of course, remaining unaltered.

It scarcely needs to be pointed out that while a moderate degree of dryness of the atmosphere is conducive to comfort, an excessive degree of it is both uncomfortable and dangerous to health, from the rapidity with which the natural body-moisture is evaporated thereby. This is exemplified by one's experience of a Turkish bath. The newly-stripped subject feels cool, though the thermometer marks something between 80° and 90° Fahr. He does not sensibly perspire upon entering into the hottest chamber, where water would boil; but upon returning to the cooler apartment the perspiration begins to run off him in streams. In a lesser degree, this is what happens to the occupants of all overheated assembly and living rooms. In an ordinary apartment, warmed by an open fire, overheating rarely occurs, unless the room is overcrowded, and the air overloaded with the products of superfluous gas-burners.

The actual temperature of the body itself changes very little, as the now common use of the clinical thermometer shows; so that when people complain of being either hot or cold, they mean that such are their sensations, which are referable to the external conditions rather than to the physiological fact. Hence it is desirable that the character of the external conditions shall be determined, wherever possible, by instrumental observations, and not left to be manifested by physiological experiences—always unpleasant and fraught with danger to health.

As regards moisture, an adult individual adds by his vital processes of respiration and perspiration anything from 300 to 600 grains of aqueous vapour per hour to the atmosphere in which he lives. This is for ordinary temperatures, and ordinary degrees of atmospheric humidity. Experiments quoted by Mr. Kinealy show that, in order to prevent the emission of much moisture from the body in a cool room, and thus prevent the loss of heat and the feeling of cold on the surfaces, the humidity should be slightly higher than in a warmer room where it is desirable to have more moisture emitted from the body in order that it shall feel reasonably cool. Thus, by a proper adjustment of the relative humidities, a room at 60° Fahr. may be made to feel quite as comfortable as one at 70° Fahr.; while at the latter the rate of perspiration must be kept up in order to prevent the feeling of chilliness due to too low humidity, or stuffiness due to its excess. And inasmuch as any bodily exertion increases the emission of aqueous vapour from living individuals—as much as three or fourfold, indeed—it is plain that the hotter the room the greater the difficulty of keeping the air reasonably fresh.

Many considerations spring out of these data. Having regard to the fact that the production of aqueous vapour from a coal gas flame cannot be more than about 400 grains per cubic foot of consumption per hour, while that of every adult person is perhaps 50 per cent. higher, even if he is quiescent, it appears that the moisture due to the burning of a single incandescent gas-burner in a room will not differ greatly from that from a single occupant. It follows next that the ultimate condition, as regards moisture, of the air of an unventilated, unwarmed interior will depend far more on the number of persons it contains than on the means used for artificial lighting, whatever these may be. This observation reveals the folly of those who pretend that the problem of the ventilation of crowded buildings is rendered any the easier of solution, or less important, by the adoption of electric lighting. Rather the contrary, indeed; because it is obvious that the less ventilation there is for an occupied room, the nearer the point of saturation approaches as time goes on. With nothing to take the chill off the walls and the ceiling—and the loftier the roof the worse it is in this respect—an unwholesome dew gets deposited on the surfaces, and the chilled, damp air falls down on the people. Perspiration is checked; a feeling of oppression and of nausea is experienced by the less robust; and the instant the inmates leave the hall for the corridors and the open air, the penned-up perspiration breaks out, to be followed by a dangerous chill. The instinctive turning-up of coat collars and donning of wraps by people in these circumstances has as much to do with the question of relative humidity as it has with that of temperature.

A proportionate consumption of gas for lighting a not too-crowded apartment is an automatic cure for this relative humidity evil. If the heat of the gas raises the temperature of the upper regions of the atmosphere by 5° or 10°, it means that the added moisture due to human life will be suspended in the upper air. This is a physical truth which cannot be gainsaid. Science therefore indicates that among other rules of good ventilation should be included this, that the temperature of the air in the upper part of the room should always exceed that of the breathing level by a moderate figure—not more than 10°. The work of foul-air extraction should therefore be adjusted to this requirement. In really hot weather, the whole atmosphere should be thoroughly changed as frequently as possible, on other accounts. It is in cold or damp and chilly weather that the difficulty of keeping the relative humidity right is likely to be most felt.

Lastly, comes the consideration of the effect of stove as compared with open-fire heating of rooms. This is a phase of the problem that only exists where the use of open fire-places is practicable; and in this connection it must be borne in mind that the substitution of gas "fires" and warming stoves for coal-fires has already been carried very far in the United Kingdom, and is growing every year. The free, not to say excessive and certainly unregulated, ventilation of rooms by the open chimney-



throat is abolished where this change is made; and the question naturally arises as to whether the indications of the hygrometer have any bearing upon the new conditions. The answer is that probably the air of gas-heated apartments is slightly drier than that of coal-fire heated rooms similarly conditioned, especially if occupied by only one or two persons. Consequently, a certain amount of added aqueous vapour is frequently found grateful, as correcting the "harshness" of the air of such apartments. This, of course, can be supplied in several simple ways. It would be useful to take a hygrometer test of the air of rooms so fitted, to make sure that the conditions are as might be expected. In conclusion, we can endorse the words of Mr. Kinealy on the general subject: "The matter of the humidity or amount of moisture in the air of theatres, churches, assembly halls, and school rooms is one of great importance, so far as the comfort, if not the health, of the occupants is concerned; and it merits more attention than it usually gets. In fixing upon the humidity to be maintained, it may be said that it should, for most people, be between 40 and 60 (per cent.) for a temperature of about 70°; and it should be nearer 60 than 40 for temperatures less than 70°, and nearer 40 than 60 for temperatures greater than 70°." Of course, the last observation is chiefly intended to show how the balance inclines within the ordinary range of temperatures; for nobody wishes to live long in rooms exceeding this maximum temperature. A difference of from 6° to 8° between the wet and dry bulb readings, at the customary British indoor temperature of 60° or 62°, is well within the limits of this prescription.

### GAS CONSUMERS AS GAS PROPRIETORS.

THE little impromptu discussion which took place at the recent meeting of the Gas Companies' Protection Association on the various methods of issuing gas stocks, has invested the subject with renewed interest. On the surface, the question does not appear to present much scope for debate; but it is one which, under the altered circumstances of the day, is worthy of consideration, and, wisely considered, may lead to profit. The existing and the past conditions of a gas undertaking are widely different; and it is the growth of competition that has made them so. While gas undertakings have, to use a common phrase, "held their own" in that competition to the present time, it would be imprudent for the administrators of those undertakings to rest content, and not to take every measure that is within reach to strengthen their position for meeting competition in the future, which is certain to be waged against them with increasing force. In the issue of new capital may be found one way of gaining strength.

The gas administrator who requires a new supply of capital has before him the choice of two methods of issuing it—by auction and by tender; and to which method he shall have recourse is to a large extent determined by the view he takes at the moment as to which (auction or tender) will produce him the best price for the stock he has to offer. He wants money; and it is to him a question of money, and nothing more. The higher the premiums he can capture by the competitive issue of the stock, the better, he argues, for the undertaking—now and hereafter. But, as a rule, he does not look deeper than that; and, while his argument is up to a certain point true, there are other questions to which he may with advantage give heed. It is in these other aspects of the matter that he will find influences which would have an immediate, and perhaps in even greater degree an ulterior, effect upon the inherent strength of the concern under his charge. Cheap money, although an important factor in the economical conduct of a gas-works, is not everything. The remarks made at the meeting of the Gas Companies' Protection Association furnish food for reflection; and reflecting, one is soon impressed with some of the feelings which must have moved Mr. Livesey when he asked Parliament to grant the two Companies with the management of which he is so intimately associated power to issue stock to "consumers" and "employees." Such undertakings as gas companies which have the sole right of supply of a specific commodity in a district are altogether different from other classes of undertakings which are not restricted to a particular locality. A gas company's business in its staple commodity is bounded; but, with few exceptions, all other commercial companies are free to traffic just where they will. While a gas company has the sole right of supply of its own chief commodity in an area, it is not free from competition from other commodities which produce for the user a like result. Therefore the strengthening of the undertaking by securing, through the auction mart or the tender form, the uttermost penny for new capital is not the only consideration; the strengthening to obtain the greatest rebutting effect in competition must be carried through the whole system—even to the consumers. The man who has the greatest number of friends is the strongest to face the world; and so a gas undertaking which has a large number of local friends, more particularly if they are pecuniarily interested, has a smoother present existence and a stronger constitution for battling with the future than an undertaking, however magnificent its works, which is dependent upon a number of people for support who have no more interest in it than exists between any ordinary shopkeeper and his customers. This is what Mr. Livesey has recognized; and he has shown the way in which a gas company may increasingly and powerfully

supplement its strength. That way is by affording the consumers of all classes a direct opportunity of becoming part proprietors in the business which they support by their custom. The sliding-scale made the consumers nominal partners; a small amount of stock—and no matter how small—makes them partners in reality, and confers a vote and voice in the management of the business.

The issue of stock by auction or by tender does not secure to the full Mr. Livesey's aspirations. Auctions may be conducted locally, and tenders may be invited locally; but in both cases the door is opened to the speculative outsider with the long purse, and no interest in the concern beyond what he can make out of it, and in whom, in turn, the concern has no interest beyond that of handing over to him dividends derived from the locality so long as he happens to hold the stock. The local investor has a greater interest; and the local investing consumer has a still greater one. The offering of the stock for sale by auction or by tender has, by scattering the stock far and wide, the effect of tenuousing the interest in the undertaking; but the greater the directors of a company can make the holding of stock in the district of supply, in the same ratio is the interest solidified. What, then, can have a more potent influence in promoting strength and ensuring prosperity than having as proprietors the consumers themselves? That is the direction in which both the South Metropolitan and the Crystal Palace Gas Companies have sought strength, and in which they are, step by step, obtaining it. What they have succeeded in doing, others may do. The power which was conceded to them will not, if asked for, be refused to others.

It was in this particular connection that Mr. R. Hall asked of Mr. Livesey information at the meeting of the Gas Companies' Protection Association. The form in which Mr. Hall put the matter showed that he, at any rate, is sufficiently keen-sighted to discern that, in the issuing of stock, the supreme advantages are secured to a gas undertaking by spreading that stock as much as possible within the limits of the Company's area of supply; and particularly among the consumers. The information which he obtained, and which through these columns was given to the industry at large, was valuable; but it did not go so far as it possibly would have done had the occasion been a little later. It may be recollected that it was mentioned that the South Metropolitan Gas Company were then issuing £100,000 of stock to their consumers, and the Crystal Palace Gas Company £20,000; and even at that early date after the invitations had been sent out, nearly the whole of both issues had been applied for. Had Mr. Livesey been speaking now, he would have been able to give further instructive particulars; but, as he is not, we have taken steps to obtain some noteworthy figures as to the Crystal Palace Company's issue. Before referring to them, however, we ought to say that both this and the South Metropolitan Company are obliged by their Acts to invite tenders by advertisement in certain papers. If application is made, a form is sent on which the reserve price is stated; but the reserve figure is not named in the advertisements. Then whatever stock is left after the day for receiving tenders has passed may be offered to the consumers, employees, or shareholders at the reserve price. For their last issues neither of the Companies had any tenders; and, consequently, the whole was free for offering to the consumers.

We have chosen the Crystal Palace Company for the purpose of illustrating this article, because its chief characteristics, internal and external, more nearly approach the majority of gas undertakings than would those of its great neighbour, the South Metropolitan Company. As already stated, the amount of the Crystal Palace Company's issue was £20,000. The invitations were sent out to the consumers on Oct. 15; and the time for application expired on Nov. 8, but even since then several applications have been received from consumers who "hoped they were not too late." The circulars were distributed, by hand, to both prepayment and ordinary consumers all over the district; the total number sent out being 25,000, which is about 600 short of the number of consumers. Those who were omitted were consumers whom the Company's officials were sure would not apply; and therefore it was useless wasting the circulars. In all 306 applications were received; and, as previously stated, the amount of stock asked for was £55,870. The list of applications and the required amounts is interesting, and it gives some idea of the class of consumers who took advantage of this opportunity of becoming interested in the Company with whom they have hitherto only had ordinary business relations. The number of applicants for £5 was twenty, for £10 nineteen, for £15 three, for £20 nineteen, for £25 fourteen, for £30 three, for £40 six, for £50 fifty-two, for £60 three, for £75 three, for £80 one, for £90 one, for £100 sixty-four, for £120 one, for £150 seven, for £160 one, for £200 thirty-four, for £220 one, for £250 four, for £300 seventeen, for £400 eight, for £450 one, for £500 sixteen; and the balance was divided into larger amounts. It will be noticed from these figures that the largest number of applicants was for £100, the second £50, and the third £200. Up to £50 the applicants received allotments in full, and the others were treated in such manner as the Board considered fair; but no single applicant received more than £100. In this way, Mr. Livesey realizes his aim, which is the spreading of the stock in as small amounts as possible over the largest number of consumers; and issuing it in small amounts gives no inducement to the monied speculator to apply. One of the applications on this occasion, however, was for £10,000; and this, it may be



supposed, was merely a speculative attempt which, as no one received more than £100, did not succeed. Among the applicants were some of the Company's own workmen who are also consumers, a few prepayment consumers, and in the ordinary class there was a preponderating number of applications from the smaller consumers, which was very gratifying. The price at which the stock was issued was £112, which at the time the issue was decided upon was a fair market price; and it is pleasing to notice that, notwithstanding the issue of this additional stock at that comparatively low price, the market value has risen. No doubt one of the secrets of the success of these issues of stock to consumers, is this fixing of the price. The ordinary investor does not understand tendering with a reserved price. What he wants to know is the exact price at which he can buy the shares or stock; and this the Crystal Palace and the South Metropolitan Gas Companies tell him. The eagerness with which the stock to which we have been referring was applied for gives ground for believing that it would all have been readily taken up even if the price had been placed at a higher figure. As it is (at the present price of gas and at the price of issue), the stock will yield £4 9s. 3d. per cent. on the investment; and in the case of the South Metropolitan Company's issue, the yield will be £4 2s. per cent.

This is the second issue of stock to the consumers in the Crystal Palace Company's district. The previous one was on Jan. 1, 1897; and it was of similar amount. Then only 208 consumers made application, as against 306 on this occasion; and the amount applied for was then £45,110, as against £55,870 on this occasion. These figures bear eloquent testimony to the faith the consumers have in the Company; and it is a full justification of the Directors' policy. An interesting fact is that nearly all the applicants for this last issue were not shareholders before; and therefore the two issues have given to the Company something like 500 shareholder consumers, which is a no mean stay in the stability of the Company's business. And, of course, these figures do not include the large number of consumers who are holders of stock purchased on the market. The 500 consumers, however, would, in all likelihood, never have become shareholders but for the action of the Directors; and the extent of the beneficial influence of this action on the future of the Company, no one can foresee.

In writing this article, we have viewed the question without having regard to the present condition of the money market or the depreciated value of gas securities on account of the high price of coal—both being exceptional. But it is an interesting fact, worth noting in this connection, that while difficulty is experienced just now in getting rid of substantial amounts of stock or shares by the ordinary means of auction or tender, the two Companies we have been alluding to have succeeded in placing these large issues among their customers, with a considerable surplus application in one case (the exact result of the other we have yet to learn). Only last Tuesday a near neighbour offered (at par) £30,000 of new ordinary stock for sale by auction at the Mart; and, although the stock yields above 5 per cent., only £17,400 of it was publicly disposed of.

**Disinfecting Well Water with Permanganate of Potash.**—According to some experiments made at the camp of Châlons, of which a few particulars are given in the "Revue des Produits Chimiques," 5 to 10 centigrammes of permanganate of potash per litre of water destroys by oxidation all the organic substances, and sterilizes the water by killing all living organisms. To attain this result, it is requisite to obtain a rose colour during half an hour. A brown compound of oxide of manganese is formed, perfectly inoffensive, which can be removed by mixing fine charcoal dust with the water, or a mixture of cleansed charcoal dust and sand—25 per cent. of the former to 75 per cent. of the latter. In three or four days the water is quite clear. Well water thus treated only had 1026 microbes per cubic centimetre in it, and no putrid or pathogenic organisms, though it had previously contained 72,306 microbes and a considerable number of the putrid species exhaling a disgusting odour. A well containing 112,160 bacilli per cubic centimetre before treatment only had 150 bacilli afterwards.

**Manchester District Institution of Gas Engineers.**—The 124th quarterly meeting of the Institution will be held next Saturday, at Southport, under the presidency of Mr. T. N. Ritson, of Kendal. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) that on reaching Southport, shortly after eleven, an electric tramcar will convey the members to the gas-works, which will be inspected under the guidance of Mr. John Booth, the Gas Engineer to the Corporation. Special interest will doubtless be shown in the carburetted water-gas plant and the Peebles and benzol systems of carburetting which are in operation at these works. The Gas Committee of the Corporation will entertain the members at luncheon at the Victoria Hotel, after which the business will be proceeded with. This will comprise the election of new members and the President for the ensuing year, a description of the Southport Gas-Works by Mr. Booth, and a paper by Mr. R. G. Shadbolt, of Grantham, on "The Minimizing of Sunday Labour in Gas-Works." Discussion will be invited on this latter communication; and, at the close of the business, tea will be served, as usual.

## OBITUARY.

JOHN BLACKET GILL.

We regret to announce the death of Mr. John Blacket Gill, the Chairman of the Commercial, European, and Oriental Gas Companies. Never, perhaps, in the enjoyment of robust health, Mr. Gill had for some time past been a great sufferer. His calm fortitude, however, and his unflinching devotion to duty effectually concealed the extent of this from all but those who knew him best. His symptoms recently having become more acute, he had gone to Eastbourne in search of relief, but without success; and he died there on the 11th inst. Mr. Gill had been prominently connected with the gas industry for more than 27 years, having been appointed in February, 1873, to a seat at the Board of the Ratcliff Gas Company, of which undertaking his father had for many years previously been Secretary. Upon the amalgamation, in 1876, of the Ratcliff with the Commercial Gas Company, he became a Director of the latter Company. In March, 1889, he was chosen Deputy-Chairman; and in March, 1890, he became Chairman. His connection with the Oriental and European Gas Companies was more recent; he having joined the Board of the former in 1887, and of the latter in 1891. A clear-headed man of business, and a most courteous gentleman, he had won the highest esteem and regard of all his colleagues over whose counsels he presided; while his kindly manner endeared him to all the staff, both English and Continental. The qualities which achieved for him success while presiding over general meetings were yet more rare. In plain, unvarnished language, free from all oratorical affectation, he would place the affairs of an undertaking before the proprietors with a transparent sincerity which irresistibly impressed his audience with the conviction of faith and with confidence in the speaker. Mr. Gill was 61 years of age at the time of his decease; and he was interred on Thursday last at Caterham, where he had resided for the past 14 years.

T. W. R. WHITE.

The earthly remains of the late Mr. T. W. R. White, whose death was announced in the "JOURNAL" for the 13th inst., were laid in their last resting-place in Sherborne Cemetery on Wednesday afternoon, in the presence of a large assembly, including many of the principal residents of the town and neighbourhood. Three of the Directors of the Sherborne Gas Company—Messrs. Dalwood, Pooley, and Vincent—attended, as well as Mr. Brock (Assistant-Manager), Mr. Knowles (Clerk), and a goodly number of the employees. The Urban Town Council, the local lodge of Freemasons, and other bodies, were well represented, though there was no formal attendance; and it was understood that every visitor came in an unofficial capacity. Unfortunately, the season of the year, and a somewhat brief notice of the ceremony, were not favourable to an adequate representation of the industry with which Mr. White was especially identified, and of the large circle of friends in the gas engineering profession by whom he was highly respected and esteemed. But many of those unable to be present sent wreaths and other tokens of their remembrance. Among those who attended, however, were Messrs. E. Howell (Yeovil), Norton H. Humphrys (Salisbury), J. Lowe (Weymouth), F. Osmond (Dorchester), and F. Philpots (Dursley). The coffin was of polished elm with brass mountings, and bore the inscription: "T. W. R. White. Died Nov. 12th, 1900, aged 55 years."

Mr. White came to Sherborne from Dursley about the year 1866, and had held the appointment of Manager and Secretary to the Sherborne Gas Company for 33 years. During that period he became very intimately associated with the public life of the place. He was upon the Sherborne Urban District Council, and was the oldest member of the Technical School Committee, and Chairman of the Gardening and Finance Committees. He was also Vice-Chairman of the Longburton Technical Instruction Committee, a member of the Burial Board, a Governor of Foster's Grammar School, and of the British School. He was initiated a member of the Sherborne Masonic Lodge of "Benevolence" in 1877, and had been a Past Master of the lodge for 15 years. His connection with the South-West of England District Association of Gas Engineers and the Gas Institute was referred to last week. He was highly respected by his fellow-townsmen as a capable business man. He was orderly and punctilious to a degree; and the Sherborne Gas-Works have long been quoted as a standing example that a gas-works need not necessarily be either devoid of all beauty or encrusted with dust and dirt. They are a model, not only of neatness, but also of elegance. Mr. White was Consulting Engineer, and in this capacity constructed or rearranged several other gas-works in the neighbourhood. He also attained some success as a trainer of pupils for the gas engineering profession; and the excellent understanding and good feeling which prevailed between him and them, even long after they had left him, was in itself a striking evidence of his genial and kindly disposition. It may well be said of him that his light went out while it was yet day, for he might have looked for another ten or fifteen years of useful and active work. But, after a prolonged illness, he passed away while still surrounded by evidences of his handiwork. The large attendance and sincere manifestations of sorrow that were so marked a feature of the proceedings, showed plainly that a remembrance



of Mr. White will remain green in the hearts of his friends and neighbours for many years to come.

Mr. White leaves a widow, a daughter, and two sons. The elder son—Mr. Thornton White, formerly Manager of the Woodstock Gas-Works, Cape Town—is still abroad. A fitting reference was made to the deceased at the meeting of the Southern District Association of Gas Engineers and Managers last Thursday, when, as will be seen by our report, a vote of condolence with the widow and family was unanimously passed.

The death recently occurred of Mr. ELI BRYAN, who for eighteen years held the position of Manager of the Beverley Gas-Works, and at the time of his death held a similar post in connection with the Raunds Gas Company.

The death occurred last Thursday, at the early age of 46, of Mr. JAMES HUSBAND CARVOSSO, Engineer and Manager of the Dartford Gas Company. Deceased was a member of the Southern District Association, which he joined at the November meeting in 1891.

The death recently occurred of Mr. ARTHUR H. LOCK, the Chairman of the Dorchester Gas Company, as the result of an apoplectic seizure. Deceased was a Solicitor by profession, and had had an honourable career in municipal life—on two occasions filling the position of Mayor; and his loss will be keenly felt. He was elected an Alderman in 1898.

### PERSONAL.

At the end of the year, Mr. F. G. COCKEY, Assoc.M.Inst.C.E., will be leaving Newport (Isle of Wight) to take up the management of the new Swindon Gas-Works.

Mr. J. HARGER PYE, Engineer and Manager of the Clevedon Gas-Works, has, in virtue of a mutual arrangement come to between his Directors and those of the local Water Company, been entrusted with the management of the water-works, with a commensurate increase of salary.

Mr. JOHN DENNEY has relinquished the position of Secretary to the Ilford Gas Company, which he had held for upwards of 21 years, and accepted the seat on the Board rendered vacant by the death of Mr. Alfred Green. Mr. HENRY WILLIAM ASHMOLE has been appointed to succeed Mr. Denney.

At the Swansea Gas-Works, last Friday, the officers of the Company presented their respected Manager, Mr. THORNTON ANDREWS, with a full-sized portrait of himself, in token of the excellent feeling existing, the high esteem and admiration in which they regard him, and the kindness and consideration he has always shown for their welfare and comfort. Mr. Andrews was deeply moved by the good feeling displayed by the officers, and their expression of sincere regard for him, which he felt had increased with the number of years he had himself devoted to the Company. It was now, he said, 45 years since he first entered their service, and the works had extended in an enormous degree during that period. Many of the officers who that day attended, and had presented the excellent portrait which they had so kindly provided for him, had been with the Company for 20 years; and he was pleased to find that they all bore testimony to the good feeling which existed between them. This he had striven to cultivate; and he trusted that, notwithstanding the difficulties which all business men had to encounter at times, he had not been unsuccessful. The portrait was executed by Mr. H. A. Chapman, of Swansea, and was an admirable likeness of Mr. Andrews.

An interesting ceremony was performed at the ordinary meeting of the Board of the Newcastle and Gateshead Gas Company last Wednesday, in the unveiling of a portrait of Mr. LAWRENCE WILLIAM ADAMSON, LL.D., the late Chairman. It forms one of a series of portraits of the Chairmen since the year 1864; the others being the late Mr. John Clayton, the late Mr. Alderman Hedley, and Mr. W. B. Wilkinson. These four gentlemen link the past with the present to a remarkable degree; Mr. Clayton having been elected to the directorate as long ago as 1831. Dr. Adamson was, by invitation, present at the ceremony. Sir W. H. Stephenson, the present Chairman, in unveiling the portrait, said that the Directors deeply regretted that the multiplicity of other duties had compelled Dr. Adamson to withdraw from the Board. The loss of his long and valued experience would be greatly felt by his colleagues. He trusted, however, that the counterfeit presentment of the worthy Doctor would, for all time, adorn the walls of the Company's Board-room, and be before the members for the time being to act as a stimulus to them to do their best for the welfare of the Company. On behalf of the present members, he wished Dr. Adamson many years of happiness. Dr. Adamson returned thanks for the compliment paid to him, and for the kind expressions of the Chairman. He said the period during which he had served upon the Board had been extremely pleasant to him; and whenever he could be of service to the Company, his assistance would be gladly rendered.

The increase in the price of petroleum and the reduced cost of calcium carbide are gradually enabling acetylene gas to supplant oil as an illuminant in Germany. The importance of this may be gauged from the fact that Germany for many years has paid annually about £5,000,000 to America for petroleum, which sum has latterly risen considerably owing to advances in price.

## COMMUNICATED ARTICLE.

### ON THE ESTIMATION OF SULPHURETTED HYDROGEN IN COAL GAS.

By H. LEICESTER GREVILLE, F.I.C., F.C.S., &c.,

Chemist to the Commercial Gas Company,

International literature is always the most interesting, because it is always the most comprehensive. Science is so far impartial that it is cosmopolitan. Many students have, however, a limited knowledge of languages outside their own mother tongue, and welcome translations in the "JOURNAL" of the results of researches pursued in other countries, and offered to them for perusal in what we insular people call "Good Queen's English." I always read these productions with the greatest interest, but have noticed on more than one occasion the undue elaboration involved in Continental methods, more especially those manufactured in Germany, and particularly from the representative Press organ having the euphonious title of the "Journal für Gasbeleuchtung."

The latest translation from this periodical in your columns (Nov. 6) is headed "The Estimation of Sulphuretted Hydrogen in Gas;" and I was especially impressed by the (to my mind) needless complication of the method advocated. I published some years back (see "JOURNAL" for June 23, 1896) a process for the estimation of sulphuretted hydrogen in gas liquor. The same method is applicable for the estimation of the sulphuretted hydrogen in coal gas. The procedure now advocated by Herr A. Müller may claim to possess the highest degree of scientific accuracy; and I do not propose to criticize it on this ground; but there is one substantial fact in technical science that must never be lost sight of—viz., that methods of analysis, to be within the region of practical politics, must be capable of rapid execution, and that more useful work can often be accomplished by a quick method, accompanied by a small sacrifice of accuracy, than by a more elaborate process involving a very much larger expenditure of time and labour in order to ensure a more ideally scientific result.

My process for the estimation of sulphuretted hydrogen in gas liquor is based upon the use of a standard solution of ammoniacal copper sulphate, reacting on sulphuretted hydrogen with formation of copper sulphide. The full details of working can be ascertained by reference to my article; but considering the time that has elapsed between the previous and the present communications, it will perhaps be useful to republish the figures embodying the results of my volumetric test, in comparison with the more usual and tedious gravimetric method of precipitating the sulphuretted hydrogen as arsenic trisulphide ( $As_2S_3$ ).

#### Comparative Tests of Sulphuretted Hydrogen in Gas Liquors.

	[Per Cent of $H_2S$ .]	
	Volumetric, by Cu Solution.	Gravimetric, as $As_2S_3$ .
Condenser liquor . . . . .	1.180	1.200
Scrubber . . . . .	0.470	0.450
do. check test . . . . .	0.475	0.450
Scrubber . . . . .	0.680	0.690
Condenser . . . . .	0.410	0.390
Unnamed . . . . .	0.107	0.106
Well liquor. . . . .	0.607	0.600
Weak scrubber liquor . . . . .	0.081	0.079

A test can be made easily in less than five minutes.

For the estimation of sulphuretted hydrogen in coal gas, the gas is passed into the Harcourt tubes such as are used for the ordinary volumetric determinations of carbonic acid and sulphuretted hydrogen, with the usual colour standards. The first tube is charged with a solution prepared by mixing 1 volume of strong liquid ammonia with 10 volumes of water; and the second is filled with pure distilled water. In the outlet of the second tube is placed a small piece of lead test-paper, as a check on the total absorption of sulphuretted hydrogen by the solutions. The gas can be passed at a comparatively rapid rate through the capillary tubes usually employed; and for the measurement of the volume, either my "combined measure and aspirator" (as devised for the Harcourt test, and manufactured by Messrs. Townson and Mercer) may be employed, or the usual experimental meter may be used. After the conclusion of the experiment, the contents of the two tubes are emptied into a white porcelain basin and titrated, exactly as in the case of gas liquor.

As an example of the rapidity of the process, one-tenth of a cubic foot of gas was passed in between ten and fifteen minutes on a gas known to contain about 400 grs. of sulphuretted hydrogen per 100 cubic feet, without the faintest discoloration of the lead paper at the outlet—showing that the absorption of the sulphuretted hydrogen had been complete. The subsequent titration occupied less than five minutes. The calculation is of the simplest possible description. My solution is of such strength that each cubic centimetre equals 0.05 grain of sulphuretted hydrogen. Consequently, operating on one-tenth of a foot of gas the number of cubic centimetres of solution used, multiplied by 0.05, gives the proportion of sulphuretted hydrogen in grains per 100 cubic feet, counting the result in whole numbers thus—

Cubic centimetres used  $9.0 \times 0.05 = 450$  grs. per 100 cubic feet.



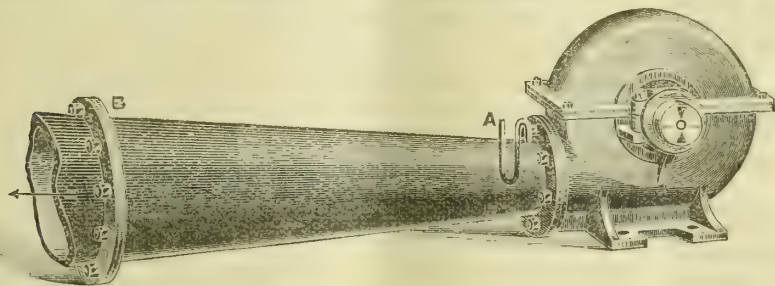
## NOTES.

## The Russian Petroleum Pipe-Line.

Writing recently of the prospects of Russian petroleum, we stated that it would be necessary to wait for the completion of the pipe-line from Baku to the tideway at Batoum before Russian oil could be expected to take its definitive place in the market. Particulars of this enterprise, so far as it has been completed, have recently been published in "Cassier's Magazine." It is stated that the pipe still lacks a distance of 418 miles to finish it, over which the oil is sent by rail. The pipe is laid alongside the railway, and is worked as a branch of the line. It is being laid by the Russian Government, at great expense; but in the best possible manner. The bore is 8 inches, and the material of which the pipe is made is steel, with screwed joints. The delivery capacity of the 141 miles of pipe opened last summer is 48,000 gallons per hour. There are three main pumping-stations on this section, working against a maximum pressure of 645 lbs. per square inch. The steam is supplied by Lancashire boilers, burning petroleum refuse. One of the difficulties of the undertaking was to get water for all these stations. The pipe was put together on the surface of the ground, tarred on the outside, and buried to a depth of 18 inches, to protect it from external damage and the heat of the sun. The curves of the railway track were followed; lengths of the pipe being warmed in a wood fire on the spot, and swept to the proper shape. The summit level of the line is at an elevation of 2200 feet. So far as it has gone, the pipe has materially lightened the work of the railway.

## Tapering Discharge-Pipes for Fans.

Mr. W. A. Granger recently demonstrated, at the Dalston Lane Engineering Works of Messrs. Capel and Co., the efficacy of a diverging conical outlet-pipe in increasing the delivery of air by a power fan. The experiment was interesting, as Mr. Granger arranged it. A No. 2 Sturtevant fan was driven by a belt from the fly-wheel of one of Messrs. Capel's excellently-made gas-engines, which kept up a very regular air pressure, on the outlet, of 2 inches of water. This was when the fan was delivering air through a parallel pipe, 4 $\frac{1}{4}$  inches in diameter and



2 ft. 11 in. long, into a wooden box with a hole in it for the escape of the air. When the parallel pipe was changed for a tapering one, 4 $\frac{1}{4}$  inches at the outlet A, of the fan, to 7 $\frac{3}{4}$  inches at its far end B—the same length as before—the air pressure in the box at once rose to 3 $\frac{1}{2}$  inches. This is a remarkable example of the well-known property of increasing taper pipes for accelerating the discharge of fluids. Curiously enough, although the principle is so familiar as a phenomenon of physics, it is very little used by mechanical engineers in connection with such possible applications as are offered by air blowing, gas exhausting, and the discharge of fluids from orifices. Mr. Granger holds that there is a large field open for the use of this principle in connection with forced-draught machinery.

## Combustible Gases in the Atmosphere.

That the composition of atmospheric air is not so simple as it is usually assumed to be for practical purposes, has long been known by chemists. Not to speak of the discoveries of various inert gases in the atmosphere by Lord Rayleigh, Professor Ramsay, and others, the presence in air of combustible gases has been suspected from the Seventeenth Century. So long ago as 1833, Boussingault proved that hydrogen is present in the air of towns and of marshy districts, most likely combined with carbon as methane. The difficulty of detecting hydrogen or methane in the atmosphere is very great, as Gautier has recently testified. We have no absorbent for either hydrogen or methane, which could be used for analytical purposes. Yet this French experimenter has contrived, by refining the combustion method, to arrive at fairly consistent and comparable determinations of the combustible gases in air at different places. Experimenting in this way in Paris, in an oak forest 40 miles from Paris, and high up in the Pyrenees, Gautier found that the amount of free hydrogen varied between 19 and 17 cubic centimetres per 100 litres. From complete experiments, it is concluded (as already mentioned in the "JOURNAL") that the air of Paris contains, in 100 litres: Free hydrogen, 19.4 c.c.; methane, 12 c.c.; higher hydrocarbons, 1.7 c.c.; and carbon monoxide, 0.2 c.c. Free hydrogen would thus be normally present in the air, and the presence of hydrocarbons is probably connected with vegetation and putrefaction. Various sources are suggested for the free hydrogen. It may be derived from the action of water on granite in the streets.

## A Centrifugal Gas-Washer.

An illustrated description is given in the "Iron and Coal Trades Review" of Theisen's centrifugal gas-washer, as erected at the Hoerde Works. This is called a medium-sized apparatus, and consists of a horizontal cylinder 60 inches in diameter and 15 ft. 4 in. long. The machine sucks in blast-furnace gas from the main at a pressure of from 1 to 1 $\frac{1}{2}$  inches, and delivers it purified, at a pressure of 6 inches, into a holder from which the gas-engines are fed. The water is admitted by a 1 $\frac{1}{2}$ -inch pipe, and is used at the rate of 22 gallons for every 35 cubic feet of gas, which seems a large consumption. The water, after being cooled, is used over again. Its office is to deprive the gas of dust and aqueous particles. The former is the greater nuisance. It proceeds from the crepitating materials of the charge in the upper portion of the blast-furnace, and also from the zone of reduction. The former is comparatively heavy, and deposits itself very easily in the gas-mains. The latter, on the contrary, is very light and extremely buoyant, and is carried by the gas a great distance. It consists chiefly of the oxides of the metals constituting the charge, of silicic acid, and of salts of the alkalies and alkaline earths; and there are also present products of lower degrees of oxidation of the elements, and combinations of iron with carbonic oxide. For all useful purposes, the presence of dust in the gas is objectionable. In the centrifugal washer the gas is forced against a skin of water maintained upon the inner side of the cylinder. An apparatus of the size mentioned will deal with 7000 cubic feet of blast-furnace gas per minute. It ought to be useful with other kinds of gas.

## Cooling Hot Gases in Pipes.

One of the incidental studies in the engineering of automobiles is the cooling of the motor cylinders. The expedients found necessary in this regard throw some light upon the general problem of the cooling of hot gases in metal containers. All light road motors, almost without exception, follow the Otto gas-engine cycle; the rate of working being generally very rapid. For the sake of simplicity, the piston-rod is usually suppressed; the connecting rod being jointed direct to the piston itself. M. Desjacques, reporting on these motors for "Engineering," remarks that if one of them, using "petrol," starts without any cooling device, it very soon gets red hot, and stops through charring of the lubricating material. Such an internally-heated cylinder can be cooled artificially in various ways. It is sometimes cast with wide projecting wings, or has a circulating water-jacket. He prefers the arrangement of circulating the cooling water through tubes made with wings, or flanges, to increase the radiating surface. It is known that, when a metallic surface separates two mediums at different temperatures, the quantity of heat which passes increases with the difference of the temperatures. This heat is dispersed by radiation and air conduction—how divided, is not easy to say. What is more, arrangements that are good for radiation are bad for air conduction. Thus a multiplicity of flanges or deep ribs helps radiation, but hinders free air circulation. An arrangement for sprinkling radiating pipes with a water-spray is well spoken of; the point being to use as little water as possible, in order that it shall be evaporated and thus take up the great quantity of heat that becomes latent in steam. Altogether, it would seem that the study of pipe radiators is yet in an elementary stage.

## The Banki Gas-Motor.

Professor Donál Bánki, of Buda Pesth, has invented a gas-engine working on a new principle. This motor has recently been described in several Austrian technical journals. It is explained that, in order to obtain high economy in an internal combustion motor, a high compression of the charge must be adopted. In the ordinary gas or oil engine, the limit of compression is reached when the temperature resulting from the operation attains the ignition temperature of the mixed charge. If this ignition temperature is reached before the end of the compression stroke, there will be a premature explosion, the motion will be reversed, and the cycle upset. In the Diesel motor, which uses high compression, and depends upon the temperature thus produced for igniting the charge, the difficulty is avoided by compressing the air only. Professor Bánki's method is different again. The charge of mixed air and hydrocarbon is drawn into the cylinder as usual; but with it is also mingled a fine spray of water. When the high compression is given to this mixture, the water absorbs a portion of the heat, and thus helps to keep the temperature of the charge below the ignition point. When ignition does occur, the conversion of the water into steam adds to the expansive power of the charge, and thus helps the power stroke; while at the same time the absorption of heat due to this process tends to keep the cylinder walls from getting over-heated. Such motors have been made, and it has been found possible to get the compression as high as 233 lbs. per square inch, without premature ignition; while the pressure attained by the explosion is 540 lbs. per square inch. The fuel used was benzine. The thermal efficiency of the motor at full load is 28 per cent. The effect of the water-jet is shown in the reduction of the loss of heat by the circulating cooling water from 40 per cent., as in the case of ordinary gas-engines, to 27 per cent.



## TECHNICAL RECORD.

### SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The final Meeting for the year of the members of the above Association was held last Thursday, at the Holborn Restaurant. There was a good attendance, and an excellent programme. It was a matter of regret that the President (Mr. D. Irving, of Bristol) was unable to be present, owing, as the Hon. Secretary (Mr. J. W. Helps, of Croydon) stated, to the illness of the Chief Engineer of the Bristol Gas Company, Mr. W. Fiddes. Early in the proceedings, a telegram was received from the President, in which he said: "Kindly apologize to Committee and members for my absence, assuring them there is no lack of interest in the Association or appreciation of honour conferred. Wishing successful meeting." Under the circumstances, Mr. A. E. BROADBERRY, of Tottenham, the ex-President, was called upon to take the chair.

The HON. SECRETARY opened the business by reading the minutes of the last meeting, and they were confirmed. The members then proceeded to elect the

#### OFFICE-BEARERS FOR 1907.

The CHAIRMAN remarked that the first office to be filled was that of President. The rules of the Association having been altered so as to enable the members to elect a Vice-President, he had no doubt all would expect to hear him nominate Mr. Corbet Woodall, who was now the Vice-President, for the position of President in the coming year. Mr. Woodall, he was happy to say, had consented to take the office; and he (the Chairman) was certain the Association would derive a great deal of benefit from having him presiding over them.

The HON. SECRETARY asked that he might be allowed to second the proposal.

The resolution was carried by acclamation.

Mr. W. D. CHILD (Romford) next proposed that Mr. W. E. Price, of Hampton Wick, be elected to the Vice-Presidency. Mr. Price, he remarked, had been a useful member of the Association, and had assisted it by papers, by serving on the Committee, and in other ways. He ought really to have been President long ago; but, in his good nature, he had kindly stood on one side for other members.

Mr. J. T. JOLLIFFE (Ipswich) seconded the motion, which was very cordially agreed to—the CHAIRMAN remarking that he was sure all the members were pleased to know that Mr. Price had at last consented to take the Vice-Presidency and ultimately the Presidency.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) moved the re-appointment of Mr. Helps as Hon. Secretary and Treasurer. The members, he said, one and all knew of the immense interest Mr. Helps took in the Association; and, without his arduous labours, he was sure the Association would not be in its present successful position. They were very grateful to Mr. Helps; and they hoped he would long continue to hold the office.

Mr. S. W. DURKIN (Southampton) seconded the motion, which was heartily passed.

On the motion of Mr. F. SMALLBONE (Woodford), seconded by Mr. F. W. CROSS (Lea Bridge), Messrs. F. G. Cockey and C. F. Ruggles were elected members of the Committee.

Mr. D. H. HELPS (Redhill) proposed, and Mr. W. B. RANDALL (Waltham Cross) seconded, the re-election of Messrs. James L. Chapman and A. Dougall as Auditors—the proposition being cordially agreed to.

#### NEW MEMBERS.

The following names were then submitted for membership: Mr. Octavius Thomas, of Rhonda; Mr. T. R. Murray, of Tottenham; Mr. Harold W. Woodall, of Bournemouth; Mr. S. J. Symonds, of Farnham; Mr. H. S. Baker, of Reading; and Mr. George R. Love, of Guildford.

Mr. C. E. BOTLEY moved that the gentlemen named be elected members; and he observed that all must be glad to see such an accession to their strength.

Mr. T. PRICE (Walton-on-Thames) seconded the motion, which was unanimously carried.

#### THE LATE MR. T. W. R. WHITE.

The HON. SECRETARY said it was with very considerable regret that he received a letter on Tuesday informing him of the death of Mr. T. W. R. White, of Sherborne, who had been a member of the Association since the amalgamation with the South-West Association. He had also received a letter from Mr. Norton H. Humphrys relating to the same sad event. (Both communications were read.)

Mr. DURKIN said it was with very deep regret that he rose to propose a vote of condolence with Mrs. White and the family. He was connected with Mr. White for a good many years in the old South-West Association; and, since the amalgamation, their late friend had been a member of the Southern Association.

Mr. H. SAINSBURY (Trowbridge), in seconding, said he had known Mr. White ever since the South-West Association was formed; and he knew, as the first Secretary of the Association, Mr. White took a great interest in it and in gas matters generally, and he was always ready to communicate any information

within his power to his brethren. They sincerely felt his loss to the Association and to the gas profession generally.

The members signified their approval of the resolution by rising silently in their places.

#### THE DAY OF MEETING.

The HON. SECRETARY read a letter received from Mr. J. D. Ashworth, of Portsmouth, who was unable to be present, owing to Thursday being his Board-day. Mr. Ashworth suggested that the day of the Association meetings should be varied a little, so that all the members might have an opportunity of attending the meetings. Mr. Helps pointed out that the letter had been before the Committee; and they desired to have the opinion of the members on the subject. Thursday was the day fixed at the commencement of the Association; and it had been adhered to since. It was true, according to the rules, that the Committee had power to alter the date, and so probably they could alter the day. They had a good many members present that day, so that evidently Thursday was not generally inconvenient. But if any of the members knew that the day was unsuitable for other members, the Committee would like to know of it.

Mr. DURKIN remarked that he thought Thursday was as generally convenient as any other day; and some of the others might be more inconvenient. He thought it was a matter that should be left to the Committee to decide.

None of the other members expressed any opinion; and the matter dropped, with the understanding that any communication on the subject addressed to the Hon. Secretary would be referred to the Committee.

Mr. G. P. LEWIS (Lower Sydenham) read the first paper. It was entitled—

#### NOTES ON PURIFIER CONSTRUCTION.

The mode of construction of dry purifier-boxes has, until a comparatively recent period, generally followed the lines adopted in the very early days of gas manufacture. The only improvement calling for special mention is the substitution of india-rubber joints for the cumbrous water-seals in vogue for so many years. The use of the former system of jointing, though originally proposed many years ago, remained practically in abeyance until it was employed on a considerable scale by Mr. Green, of Preston; since when it has been freely adopted by a number of engineers. This system of jointing has been proved to be thoroughly successful in practice when properly designed, and results in a considerable reduction in the weight of the boxes and covers—amounting, in some cases, to about 20 per cent.

One of the disadvantages of the water-seal system lies in the wastage of the lute-plates and side sheets of the cover at the water-line; the effects of this evil being so great as to render the use of cast iron for the lute-plates almost a necessity, while, on the contrary, wrought iron or steel is equally suitable for the construction of purifier-boxes on the dry-jointed system. Among other points, the problem of designing cast-iron side plates with water-lutes calls for some attention, as although at first sight this may appear to be a very simple operation, it is really a matter that requires some degree of experience; these plates being subjected to severe strains, due to the combined action of the outward pressure of the gas and the upward pull of the cover, also due to the same force. The general nature of these stresses is illustrated in fig. 5; the greatest strain being in the neighbourhood of the point marked A. If care is not taken to meet this strain by substantially bracketing the underside of the lute to the body of the lute-plate, and also to provide proper internal ties, considerable trouble is experienced by frequent "cracking," and, as a consequence, leakage of water from the lute. On the contrary, the strains on the side plates are much less in the case of the "dry" joint—the "lift" of the covers acting almost as a direct tensile stress; while the multiple system of covers usually associated with this method of construction, gives substantial cross-ties for resisting the outward pressure of the gas.

The fact that the side plates of dry-jointed purifiers are very much less severely strained than those with water-seals, coupled with greatly reduced weight and a wider choice of materials, has led the author to investigate the possibility of improvements in the general construction of dry purifiers; and he ventures to lay before the members of the Association a few suggestions with the aforementioned object. It should be understood, however, that these suggestions more particularly refer to the construction of purifiers and purifier-houses on the overhead system. The general lines of the proposed improvements will be most readily apparent by reference to the diagrams accompanying this communication, from which it will be seen that the main feature of novelty in the proposal lies in the idea of making the boxes not only support themselves, but also contribute to that of the upper revivifying floor and roof over same, coupled with a reduction in the weight of the pipe connections.

By reference to figs. 1, 2, and 3, it will be observed that the purifiers are oblong in shape, and are arranged in consecutive pairs, side by side, with the greater dimension in the longitudinal direction, and the contiguous sides and ends connected together in such a way as to form "box-girders;" while the outer sides and ends are ordinary web-plate girders. The bottoms of the purifiers are composed of wrought-iron or steel plates, slightly dished for the purpose of drainage, and for reducing strains due to gas pressure. It is also proposed to stiffen up the sieve-bearing



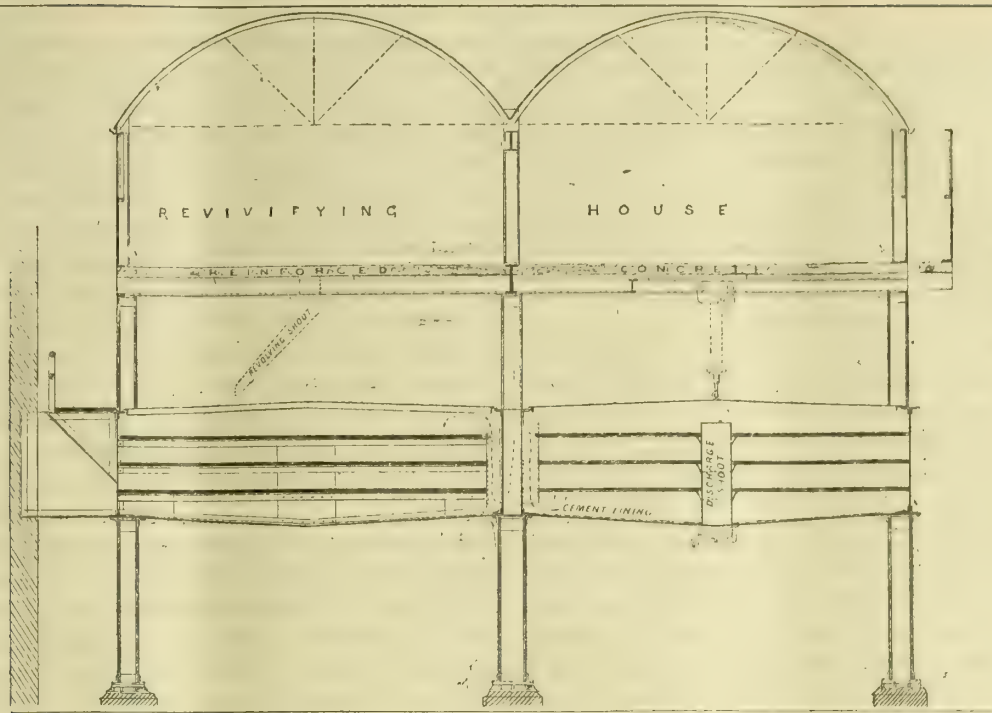


FIG. 1.

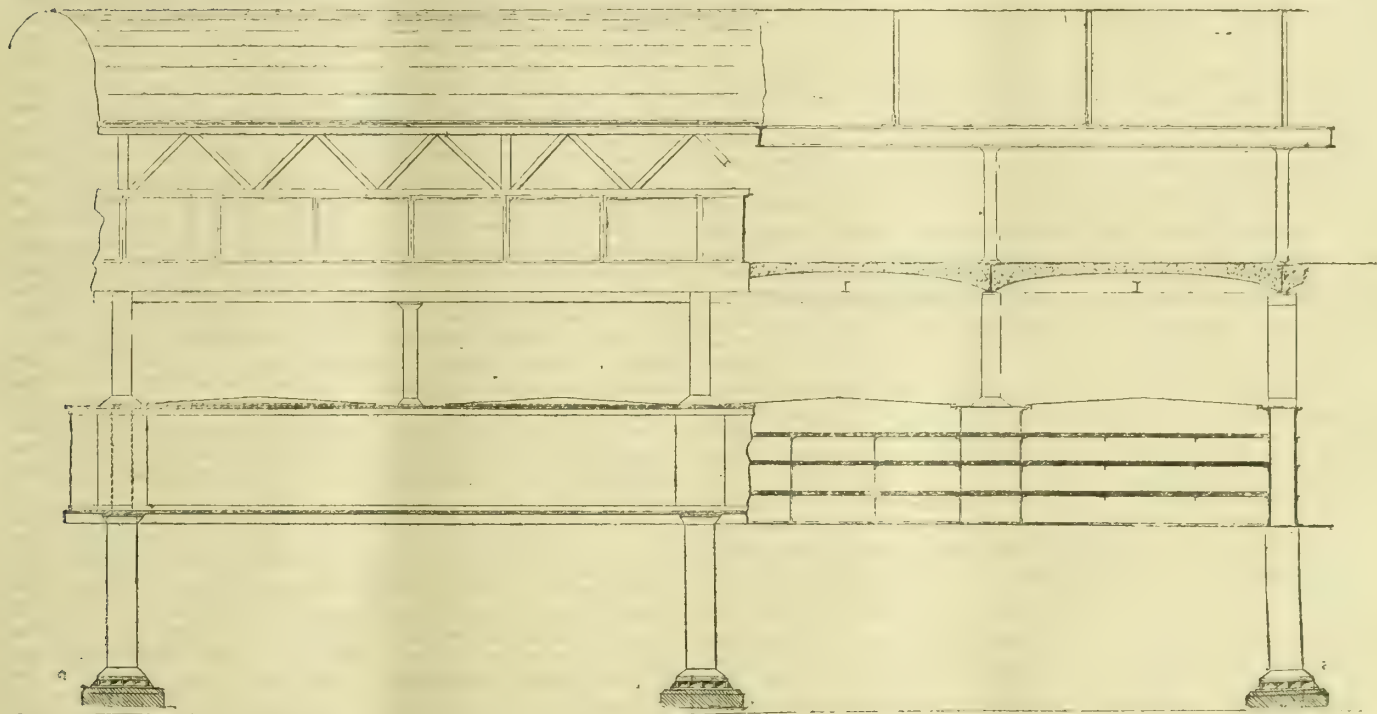


FIG. 2.

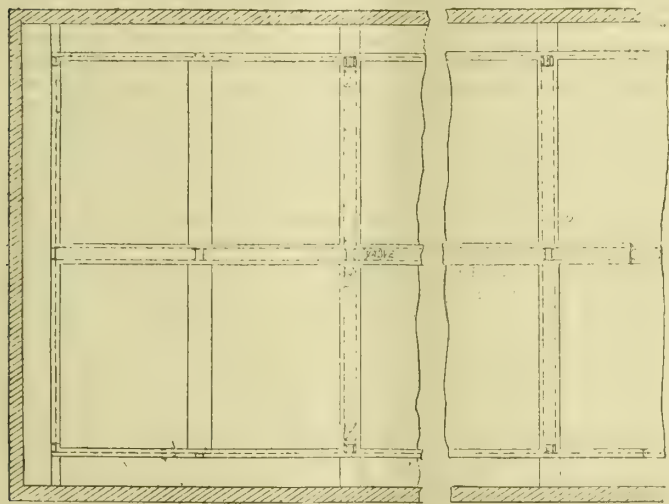


FIG. 3.

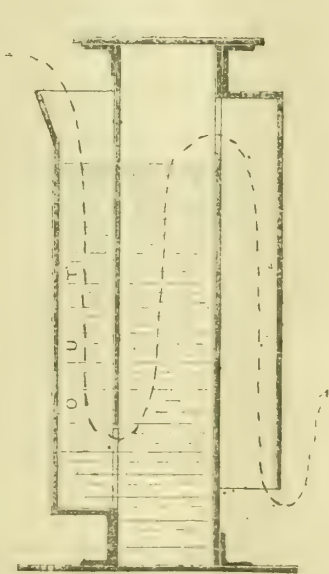


FIG. 4.

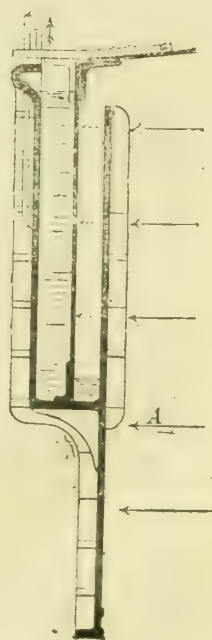


FIG. 5.

bars in combination with the general structure of the purifier, so that they collectively act as girders and struts for carrying the weight of material, and to prevent distortion of the girder sides. The purifiers are shown to be supported by short columns placed directly under the boxes ; but they could be equally well carried on the outer sides, by prolonging the girders on to the walls of a building—the central columns only being retained. The spent purifying material can be readily discharged through



the sectional discharge-outlet shown on fig. 1. Each of these sections should be made light, so that it can be easily handled by two men, and provided with a padlocked discharging door. It is also possible, with the system shown, to materially reduce the weight of pipe connections; and as these represent in ordinary practice from 9 to 30 per cent. of the weight of the purifiers and covers, it is evident that there is room for economy. By the aid of hydraulic valves formed in the body of the box-girders, as shown in fig. 4, and also by utilizing the space in the interior of the box-girders as gas-passages, it is quite practicable—assuming proper workmanship in erection—to work a set of four purifiers on a rotation system, with a less extent of pipe connections than is necessary with an eight-way centre-valve.

The use of some system of reinforced concrete flooring, such as the Monier system, or the "expanded" metal form of construction for the revivifying floor, is recommended. Full particulars of the latter system are given in a paper by Mr. A. Baker, read before the Institution of Gas Engineers in May, 1900; and although it has only recently been introduced, it has been employed already at Beckton and other gas-works for a similar purpose. The revivifying floor is shown to be enclosed by cast-iron parapet plates, with a light single lattice girder secured to the upper flanges, for the purpose of carrying the roof principals. It is self-evident that the weight of metal in overhead purifiers constructed as described must be very much less than in any water-lute system. It must be borne in mind, however, that cast-iron plates cost only about one-half that of wrought-iron or steel work, such as is shown. The degree of ultimate economy likely to be attained depends entirely on the skill of the individual designer; but the author is of opinion that the purifier-boxes and covers *alone* can be erected for about the same cost as those of equal capacity on the ordinary water-lute system, and that the cost of the supporting structure and connections can be reduced by an average of 50 per cent.

The author regrets his inability to give a greater amount of detail in the diagrams owing to the time for the preparation of this communication being somewhat limited.

The most complete and exhaustive system of sulphur purification practised almost exclusively to meet the regulations prevailing in London, remains in very much the same condition as when it was evolved many years ago. The author ventures to assert that very few of those who are, or have been, engaged in the practical working of the system will claim that it is an entire and economical success, and more especially under present conditions, when the gas manufacturer has perforce to be content with the supply of "all sorts and conditions" of a mixture called coal, giving a low yield of gas and residuals, but a very high one of other things, not the least of which are sulphur compounds and sulphuretted hydrogen. The introduction of air in purification has been of undoubted value in those happy places where sulphur clauses are unknown; but it is an unfortunate fact that it cannot be employed to the same extent under more rigorous conditions.

The hopes of the possibility of purification of gas in closed vessels, raised by the advent of the Claus process, still remain unfulfilled; and the "process" itself has apparently been relegated to the position of a thing of the past. The principle underlying the process, however—that is, "self-purification"—still remains, and is worthy of attention. A study of the very able and candid account of the failure of the experiments on the Claus process at Belfast, given in a paper read by Mr. Stelfox before the Incorporated Gas Institute in 1897, gives a good clue to the defects in the mode of application of the underlying principle. The non-success of the experiments appears to have been quite as much due to mechanical and constructional defects as to chemical ones. There is no reason why the former could not be overcome at the present day; thus restricting the problem to one requiring chemical solution only. The latter is again reduced by the proved fact that the process was found to be quite capable of effecting complete purification for consecutive periods of two and three weeks.

The reason why the system was subject to fits of bad behaviour has still to be solved, and deserves our attention. A perusal of the papers dealing with certain phases of this subject by Mr. George Livesey and Mr. F. D. Marshall, read before the Gas Institute in 1875 and 1878 respectively, sheds some light upon the phenomena. The author is of opinion that if some scheme of experiments could be initiated under the direction of a Committee of practical men, a solution would be discovered.

Hills's liquor purification process in use at the Old Kent Road Gas-Works for many years, and the more recently adopted Holgate's liquor purification system at Halifax, have proved successful within the limits of their application. Need we, therefore, despair of the devising of some intermediate scheme between the extreme pretensions of the Claus process, and the more modest aspirations of the two latter?

It may not be out of place, in conclusion, to express regret that very little progress can be claimed for improvements in the general process of purification.

#### Discussion.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said he was sure the Association were much indebted to Mr. Lewis for his interesting and suggestive paper, and all the more so because it was prepared at the eleventh hour, in response to an appeal from the Hon. Secretary. The chief feature of Mr. Lewis's design

appeared to him (Mr. Shoubridge) to be the combination of the purifiers with the purifier-house; and though it seemed to him somewhat doubtful as to the wisdom of making purifier-boxes of steel or wrought iron—owing to the greater liability of corrosion—there was certainly very great advantage in being able to save such a large amount in the cost of construction, as Mr. Lewis found that he could do by this method. Fifty per cent. in the cost of construction was a considerable saving. But he (the speaker) thought it was very important that the purifier itself should be kept quite distinct from the superstructure, because there was no doubt the purifier itself would wear out considerably before the other part of the structure; and in that case, if it had to be renewed, it might interfere with the stability of the building. There was, however, also a considerable saving in space; and that was a matter of importance in very many works—especially in works where they were at all cramped. Beyond this, the system was similar to that which had been in use in a great many gas-works. At Lower Sydenham, they had a purifier-house very similar to the one shown in the drawings, in which the india-rubber lutes were employed; and the purifying material was shot down in shoots like those described in the paper. They found that it was an economical arrangement, both for charging and discharging. It took up very little space, and could be constructed—purifiers and house together—at very little more cost than purifiers alone with the old lutes and in the old way. He thought one of the chief advantages of the paper would be in directing attention to this subject of purifier construction and gas purification. It was singular how little had been written, or how few papers had been read upon this subject, which, after all, was an exceedingly important one to the gas industry. They all knew of the experiments that were made at Belfast and Birmingham to effect the complete purification of gas in closed vessels; but so far as he (Mr. Shoubridge) was aware, these experiments, not having succeeded, had not been repeated, and nothing further had been done. He thought it was very much to be regretted that this was so. If anything had been done, the results had not been published; and this paper might have the effect of inducing some persons who were experimenting in this way to let either this Association or some other Association have the benefit of their work. It was somewhat a reflection upon the gas industry that the same methods of purification were in vogue now that were in use almost at the commencement of the industry—that the mechanical appliances for saving labour which had been introduced in so many other directions, had not been applied to any great extent in respect to purification. It was a subject to which, he thought, they ought all to give more attention, with the view of economizing in the cost of labour. Even in some of the largest gas-works the whole of the labour was now done by hand; and as it was labour of a kind that lent itself particularly to mechanical means, it was unfortunate that no one appeared to think it worth while to devote his attention to it. He hoped Mr. Lewis's paper would arouse fresh interest in the subject, which they all agreed was of great importance.

Mr. C. E. BOTLEY (Hastings) remarked that the paper, which was very interesting, divided itself into two points—the construction of the purifier-house and the method of purification when one was under the sulphur clauses. Now, looking at Mr. Lewis's plans, it must be borne in mind that one had to design a purifier-house according to the requirements of the particular place and the ground area. He thought, with plenty of room, he should not feel inclined to have the revivifying-floor above the purifiers. They did not get that promptness and convenience in loading the purifier that they did if they had it on the ground level. The position, of course, depended very largely on circumstances, and on the site. He found Mr. Lewis suggested, with regard to the method of purification, that the use of air had not been altogether satisfactory. Well, he (Mr. Botley) could say that this was not correct, so far as his experience was concerned. They were under the sulphur clauses at Hastings; and they had been very successful for many years—even in keeping the sulphur down. They had an Official Gas Examiner who was not a local man, but one of the Metropolitan Gas Examiners; and he came at any time he liked. He had found the sulphur compounds as low as 4 grains; and he (Mr. Botley) did not think their average over the year would be more than 8 grains. And they used air in purification. He had read some interesting articles from the practical point of view of a gentleman who had had charge of the purification in a London gas-works, in which articles he said the use of air in purification for sulphur compounds was absolutely wrong. He (Mr. Botley) had tried both ways, with air and without; and he said most distinctly that with air they had the most successful results. They did not want to admit air indiscriminately, but they wanted to admit it according to the proportion of sulphuretted hydrogen there was in the gas. In this way, they had been able to keep down the sulphur compounds to a low point, and at a minimum of cost. Now at Hastings, it would not be considered they were favourably situated with regard to purification, to the cost of materials, and various other things; but when he told them that their purification charges, for materials and labour, had not exceeded  $\frac{1}{2}$ d. per 1000 cubic feet of gas—keeping the sulphur compounds down to the low point he had described—they would not, he thought, consider that this was very unsatisfactory. Therefore, he was not able to agree with the statement that the use of air in purification, when they were under the sulphur clauses,



was prohibitory. On the contrary, he was convinced it was the right thing to do.

Mr. W. E. PRICE (Hampton Wick) asked the author how his hydraulic valve was used—filled and emptied. The object of these purifiers, he took it, was to do away with the water-lutes, and doing away with the objectionable blowing from excessive pressure, especially when the works were being run at high pressure. It seemed to him (Mr. Price) to be transferring the trouble from the purifier-covers to the valve. There was no doubt steel covers were the right things to use; but there came in the little trouble as to making the joints. He would like to know how the india-rubber acted under the influences of the gas. Was it necessary to treat the rubber in any way? Did it perish or become hard; and was it easily removed? Did it remain attached to the surface of the purifier, or was it raised with the cover? It was, he thought, rather a large piece of jointing to put in one piece. He took it the covers would be not less than 12 feet square; and to raise a piece of rubber which would be perhaps 3 inches wide by  $\frac{1}{2}$  inch thick would be rather a difficult matter.

Mr. S. W. DURKIN (Southampton) said he seemed to recognize in fig. 4 an old friend that he had had in use for some years. It looked like merely a section of Mr. George Livesey's gasholder manhole lid; and he had had the pleasure of paying a royalty for the use of a similar thing. He had for years used a hydraulic valve for purifiers, instead of the old slide-valves. It arose at the time when they used nothing but oxide of iron in the process of purification; and as those who had used the same purifying material would know, the discs of the slide-valves very rapidly became honeycombed, and there was constant expense incurred in keeping the valves sound or in keeping duplicate valves to replace those which had become unsound. The trouble grew to such an extent that he thought of an arrangement very similar to the one shown, and it was put in operation. Then he found it was a section of Mr. Livesey's gasholder manhole lid; and a small royalty was asked for it. But for this payment, he had power to use the things to any extent he liked. Anyway the arrangement had been working ever since. With reference to the use of air in purification, they were not brought under the sulphur clauses at Southampton until the latter part of 1898. But for some years before that—knowing it was very likely it would come about—they had been "practising" with air purification in connection with the lime and oxide boxes; and very successfully too. So when the legal responsibility came upon them to keep the sulphur compounds down below a certain number of grains, they had no difficulty about it; and they had continued to use air ever since. He did not say he got down so low as Mr. Botley did at Hastings. But 8 to 9 grains was all they got; and sometimes, when their make of gas had been pretty low in warm weather, they had disappeared altogether. On an average, however, they kept down to 8 or 9 grains. He therefore saw no reason why he should discontinue the use of air. Their purification was nearly all performed by lime at the same cost as had been mentioned for Hastings, excepting that there was a certain kind of gas made now which had a tendency to increase the purification charges.

Mr. D. H. HELPS (Redhill) inquired whether the author had considered, in using wrought iron in oxide purifiers, that it would tend to decay more quickly than cast iron.

Mr. J. H. BROWN (Ilford) said that some four or five years ago, they had 22 feet square purifiers erected at their works; and after about three years' working, the bolts in the purifiers needed taking out. They were affected by the liquor, and began to corrode. He could not, therefore, agree with Mr. Lewis in reference to the use of steel—especially at the bottom of the purifiers, where liquor from the oxide ran. With regard to air purification, he had had a rather peculiar experience. They were not under the sulphur clauses; and they had very few restrictions with regard to the purity of their gas. He was not using any lime whatever; and, by admitting air, he was able to obtain 40 per cent. of sulphur and 6 per cent. of "blue" in the oxide. He was obtaining for this 23s. 6d. to 24s. a ton; and they bought the new oxide at 16s. 6d. per ton. The result last half year was that they really made a profit of £5 on purification, as against a cost of £180 the previous half year. This, he thought, was a novel experience for a gas-works.

The CHAIRMAN said he had been particularly interested in the paper, as at Tottenham they had some purifiers that were constructed somewhat on the same lines—that was to say, they had india-rubber joints, and the bottom discharge. They were very much on the style of those shown in the diagrams. Regarding the bottom discharge, however, they had at Tottenham arranged the door to open on a vertical hinge, instead of a horizontal one, so as to make the door open and close more easily. The shoot was also curved, so as to bring the door upright. The lids at Tottenham were 12 feet by 14 feet, and of steel, with india-rubber joints. These had now been in use for about five years. The same rubber joints that were first put in were still in use; and he thought, from the look of them, they would be in use for about the next century if the purifiers lasted so long. (Laughter.) The rubber joints were quite as useful now as when they were first put in. In one of the purifying-houses at Tottenham, they had the revivifying-floor above the purifiers; and the chief difficulty, of course, was elevating the material up to the top. In building the new purifiers, they determined on the bottom discharge, so as to utilize the space below the purifiers for the

purpose of revivification. In Mr. Lewis's scheme, he noticed that there was the space below; but there was also the revivifying floor above the purifiers; and he (Mr. Broadberry) had been wondering why there were both. He could quite understand the advantage of having a roof over the purifiers, which they had not at Tottenham; and they missed the roof during bad weather when they were cleaning the purifiers. But it did not seem to him to be quite necessary to have the revivifying-floor above the purifiers when there was space provided below.

Mr. A. F. BROWNE (Vauxhall) referring to the point as to the use of air in purification, said the author made this statement: "The introduction of air in purification has been of undoubted value in those happy places where sulphur clauses are unknown; but it is an unfortunate fact that it cannot be employed to the same extent under more rigorous conditions." He (Mr. Browne) did not think the discussion had so far brought out what each meant by the employment of air in purification. One speaker made his position very clear. He said he did not use lime; and he found a good effect in using air in his oxide boxes. Mr. Botley, on the other hand, employed air in lime purification with good effect. So they did at Vauxhall, with very good effect indeed. But it all depended upon putting in a known quantity of air, over which they had complete control, and not admitting it indiscriminately. In putting atmospheric air in the oxide boxes, they did so to throw down sulphuretted hydrogen, in the form of free sulphur; and in putting it into the lime purifiers, they did so, not for the purpose of arresting, but to drive forward the sulphuretted hydrogen into the oxide boxes. The members would probably remember that a very interesting paper was read before the Institution of Gas Engineers some few years ago by two professional chemists (Messrs. Hood and Salamon), upon the effect of putting atmospheric air into the lime box into which sulphuretted hydrogen was entering freely, but no carbonic acid. A very beneficial effect followed in the elimination of sulphur compounds, and what they described as "tender" sulphide was formed, which, when the carbonic acid reached it, was broken up; and the sulphuretted hydrogen was driven forward to the oxide purifiers, and the lime was very thoroughly carbonated in consequence. He (Mr. Browne) wanted to put in a word in favour of the use of air in lime boxes under these conditions; and he hoped the author of the paper in his reply would be able to tell them he meant the same thing.

Mr. R. HERRING (Dover) observed that he should like to understand from Mr. Lewis whether he admitted air in any percentage, or did he generally condemn it. He should like to know whether he advocated the entire exclusion of air or whether he allowed the use of any percentage at all.

Mr. LEWIS, in reply, said he thought Mr. Botley misunderstood him to a certain extent when he referred to the admission of air. He (Mr. Lewis) simply said that air could not be used to the same extent in the case of sulphur purification. They were using air at the present time at the Crystal Palace Gas-Works.

Mr. BOTLEY said it was the form of words to which he took exception—the words that air "cannot be employed to the same extent under more rigorous conditions."

Mr. LEWIS (continuing) repeated that they were using air successfully at the Crystal Palace works at the present time; but they could not use so much of it as they would like to. (Laughter.) Mr. Shoubridge and Mr. Helps had mentioned the use of steel and wrought iron in the boxes. From his experience in the construction of purifiers, if they once got rid of the water-lutes, then they had very different conditions. He thought in that case that, if they put a little extra thickness into the plates, that they had all they required in the way of weight. As a matter of fact, the steel might rust away at a slightly greater rate than would cast iron; but, on the other hand, they could let the steel run down to a much greater extent than they could cast iron. With reference to the question of bolts, he did not think it advisable to put bolts into purifiers constructed of steel or wrought iron. With regard to the floor of the purifier and the effect of drainage upon the floor, he had shown in the diagram the purifiers lined so as to prevent any action on the bottom plates. His suggestion was to line them with cement, asphalt, or something of that kind. Mr. Botley brought out an important point as to local conditions. Space, of course, was a great thing. If space was everything, then it was necessary to have not only the under floor but the upper floor. But if space was not of quite so much value, then they could very well be content with the lower floor for revivification, and simply cover the purifiers over. He could quite corroborate Mr. Broadberry in his remarks regarding the india-rubber used. At the present time the rubber they had at the Crystal Palace works was  $1\frac{1}{2}$ -inch by  $\frac{3}{4}$ -inch section; and it seemed quite unaffected. The only thing that had happened to it was that when the lids had been screwed down the first time, when the pressure was released, the rubber lengthened. It was (say) about 40 feet long at first; and it lengthened about 18 inches when it was set free. All they did was to cut a piece out, and solution a new piece in; and it was as good then as ever before. The rubber rested on the purifier, and did not go up with the cover. With regard to the bolts employed, he thought the ordinary distance was about 1 ft. 6 in. or 1 ft. 8 in.; so that they were not nearly so close as had been supposed. With reference to Mr. Durkin's remarks regarding the valve. The valve itself was not new. It was simply an adaptation of a particular system. There was one point he should mention, that in the case of a valve of this



kind, he thought it was advisable to use, instead of ordinary water, some kind of liquid that was rustless. It would be necessary to have a tank on the ground floor, and one overhead for the purpose of dealing with the liquor and feeding the valve. A point had been raised regarding the blowing of purifiers. It was one of the advantages of the non-water seals that they did not get any blowing of the purifier, although he thought it was rather advisable at times to have something to blow somewhere. (Laughter.) Reverting to the question of the two floors, he said it was simply a question of space. He showed the two floors merely by way of illustration. The drawings did not profess to be an actual constructing example; it was simply a proposal. Of course, one floor or two could be adopted just as desired.

Mr. F. G. COCKEY (Newport, Isle of Wight) contributed the next paper, which dealt with

#### DIFFICULTIES MET WITH IN THE CONSTRUCTION OF A CONCRETE GASHOLDER TANK.

In accepting the Hon. Secretary's invitation to contribute a paper at this meeting, I felt grave doubts as to my ability to produce one that would be of any service to the members or provoke discussion. In the management of a works of moderate size, where the staff is small, one has little time for research, or even for the systematic recording and classifying of facts, except in the somewhat unreliable receptacle of one's memory. The ultimate choice of a subject, however, was suggested to me by a recollection of the want I felt of records of similar pieces of work at the time I was called upon to design a gasholder tank to be placed upon a rather awkward site; and I venture to hope that a record of my own experiences may be of service to others in a like position.

The increased demand for gas had rendered the months of December and January periods of continual worry and strain for several years before my Directors could be persuaded to face the expenditure of capital necessary to place the storage capacity of the works on a safe footing; and it was late in 1898 before it was decided to put in a new holder. There was a piece of land available in an excellent position in relation to the rest of the works; and although on the slope of a hill, it did not at first appear to offer any great difficulties in the carrying out of the work.

The first consideration was the size of the holder; and this was governed by the shape and area of the land, which was such that, whatever sized holder was put on it, there would be no room for anything else. It was therefore decided to make the diameter of the tank as large as possible, and to put in only one lift of the vessel at present, which would practically double our storage, and provide for a good many years to come.

The treacherous nature of the ground in the Isle of Wight is well known to many contractors who have had the misfortune to carry out works in that beautiful, but unprofitable, district; and possibly had the advice of some of these gentlemen been available at the time, many of the difficulties afterwards encountered might have been avoided. But, as a rule, when a job is finished, if not before, they go away never to return.

A pair of large sewage precipitation tanks had been constructed a couple of years before on land adjoining the lower side of the proposed site; and by carefully watching the progress of these works, it was thought that a fair idea of the nature of the ground had been obtained. In order to get some further information, a trench was cut into the slope on the upper side of the site, which showed stiff, yellow clay; and this appeared to stand well. A shaft on the lower side showed similar clay at a depth of about 9 feet, with loose ground above, which was known to have been tipped there when the tunnel on the Ryde Railway was made some 25 years ago.

The choice of materials lay between steel, brick, and concrete. At first, a steel tank appeared to present many advantages; but on further consideration, there seemed to be several objections to the use of this material. In the first place, during the construction of the main sewer, it had been observed that the whole of the upper clay had a tendency to slide towards the river; and it would have been necessary to go to a considerable depth to get a foundation of approximately uniform resistance, and to obtain a sufficient abutment to overcome the tendency to slide bodily on the greasy surface of the clay. Secondly, although there is no difficulty in designing a steel tank to stand any given bursting pressure, it has little stiffness to resist distortion due to external pressure applied unequally on different parts of the circumference, as would have been the case in this instance; and to stiffen it sufficiently would have greatly increased the cost. These considerations appeared fatal to the steel tank.

Between the other two materials, there was no difficulty in deciding. The homogeneity and rigidity of concrete, and the ease with which it can be made practically water-tight, would have been sufficient to turn the scale in its favour, even had it not been cheaper than brick in cement. The fact that excellent cement is produced within about a mile of the works, and could be delivered by water, and clean shingle in abundance was obtainable in the Solent and on the Hampshire coast, rendered this by far the cheapest method of construction.

In deciding on the thickness and form of the tank wall and the level of the coping, the slope of the ground was again an important factor. If the tank were placed too low, the bank on the upper side would have been unstable; and, on the other

hand, as the embankment on the lower side had to be made up, it was not safe to rely on it for much support. It was therefore decided to make the wall of a thickness calculated to resist the maximum bursting pressure at the bottom, taking into consideration the support due to the solid clay, and to carry it up of this thickness to its full height. There were other advantages in this method of construction that appeared to compensate for the extra quantity of concrete required—viz., the thickness at the top (3 ft. 6 in.) gave a sufficient base for the steel standards without any piers; and the vertical external surface enabled the concrete to be deposited in the trench against the solid earth, instead of having to form a battered casing and to fill in at the back of it.

The dumpling was originally intended to be a truncated cone, with a slope of 2 to 3, covered with a 9-inch casing of concrete. The inlet and outlet pipes were of cast iron, 18 inches in diameter, carried up the back of the wall, resting on a single casting forming a drip-box; the horizontal lengths being of steel bedded in the concrete bottom of the tank, which was thickened up at this point.

The contractor commenced work in January, by sinking a shaft at the point where the pipes were to be fixed, about 18 feet by 12 feet. This was carried down to the full depth, or about six frames, with poling boards and 6-inch square walings and struts; and throughout the whole job this never moved. This encouraged the idea that the ground was better than had been anticipated; and the ring was commenced 3 ft. 6 in. wide in clear of poling boards, with 11 inch by 3 inch walings and 6-inch die square struts—only about six bays on the upper side being timbered with 3-inch runners. All went well until about three frames of timber were in on the upper side, which brought the trench about level with the road on the lower side; but, unfortunately, the contractor, anxious to cart away as much as possible before the road was blocked, had been hard at work levelling the interior of the ring, and had also, in making a road for the crane, thrown his surplus soil on to the upper part of the bank. This disturbed the equilibrium of the ground; and the first sign of trouble we had was the appearance of several ugly cracks in the gardens on the other side of the hedge. At the same time the timber on the inner side of the trench began to rise until the struts were some 2 inches out of level, showing that the weight on the outside was lifting the core by fluid pressure. All hands were immediately turned on to remove the earth from the bank and tip it on the inner side of the trench, thus transferring a portion of the weight from one side to the other; and an extra row of walings was put in on the inner side below the others, with struts raking in the opposite direction to the acquired slope of the original ones. After several days of constant work, during which some 400 yards of earth was shifted, the movement ceased. This was tested daily for some time by checking the levels of plugs driven into the ground in the gardens above the bank with a point on a building some distance away from the works. It was found that the timber on the outside had come in about 1½ inches; but this could be got over by cutting out the runners as the concrete was put in, instead of leaving them in. By the time the fourth frame of timber was in on the upper side, the runners were well into the solid blue clay, and there was no further difficulty on that side. But as work proceeded on the south-west side of the ring, trouble again commenced. The yellow clay, which had appeared so stiff and solid in the trial holes, proved to be all alive, and poling boards were no use against it; while 11 inch by 4 inch pitch-pine walings required four struts in a 13-feet bay, which barely left room for the skips to work. There was evidently nothing for it but to put down runners behind the boards—this time on the inner side of the trench, as the pressure was now from that direction. It was also decided to increase the thickness of the wall, as we went down, to about 3 ft. 9 in. It may be mentioned that we had put down bore-holes at several points to ascertain at what depth the blue clay would be reached; and finding that on the lower—i.e., west—side it was about 30 feet below the coping level, it was decided to carry the wall down 3 feet below the depth originally intended for some distance round this lower side, in order to get a good abutment to resist any tendency to move bodily. With some 25 feet depth of trench in this semi-fluid clay, the trench only 3 ft. 6 in. wide, so much timber in that there was hardly room to move, and the timber men working all night, the time was an anxious one; and everyone concerned was glad when the blue clay was reached, and it was possible to bottom up the trench and begin concreting. Under the circumstances, it was, of course, impossible to undercut the outer side of the trench as originally intended; and the concrete had to be placed as soon as a length had been cleared for it. Taking into consideration the enormous pressure on the upper side of the tank, which was comparatively unbalanced by any possible resistance we could apply to the rest of the circumference, it was decided to embed rings of railway metals, fished together at intervals, as the wall was carried up, with vertical rails to transmit any strain from one ring to another; and the proportion of cement in the concrete was increased from 1 part in 8 to 1 part in 7. This was undoubtedly erring on the side of safety; and I have now little doubt that the wall would have stood as originally designed.

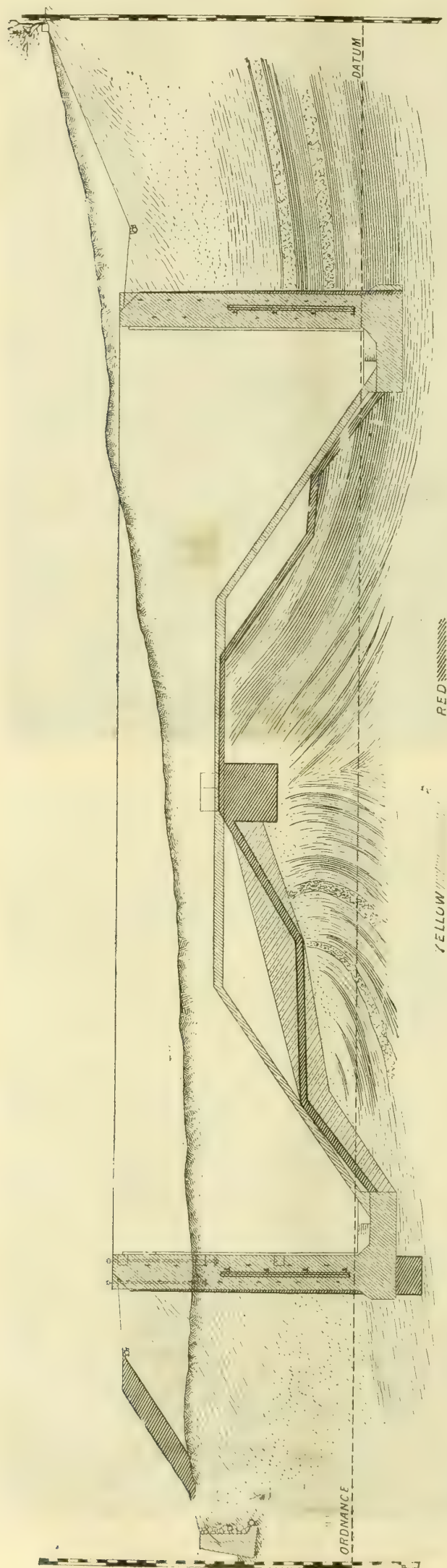
The shingle used for the concrete was very clean; and the proportion of sand in it as delivered was exactly what was required to form a compact and impervious concrete. The cement





THE NEWPORT (ISLE OF WIGHT) GASHOLDER TANK UNDER CONSTRUCTION.





was of remarkably even quality, and in every case far exceeded the specified tests both in fineness and tensile strength.

When the concrete wall was brought up to its full height, it was hoped that our troubles were over; and the excavation of the interior of the tank was proceeded with, trimming the slope of the dumping as the excavation went on. When about 18 feet of earth had been removed below the coping level, one afternoon a slight crack appeared on the levelled top of the dumping; and in about five minutes a huge piece had separated itself on a line parallel to, and about 3 feet from, the north and south diameter of the tank, and slid gracefully down, leaving a beautifully polished slope. The whole of this earth was removed, and a bench formed at the bottom of the slip. The batter of the cone was increased, and the excavation proceeded with; careful watch being kept for further movements. The top was also concreted over, to prevent the rain from penetrating and further disintegrating the clay. In the course of this excavation, a most extraordinary geological formation was revealed, which is indicated by the coloured bands on the diagram. The north and south diameter of the tank appeared to be the anticlinal axis of a singular folding of the beds, which in one place were quite inverted; and it would have been hard to find a more unfortunate site for a tank, though no amount of isolated borings would have revealed this beforehand. These beds appear to belong to the upper Bembridge marls (a portion of the Oligocene strata), which are peculiar to this one portion of the British Isles. They are of fluvio-marine origin, and are characterized by bands of different coloured clays separated by beds of characteristic shells, with occasional bands of stone coloured by iron and interlaced with small roots. These shell and stone beds proved fruitful sources of trouble; for they broke up the cohesion of the mass, and further slips took place on the east side of the dumping on the joints of these beds.

The ultimate section of the tank is shown in the diagram by the parts tinted red; while the original design is indicated by the parts coloured yellow. The shape of the dumping will probably puzzle any engineer who may have occasion to empty the tank at some future time without knowing its history. As a precaution against further slips, a heavy buttress of concrete (3 feet wide) was carried up from the bottom of the tank to the centre pier, which consisted of a block of concrete 6 feet cube, with a cross-shaped rest-block on the top. Ribs or buttresses were also carried up at four other points; and after the whole was concreted over, no further movement took place. The interior of the wall was rendered with cement and sand 1 to 1, and finished with neat cement, killed and worked in with a trowel. The bottom and dumping were well grouted with equal parts of cement and sand. On filling the tank, it was satisfactory to find that it lost only half-an-inch in the first twenty-four hours. This, by the end of about a fortnight, during which horse dung, hops, and middlings, mixed with cement, were from time to time put in, had diminished to an imperceptible quantity; and though for several months it was possible to detect a slight loss from week to week, the water-level now appears to remain practically constant.

The thickness of the embankment on the lower side was increased, as shown by the red tinting; and in this, and in the bank above the tank, two deep trenches were cut meeting at the top in the form of a triangle, and filled with large stones, to act as buttresses and drains and lessen the tendency of the banks to slip during wet weather. The surface of the slopes all round the bank was covered with about 4 inches of chalk, soiled over and sown with grass seed; and a drain was carried round the whole circumference of the tank.

In looking back on the work now in the light of the experience gained, one can see many points in which both the design and the methods of carrying it out might have been improved; and it was simply with the object of bringing out these points, and drawing forth the opinions and experiences of others, that I have ventured to describe the work at such length.

#### Discussion.

Mr. J. W. HELPS (Croydon) said he did not rise with the idea of discussing the paper, but rather to point a moral. It was only about three or four weeks ago that he approached Mr. Cockey, and asked him to read a paper. He kindly consented; and he (Mr. Helps) thought the paper Mr. Cockey had written was one which would form a no inconsiderable addition to the records of the Association. The sort of paper he had read was one which was particularly suitable for a meeting such as the present, though perhaps it would not lend itself so much to discussion as some of the papers they had had before them. It was an actual account of difficulties and experiences which an engineer had met with in the course of his everyday work; and he (Mr. Helps) thought there must be many members of their Association and others who, when they carried out certain works, could make records of the difficulties they met with, and the ways in which those difficulties were overcome. The Associations would thus have no trouble in getting many papers for their meetings.

Mr. W. D. CHILD (Romford) remarked that the members were very glad indeed to receive the information Mr. Cockey had placed before them as to the difficulties he had met with in dealing with this work in the particular part of the country where it was carried out. Some years ago Mr. Garnett gave an account of the peculiar formation of the soil in the Isle of Wight district, and the measures he was then obliged to take to prevent the slipping of large masses of earth. In Mr. Garnett's case, he



believed, at one time he was threatened with the slipping of the gasholder tank itself. They must all of them be pleased to know that Mr. Cockey had not only had the energy and resource to tackle this matter and bring it to a satisfactory conclusion, but he was glad that he found no difficulty in building a perfectly tight concrete tank. This appeared to have been in fact one of the least difficulties he had had to contend with—the rendering of the tank perfectly water-tight. From experience he (Mr. Child) had had in dealing with concrete, he felt that it really rested with the contractor or the contractor's men to perform the work thoroughly and well. If the concrete was well made and clean (cleanliness was the greatest essential), and properly put in, they might rely upon it far more than they had done in building works—especially tanks. He was glad to hear that Mr. Cockey had had no difficulty in this particular respect.

Mr. D. H. HELPS (Redhill) inquired whether Mr. Cockey, in designing the work described, considered the advisability of using expanded metal in the construction of his gasholder concrete tank. He had himself been considering the question of tank construction a good deal lately; and he thought the amount of concrete might be much reduced by expanded metal. Sir Benjamin Baker had stated that a concrete slab 5 inches thick and 6 ft. 6 in. apart with expanded metal was ten or eleven times stronger than the same slab without expanded metal; and he also proved that expanded metal was very nearly as useful in an arch. He (Mr. Helps) therefore thought it was worth the consideration of anyone who was going to build a concrete tank whether expanded metal should not be used. Of course, one would have to consider the best place to put it; and, though he had not gone very far into the question, he should suppose it would be best placed in two positions—on the outside circle of the tank and again on the inner circle. He believed expanded metal would occupy a large part in all structural work in the future. In considering the strength of tanks, he believed it was usual when building a steel tank, if it was put into the ground, to make it strong enough to take the bursting pressure of the water without any assistance from the soil. A brick-rendered tank was not built strong enough to take this pressure without assistance; and so, why one should be built strong enough and the other not, he had often wondered.

Mr. T. PRICE (Walton-on-Thames) said he had recently constructed a concrete tank on similar lines to Mr. Cockey; and he was thankful to say he had not had the difficulties that Mr. Cockey had experienced. His greatest difficulty had been (as Mr. Child mentioned) in making the tank water-tight by rendering. He thought perhaps the soil that Mr. Cockey's tank was in—stiff yellow clay—had had something to do with his success in this respect.

Mr. PERCY GRIFFITH (London) said he had had experience in constructing concrete tanks, but they had not presented anything so interesting and novel as Mr. Cockey had described in his paper. At the same time, the paper had confirmed the opinion which he (Mr. Griffith) had formed as to the use of concrete for such purposes. He had used it for water-works reservoirs, as well as for circular gasholder tanks; and in both cases he had found it compare very favourably, both as regarded strength and cost, with any other form of construction which was used. He thought the author might perhaps emphasize the fact which appeared to him (Mr. Griffith) in connection with the difficulties he had encountered at Newport—that the construction by concrete was peculiarly and especially favourable for overcoming the difficulties he met with, particularly when there was a danger of the bottom of the trench breaking in. He assumed he was able to put all the concrete into position—that was to say, to bring weight to bear upon the bottom of the trench—very much more rapidly than he would have been able to do with brickwork. He (Mr. Griffith) had had experience also in keeping tanks water-tight under both methods of construction—brickwork with puddle backing, and concrete rendered on the inner face; and his experience had shown him most conclusively that it was far easier to get work carried out efficiently with concrete and cement rendering than it was with brickwork and puddle backing. Both puddle and concrete required careful supervision or they were both equally dangerous. This, he thought, was an opinion that would be shared by all who had had experience of the two. He, however, considered it was far easier to overcome the difficulties encountered in rendering concrete water-tight than in overcoming the difficulties to be met with in various grades of puddle.

Mr. J. S. INESON (Ventnor) said that, coming from the immediate district where Mr. Cockey had constructed his tank, he could sympathize with him in the difficulties he had had to contend with. Altogether perhaps the difficulties had not been so great as his (the speaker's) on the southern side of the Isle of Wight. They had there a different geological formation from that at Newport. In fact, some of the strata of the island seemed upside down; what should be at the top was very often found at the bottom. In his part of the district, they were particularly troubled with what was called "blue slipper;" and it was a very appropriate name indeed, for it was continually slipping. He remembered vividly 16½ years ago, when he first went to Ventnor. The morning after his arrival, not having seen the works, he went down to look at them; and when he got to the top of the hill overlooking the works, to his astonishment he found one of the gasholder columns upside down—the minaret at the top was pointing to the centre of the holder; and two other

columns were completely smashed up at the base. They appeared to be slipping towards the sea; and the holder was about 2 ft. 6 in. out of its circular diameter. He had to commence at once to face these great difficulties, and patch up the holder tank, and bring it into a true circle again. Through perseverance and a use of concrete, he brought it into true circle; and it was working very well down to to-day. It was something like 4 inches out of diameter even now; but it was perfectly tight. The distance from the top of the sea wall to the inside of the tank was only about 10 feet.

The CHAIRMAN thanked Mr. Cockey for the useful information he had laid before the Association. He felt sure there must be many of the members who had had considerable difficulties in the construction of their tanks, and probably would have considerable difficulties in the future; and a paper such as that just read, and the discussion it had given rise to, would certainly help them very considerably in providing against similar contingencies. The paper seemed to sound a note of warning against building gasholder tanks below ground in the Isle of Wight; and it would be a good plan for engineers in future to consider the advisability of having steel tanks above ground. In the works of which he had charge, they had fortunately very good soil for the construction of tanks. They had about 16 feet of excellent ballast, and below that they got at once into the London blue clay. This formed a very good bottom for a tank, and it lent itself admirably to the construction of brick-and-puddle tanks. But as he said before, in cases such as Mr. Cockey's, he should be disposed to consider the advisability of having a steel tank in preference.

Mr. COCKEY, in reply, said the main point he wanted to bring out was that they had no means of foreseeing the difficulties they would have. The singular formation was quite unforeseeable; and they did not find it out until they got on to the tank. The question of steel tanks did occur to him; but he was confident that a steel tank on this particular site would have slid away downwards. Mr. Child had brought out the point about making concrete water-tight; and he (Mr. Cockey) quite agreed with what he had said in this regard. It was merely a question of careful supervision, clean ballast, and a fair proportion of sand. The concrete was laid on a stage, shot down a vertical shoot, turned over again at the bottom, and then put in place with a shovel and sharp tools, so as to work out all the air from it, which, he thought, was an essential point. It was only fair he should say a good word for the excellent workmanship all round. He had had no trouble with the contractor; although, possibly, he was losing money the whole time. With regard to the expanded metal of which Mr. Douglas Helps had spoken, he (Mr. Cockey) was anxious to try it in a gasholder tank. He did not, however, quite see his way to use it in this instance. He had omitted to say that in the tank there were rings of 1½ inches by ⅜-inch hoop-iron bedded in at about intervals of 1 foot the whole way up. But he should very much like to have an opportunity of putting in a small tank with expanded metal, just to see what could be done with it. With regard to the bursting pressure of a tank supported and unsupported. It appeared to him that, when they went down in solid ground, if they had sufficient weight above to form a fluid pressure, they must be able to derive help from the ground. And this was the reason why, with a steel tank, they did not reckon upon the support of the ground outside—that a steel tank was weak to resist external pressure, but not internal. He did not think in their case they derived any material assistance from the clay in keeping the tank tight, because there were the beds of stones which carried the water. At one point they had some difficulty getting the tank tight; and there they had a little soft place, which they filled up from the top after the job was finished. Another great point about the concrete was the facility with which the trench could be filled in in troublesome ground.

Mr. A. W. ONSLOW (Woolwich Arsenal) read the last paper on HIGH-PRESSURE GAS FOR INCANDESCENT LIGHTING.

We now look to an increased pressure of gas beyond that usually supplied from the works for general use, as a familiar matter; but I do not propose dealing with the question for any other purpose than giving effect to the incandescent lighting, beyond mentioning that the principle of high-pressure gas in mains generally has been dealt with in the Technical Press lately. Probably the time will come for mains to be charged with pressure at so many pounds per square inch, so that ordinary street-lamps can supply illuminating power to any extent without difficulty—counting the candle power by hundreds—thus rendering individual efforts to overcome the difficulty unnecessary. At the present time, however, we must look to water or other means for motive power to do the work.

High-pressure gas has now been in use about three years. One of the first forms was the hydro-press. The pressure can be increased to any extent up to the point when the mantle is blown off the rod, provided sufficient water pressure is available in the mains. One of the drawbacks was the excessive use of water; and the cost, not only of supplying the water, but also dealing with the waste, had to be considered. This is now modified by economical use of water and other improvements; and without attempting to describe the various systems at present in use, suffice it to say that the Keith, Sugg, and other apparatus deal with the power so fully and well that a perusal of the systems

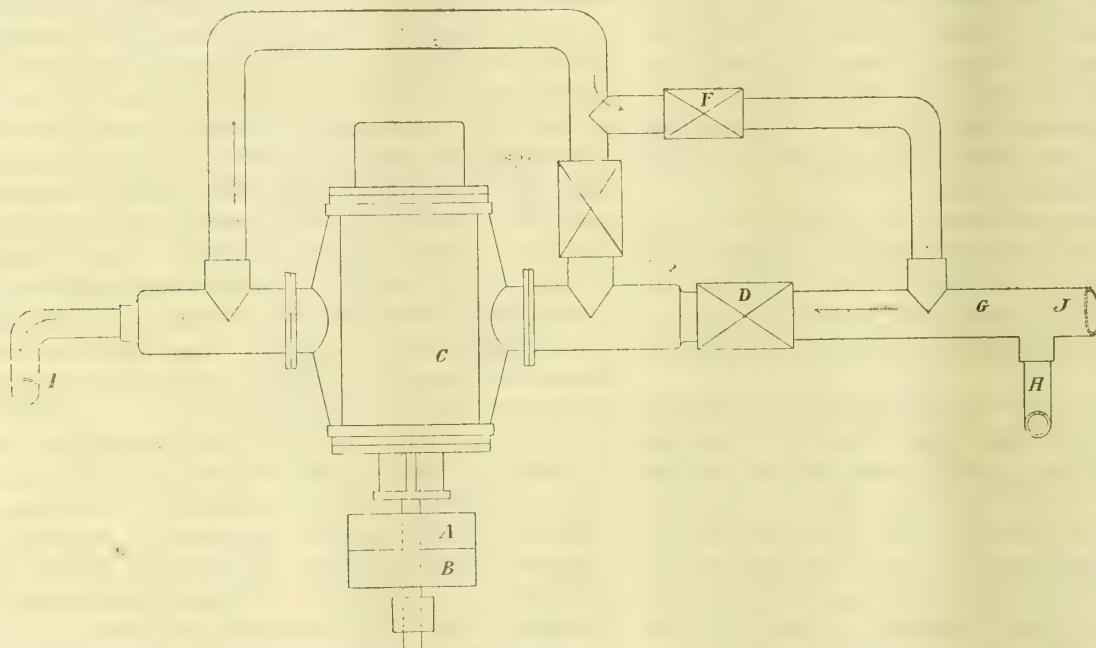


will repay any consumer of gas when considering the subject for future use.

Before high pressure can be available for intensifying the light, the burner must be improved; the "C" Welsbach being useful up to a point not exceeding 1-inch pressure, thus proving that the mantle was sufficient and ahead of the burner. Then the Kern or its prototype appears, carrying the burner and mantle together so far as the relative value of each is concerned, until a point at about 8 inches is reached. The "C" burner gives a value of 15 candles per cubic foot of gas; the Kern burner gives 25 candles at 1-inch pressure; and this gradually increases until, at 8 inches, the illuminating power is 30 candles, or 240 candles for 8 feet of gas, with a 70-cotton mantle. At this point the maximum light is reached with this burner and mantle.

I might add that in all the experiments mentioned herein the results are with a new or comparatively new mantle. From 8 inches pressure, it is necessary to alter the burner and mantle; the fibre of the mantle must be strengthened, and the air space modified. The following tests show the importance of closely watching this point, and, of course, compel one to keep this in view always.

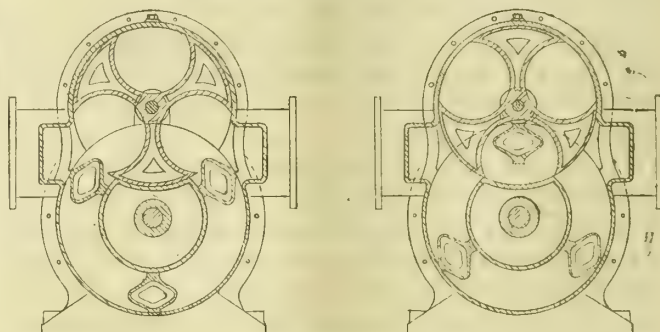
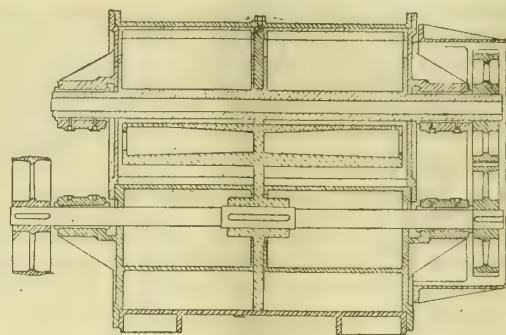
The following results of several tests made by the Welsbach Company with a No. 4 burner and mantle, at 54 inches of water, maybe very useful. It was found that 30-cotton single mantles held their shape better than any other size. The gas-way was 0.85 mm. diameter; and 14 feet of gas was consumed at each test. The ordinary Kern gave 205-candle power, or 14.6-candle power per cubic foot of gas. Four circular air-holes, 7 mm. diameter, gave 332-candle power, or 23.7 candles per cubic foot. Four circular air-



holes 6.5 mm. diameter gave 423-candle power, or 30.2 candles per foot of gas. Four circular air-holes 6 mm. diameter gave 433-candle power, or 30.9 candles per foot of gas. Four circular air-holes 5 mm. diameter gave 318-candle power, or 22.7 candles per foot of gas. So that the gas must be kept at a uniform pressure to ensure this; and apparently the efficient power of the mantle that is made up to the present time is obtained, and cannot exceed 30.9 candles per cubic foot of gas.

One of the questions to be considered is: "Does it pay to go beyond 8 or 9 inches pressure, and have fewer number of burners, but the life of the mantle to be considerably reduced thereby, or to have more burners (the number would be doubled to give the light at 8 inches over that at 54 inches)?" The incandescent ordinary burner was looked upon as the acme of lighting at one time; but powerful arc lamps must be used now, and the demand continues for more light—not merely for dark corners, but a brilliant one everywhere in shops, factories, and streets—until one pauses to think, When shall we get to the end of this extraordinary run into thousands of candle power, where single candles a few years ago was considered sufficient? But as the cry goes out, we must compete; and if thousands of candle power are demanded, I suppose they must be given. And when we come to the happy state that hundreds of thousands and millions of candle power for such-and-such a street is required, I do not see why gas should not supply the demand. I am very sanguine as to the value of a mantle, if it can only be made to stand the pressure a burner can give; but, of course, the texture must be stronger at the nearest point to the flame, so that none of the flame passes through the interstices of the mantle.

When we tried the Hydro-Press Company's first apparatus, the light said to be given was 600-candle power for a No. 4 burner; but this cannot now be accepted. Certainly, the latest form of mantle (30-cotton) will not give this light, although my tests with a Continental burner consuming 11.82 cubic feet of gas per hour furnished a very effective light, and was sufficient to enable anyone to read newspaper print comfortably at a radius



of 24 yards from the lamp; the nearest ordinary flat-flame lamp being 80 yards away. This test was with a double mantle; and though the appearance and power of the single 30-cotton mantle is good at first, I am inclined to the double mantle, as it does not curl up a few hours after use, and should last for about 200 hours indoors before its lighting effect is materially impaired. I have had one last for 250 hours, and the light given was extremely good; but its appearance as a thing of beauty was not favourable.

It is possible to obtain high pressure without water, though this is no doubt useful where applicable; but a factory with running machinery can supply the power to any extent, with a suitable apparatus, at a trifling cost. The question whether the cost of a small engine is desirable in large factories counting the number of lamps by hundreds, is one to be seriously considered; but the use of power in workshops with machinery already at hand is dealt with only in this paper.

Ordinary blowers, or fans, will give 7 to 9 inches without difficulty; but if we want 50 inches or thereabouts, an exhaustor or strong blower is necessary—not the exhaustor for choice, owing to its powerful or non-elastic action. A blower which is used largely for supplying air for smiths' fires, is very suitable, and can be driven at 400 revolutions a minute. This alone is an advantage. The gas waves are not observable—in fact, the pressure may be said to be quite equal.

The method of using this apparatus, as shown by the diagram, is as follows: A is a fast, and B a loose pulley, driven from a shafting overhead. C is the blower. D is a valve on the inlet to the blower. F is a by-pass or safety-valve, which can be weighted to any extent, so that as soon as the pressure arrives at that intended, the surplus is passed back into the inlet-service; and so well does this act that, as each burner is shut down, the pressure does not vary. G is the inlet-pipe. H is a by-pass for the pilot-lights. I is the inlet to the burners.

The blower is now working at 100 revolutions per minute. The inlet pressure before starting the machine at 5 p.m. was 15-10ths, and the same at 8 p.m.; the pressure of 14-10ths at







this high-pressure system gave them would be instrumental to a large extent in his district in checking the advance of electricity—in fact, he might say of nipping it in the bud.

Mr. ONSLOW, replying to the discussion, said, with regard to the pressure at which he worked, he had been told, and had been impressed upon by certain people, not to go beyond 8 inches for incandescent lighting. To this his answer was that, if a mantle maker and a gas-burner maker would supply him with a mantle and a burner to take 180 inches, he was quite prepared to work at that pressure. He liked to have the idea before him that he had got to 54 inches, and that there was a possibility of going higher, and not confining himself to the low pressure of 8 inches. He did not see why, if mantles could only be made strong enough to suit higher pressures, an incandescent burner should not easily give 1500 and 2000 candle power. Take a No. 7 Kern burner and mantle, if they put 54 inches on them, the mantle was blown away; it was destroyed at once. This, however, was the fault of the mantle, not of the burner. Could not, he asked, a mantle be made to suit the burner? Mantles were made to suit the No. 4 burner; but the makers did not seem to try to suit the No. 7 burner. The ordinary mantles were 70-cotton ones; and they got 30-cotton ones for high pressure. If the makers would double and strengthen them, so that the pressure could be increased, there was no end to the future of the high-pressure system. There were several other matters he should like to have touched upon; but he would confine himself to one. In his own case, he had to light as well as make gas, and he had also to be economical. Though his make of gas was very large, and there were some 25,000 men who had to have light, they had to have it economically. He had to consider the question of the economical use of some 350 million cubic feet of gas which they made at the Arsenal; and therefore it was a vital question, not only for himself, but for others, whether they could not increase the illuminating power and reduce the cost.

Mr. WEBBER asked to be allowed to supplement his previous remarks with the observation that there was not the slightest fear that a mantle would not stand all the blast they could put upon it. Anyone who had seen the process of firing ordinary incandescent mantles as they were formed with a high-pressure blast of gas and air would bear him out. They were raised by this means to a degree of incandescence so dazzling that the workmen had to use a dark glass lens to look at them. The way in which these comparatively fragile mantles (simply suspended from the top) would stand these high blasts was almost a complete proof that mantles could be made to stand almost anything that they liked to put on them in the way of a blast.

#### A VOTE OF THANKS.

The CHAIRMAN said the most hearty vote of thanks was due to the authors of the three papers. The Association had had a record meeting, and a full one, with interesting discussions. He thought the large attendance was probably due to the fact that the members knew the papers were to be of special interest. Therefore, for this successful meeting, they had to thank the gentlemen who had kindly prepared these contributions to their proceedings.

Mr. PERCY GRIFFITH, in seconding the motion, also remarked upon the value and interest contained in the papers.

The motion was unanimously passed.

Tea was then served; and this made a pleasant conclusion to a most successful meeting.

#### PHOTOMETRY AND CARBURETTED WATER GAS.

A subject of general interest to gas managers and photometrists was debated at a recent meeting of the Gas Engineering Society, over which Mr. G. P. Lewis presides. The question considered was: Is there any reason to suppose that, with a mixture of carburetted water gas and coal gas, readings on the bar photometer are prejudicial to the quality of the gas? The opening of the discussion was undertaken by Mr. E. D. Weippert. His conclusion was that, in a strictly photometrical sense, the question must be answered in the negative; there was no reason to suppose that the readings were prejudicial. There was, however, a general impression that neither carburetted water gas alone, nor a mixture of it with coal gas, obtained justice on the photometer. Rich gas (say, of 25 or 30 candles) might suffer by the unsuitability of the burner, or by conditions which did not bring out its full value; but drawbacks such as these would have no existence with a mixture of coal and water gas of a little above 16-candle power. For the universal impression as to the gas not receiving justice, there was, he believed, a simple explanation. It was this: That when a 16-candle water gas was under test, the length of the flame from the argand burner was appreciably less than would be the case with coal gas of equal power. Consequently, the same amount of light was radiated from a smaller surface, which had the effect of dazzling the eyes of the observer, and impressing him with the idea that the gas had a high illuminating power. In comparisons of water gas and coal gas of equal quality, it was noticeable that the flame of the water gas appeared superior to that of the coal gas; but the latter lighted objects in the vicinity rather better than the former. This phenomenon he attributed to the difference between illu-

minating power and illuminating effect. In these remarks, Mr. Weippert wished it to be distinctly understood that he was referring to gases that were of corresponding value on the photometer; but if there was merely a small percentage of water gas present, the differences in appearance and effect would be so slight as to pass unnoticed. On the question of illuminating power and effect, he thought it would be agreed that a large amount of light emanating from a small surface gave a very bad effect; and it might be taken as generally true that the greater the surface from which a given quantity of light emanated, the greater would be the lighting effect. The extended surface could be obtained by employing burners designed to produce it, by consuming a larger quantity of a poorer gas, and by using a greater number of small candle-power burners. The effect produced increased with the number of separate points of light. Mr. Weippert summed up by saying that, compared with the photometrical readings, the illuminating effect of a water-gas flame was poor. In the discussion, the Chairman thought that, with the many special conditions and precautions necessary when water gas was being photometrically tested, some very strange results were likely to occur. Another speaker considered the stratification of water and coal gas might have something to do with the surprising results; and the Chairman further pointed out that the rapid changes in the specific gravity of the mixture rendered the jet photometer absolutely useless.

**"Lunge on Coal Tar and Ammonia."**—We have received from the publishers, Messrs. Gurney and Jackson, the third (enlarged) edition of the above-named work, which first appeared in 1882. We shall notice the book fully in an early issue.

**"Garcke's Manual of Electrical Undertakings, 1900-1901."**—We have received from the publisher, Mr. W. Alderson Smith, of Donington House, Norfolk Street, W.C., a copy of the above-named work. This is the fifth year of issue; and the present volume extends to 1272 pages, as compared with 490 in 1896. Particulars and figures are given relating to upwards of 700 electrical undertakings owned by companies and municipalities, besides general information concerning upwards of 550 others.

**A Tar-Oil Solution for Impregnating Wood.**—For this purpose, a suitable solution, according to the "Revue des Produits Chimiques," is made as follows: In a machine with transverse motion mix some resin oil, either raw or purified, and cold as far as possible, with a like quantity of sulphuric acid containing a little anhydride. In liberating a small amount of sulphurous acid, the resin oil is dissolved in the sulphuric acid. Two layers are obtained—the lower one formed of dilute sulphuric acid, and the upper one containing nearly all the acids of the compound ethers, with a very little free sulphuric acid and the undissolved resin oils. All is then heated for some time, which causes again a separation of small amounts of acid. The top layer is neutralized by the aid of a moderately dilute soda or potash liquor, and water added so as to bring all to about 200 parts. The liquid, which is only slightly turbid through small quantities of separated substances, is mixed with an equal amount of tar oil, and water is added until the requisite degree of dilution of the injecting liquid is obtained. It is better to add to the acid of the free compound ethers an equal or greater amount of tar oil before neutralizing with an alkali. Then by adding limited quantities of water all the remaining free sulphuric acid is separated; thus preventing formation of alkaline sulphates and their noxious action on the tar-oil solution. Finally, neutralize and add the requisite amount of water. By tar oil, the inventor (Herr Rütgers) means the heavy coal-tar oil which is much employed for the treating of railway sleepers.

**Increased-Pressure Gas Lighting of Southwark Bridge.**—The process of converting public street-lamps to the improved higher-pressure systems of incandescent gas lighting is gathering speed as well as volume every day. Last week the whole of Southwark Bridge, in the City of London, was completely relit on Messrs. Sugg and Co.'s system. Hitherto the City of London Electric Lighting Company's arc lamps have been carried up the bridge approach, and the bridge itself has been lighted by parapet lamps, each containing a pair of tangent 5 cubic feet flat-flame gas-burners. These lanterns are disposed opposite to one another—some singly, others in twos, and on one pier in threes. They are now all fitted with 10-feet increased-pressure incandescent gas-burners, so that, without consuming any more gas, the lighting has been magnified from about 24 to 350 candle power per lamp, counting in the effect of the reflection from the inside of the lantern, which is darkened on the side towards the river. Moreover, the colour of the new light being practically the same as that of the arc lamps on the approach, the eye is not conscious of any break in the character of the lighting; except that, if anything, the gas lighting is more effective than the electric arcs, especially in dirty weather. By a striking coincidence, last Friday night, as a party of observers were trying in wind and rain to satisfy themselves as to which was the best lighting, all the electric lamps went out suddenly; thus leaving no room for doubt on the point. The increased-pressure gas-mains of this service, and all the connections, were laid as in the ordinary course by the South Metropolitan Gas Company; who thus mark their recognition of the permanent character of the new system of street lighting.



## THEORY OF THE INCANDESCENT GAS-LIGHT.

By Dr. E. G. LOVE, of New York.

[A Lecture delivered before the American Gaslight Association, Oct. 18, 1900.]

The subject of incandescent gas lighting, especially in its more practical aspects, has become a very familiar topic at conventions of representatives of the gas industry; and it has also been very fully discussed in the technical journals. It is not my intention, therefore, to dwell upon the general features of the subject, but to confine my remarks more particularly to the theory of the light.

Up to the time that Welsbach demonstrated the possibility of obtaining from combustible gases a greatly increased luminosity, through the agency of the oxides of certain rare elements, the sources of these oxides were such rare minerals as allanite, gadolinite, xenotime, euxenite, zircon, monazite, and others which contain ceria, yttria, lanthana, erbia, and zirconia, and thorite containing thorium. The results obtained by Welsbach made it apparent that if the discovery was to prove of any practical value, it would be necessary to find a cheaper and more abundant supply of the oxides than could be furnished by the minerals just mentioned. The need has been more than met by the discovery of extensive deposits of monazite—especially of what is known as monazite sand, resulting from the disintegration of granitoid rocks. The most productive localities at present are North and South Carolina and Brazil. In the Carolinas, it occurs in the river beds and adjacent country; and in Brazil, in sand banks on the seashore. Besides the monazite, the sand also contains quartz, zircon, garnet rutile, and other minerals; but if it contains from 60 to 70 per cent. of monazite, it is considered of a very good quality.

It is a fact familiar to all that the first Welsbach burners which were put upon the market were in no way to be compared, either in the stability of the mantle, the colour of the light, or the efficiency in illuminating power, with those offered to the public to-day. In 1886-88 it was considered a satisfactory result to get 8 to 10 candles per cubic foot of carburetted water gas; while now 25 to 30 candles per cubic foot are readily obtained.

In the earlier forms of the Welsbach light, the mantles were impregnated with mixtures of zirconia and lanthana; the latter being sometimes replaced by yttria, erbia, or other rare oxide. The lanthana and zirconia give a white light; yttria, a yellowish white; erbia, a greenish; thorium, a bluish white; and ceria, a reddish. The various patents issued about that time covered a variety of oxides—the object evidently being to include everything which it was thought might be of advantage to the manufacture of the mantles, without any knowledge as to what combinations would give the greatest luminosity to the mantle.

The development of the incandescent gas-light has naturally been a purely experimental one; and it was only after several years of research that a mantle was made which showed any decided advance in the production of a high luminosity. Still later it was found that by far the best result was obtained from a mixture consisting of 99 per cent. of thorium and 1 per cent. of ceria; and this may be considered as representing the composition of the most efficient Welsbach mantles of to-day.

The chemical separation of the rare oxides in a state of purity is a matter of considerable difficulty; and it was found that an impure oxide would give a better result than a pure one. Thus a mantle containing commercial or impure thorium gave six times as much light as when pure thorium was employed. The reason for this is found in the fact that the impure oxide contained other oxides than thorium, in proportions more nearly approaching those artificial mixtures which experience subsequently showed gave greater efficiency.

In 1896, Fresenius and Hintz, after analyzing commercial thorium nitrate and also incandescent mantles, came to the conclusion either that the ceria was added directly to the impregnating solution or that a thorium nitrate containing more ceria than was to be found in the commercial nitrate was intentionally employed.

One of the interesting questions which have been raised more recently in connection with the incandescent gas-light is to account for the very high efficiency given by certain substances used in impregnating the mantle, and especially the thorium-ceria mantle. I should take too much of your time were I to discuss the various theories, physical and physico-chemical, which have been proposed. The names of Drossbach, Thiele, Le Chatelier and Boudouard, and others are familiar to many of you in connection with the purely physical theories of this phenomenon. It will answer our present purpose if I refer only to those physico-chemical theories which are now generally accepted as most satisfactorily explaining the production of the high illuminating power of the light.

In 1896, Dr. C. Killing published an article in the "Journal für Gasbeleuchtung," in which he proposed a theory to account for the luminosity of the thorium-ceria and other mantles.\* He claimed that, in order to produce a maximum light from a thorium mantle, it must also contain another substance, and that such substance should be one having more than one degree of oxidation. Ceria answers this requirement; the metal cerium having two oxides, while thorium is the only oxide of thorium. It was

Killing's theory that, in this case, the ceria acted catalytically, or as a carrier of oxygen, thus increasing the flame temperature.

I trust that I shall be pardoned for making a digression here in order to explain somewhat in detail what this so-called catalytic action is, since upon it depends an understanding of the theories we are discussing. Catalysis is a term introduced by Berzelius, and by him applied to the changes which sugar solutions undergo in the process of fermentation. The word catalytic is now conveniently applied to those substances which by their mere presence effect changes in other bodies, without themselves undergoing any apparent change. A familiar example of a catalytic substance is the binoxide of manganese. Chlorate of potassium is decomposed with the evolution of oxygen at about 700° Fahr.; but if some oxide of manganese be mixed with it, the oxygen is liberated at between 450° and 500° Fahr., and the oxide of manganese remains unchanged. In this case the action possibly consists in the oxide of manganese taking up oxygen from the chlorate of potassium, forming a higher oxide, which in time is decomposed into the lower oxide and free oxygen. There are other substances which act catalytically—not by alternate oxidation and reduction, as in the case of the oxide of manganese, but by a peculiar property they possess of condensing oxygen and other gases upon their surfaces, probably without the production of any chemical compound. Platinum is the best example of this latter class of catalytic bodies.

It is a well-known fact that oxygen and hydrogen, which under ordinary conditions require a temperature of 1200° Fahr. to effect their combination, will, in the presence of spongy platinum, combine without the application of any heat. Döbereiner discovered this fact nearly 80 years ago, and devised the well-known lamp which bears his name, in which a jet of hydrogen was ignited by contact with spongy platinum. The same use of platinum, in the form of platinum-black, is seen in many patent burners.

The explanation of this property of platinum is that the gases which are condensed upon its surface are brought into such close molecular contact that combination results. It seems very probable that the so-called catalytic substances do undergo a change of some kind in the process of catalysis; and it is, therefore, not strictly correct to speak of them as acting by their mere presence, although the catalytic may be found at the end of the action of the same nature as when it was introduced. Catalysis is, therefore, sometimes spoken of as a convenient fiction.

Dr. Killing supposed that, in the thorium-ceria mantle, the ceria acted as a catalytic, much in the same way as the oxide of manganese is supposed to act in the case cited—that it becomes alternately the higher and the lower oxide of cerium, and that the oxygen liberated in this process increases the flame-temperature and so the luminosity of the mantle. He also found that other bodies besides ceria are capable of exciting the thorium mantle. He states that one composed of 99.96 per cent. of thorium and 0.04 per cent. of platinum gives ten times as much light as one of pure thorium; and a still better result is obtained with thorium and iridium. Gold, osmium, palladium, rhodium, and ruthenium act in a similar manner; but not all bodies possessing this catalytic property are available for this purpose, as many of them are volatilized at the high temperature of the mantle.

Besides the rare oxides and the metals already mentioned, Killing tried the oxides of many of the baser metals—as chromium, iron, cobalt, nickel, and manganese—all of which were capable of performing the same function in the mantle as ceria, although none of them possesses the same degree of non-volatility as the ceria, nor develops the same high luminosity. That some of these are suitable for mantles is shown by the fact that the "Sunlight" mantle is composed of alumina, or alumina and zirconia, as a base, with oxide of chromium as the catalytic or oxygen carrier.

Acting on the theory of the catalytic property of ceria, it was suggested that a larger quantity of ceria might be added with advantage; but such did not prove to be the case. Thus Hintz has shown that a mantle containing 99.5 per cent. of thorium and 0.5 per cent. of ceria gives 11.6 candles per cubic foot of gas; and with 99 per cent. of thorium and 1 per cent. of ceria, the efficiency was 17.8 candles per cubic foot. But when the ceria was increased to 2 per cent., the light per cubic foot of gas fell to 15.3 candles; with 5 per cent. of ceria, to 10 candles; and with 10 per cent., only 2.7 candles per cubic foot of gas was obtained. Bunte explains this by saying that, on the ignition of the nitrate of cerium, a comparatively dense oxide is produced, which, in consequence, becomes a better conductor, and if employed in larger quantities diffuses the heat, instead of localizing it, as is the case when a small quantity of ceria is used. On the other hand, the nitrate of thorium on ignition intumesces in a remarkable manner—producing a very porous oxide, which is a poor conductor of heat. Moreover, according to the law of Dulong and Petit, the thorium should have a lower specific heat than the ceria, which is an additional advantage. The most favourable conditions, therefore, are a body of porous, non-conducting thorium, with just sufficient ceria as a catalytic to serve to raise the temperature of the flame to a high point.

Dr. Bunte, while ascribing catalytic properties to the ceria, takes a somewhat different view from Dr. Killing of the part which this oxide plays in the development of the light. He supposes that the ceria acts, not by a transference of oxygen, but that it possesses the property similar to the platinum, of condensing the gases upon its surface; and that the ceria, being spread over the surface of the non-conducting thorium, effects the

\* An abstract of the paper referred to appeared in the "JOURNAL" for Dec. 8, 1896, p. 1128.



combination of the oxygen with the gases of the flame at innumerable points, developing intense incandescence. He has fortified this position by considerable experimental work; and his views regarding the action of the ceria in the mantle, together with other conclusions to which he has come, constitute what is known as the Bunte theory.

The views of Killing and Bunte have naturally met with considerable criticism, especially from those advocating a purely physical theory. It is evident that if the same high luminosity of the mantle could be obtained under conditions entirely removed from all combustion, it would be the end of the catalytic theory. Le Chatelier and Boudouard claim to have obtained as high luminosity when the mantle was heated in the hot products of the combustion of the flame as when placed in the burning gases themselves. Of course, if the combustion of the gases was complete, there would be no further opportunity for catalytic action. On this point Bunte reports some experiments made by Eitner, in which magnesia, thoria, ceria, and the thoria-ceria mixture were subjected to an intense heat by means of the electric current, without showing any difference in their light-emitting power. From this it may be inferred that, inasmuch as magnesia and the thoria-ceria mixture (which show such a great difference in luminosity in the bunsen flame) do not show such a difference when subjected to heat in which there is no combustion, it must be the combustion which is concerned in the production of the light from the thoria-ceria.

The researches of Döbereiner, Dulong and Thenard, and others years ago showed that platinum was not the only metal which lowered the ignition point of mixtures of oxygen and hydrogen, but that palladium, rhodium, iridium, osmium, gold, silver, cobalt, and nickel also possessed this property to a certain extent. Not only the metals, but certain non-metallic bodies—such as charcoal, powdered glass, porcelain, fluorspar, crystallized quartz, and pumice stone—were found to act similarly, but in a much less degree. They required a certain amount of heating before this property was manifested, but they never wanted heating to the ignition point of the mixture. Bunte has shown that ceria must be added to the list of non-metallic substances possessing this catalytic property. He found that when thoria did not possess the power of lowering the ignition point of a mixture of oxygen and hydrogen, the presence of ceria effected the combination of these gases at 660° Fahr. instead of at 1200°, which was required when the ceria was not present, or a reduction of 540°. It is probable that all solids have this property of condensing gases upon their surfaces to a greater or less extent; but it is in comparatively few cases that this condensation is sufficient to have any material effect in lowering the ignition point of the oxy-hydrogen mixture.

The "catalytic" theory, thus briefly stated, commands more recognition at the present time than any other which has been suggested; and whether we accept the views of Killing, or the more probable ones advanced by Bunte, relative to the action of the ceria in the mantle, the evidence is strongly in favour of one or the other as against any purely physical theory.

#### AMERICAN EXPERIENCE WITH INCLINED RETORTS.

By A. H. BARRET, of Louisville, Kentucky.

[A] Paper read before the American Gaslight Association, Oct. 17, 1900.]

The erection of an installation of inclined retorts having been determined on, the first question to decide was, "How large a plant should it be?" and then, "What units should be adopted?" To the first question, 2 million cubic feet daily was decided; and, to the second, units of 100,000 cubic feet—this latter being represented by benches of sixes with retorts 15 inches by 26 inches by 18 feet. This length retort, when set at the adopted angle, requires a bench 15 ft. 4 in. deep, face to face. It was further determined to build the plant in two stacks of ten benches each. The benches as arranged were to be 15 ft. 4 in. in width, with 22½-inch pier walls, and 3 ft. 6 in. end walls; the width of the arch being 8 feet. Upon these fixed determinations the house was planned as follows.

The retorts were to be so arranged as to discharge toward the outside walls; this being, in my judgment, the most desirable arrangement. A space of 25 feet between the benches was allowed for the middle gallery or charging floor; this space being required for placing the two lines of coal-hoppers overhead, as well as the two stacks, and allowing for proper ventilation. This floor is 27 ft. 9½ in. from the ground-level. The outside or discharging floor was made 13 ft. 10 in. from the face of the bench to the house wall, and 13 feet from the ground-level. A space of 11 ft. 3 in. was allowed at each end of the stacks for passage, stairways, &c. These requirements called for a house having a length of 128 ft. 4½ in., and a width of 85 ft. 4 in.

Circumstances requiring that great economy be exercised as to the cost of building, it was determined to build the house of skeleton steel construction, and fill it with fire-proofing of 12-inch thickness; and 7-inch channels were used on the side and walls for both verticals and horizontals, with the addition of a few members of greater depth as stiffeners.

The roof is carried on the front and buckstays, which in the former case consist of two 15-inch channels, and in the latter case a box-column of channels 15 inches in depth. These latter buckstays are made heavy, as they must serve as columns as

well, not only to carry the main roof superstructure, but the coal-bins and gas-engines for working the conveyor, and the conveyor itself.

Above the coal-bins and conveyor is a ventilator, fitted with louvers running the entire length of the house. In the roof over the stand-pipe are suitable doors, which may be raised, and through which rods or augers can be passed when cleaning may be needful. This arrangement was necessary by reason of lack of headroom otherwise for this work.

The coal-bins are in two rows—one next each stack, and 9 ft. 10 in. wide, 11 ft. 6 in. deep—running the entire length of the benches, and carrying sufficient coal to last 48 hours, represented by 280 tons. The coal-bins, &c., as mentioned, are carried on 30-inch girders, riveted to the top of the buckstays. The house stands 39 ft. 1¼ in. under the eaves, and 71 ft. 6 in. to the comb of the ventilator.

The angle of 32° was adopted as being the most desirable, from the fact of my having seen good work on this slope, as also the fact that I believed I could purchase, with general regularity, a grade of coal suitable to this condition.

The dimensions of each stack, as already indicated, are 103 ft. 10½ in. long, 15 ft. 4 in. wide, with a height of 27 ft. 9 in. at the discharge side, and 35 ft. 6 in. at the charging side. The retorts are fitted with mouthpieces having the same angle as retorts with vertical faces. The lower mouthpieces have screw-cotter, and the upper or charging doors have cam-cotter. The lower mouthpieces average 16 inches deep, and are so made that they increase in depth from the bottom up, to allow the drippings of tar to fall free. The upper mouthpieces are 17 inches deep. The lower mouthpieces have 7-inch stand-pipes. Each bench has a separate main and take-off pipe—the latter 8 inches in diameter.

The hydraulic mains are carried over the lower or discharge end of the bench on channels, which are further used as tie-rods between the front and back buckstays. The height of the main from the discharging floor is 30 ft. 2 in.; leaving a clear space of 7 feet between the bottom of the main and the top of the bench, for ventilation. A suitable gallery is arranged for reaching the hydraulic main, as also another on the outside of the bench for reaching the stand-pipes.

The hydraulic main has some novel features to which I desire to call your attention. My own experience with removing the pitch or heavy tar from the ordinary main in the usual manner and maintaining the integrity of the seal, has been far from satisfactory. This main is arranged in two compartments; the upper part (or main proper) into which the dip-pipes run, having the usual dip regulator, and the lower (or tar receptacle) having the tar-outlet. When the main is in normal working and full of water, the 8-inch cone-valve which connects the two chambers is allowed to stay at the bottom of the tar-chamber. The bottom of the main proper being sloping, any heavy tar (or, for that matter, any tar at all) readily runs down into the lower chamber, displacing its equal bulk of water or lighter tar and oils, or forcing them into the upper chamber to maintain the seal or overflow through the usual dip regulator, as the level of liquor may demand. Now, periodically—which is controlled by local conditions—the tar-valve is raised and held in its seat; and a small air-cock connecting into the tar or lower chamber is opened, and the tar-valve outlet on the bottom of the lower or tar chamber is opened, allowing the air to flow in and the tar to flow out into the usual tar-trough. When the tar-chamber is empty, the tar-valve is closed and a water-valve opened, and water is allowed to flow in until it is full. Its being full is indicated by the overflowing of the air-cock, when both air and water are shut off, and the tar-valve lowered into its normal position at the bottom of the tar-chamber, ready for its next charge of tar. By this method of operation, the seal of the dip-pipe is in no way disturbed, and the main is thoroughly freed from heavy tar. The capacity of the tar-chamber is about 60 gallons. Suitable hand-hole plates are arranged for periodical inspection. The mains are connected by an 8-inch take-off pipe, before mentioned, to a 16-inch main running around the entire house under the eaves.

Going back now to the bench construction. The furnaces are set well under the benches, and the coke-shoot projects 3 ft. 10 in. in front of the face of the bench. This was so arranged to produce a more even bed of fuel in charging, and to make the entire fire surface accessible from the top for breaking-down clinker—thereby facilitating and expediting the work of clinkering. The grate surface of 4 ft. by 2 ft. 3 in., gives 9 square feet of surface, not including the stop grates.

The recuperators have horizontal flues, and are provided with iron stoppers at each level. The waste-gas flues from each side (two at the front and two at the rear of the bench) are carried to a common flue under the centre of the bench below the ash-pan, and from there to the main flue, extending the full length of the stack outside the wall of the bench foundation, and from there to the stack, which is centrally located—there being one stack for each stack of benches. These stacks are of iron lined with brick, and are 4 feet in diameter and 32 ft. 6 in. high from the bottom of the main flue. This stack gives ample draught with ten benches going and the flue dampers more than two-thirds closed. The primary and secondary air supplies have dampers at both front and back of the benches.

The coal-hoppers are provided with suitable gates at the centre of each bench. Below this, running on a tramway suspended from the buckstays on one side and the beam carrying



the coal-bins on the other, is the measuring and charging shoot, combined in one. The shoots are so arranged as to be adjustable as to the weight of the charge; and each elevation of retorts has its own fixed charger or shoot. The shoots are combined in units of threes; so that they may be filled and discharged into a vertical line of three retorts. No baffle-plates or regulating device other than the main valve are used. The actual time of placing a charge of 650 lbs., from the time of opening the valves until all the coal is in the retort, is 10 seconds.

On the lower or discharging floor two shoots are used—one for passing the coke through suitable openings in the floor to the coke-waggons, and the other for diverting the coke to the furnaces. For the comfort of the men, it is necessary that these floor-openings should be of ample size, as the coke frequently rushes out, when the fender is removed, in great quantities. With an ordinarily well-burned charge, it takes 15 seconds from the time the stopper is removed until all the coke is out. As a rule, the retort will not empty itself. It requires a little assistance, both from the man on the lower end to break the gorges, and by the charging man to start it from the upper end. How much this labour is, you may judge from the amount of work done by each gang, which I will give later on.

The coal as it comes from the contractor or storage sheds is delivered to a conveyor, which carries it up to a hopper, from which it is distributed to the screens, of which there are two, the first or top screen having a 4-inch mesh, and the second,  $\frac{3}{4}$ -inch and 1-inch mesh. From the top screen all lumps over 4 inches are delivered to the first crusher (of which there are two), where it is reduced to about 4-inch grade. The balance falls to the second screen, where everything above  $\frac{3}{4}$  inch or 1 inch is sent to the second crusher, where, together with that coming from the first crusher, it is reduced to about  $\frac{3}{4}$  inch. This then drops into a trough, where it joins the portion which had passed the second screen, and then into the boot of the elevator. From here it is elevated into the second conveyor, some 73 feet above the ground, where it is carried across the street and over an old retort-house to the new retort-house. Up to this point we have but a single conveyor. Just inside the house, the coal is emptied into a hopper, having suitable valves, by which it is diverted to other conveyors, running over each line of coal-bins. The conveyor troughs have suitable doors, permitting the coal to be deposited at any point desired. The conveying, crushing, and elevating machinery at the receiving end is operated by a steam-engine. The conveyors to and through the retort-house are operated by gas-engines, located between the bins at the extreme end.

The coke as it comes from the retorts is dropped into waggons, running on rails. These waggons, having a capacity of 60 bushels, are provided with spraying pipes, placed around the inside of the upper edges and on the bottom of the wagon. The sole object of these sprays is to protect the ironwork. When the cars are filled and ready to be moved, they are shoved to one of the four corners of the building, and placed under hoods located there—having a ventilating pipe, 30 inches in diameter, extending through the roof—where the coke is completely quenched, and the smoke and steam carried out of the building. These shafts also materially aid in carrying off the smoke, &c., incident to the discharging of the retorts.

After complete wetting, the coke is carried to a hydraulic elevator, where it is raised to the top of the bins and distributed by suitable tracks and switches. The coke-bin proper is 90 feet long, 30 feet wide, and 50 feet high, and is capable of containing 22,950 bushels of lump, 11,473 bushels of egg, 5736 bushels of nut, 5736 bushels of pea, and 5736 bushels of breeze. As the lump coke is taken from the bins, it is automatically screened in passing over the shoots, which have  $1\frac{1}{2}$ -inch holes in their bottoms, through which the small coke and breeze pass to pockets. From the pockets the residual is taken by tram car to a bucket elevator, and carried again to the top of the bins, where it is assorted by proper screens into the sizes above mentioned. So that, from the time the coal is placed in the first conveyor until it is loaded into the waggons as coke for distribution, it has not to be touched by hand.

The first two benches were charged on Aug. 9, and were quickly followed by others until one entire stack of ten benches was in operation in five-hour charges, burning off 650-lb. charges. The old retort-house was discontinued on Sept. 7. The charges are satisfactorily and evenly placed, and are easily within the control of any fairly intelligent labouring man. The only trouble experienced by me has been when the coal was too fine—that is, contained too much slack or dust—when it seems to drag and pile in the upper end of the retort. It must then be assisted by pushing with a hand rake. There also appears to be considerable tendency to crowd or slip with this grade of coal. Using mine run coal, I have had serious trouble from this on not more than three or four occasions. It is essential to satisfactory working that the coal be as nearly of uniform quality as possible.

The labour as now being worked is as follows: The gangs are of four men each, two for charging and two for discharging. These men draw and charge nine retorts per hour in 22 minutes average working; and I am expecting with cooler weather this gang may be able to draw and charge twelve retorts. By far the greater part of the time is occupied in filling furnaces, cleaning mouthpieces, and placing fenders, as the actual time of discharging is only about  $2\frac{1}{2}$  minutes, based on the statement of actual time of discharge previously given. The time of charging

is not to be considered, as the delay occurs at the discharging end. Figuring on 650 lbs. and five-hour charges, this would give 8.8 tons per man per day on the retort-house floor for nine retorts, or 11.7 tons per man per day for twelve retorts.

The yield and candle power are about what you could expect from this grade of coal under any ordinary working conditions. In this short time of working, I am unable to state positively as to the coke, tar, and ammonia; but from evidence up to this time, I shall expect the yield of tar to be materially decreased.

Many little peculiarities have developed which, when worked out and understood, can be easily controlled. One thing is, however, certain—that the coal can be accurately and certainly placed and burned to any degree desired. I have so far been very slow about pushing the benches up to what I believe them capable of doing; being satisfied to go slowly and learn any peculiarities that may develop.

## REGISTER OF PATENTS.

### APPLICATIONS FOR LETTERS PATENT.

- 2888A to 2888F.—NAEF, P., "Producing gas and bye-products." Nov. 9.  
 2917A to 2917D.—NAEF, P., "Producing coke, gas, and bye-products." Nov. 10.  
 19,783.—CROWTHER, A., "Preventing vibration in incandescent gas-burners." Nov. 5.  
 19,794.—ROBINSON, J. W., and CORSHAM, R., "Incandescent lamps." Nov. 5.  
 19,848.—KITSON, A., "Oil-vaporizing apparatus." Nov. 5.  
 19,853.—CSÁKY, S., SÁRKÁNY, J., and CENTIAN, S., "Acetylene gas-generator." Nov. 5.  
 19,859.—MEYER, G., "Incandescent bodies for lighting purposes." Nov. 5.  
 19,895.—DAWSON, S. & J., and LEWIS, W. W., "Acetylene generator." Nov. 6.  
 19,908.—SCOTT-SNELL, C., "Lanterns for illuminating purposes." Nov. 6.  
 19,938.—SALOMON, J. M. J., "Engines driven by a mixture of air with gas." Nov. 6.  
 19,955.—DELALOYE, L., "Producing a mixture of acetylene and atmospheric air for lighting." Nov. 6.  
 19,980.—BENNIS, E. & A. W., "Furnaces or retorts in which a heated solid product or refuse has to be removed." Nov. 6.  
 20,073.—SMITH, G. G., "Purifying acetylene and other gases." Nov. 8.  
 20,080.—WARD, E., "Incandescent gas-burners." Nov. 8.  
 20,143.—BOULT, A. J., "Gas-lamps." A communication from K. M. Seifert and Co. Nov. 8.  
 20,149.—GENTY, L., "Internal combustion engines." Nov. 8.  
 20,168.—RICHARDS, E. J. W., and MARSHALL, R., "Gas reversing valve." Nov. 9.  
 20,229.—SHEPHERD, H., "Acetylene gas-generators." Nov. 10.  
 20,239.—KEITH, J., "Apparatus for heating and ventilating." Nov. 10.  
 20,249.—CAMPBELL, J. G., and SILLARS, A. T., "Acetylene gas-producer." Nov. 10.  
 20,261.—POTTER, W. G., "Gas-governors." Nov. 10.  
 20,275.—WERTHEN, M., "Incandescence gas-burners." Nov. 10.

## LEGAL INTELLIGENCE.

### SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Nov. 13.

(Before the MASTER OF THE ROLLS and Lords Justices COLLINS and STIRLING.)

**Welsbach Incandescent Gas-Light Company, Limited, v. United Chemical Works.**

This was an appeal by the defendants from an order of Mr. Justice Day, in Chambers, on the 3rd inst., granting an injunction against them, preventing infringement of plaintiffs' patent of 1893, and also restraining the issue of an advertisement they had published.

Mr. ASTBURY, Q.C., and Mr. NEILL appeared for the appellants.

When the Court sat, shortly after half-past ten, there was no one present on behalf of the respondents; the printed list stating that the Court would sit at eleven o'clock, which the Master of the Rolls said was a blunder.

Mr. ASTBURY said he understood that Mr. Moulton, Q.C., Mr. Bousfield, Q.C., Mr. T. Terrell, Q.C., and Mr. Walter were briefed for the other side, and he could open the appeal and send for respondents' Counsel.

Mr. Terrell and Mr. Walter shortly afterwards appeared.

Mr. ASTBURY stated the facts as to the action commenced in August in the Chancery Division, in which Mr. Justice Farwell declined to grant an interlocutory injunction in the Vacation, after which the proceedings were discontinued and the present suit commenced.

Mr. TERRELL and Mr. WALTER supported the order, on the ground that irreparable damage might be done to the plaintiffs if the defendants were allowed to go on trading.

In the result, their Lordships decided that the injunction ought not to have been granted; and they allowed the appeal, with costs both in this Court and the Court below.

### WESTMINSTER POLICE COURT—Thursday, Nov. 15.

(Before Mr. SHELL.)

**Alleged Impurity of the Gaslight and Coke Company's Gas.**

This was a prosecution instituted by the London County Council against the Gaslight and Coke Company for supplying impure gas on



the 14th of July; the impurity being an alleged excess of sulphuretted hydrogen. The circumstances had been investigated on the 16th ult., according to the ordinary course, by Dr. A. W. Williamson, the Chief Gas Examiner, whose report had been issued, and who, it was contended, had disallowed the appeal of the Gas Company.

Mr. J. W. GODFREY appeared for the Council; Mr. HORACE AVORY represented the Company.

Mr. AVORY contended that there was really no report showing an excess of impurity in this case, but that the one issued was worthless inasmuch as, though it set forth that certain witnesses had been examined, who stated there was a faint discoloration of the test-paper, and evidence had been given the other way, it was not said that the Chief Gas Examiner believed either one side or the other. Though the report stated that the Metropolitan Gas Referees had ruled that distinct discoloration of the surface of the test-paper was to be conclusive evidence that sulphuretted hydrogen was present, the learned Examiner had not found, as a fact, that there was such discoloration, but had only reported that various competent witnesses present at the hearing stated that a faint discoloration of the test-paper was visible. Mr. Avory further stated that the Chief Gas Examiner was over eighty years of age, and that, his eyesight being defective, he could not himself see whether or not the paper was discoloured, and had appealed to someone present to look at it for him.

Mr. GODFREY: I submit that you cannot go behind the report. You must take proceedings to quash it.

Mr. AVORY: The gentleman who is invested with the powers cannot see the difference between a pin-hole and a black spot. Besides, the report is no decision at all. The Examiner only says that "the Gas Referees have found" so-and-so. He does not anywhere say that he finds as a fact that there is any distinct discoloration of the test-paper. He speaks of the opinion only of numerous competent witnesses.

Mr. SHEIL said he agreed that it was a most remarkable report.

Mr. AVORY: He gives his reasons without giving his decision.

Mr. GODFREY: It is entirely a matter for him. He is the judge; and the County Council cannot interfere with the terms of the report.

Mr. AVORY: This old gentleman, from age, is incompetent to perform the duties of his office.

Mr. SHEIL: He is not very competent to draw a report. Mr. Avory is getting out of the case by a technicality; but I cannot help that. The summons is dismissed.

Mr. AVORY asked for costs.

Mr. SHEIL: Oh, no! You are only honourably acquitted through a flaw in the indictment.

#### The Liability of Traction-Engine Proprietors.

At the November sitting of the Deal County Court, before his Honour Judge Sir Lucius Selfe, the Walmer Urban District Council claimed £2 from Mr. A. Baldock for expenses connected with the repair of a water-main in Grove Street, Walmer. Mr. John F. Cullen, the Water Engineer and Surveyor to the Council, stated that the main was fractured by a traction-engine driven over the road by the defendant; the wheels having made an indentation of 3 or 4 inches over the spot where the pipe was laid. The road was made up with shingle, as it was not much used. The pipe was a 7-16ths inch cast-iron one, and was laid at a depth of about 15 inches, which had been sufficient for ordinary traffic for the past thirty years. He had relaid it at 2 feet. The pipes now used were large, and were laid deeper. Witness cited cases in which it had been decided that owners of traction-engines were liable for damage caused to gas and water mains by their engines, and that it was not necessary to prove that the road was of sufficient strength to sustain traction-engine traffic in order to fix the liability. Defendant denied that his engine went over the spot where the main was laid, and suggested that the pipe broke in consequence of rust. He had to pay heavily for his license to travel on the roads. His Honour said the law seemed to him to have been settled by a higher authority than those cited—viz., the Court of Appeal—who had held that a vestry was liable for damage to gas and water pipes by steam-rollers used in repairing the roads, if such pipes were laid at a sufficient depth to sustain ordinary traffic. From the evidence before him, he concluded that the main had been properly laid at a depth to resist ordinary traffic, but not that caused by traction-engines on a road of the kind in question. The defendant stated, first, that his engine did not break the pipe. This was a question of fact which he (his Honour) should decide against him. Secondly, he said he was licensed to use his engine on the road. The Acts of Parliament regulating the employment of locomotives on roads expressly fixed the liability of a person using a traction-engine for damage or injury caused, not merely by negligence, but by nuisance. The question was whether the engine in the present case was so used as to be a nuisance. The pipe was laid in a road not made up for such traffic, and was broken by defendant using a traction-engine on it. He was therefore liable for damages. Judgment was given for plaintiffs.

#### The Employment of Lads in Gas-Works.

At the Wolverhampton Police Court, last Friday, the Wolverhampton Gas Company were fined 10s. and costs in three cases under the Factory and Workshops Act, where three lads under 16 years of age were employed more than seven days without a medical certificate of fitness having been obtained. It was stated that the lads had worked for the Company for twelve months.

**Wells Water-Works Purchase.**—A meeting of the ratepayers of Wells was held yesterday week, for the purpose of giving them an opportunity of expressing their approbation or otherwise on the question of the City Council acquiring the water-works. The Mayor (Mr. E. A. Crosse) stated that the promises of the Company to give a better supply had not been carried out; and the inhabitants and the Medical Officer complained of the present condition of affairs. The Company had no further borrowing powers according to their Act; and therefore they were unable to expend the large sum necessary for improvements. A resolution was passed consenting to the promotion of a Bill for the acquisition of the works, and to make better provision in regard to the supply of the district. A poll, however, was demanded.

## MISCELLANEOUS NEWS.

### PROJECTED METROPOLITAN GAS LEGISLATION.

**Additional Capital and other Powers for the Gaslight and Coke Company—The South Metropolitan Company and the Nine Elms Works.**

The Gaslight and Coke Company published last Friday the usual "Gazette" notice of their intention to apply to Parliament next session for power to raise further share and loan capital by the creation and issue of ordinary, preference, and debenture stock, "rateably and in such proportions the one to the other as may be prescribed in the Bill." It is intended to make new and special provisions with respect to the dividends to be paid by the Company upon the ordinary stock to be created and issued, and for these purposes to declare and define, but as applicable only to this stock, a standard price of gas and a standard rate of dividend, such rate to increase or decrease with the decrease or increase in the price charged for gas. For the purpose of calculating the rate of dividend to be paid, "the price from time to time charged by the Company in their district south of the River Thames shall not be deemed to be the price of gas for the time being." Provisions are to be made with respect to the Company's insurance and reserve funds; and they are to be authorized and empowered—or, if deemed expedient, required—to create and provide "a redemption fund to be used and applied by the Company for the purpose of effecting a reduction in the aggregate amount of the capital of the Company entitled to dividend, or for such other purposes as Parliament may prescribe." The remaining powers to be applied for relate to the acquisition of land in the parish of East Ham, on which to construct works for the manufacture of gas and the conversion of residuals.

The South Metropolitan Gas Company have given notice of their intention to apply again to Parliament for powers to purchase from the Gaslight and Coke Company the portion of the undertaking of that Company situated on the south side of the Thames, for such price or consideration, and generally upon such terms and conditions, as may be agreed upon. The Bill will provide for the extension of the southern Company's limits so as to include the acquired area, and also for the appropriation and application of the price or consideration paid for the transfer. It will likewise empower the Companies to enter into and fulfil agreements for and in relation to the transfer, and confirm, with or without alteration, any agreements which may have been or which, during the progress of the Bill, may be entered into touching the matters above referred to. The Company will ask for authority to apply to the purposes of the Bill their existing funds, and any moneys they are still authorized to raise, and for the purchase of the district and works in question, and for the general purposes of their undertaking, to raise additional capital by the creation and issue of new ordinary stock, and by borrowing, and by the creation and issue of debenture stock. The Bill will extinguish all such rights and privileges as would interfere with any of its objects, confer others, and repeal, alter, and amend, and if thought fit consolidate all such provisions as may be deemed necessary or expedient in several local and personal Acts.

### WEST BROMWICH CORPORATION GAS SUPPLY.

#### The Price of Gas for Motive Power.

In a paragraph which appeared in the last number of the "JOURNAL" (p. 1232), we briefly recorded the result of a discussion which took place in the West Bromwich Town Council on the 7th inst. on a resolution of the Gas Committee to amend the existing scale of charges for gas by making the rate for all consumers of a million cubic feet, and upwards per quarter, for motive power purposes, 1s. 9d. per 1000 feet, as from the commencement of the current quarter. It may be remembered that the Committee's decision was approved by the Council by 16 votes to 6; but it was not until there had been a good deal of talk on the subject, which we could not notice last week. The first discordant note was sounded, curiously enough, at the very outset; for Mr. Bushell, the Chairman of the Committee, who moved the adoption of their report, candidly confessed that he was unable to agree with the recommendation. He reminded the Council that a short time ago, in consequence of the rise in the price of coal, the Committee were compelled to make an advance in the scheduled prices, and though the average was more moderate than in neighbouring towns, there was a considerable increase to the largest consumers—from 1s. 6d. to 2s. per 1000 cubic feet. Though there was only one consumer taking advantage of the lower rate, there was another coming on towards the amount at which he would be qualified for it. If the resolution was carried, he argued that the Council would be setting a very bad example by selling one of their products at materially less than cost price. So greatly was it below its cost that, if carried to a logical conclusion, and all the consumers were supplied at this rate, he believed it would mean the ruin of the undertaking. The average cost of gas in the borough was about 2s. 2d. net per 1000 cubic feet; but if the resolution was approved, they would be selling it at 1s. 8d. net to these particular consumers. No argument about day and night load, surplus gas, or anything else, could alter these facts; and he wished to disclaim any responsibility for the resolution which he had formally moved. Mr. Wilson, in seconding the motion, expressed surprise and regret that the Chairman of the Committee should have raised this question in the Council. It had been thrashed out in Committee; and it was, to his mind, a very simple matter. Last year the gas in the holders did not cost them 1s. per 1000 cubic feet. After providing for interest and the sinking fund, it would, he contended, pay the Committee to supply gas at 1s. 9d., simply because it was produced when the plant would otherwise be idle. Even with the advance in the price of coal, the gas in the holder did not cost 1s. 2d. per 1000 cubic feet; so that they had 7d. to the good. Their plant was very valuable and expensive; and if they could get 7d. per 1000 cubic feet by supplying gas when it would otherwise be idle, they were right in doing so. If they did not so utilize their plant, the result at the end of the year would be very much worse than it was. Mr. Bushell argued that, on Mr. Wilson's own showing, it could not be 7d. Mr. Wilson replied that he would take it as 6d.; but this would not alter his argument. He considered it was better



to get this than to let the works stand idle. They would by so doing encourage local industries, and induce local manufacturers to put down gas-engines, which would be in the interests of the Corporation. He considered that they behaved most unfairly to the motive power consumers when they raised the price; and he did not think the large increase which was then made was warranted. He concluded by expressing the hope that the Council would stand by the Committee.

The discussion having been fairly opened by these two speeches, other members of the Council proceeded to express their views on the subject. The first speaker was Mr. Brockhouse, who thought there was a good deal of sense in what Mr. Wilson had said. Mr. Turley inquired whether 3d. per 1000 cubic feet was not a sufficient increase on the old price to meet the rise in the cost of coal. They ought to keep faith with those who had put down gas-engines, and do what they could to encourage them. Mr. W. Lawley thought it would have been better in the first instance to have made the increase a uniform 3d. per 1000 all round. Mr. Peters said as the day consumption was so much to the good, he should support the resolution. Alderman Blades thought that, while the larger consumers were entitled to consideration because it was less expensive to collect the accounts, it was a dangerous principle that they should sell gas below its cost to the large consumers. Mr. Price said it would seem that they were to supply gas at the cost price and add nothing for the wear and tear. Alderman Salter remarked that when they altered the prices they raised them 2d. per 1000 cubic feet only to the ordinary consumer, but over 33 per cent. to the consumer for power purposes. Before long the Electric Light Committee would be going round, hat in hand, asking manufacturers to adopt the light; but if the latter had not confidence in the rates being adhered to, he did not think they would find many prepared to run the risk. They did not object to a fair increase, but they did to such a one as was recently made. The Mayor (Alderman Pitt) reminded the Council that in what they were doing that day they were not rescinding anything, but simply making a new figure. The difference between the Chairman of the Committee and themselves was not much—it was £12 10s. Mr. Bushell here chimed in by asking: "Multiplied by how many times?" The Mayor resented the interruption, and said the difference between them was £12 10s. per million cubic feet. He thought if they could keep the men employed during the day, get something for the interest and sinking fund, and benefit the trade and the town, they were doing the right thing. Mr. Newman said it was wrong to induce people to put in gas-engines and then increase the price; but if the Corporation could not make the gas at the price they fixed, they ought not to sell it at that price.

The last speaker brought the discussion to a close, and Mr. Bushell replied. He said he had nothing but the public interest at heart, and if the Council relieved him from the responsibility of a policy he did not believe in, he had done all he could when he made his protest, and must accept the verdict. But he hoped a majority of the Council would show their disapproval of a system which was commercially unsound—a juggling and turning things inside out and subverting them from their proper course. Their gas cost them 2s. 2d. per 1000 cubic feet; and whether they made more or less was not a material fact in the argument. The ordinary charges were fixed; and it was only the day charges they had to take into consideration in judging this proposal. Their coal cost them 18s. 6d. per ton, but to these large consumers of gas they would be practically selling it at 9s. 6d. per ton. They would be selling the gas, he repeated, at 6d. per 1000 feet less than cost price. These were facts that could not be gainsaid. He would not believe, until the vote was taken, that the Council would give effect to a principle that was so rotten. As to the charge of breaking faith with the large consumers, it really could not be upheld. They had no contract with them, and when they had not sufficient faith in the Council as a whole to do to the best of its knowledge justice between one and another, the public life of West Bromwich would have fallen to a low ebb. The vote was then taken, with the result already recorded.

#### THE PROPOSED MUNICIPALIZATION OF THE HARTLEPOOL GAS AND WATER WORKS.

A Special Meeting of the West Hartlepool Town Council was held on Monday last week to receive the report of the Committee who recently, in conjunction with a Committee of the Hartlepool Corporation, had under consideration the advisability of the two Corporations jointly applying for powers to purchase the undertaking of the Hartlepool Gas and Water Company. The report was discussed in private; and upon the Press being admitted, the Mayor intimated that the Joint Committee, after going thoroughly into the question, had recommended the adoption of the following resolution: "That this Council adopt the recommendation of the Joint Committee, and recommend that, in conjunction with the Corporation of Hartlepool, a Bill be promoted in Parliament for the joint purchase of the undertaking of the Hartlepool Gas and Water Company, and that the purchase price be based upon the rateable value of the two boroughs, that the promotion expenses be paid in that proportion, and that the Hartlepool Corporation be informed of the conclusion come to." Dealing with the matter of cost, he said that it would be quite impossible to fix absolutely the purchase price of such a lucrative undertaking until every inquiry had been made. The Committee had been absolutely unanimous in the decision they had come to. They had been largely guided in their conclusion by the evidence that had been afforded them of what had occurred in other towns where several similar undertakings had been transferred. In none of these cases had the ratepayers had occasion to regret the transfer. Either at once or after a year or two, there had been a balance on the right side of the revenue account, and soon after a balance in relief of the rates. The evidence of other towns in this respect had been so overwhelming that several members of the Council who had been sceptical had agreed with the Joint Committee's finding. He went on to point out that, in nearly every case in which arbitration for compulsory purchase had been resorted to, the result had been very much more favourable to the corporations than had even been anticipated by them. The Company had been approached, and were not willing to sell; but it was hoped that the unanimity shown by the two Corporations would have such an effect upon the minds of the Directors that they would be spared anything in the nature of a long contest. The recommendations were unanimously carried.

#### THE EDUCATIONAL FUND OF THE AMERICAN GASLIGHT ASSOCIATION.

As a supplement to the paper by Mr. Forstall, read at the recent International Gas Congress in Paris (*ante*, p. 707), some extracts may be given from the report of the Trustees of the Educational Fund of the American Gaslight Association to the recent meeting at Denver.

The Committee—under the chairmanship of Mr. Walton Clark, with Mr. Alfred E. Forstall as Secretary—stated that the educational work had been continued along the lines laid down in their last annual report. The advanced section of the Correspondence Class having finished three years' work, the 19 members of the section severed their connection with the class on Jan. 1 last. Many of these students entered the class when the work was first begun in 1896. Upon learning of the decision of the Trustees to limit the length of the course of study to three years, they "almost without exception wrote expressing regret at having to retire from the class, and thanking those who had given them the opportunity to increase so greatly their knowledge of the business in which they are engaged." As the same feeling of gratitude was expressed in letters of resignation received from members of the class who were unable, from force of circumstances, to keep up the work, the Committee felt that their efforts had not been entirely in vain. The second section of the class had a membership on Oct. 1, 1899, of 81, which had been reduced by death, resignations, and failures to answer the questions to the present number of 42. At the same time that the advanced section was dismissed, a new section (called the third section) was formed with a membership of 79. The net loss by resignation and failure to answer the questions had been 26; and the membership of this section was now 53.

The present number of subscribers is 94. Deeming it wise to lay aside as much as possible for the carrying on of the work, in case all the present subscriptions should not be renewed at the end of the five years for which they were made, the Trustees decided to set aside the surplus left over—after paying the expenses incurred during the first fiscal year—and all interest on investments, to form a nucleus for a permanent fund.

Realizing and appreciating the value of the services rendered by Mr. Alex. C. Humphreys in connection with the work of the Trustees, and being unwilling to suffer the loss of these services at the end of his term of office as an *ex-officio* Trustee, his fellow members of the Board increased the number of its permanent members from three to four, and elected Mr. Humphreys a permanent Trustee.

#### THE SEQUEL TO THE FATAL GAS EXPLOSION IN BOSTON (U.S.A.).

##### Damages Against the Gas Company.

Our readers will doubtless remember that early in the year 1897, we reported a serious explosion of gas which had occurred in Boston (U.S.A.), resulting in six deaths, and injuries to about forty people. It took place just before midday on the 4th of March, in a subway at the corner of Tremont and Boylston Streets, into which gas from the mains of the Boston Gas Company had leaked. The accumulated explosive mixture was ignited either by a spark from a tramcar which was passing, or by a temporary arc formed by an imperfect connection in the return circuit of the electric cable under the tracks. Two cars were at the curve of the road at the time; and both were badly damaged. The whole width of Tremont Street was thrown up at its juncture with Boylston Street; and several holes were made in the pavement some hundreds of yards away. Altogether, three street cars, a *coupe*, and a public carriage were burnt; and, worse than all, as stated above, lives were sacrificed and bodily injuries sustained. One of the victims was the Rev. W. A. Start, a Professor at Tufts College; and, in accordance with the Public Statutes of the Commonwealth, an inquiry was instituted into the cause and manner of his death. It was conducted by Judge Ely, and lasted from the 12th of March till the 2nd of April. On the 22nd of that month he issued his report, the principal points in which were given in the "JOURNAL" for the 25th of May. He found that the explosion had been caused by the negligence of the Gas Company, that this negligence was "gross and inexcusable," and that the death which was the special subject of his investigation "resulted from the unlawful act" of the Company. This decision fixed the responsibility.

The matter then came into the Courts on a test case; the plaintiff being one Wolf Koplan, a young bootblack, who was standing near the scene of the explosion when it happened. He was thrown to the ground and slightly injured. An action was brought on his behalf to recover \$10,000 damages; and, after a trial extending over six weeks, he was awarded \$3000 against the Gas Company. There were several other Companies concerned in the matter—the Bay State Gas Company, the Boston Electric Light Company, the Edison Electric Light Company, the Metropolitan Construction Company, and the West-End Street Railway Company; but, before the trial, proceedings were withdrawn against the first two. At the trial, when the evidence for the defence was closed, the Court ordered a verdict to be given in favour of the Edison Company. The proceedings against the other defendants, however, went on, though the Counsel for the Construction Company practically took no part in them, except to adduce a final argument when the time came for doing so. Verdicts were eventually returned for that Company and the Railway Company; and this left the issue between the plaintiff and the Gas Company solely. The latter made a strenuous effort to show that the gas which caused the explosion was not theirs, but some which had been generated from a composition kept in the junction-boxes of the Edison Company. They further contended that, even if it should be found by the Jury that it was their gas which brought about the catastrophe, they were not liable, inasmuch as they had not been negligent in looking after their pipes. Experts were called by both sides on different lines of evidence; considerable testimony being offered with respect to the effect of electrolysis on the gas-pipes. The plaintiff sought to show that this produced corrosion, and consequent weakening of the pipes; while the defendants maintained that it formed a crust which had a tendency to strengthen them. A number of exceptions were taken by the Company, none of which, however, went to the actual merits of the case, but related



to the admissibility of particular evidence, and the refusal of the Court to give certain rulings. In the result, the Company were found to be solely responsible for the accident. The case was taken to the Supreme Court, who, on the 18th ult., sustained in every particular the rulings of the Court below—their decision being adverse to the defendants on every point. While this does not preclude the Company from defending the other actions before a jury on questions of fact, it is regarded as extremely doubtful whether they will allow to go to trial any cases but those in which efforts to effect a settlement have been unavailing, seeing that the circumstances involved in the suit just determined are substantially the same as those forming the basis of the other actions arising out of the disaster. The adjudication is one of great moment; the damages amounting, according to the "Boston Advertiser," to which we are indebted for the latest particulars in reference to this matter, to approximately £200,000.

### MR. LIVESLEY ON THE PRICE OF COAL.

#### Brighter Prospects.

"The Times" last Wednesday contained a letter from Mr. George Livesey, in which he called special attention to "two ominous paragraphs" in the weekly market reports in that paper on the previous Monday, as evidence that producers of coal are getting anxious lest the largely reduced demand should compel a reduction of prices, which has already taken place in several directions. The paragraphs referred to are as follows:—

*Barnsley, Nov. 10.*—Many of the collieries in the district have played one or two days during the week, with a view to reducing the output to meet the altered conditions of trade. There have been suggestions that the miners should take the matter in hand and "play" a few days until trade recovers; but the men's leaders do not propose to adopt such a course at present.

*Cardiff, Nov. 10.*—In accordance with the decision of the South Wales Miners' Federation, the whole of the collieries in South Wales and Monmouthshire were idle on Friday; and work will not be fully resumed until next Monday. The object of the stoppage was to restrict the output, and by this artificial means to checkmate, if possible, the retrograde movement which has apparently commenced in the coal industry; and to-day "a delegate meeting will be held at Cardiff for the purpose of taking into consideration a proposal to empower the Council of the Federation to declare a general holiday whenever they deem it necessary in the interests of the workmen and the trade generally."

Commenting on these paragraphs, Mr. Livesey said: "One hardly expected that such action would be taken officially by the Trade Unions, though it certainly was expected that the miners would restrict output to prevent the accumulation of stocks of coal at the pits. Happily, no such action has any prospect of checking the downward movement in the price of coal which has now distinctly begun in obedience to the law of supply and demand. Last year at this time all our contractors were seriously falling behind in their deliveries, whereas now the contrary is the case, and offers are being made to supply increased quantities. The stocks of coal at gas-works are very large; and while twelve months ago the then stocks were rapidly decreasing, causing great anxiety, we are now quite happy on the point. From all I can see and learn, it appears that consumers of coal generally are in a similar position. This is largely due to the lessened demand for coal and coke by the iron trade—the main cause of the rise in 1898-9—and which, according to one of the highest authorities, passed its summit last spring. Since then the backward movement, according to your weekly reports, has been at an accelerating rate. In August last you gave a letter of mine on this subject the privilege of your columns, in which was the statement that, instead of coal being dearer in the winter, 'it is quite possible prices may then be lower.' Now everything points in that direction. We may have a severe winter, which may possibly cause a temporary spurt in prices; but this cannot last. It is at least to be hoped that consumers of coal will keep their heads—many lost them over 'the lowest summer prices'—and defer buying as long as possible, and then only from hand to mouth. The two Gas Companies whose policy I have a share in directing are following this course, having only lately obtained full supplies up to the end of the year, because they believe coal will be cheaper in January, and still lower in each succeeding month."

### FATALITIES THROUGH INHALING GAS.

Mr. A. J. Martin Ball, the Mid-Gloucester Coroner, held an inquest at Ebley, near Stroud, last Thursday, on Mrs. Matthews, widow (75), and Ada, her daughter (33), who were found dead in their bedroom, poisoned by an escape of gas, on the previous Tuesday. The evidence showed that a steam-roller, which had been in use on Monday, had fractured a 2-inch gas-pipe, the gas escaping into an old stone drain which communicated with the cottage inhabited by the two women. When found, they had been dead for many hours, and the whole house was filled with gas. A verdict to the effect that death was caused by gas poisoning was returned; and the Jury added a rider that the defective state of the drainage practically caused the deaths of the deceased. On Monday, the 12th inst., an inquest was held by Mr. J. F. Price, County Coroner, on the body of Samuel Booth, engineer's labourer, 48 years of age, of Brook Street, South Reddish. Deceased was employed at the works of Messrs. J. E. H. Andrew and Co., Limited, gas-engine manufacturers, and was doing duty for a fellow-workman who was ill. He was found in the syphon pit, into which there had been an escape of gas, through injury to one of the inlet-pipes. A verdict of "Death by misadventure" was returned. Last Thursday, the Liverpool City Coroner (Mr. T. E. Sampson) held an inquiry into the circumstances relating to the death of Edward Stewart Martin, of Rhyl. Deceased was a steward on board a vessel, and on the afternoon of the 10th inst. he booked a bedroom for two nights at the cocoa-rooms in Hanover Square, Liverpool. The Manager's attention was drawn to deceased's room on the following morning. He entered, and found the room full of gas, the gas-tap being turned right on. Deceased was lying in the bed in a natural position. He was removed to the Northern Hospital, where he died later. Mr. E. Allen, Assistant-Engineer

to the Gas Company, said that in the particular district in which the occurrence took place, only coal gas was supplied from eleven till six. During the other hours, a certain quantity of carburetted water gas was mixed with it; this was less injurious to health than the pure water gas. The proportion of water gas, taking the average of the day, would not be more than 28½ per cent. A post-mortem examination revealed the ordinary signs of coal-gas poisoning. The Jury returned a verdict to this effect.

### ORIENTAL GAS COMPANY, LIMITED.

The Late Mr. John Blacket Gill.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES in the chair.

Before commencing the business,

The CHAIRMAN said he had the melancholy statement to make that their friend and Chairman, Mr. John Blacket Gill, died on Sunday night. He wrote him (Mr. Jones) on Sunday, asking him to preside over this meeting, and adding: "I am sorry to say I have been unwell the last few weeks; and the doctor will not hear of me leaving home." This letter was received on Monday morning; and in the evening one came from Miss Gill, in which she said: "You will be grieved to hear that dear father passed away last night. The end was very sudden, though, of course, he had been ill for a long time." Before the shareholders parted, he should again have occasion to allude to their sad loss.

The SECRETARY (Mr. H. J. Luff) having read the notice convening the meeting, the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the first paragraph in the report alluded to the business of the Company during the past year; and it would be seen that the Directors referred to the increased revenue from gas. The sale of residuals, too, had been unprecedentedly good. The cost of coal per ton had been somewhat less; and the exchange also had been rather better—resulting in profits to the amount of upwards of £2000 in excess of the preceding year. But notwithstanding these increased profits, the Board did not recommend any increase in the dividends, but a continuation of their policy to build up a *bona fide* reserve fund, which now amounted to the respectable sum of £32,664. This policy had been endorsed by the shareholders on previous occasions; and he felt certain it would be again that day. The second paragraph alluded to an agreement having been entered into with the Municipal Commissioners of Howrah, on the other side of the river. It was a small district; and it had its own separate gas-works. For some few years before the new contract was entered into, the Company were supplying the public lamps on the terms of the expiring contract, and they were also supplying gas on the terms of the new contract for many months prior to the execution of that contract. He pointed this out in order to show that the shareholders must not be alarmed at the fact that the Company had not yet entered into a contract for the supply of gas to Calcutta proper. But with reference to the Howrah contract, he might say that they had introduced incandescent lighting throughout the district, and that it was working satisfactorily both to the public and themselves. He had no doubt the shareholders would be glad to hear something about the Calcutta contract. Last December the Directors submitted to the Corporation of Calcutta an offer for the public lighting of the city for ten years from May 1, 1901. This offer provided for the conversion of the whole of the public lamps, within a period of twelve months from the signing of the contract, to incandescent lighting similar to the lamps at Howrah. He need not refer to the terms, which were based on equitable prices as between the Corporation and the Company. Many reasons—changes in the constitution of the Municipality due to Imperial legislation, and the usual tardiness of municipal bodies to come to terms—had prevented them actually getting the contract signed; but the offer was being considered, and had been printed and circulated among the members of the Municipality. No objection had been raised to the terms of the offer; and a short time since the Company were requested by the Secretary of the Corporation to provide a stock of new lamp-posts and lanterns to meet an anticipated order for additional lamps to be erected. Therefore they might fairly hope that the offer would be accepted.

Mr. H. D. ELLIS seconded the motion.

Mr. SAMUEL SPENCER remarked that the Chairman's statement was very gratifying. Among other matters, he had told them that the price of coal had been slightly lower. This was so opposed to experience in this country, that he should like to know how the Directors managed it.

Mr. EDWARD CLARK inquired what provision the Directors had made for coal during the ensuing year. In referring to the public lighting of Calcutta, the Chairman had not mentioned the price; and he (Mr. Clark) had no doubt he had acted wisely. But he thought it was only fair to the shareholders (some of whom were experts in the matter of gas supply) that the Chairman should tell them whether the price was higher, and a reasonable percentage higher, than it was previously. His object was an obvious one, as it had an important bearing upon the future of the Company.

The CHAIRMAN, in reply, said, with regard to the inquiry as to how they managed to get coal at a less rate than the previous year, it was due to the skill and watchfulness of their representative at Calcutta (Mr. D. C. Niven). The price was not much lower; but it was somewhat. Respecting the future provision of coal, he believed they were well covered for between one and two years, at prices which were fair and reasonable, and which would not put any additional burden on the Company. As to the price for the public lighting of Calcutta, he accepted the suggestion that it was wise he should not mention it; and he thought if the shareholders would be good enough to leave the matter entirely in the hands of the Directors, it would be more satisfactory than for him to make any comment on the tender they had made to the Corporation, which anyone could see in Calcutta, because, having been printed and circulated among members of the Corporation, it was now a public document. He might, however, say it was fair and equitable; and the Directors had taken steps to conserve the interests of the shareholders.

Mr. CLARK: We leave it in your hands entirely.

The motion was unanimously carried.

On the proposition of Mr. R. MILLER, seconded by Mr. A. T. EASTMAN,



a dividend of  $4\frac{1}{2}$  per cent. was declared, free of income-tax, making the distribution 8 per cent. for the year.

The CHAIRMAN said the next paragraph in the report referred to the retiring Directors; and in it the name of their late friend Mr. Blacket Gill was mentioned. As a matter of fact, they could not fill up the vacancy at this meeting; and he was sure the shareholders would think it very indecent if the Directors were to suggest a name. The matter would, in the ordinary course of business, be left in the hands of the Directors; and he felt that the shareholders would repose in the Board sufficient confidence that they would do their best in the selection of a successor to Mr. Gill. Before proceeding further, he would ask the shareholders to join with him in a vote of condolence to Mrs. Gill and her family; and he would propose—

That the Directors and Shareholders record their profound sorrow at the death of their late Chairman, Mr. John Blacket Gill. By his untimely death, after having been connected with the Company for thirteen years as Auditor and Director, the Board lose a most valued and genial colleague, who never flagged in his efforts to promote the best interests of the Company. The Directors and Shareholders desire to express their deepest sympathy and condolence with Mrs. Gill and family, on whom has fallen a blow profoundly felt by all who were privileged to share his friendship.

He (the Chairman) thought no words were needed by way of supplement to the resolution. He would ask Mr. Ellis to second it, and Mr. Williams, of the European Gas Company, to support it. Mr. Gill had been the Chairman of both the Commercial and the European Companies.

Mr. H. D. ELLIS said that it was his special privilege to second this very melancholy vote of condolence. He did not know whether there were many proprietors in the room who had known their late Chairman as he had done; but if there were, they would feel that theirs was no common loss. It had been his pleasure and privilege—he said “privilege” emphatically—to be associated with Mr. Gill in the business of this and another Company for more than twenty years; and he could honestly say that each year had only strengthened the feelings of attachment and admiration that a character such as his inspired. He (Mr. Ellis) knew of no man more beloved or more respected. His probity of character, his charming manner, and his unaffected kindness, thought, and consideration for all endeared him wherever he went. A man of such a character was not easily replaced. He could not say more.

Mr. W. WILLIAMS said, as one who had worked under the Chairman, travelled with him, and had had many opportunities of appreciating his good qualities, he could endorse, from his own personal knowledge, all that had been said as to his unfailing tact, kindness, and ability. Mr. Gill always showed shrewd common sense in his judgments, and he cared more for solid results than for showy figures. The consideration which he always evinced for those beneath him made him esteemed and respected by the staffs of every Company with which he was connected.

Mr. E. T. E. BESLEY, Q.C., wished to be allowed to say that he had been a colleague of Mr. Gill on the Board of the Commercial and European Gas Companies for some years; and he could unhesitatingly say that the loss they had sustained was irreparable. That was a phrase of the day perhaps; but his colleagues felt its actual meaning—that they would not find anyone to fill his place in the same way that he had filled it. His qualities were very marked, and at the same time very rare. He was a man of a singularly straightforward bent of mind and inclination. He was amiable to a degree; and he endeared himself to everyone with whom he came in contact.

Mr. SPENCER, speaking for the shareholders who were not identified with Mr. Gill in any official capacity, added an expression of deep sorrow, and referred to the courteous manner in which their late Chairman always conducted the proceedings at the meetings.

The resolution was unanimously agreed to.

Mr. A. T. Eastman was then re-elected to his seat at the Board, on the motion of the CHAIRMAN, seconded by Mr. H. D. ELLIS; and the Auditors (Messrs. S. W. Savage and W. Williams) were re-appointed, on the proposition of Mr. SPENCER, seconded by Mr. E. F. WHITE.

The CHAIRMAN moved a special vote of thanks to the Company's Manager, Mr. Niven. In the course of his remarks, he said he had no doubt the shareholders saw some time ago that Calcutta was flooded, and Howrah especially, to the extent of something like 4 feet in the streets. The Directors were naturally very anxious at the time; and they cabled to Mr. Niven for information. They received two letters from him, which showed that he had the matter well in hand. On October 18, he wrote that the Howrah Gas-Works were then in working order; and on October 25, he wrote that everything was satisfactory there. In the latter communication, Mr. Niven also stated that Mr. J. C. Watson, the Assistant Engineer, had been in charge of the Howrah works for the past three years. Owing, however, to the floods, the state of the works was too serious to allow him (Mr. Niven) to depute the restoration to another; and therefore he had seen to the work himself. Mr. Watson had had plenty to do in seeing that the men attended to the syphons in the streets of Calcutta. Mr. Niven also mentioned that he would shortly send a report as to the simplest and most effective plan of preparing for a flood of this kind, to prevent the works being damaged or in any way affected in their working. Mr. Niven, the Chairman added, took every precaution to satisfy the public. The retort-house was flooded; and they could not make gas for about twelve days. In the meantime, Mr. Niven provided oil-lamps in the district, and took care to light the East India Railway Company's station. He did everything that a man possibly could do under the circumstances; and he must have worked night and day—being most ably assisted by Mr. Watson. It was therefore a pleasure to propose a hearty vote of thanks to both Mr. Niven and Mr. Watson.

Mr. ELLIS seconded the motion, which was heartily agreed to.

The thanks of the shareholders were also accorded to the Chairman and Directors, on the proposition of Mr. BESLEY, seconded by Mr. N. E. B. GAREY.

A similar acknowledgment of the services of the Secretary and London staff concluded the meeting.

Dr. Bishop has been elected Chairman of the Electricity Committee of the Manchester Corporation, in succession to Mr. Lloyd Higginbottom. The Chief Electrical Engineer (Mr. C. H. Wordingham) has intimated his intention of not seeking a renewal of his engagement with the Committee at the termination of his agreement in March next.

## SOUTHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was recently held at the Offices in Southampton—Mr. R. C. HANKINSON, J.P., in the chair.

The SECRETARY (Mr. C. Crowther Smith) having read the notice convening the meeting, the report of the Directors was presented. It set forth that the sum available for distribution was £10,892; and the payment of the maximum dividends on the ordinary stock, amounting to £9228, for the half year ending June 30, less income-tax, was recommended. This would leave £1664 to be carried forward. During the half year there had been an increased sale of 21,807,000 cubic feet of gas, as compared with the June half of 1899. Upwards of 2750 prepayment meters had been fixed, and a further increase under this system was assured.

The CHAIRMAN, in moving the adoption of the report, said he thought he might congratulate the proprietors that, upon the whole, it was satisfactory, considering all the circumstances. The first thing that struck one was, of course, the considerable increase in the sale of gas, notwithstanding the competition they had to contend with in the lighting of the town by electricity. During the six months, there had been an increased sale of 21,807,000 cubic feet of gas, as compared with the June half of 1899. This represented 10 per cent. on the Company's business; and he might mention that it was fairly distributed throughout the district. Of course, it would be foolish to ignore the fact that the electric light affected the Company in the town proper; but they did not feel it in the district. Then the day consumption of gas was much greater than it used to be, by means of cooking-stoves and so forth; and there were also a good many gas-engines. One significant cause of the increase was the adoption of the prepayment meter system. There were now as many as 2250 of such meters fixed in the town, and the demand for them was growing every day; and the fact remained that the augmented sale was larger than it had been during any half year in the history of the Company. Increased business meant, of course, additional capital. They had had several sales of stock lately, and he thought they might congratulate themselves on the excellent prices obtained. In July the average was £117, and in October £115—the decline not being surprising, considering the depressed state of the Money Market and the condition of the country generally. The Directors had had, very reluctantly of course, to raise the price of gas; but he was pleased to say they had had very few complaints about it, for everybody had sense enough to know that gas could not be made without coal, and that if coal was dear the price of gas must be raised. Another serious item of expenditure arose from the extension of the Company's works; and a further one, which was absolutely necessary, was caused by the erection of a new gasholder, which would be a very large one, containing, in fact, as much as all the others put together. This was a very expensive matter; but the Directors had gone to work about it the best way they could, under the advice of their excellent Consulting Engineer, Mr. J. B. Paddon. The holder was already begun, and they hoped it would be finished next summer, and be ready for work the following winter. The profit and loss account was very satisfactory. The past half year was not the best the Company had had, but within £40 they had earned the maximum dividends; paying the balance out of the amount brought forward, and carrying forward £1664. The Directors considered this a very satisfactory outcome of the half-year's working. Of course, enlargement of their business meant an increase of labour for the officials all round. No one knew more of the value of the work performed by their Secretary than the Directors; and they thought the time had come when his salary should be raised. The capital account had increased from £241,000 to nearly £500,000, including premiums, which meant a great deal of additional, and very anxious, work for the Secretary, in whose ability, energy, and integrity the Directors had the greatest confidence. They therefore suggested that his salary should be increased by £100 a year.

Mr. J. K. SAMPSON seconded the motion; and it was carried unanimously.

The proposal as to the Secretary's salary was then agreed to *nem. dis.*

The SECRETARY, in returning thanks, said the kind and courteous manner in which the suggestion had been received would stimulate him to renewed energy in the performance of his duties.

The maximum dividends were declared; and the proceedings closed with votes of thanks to the Chairman and Directors, and also to the Secretary, Manager (Mr. S. W. Durkin), and staff generally.

## ELECTRIC LIGHTING NOTES.

The electric light undertaking of the Yarmouth Corporation must be a source of great disappointment to the members. The half-yearly report which the Electric Lighting Committee laid before them last Tuesday showed that the income for the two quarters failed to meet the expenditure by £405. In the corresponding period of last year, £441 was cleared, which is not much to boast about.

The Board of Trade have given the Limerick Corporation a little more grace in regard to the carrying out of their Electric Lighting Order. But if definite steps are not taken within twelve months, the Board intimate that they will not feel justified in allowing the Order to remain in force. A deputation has been appointed by the Corporation to wait on the Local Government Board to secure sanction to a loan.

At the meeting of the Court of Common Council last Thursday, the Chairman of the Streets Committee (Mr. A. B. Hudson) presented a report, which had been ordered at the previous meeting to be printed, giving effect to sundry recommendations, and submitting a scheme for the testing in future of all electricity meters for use in the City under the direction of the Electric Inspector, at the expense of the City of London Electric Lighting Company and the Charing Cross and Strand Electricity Supply Corporation (the electric lighting undertakers each to refund, in addition to the other expenses, a sum of £200 per annum to the Corporation in respect of the Electric Inspector's salary); recommending that, subject to agreements being entered into with the Companies to give effect to the proposed arrangements, Mr. Voysey's salary be increased from £350 to £500 per annum from Midsummer last; and pointing out that the acceptance of the Committee's recommendations will relieve the Corporation in future of all expenses connected with the appointment of an Electric Inspector, which at present amount to about



£350 per annum. Draft agreements were also submitted to give effect to the foregoing arrangement; and recommending that it be approved, and referred back to the Committee to complete the matter with the Companies concerned on the basis of the draft agreements. The course suggested was followed.

Particulars have just been published of an important scheme for the supply of electricity in bulk in Yorkshire. A Company, which has been registered under the title of the Yorkshire Electric Power Syndicate, Limited, will shortly apply to Parliament for power to supply electricity in bulk to local and other authorities, as well as to colliery owners, manufacturers, and others throughout the southern or manufacturing portion of the West Riding of the county of York. The portion included in the scheme is that lying south of the Rivers Wharfe and Ouse, and the turnpike road from Bolton Bridge through Elsack and Skipton to Foulridge on the Lancashire boundary. The area is about 1800 square miles, with a population of about 2½ millions.

Judging from what transpired at the meeting of the Ventnor District Council on Monday last week, the electric lighting in the town has for some time been causing dissatisfaction. Mr. Vincent asked for an explanation of this; saying he had been expecting to hear something about it. At the west end of the town several of the arc lamps had been out during the previous few nights, and even the preceding evening it was still the case with some of them. He did not know whether any communication on the subject had been received from the Electric Lighting Company. At any rate, some action should be taken in the matter. The Chairman (Dr. Robertson) said the Works Committee had communicated with the Company on the subject, but no reply had been received. Mr. Vincent said they wanted some guarantee that this sort of thing was not going to continue. If it had not been for the moon-light nights, the streets would have been quite dangerous. Mr. Grant said the unsatisfactory light given by the arc lamps ought to be taken notice of. He thought the time had come when the system of lighting by arc lamps should be better than was the case at present. Two or three letters on the general lighting of the town had been sent to the Company by direction of the Works Committee. Mr. Wetherick counselled a little patience and forbearance in this matter, seeing that the Company were doing their utmost to remedy the defect in the current, a matter over which they had no control. At the same time he recognized that the Council must keep the Company up to the mark, and see that the town had what it was paying for. The Chairman said he thought they must recognize that the Company were doing their utmost to render the period of gloom as short as possible.

Last Thursday, Mr. H. P. Boulnois, one of the Inspectors of the Local Government Board, held an inquiry at Colne, relative to the application of the Colne Corporation for power to borrow £39,000 for carrying out electric light works. The Town Clerk (Mr. A. Varley) explained that the scheme comprises the provision of a generating station, the laying of cables through the main streets of the town to the village of Trawden, and the supply of current for a light railway as well as for illumination. The plant would, when completed, be capable of simultaneously working 10,000 8-candle lamps. There would be four dynamos—two for the ordinary lighting, one for the supply of the current to the tramways, and one for use in case of emergency. The revenue was based on 10,000 lamps at an average of 4½d. per unit, the income from which would be £3000. The plant was equal to dealing with about 30 per cent. in excess of this number, and the estimated revenue from street-lamps (20 arcs and 40 incandescents) would make the total stand at £4733. Deducting the cost of management, interest, payment to the sinking fund, &c., would leave a profit of £279. With regard to private lighting, it was estimated on the basis of 6d. for the first hour and 2½d. per hour afterwards. With gas at 2s. 9d. per 1000 cubic feet—the present rate—the difference on a two hours' daily demand would be small; but electricity would compare favourably with gas. The gas undertaking was a valuable asset to the town—the profits from it during the past year being £4000, which was equal to a rate of 1s. in the pound; and by this means the Corporation were able to reduce the rates by 3d. in the pound. If the Corporation could rely on the experience of other towns, it was thought that the Gas Department would not be affected by the Electrical Committee. Mr. Hewitt, a member of the Corporation, said the site for the generating station was a very suitable one, and the destructor would save a certain amount in the cost of fuel. He believed that the electric light would be generally adopted, and that tradespeople would introduce small motors into their works. There was no opposition to the application.

Three fatalities connected with electric light undertakings have to be recorded. On Monday last week, Mr. Thomas Griffiths, the Electrician in charge of the Newport Corporation electricity station, was found dead in front of the main switch-board at the works. An examination of the board suggested the conclusion that deceased was engaged at the time in screwing up a nut on a portion of the apparatus, the current from which had been turned off for the purpose. He was in a stooping or bending attitude while using the spanner on the nut. The spanner slipped, and the wrench threw deceased's left knee against a live portion of the apparatus. There was a slight mark of burning at the point of the knee-cap where current at 2000 volts had entered the body. The current took an upward course, running down the right arm to the spanner, and then to earth. The safeguards provided against accident at the works are considered to be among the best in the kingdom; and the accident appears to have been due to pure misadventure. On the following afternoon, a shocking accident occurred at the sub-station of the Cheltenham Corporation Electric Light Works. A fitter, named Richard Edwards, 29, was making a joint of wires in the basement when, suddenly, a cry was heard, and his fellow-workmen, who ran to the spot, found Edwards lying on the floor unconscious. Doctors were called in and efforts made to restore animation by artificial means, but without avail. The body bore no mark of contact with the wires, and death was said to be due to failure of the heart's action caused by electric shock. Early last week, an assistant engineer named Rowland Herbert Packworth, employed by the Metropolitan Electric Supply Company at their South Street, Marylebone, station, was connecting some cables, but instead of taking hold of the insulated handles he by mistake touched the metal work of the switch-board with both hands. The wires were fully charged, the current passed through him, and he fell dead. At the inquest last Thursday, the Jury returned a verdict of "Accidental death," but recommended that the switches should be protected in future.

## THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

### A Purchase Bill to be Promoted.

At the Meeting of the London County Council last Tuesday—Mr. W. H. DICKINSON in the chair—the report of the Water Committee presented at the preceding meeting, and given in the "JOURNAL" for the 6th inst. (p. 1160), recommending that a Bill should be promoted next session for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies, was considered.

The adoption of the report having been formally moved, Mr. P. HARRIS said he thought the minority in the Council would wish to define their position. The report was not very explicit; but he gathered that the proposal was to introduce the identical Bill which was rejected by the House of Commons last session. The Committee scarcely pretended to think there was much chance of it passing; and, in effect, they said they did not expect it to do so, but that it would only cost £200 to carry it up to the second reading. As a sort of make-weight, the Committee threw in the curious argument that the Council were only being asked to vote on a kind of pious pronouncement with regard to purchase. As a fact, what they were asked to vote upon was a Bill for the purchase of the undertakings of the Water Companies by the Council, and without any indication as to what should be the management after purchase. It was stated in the report that the Royal Commission confirmed the policy of purchase; but there was the question of management afterwards, and the Committee asked them to go forward for purchase without any arrangement being made for management. The Royal Commission did not recommend purchase in the abstract, but purchase and management by a joint authority. If the Council wished to settle the question, the only chance of doing so was to go forward with a Bill on these lines. To give the Council a chance of adopting the alternative, he moved, as an amendment—"That a Bill be promoted in the session of 1901 for giving effect to the main principles in the report of the Royal Commission."

Mr. COHEN, M.P., seconded the amendment, and asked the Chairman of the Water Committee whether he conscientiously believed there was a ghost of a chance of such a Bill as that proposed by them passing.

Sir ARTHUR ARNOLD considered that the Committee's report was the only possible solution of the question, and he saw no difficulty in reconciling the recommendations of the Royal Commission with purchase by the Council. The initial step of purchase must, in his opinion, be undertaken by the Council; and he trusted that they would never submit, as the greatest rating authority, to make over to another body powers with regard to rates in this matter.

Colonel RORTON observed that the Progressives were going to spend the ratepayers' money on a Bill which they knew would not be passed. The Royal Commission had made up their minds that the County Council should not be the body to manage the water supply of London.

Mr. SHAW LEFFEVRE said he doubted very much whether the recommendation of the Royal Commission could possibly be carried out in its entirety. The alternative was that the purchase should be made by the Council. In any case, the purchase must be made and carried out by the Council; and to attempt to constitute a Board to take this out of their hands and enter into a bargain independently of them would only end in disastrous results to London and the ratepayers generally. When the purchase had been made by the Council, the question of management of the water supply might be open to compromise; and they would not be unprepared to listen to what the outside Local Authorities had to say on the matter. He hoped the recommendation would be adopted.

Mr. WHITMORE, M.P., supported the amendment, and said the real question raised was whether, by introducing the suggested Bill, they would be promoting a practical solution of the water problem. If they passed the recommendation, there was no possibility that they could advance the matter one step farther in the next session. There could be no question that if the Council were perverse enough to reintroduce their Purchase Bill, it would meet with precisely the same fate as it did last session. It seemed to him that the Progressives were pushing their own fads instead of showing any desire to add to the practical solution of this question.

Mr. BEACHCROFT said the Moderate Party were quite as anxious to settle the water question as the Progressives; but the latter would never do it unless they took a more reasonable view of the matter. He thought the members of the Council and the citizens of London should alike be grateful to the Government for carrying out the admirable piece of legislation which allowed of the Water Companies connecting their mains, as this had enabled the people to be supplied with water during the past summer without failure.

Colonel FORD doubted the wisdom of the Progressive leaders in introducing the Purchase Bill again next session, because it was clear that the Government would have nothing to do with the water policy of the Council. He therefore saw little use in knocking their heads against a brick wall. Still, they had heard of lambs being led to the slaughter, and, as a Progressive, he supposed he would be dragged there.

Mr. M'KINNON WOOD (Chairman of the Committee) said he had no objection to go to the Government again, for his patience was inexhaustible; but they had received no indication that the Government intended to deal with the matter. No one had objected to the Council's policy with regard to the terms of purchase. The whole question was narrowed down to whether they could accept the recommendations of the Royal Commission with regard to the controlling authority. They could not agree with these recommendations, as they were so palpably unjust and placed the Council in such a miserable minority on the proposed Water Board.

The Council then divided, and the amendment was lost by 77 votes to 44—a majority of 33.

Mr. CAMPBELL moved a further amendment to the effect that no Bill be introduced, but that the Government be pressed to legislate on the subject next session. He contended that, by adopting such a course, they would force the Government to show their hand, and thus save the ratepayers' money.

Mr. COUSENS seconded the amendment.

Mr. STUART, alluding to a statement made that £25,000 had been spent on the promotion of water legislation, said it was money well laid



out, although they were now asked to throw away a vast asset. Such dilatory amendments would cost the ratepayers thousands of pounds.

After some further discussion, the amendment was rejected, and the recommendation of the Committee was carried, on a division, by 71 votes to 43—a majority of 28.

### WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting was held at the Company's Offices, Marylebone Road, on Tuesday, the 13th inst., under the presidency of Mr. E. BOULNOIS, M.P.

The SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Auditors. This stated that the revenue for the half year ended Michaelmas had been £145,965; being an increase of £2777 as compared with that for the corresponding period of 1899. The water-rental received during the half year had been £124,766. The balance to the credit of the dividend and interest account was £69,339.

The CHAIRMAN, in moving the adoption of the report and accounts, stated that it was not necessary for him to make any prolonged observations on the report, because it set out fully important matters which had concerned the Company during the half year, and matters which were also in the future. The 42-inch main from Hampton to Barnes was very nearly completed—that was to say, 9½ miles out of a total distance of 10 miles had been laid, and the shafts and tunnel for carrying the main under the River Thames between Isleworth and Richmond had been completed. In addition to this, two of the new filter-beds at Barn Elms were finished; and the third one was expected to be completed by the end of this year. The number of new supplies laid on during the six months was 891; and the Company's constantly increasing district naturally required constantly increasing expenditure, in order to keep pace with the demands. There was still a large area to the north of London left uncovered with houses; but at the rate at which building was going on in this direction, he expected that the limit of the Company's boundary would be reached before very long. The Local Government Board, having held an inquiry into the scheme of intercommunication between the works of the eight Metropolitan Water Companies which had been submitted to them, had intimated their approval of the scheme generally, and had requested to be furnished with details, plans, and estimates, which were now being prepared. During the past summer, which was again exceptionally dry—and during which, again, a normal amount of rain did not fall—he believed he was right in saying that no inconvenience was experienced by any inhabitant of London owing to shortness of water; and although there was a slight breakdown in connection with one Company, yet this was not owing to any deficiency of water, but from other causes. In any case, each Company now had such ample storage, and the arrangements made and contemplated for intercourse between all the Metropolitan Water Companies were so complete, that there was no fear that any part of London would ever again be subjected at any time to scarcity of water. Great progress had been made during the year with the works now being carried out by the Staines Reservoirs Joint Committee—representing the West Middlesex, the Grand Junction, and the New River Companies—and one of the two great reservoirs in course of construction was fast approaching completion. When this stupendous work was finished, their Company, at all events, would feel satisfied that they had marched with the times, and had looked well ahead as regarded future requirements. He had been in great hope that they would have had a respite from the attacks of the London County Council, and that, with the report of the Royal Commission, they would have had peace, at all events for a time. This, however, was not to be, for he had no doubt whatever that the Progressives would carry at the meeting of the London County Council that day the recommendation which would be brought up from their Water Committee, that a Bill should be promoted in the next session of Parliament for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies. He could not help saying he thought that this was a wanton proceeding; for the Water Committee of the Council themselves hinted that they probably would not be successful with their Bill, and personally he had no doubt whatever that the new House of Commons, like the old, would summarily reject any Bill which was not based upon the recommendations of the Royal Commission that had so recently, and so fully, reported upon the whole question of the water supply of the Metropolis. He now came to what was, perhaps, a serious thing for the time being, and one which might become more serious unless matters were expedited. In the last paragraph of the Directors' report, the attention of the proprietors was drawn to the circumstance that the accounts did not bear the signature and certificate of the Official Auditor. This was not due to any objection which Mr. Stoneham had made to the accounts, but because no decision had yet been obtained as to the two objections which were raised by that gentleman on the previous accounts. One objection was to an expenditure which their Company incurred, in conjunction with all the other Metropolitan Water Companies, in opposing on Standing Orders in the House of Commons the Bill which was introduced in the session of 1899 for authorizing the London County Council to purchase land and to construct gigantic reservoirs in Wales. The Directors, in joining with the other Water Companies in opposing the Bill at an early stage, had no doubt but that they were acting within their powers; and they considered that, in doing so, they were taking the best means of safeguarding and protecting the proprietors' interests, and of avoiding the much greater expense of having to oppose the Bill at a later stage. It appeared to the Board to be entirely a matter of policy and management; and they could hardly believe that any arbitrator would decide that they were to sit with folded hands, and do nothing to protect the enormous interests committed to their charge—interests which were being so openly attacked. The delay in obtaining a decision on this point was not owing to any wish or fault of the Directors; but he was advised that it was entirely in consequence of Mr. Stoneham's omission to specify, as he was required to do by the Act of Parliament, the manner in which he desired the accounts to be altered, although it had been pointed out to him, and he had been asked to state his actual requirements. The Official Auditor's other objection related to the amount of payment made by the Company to what was called the

City Chamberlain's fund—a payment made on the first issue of the debenture stock which was raised under the Company's Act of 1894, which Mr. Stoneham considered was about £600 less than it should have been. As he (the Chairman) explained when addressing the proprietors on a former occasion, this question was complicated by the Company's connection with the Staines Reservoirs Joint Committee; and it also depended on a point which had been raised as to the time when the liability of the three Companies to make their payments to the Joint Committee commenced. The Directors were doing their best to obtain a decision on these various matters; it being most important that they should be shortly settled, as, by the Act of Parliament, no further dividend beyond the one to be passed at this meeting could be declared until the Official Auditor had certified the accounts. He hoped that he had made his explanation clear with respect to the last paragraph in the Directors' report; but he would be glad to answer any questions.

The DEPUTY-CHAIRMAN (Mr. Jackson Hunt) seconded the motion.

The CHAIRMAN, in answer to questions by Mr. Beare and Mr. Rankin, repeated that, unless the Official Auditor certified and signed the accounts, the Directors would not be able to declare a dividend after the one which was to be proposed that day. The dividend would be earned; but the Directors would be powerless to declare it unless they could press the Official Auditor to come to some conclusion so that he might certify the accounts. The Arbitrator had not been appointed yet, because they could not get Mr. Stoneham to say what his requirements were and what alterations he desired made in the accounts.

The motion was then unanimously adopted.

A resolution was afterwards passed declaring a dividend on the consolidated stock for the half year to Sept. 30 at the rate of 10 per cent. per annum, payable, less income-tax, on and after Jan. 5.

Mr. Howson then proposed, and Mr. GUNDRY seconded, a resolution thanking the Auditors for their careful examination of the accounts.

The CHAIRMAN stated that the accounts had, of course, been signed by the Company's Auditors, who had certified them to be correct.

The motion was carried unanimously.

Mr. WAKEMAN-NEWPORT next proposed a vote of thanks to the Chairman and Directors.

Mr. Howson seconded the motion, which was carried unanimously, and suitably acknowledged.

The CHAIRMAN then proposed—"That the debenture stock authorized to be raised by the West Middlesex Water-Works Act, 1899, be, in exercise of the powers conferred on the Company by that Act, hereby created; and that the stock thus created be issued and disposed of by the Directors in such proportions, on such terms and conditions, at such times, and in such manner, consistent with the provisions of the said Act, as may be by the Directors be deemed expedient from time to time."

The DEPUTY-CHAIRMAN seconded the motion, which was carried unanimously.

The proceedings then terminated.

### PORTSMOUTH WATER COMPANY.

#### A Concession to the Consumers.

The proceedings at the Half-Yearly General Meeting of the above-named Company on the 22nd inst. will be of more than usual interest, inasmuch as the shareholders will be asked to make an important concession to the consumers in the shape of a reduction in their rates. According to the report just issued by the Directors, they propose that the charge for water supplied for domestic purposes shall be based, as from the 29th of September, upon the rateable value of the premises supplied, instead of, as heretofore, upon the full rent, or annual value; at the same time reserving the Company's right to revert to the higher scale. It appears that this question was raised by the Corporation some time back, and though the Directors have always been advised by their Solicitor that their charges were justified by their Act of Parliament, and though they have already made many concessions to the consumers by the remission or reduction of extra charges, they are of opinion that the time has come when the shareholders may, with safety to their maximum statutory dividends, permit the public to still further share the increased profits arising from the undertaking by voluntarily conceding to them this further important reduction. With regard to the works, during the half year 2953 yards of additional service-mains were laid in new roads; making a total of about 46 miles of trunk-mains, and 129 miles of service-mains. The number of additional services connected with the mains during the half year was 560; making the number of premises now under constant supply by the Company in all the districts 40,316. The quantity of water pumped from Havant and Bedhampton in the six months was 1,426,957,000 gallons, or an average daily supply for all purposes of 7,840,000 gallons; being an increase of 497,000 gallons daily, as compared with the corresponding period of last year. The quantity supplied for domestic use was equal to an average of 30½ gallons per diem per head of the population, exclusive of all supplies by meter. The number of fire hydrants now fixed in the Company's district is 3187. The Engineers (Messrs. J. Quick and Son, M.M.Inst.C.E.) report that the engines, boilers, reservoirs, and works are in good order. In view of the rapid growth of the business of the Company, the Directors have resolved to construct a new rising main from Bedhampton to the reservoirs on Portsdown Hill, and another from Hilsea to East Southsea. The accounts accompanying the report show that the balance on the profit and loss account is £28,277, out of which the Directors recommend the payment of the full statutory dividends. After reductions for void houses, &c., this will leave a balance of about £12,515 to be carried forward.

A Pan-American Exposition will be held in Buffalo, New York, from the beginning of May to the end of October next year. There will be a large building for electrical exhibits, and in it will be the service plant, for the transformation and distribution of the 5000-horse power transmitted from Niagara Falls, for lighting and power purposes. There will also be the commercial exhibit, showing articles possessing distinctive merit, whether in respect of workmanship, novelty, or usefulness.



## HARROGATE CORPORATION WATER SCHEME.

## The Agreement with Leeds—Provision for Ripon.

A Special Meeting of the Harrogate Town Council was held last Tuesday, to receive and consider a report from the Water Committee as to the arrangements that had been made with the Parliamentary Committee of the Leeds Corporation respecting the Bill which Harrogate proposed to promote in the ensuing session of Parliament, to acquire an additional water supply from the Agil and Arnagill on Lord Masham's estate. Alderman Fortune reported that the Water Committee had arranged with the Leeds Corporation respecting the water supply from the Burn. The difficulty they had to contend with in the first instance was that they thought Harrogate ought to have taken the water from the Skell, instead of the Burn. The Harrogate deputation clearly proved to Leeds that if Harrogate took the water from the Skell, the levels were not suitable for gravity to their reservoirs; and eventually arrangements were made that Leeds should take the Skell, and Harrogate the portion of the Burn they had mapped out for their gathering-ground. This, they estimated, would give 3 million gallons per day; but, of course, compensation would have to be taken out of this. They were, however, desirous of limiting their demand, so far as the Burn was concerned, to 2 million gallons per day, or 730 million gallons a year. At the same time, if there were a certain number of days when Harrogate did not take any water from the Burn, they would be allowed to take 2½ million gallons per day until they had made up the deficiency, but not to take more than 730 millions in a year. This Harrogate agreed to; and then came the question of the Ripon supply. The Leeds reservoirs were at a rather lower elevation than the Harrogate ones. As a consequence, Leeds could not very well supply Ripon to advantage. As Harrogate had offered previously to supply Ripon, it was decided that Harrogate should give that supply. The deputation pointed out to the Leeds representatives that the Ripon supply ought to be over and above the 2 million gallons per day; and it was eventually arranged that Ripon's supply should be in addition, and that Ripon, if they desired it, should have 150,000 gallons per day—making a total of 784,750,000 gallons in the year for Harrogate and Ripon. Harrogate had fixed the price at 6d. per 1000 gallons. Leeds and Harrogate had agreed to support both Bills. It was decided to promote a Bill accordingly.

## PROPOSED WATER BOARD FOR ILKESTON AND HEANOR.

## The Unexpected Difficulties.

The consideration of the question of obtaining a supply of water from the Meerbrook Sough, either alone or in conjunction with the Heanor District Council, was the object of a special meeting of the Ilkeston Town Council last Tuesday. It was explained by the Town Clerk that the scheme could be carried through by the promotion of a Bill; but the difficulties were of no light character. From the information laid before the members, it appeared that the Sough Company were in a somewhat unfortunate position in regard to the water of the Sough. On the one hand, the mineowners found they were under no obligation to allow their water to flow into the Sough. On the other, the landowners below them were entitled to all the water which flowed into and out of the Sough. If this view was correct, the Joint Board, on acquiring the Sough Company's undertaking, would have by the Bill to deprive the mineowners of their right to prevent the water flowing into the Sough; and in this case they would have to pay compensation. They would also have to pay compensation to the owners down the river. It was evident that the Council would undertake the position of the owners of the land that joined the Sough, because it was not for their convenience that the water was taken into the Sough; but as they knew it was to drain the working in order that the miners might work. Therefore the owners of the land through which the Sough passed clearly had no legal claim to any legal compensation for allowing the water to flow into the Sough. Consequently, it was probable that the mineowners were at the present time under no obligation to see that the water they discharged into the Sough was of the high quality it at present possessed. So it would also be necessary to prohibit them from polluting it; and for this prohibition they might successfully claim compensation. The Corporation, in their Bill, would provide a clause to prevent people from polluting the stream or any feeder running into the stream. These items of compensation might considerably increase the cost of the scheme, and in any case the cost would be difficult to estimate. On the whole the Bill would be, in the opinion of all who had been consulted, a difficult one to get through Parliament; and the question of providing compensation water was fraught with the greatest difficulty. This was in brief the information the Town Clerk had to impart for the guidance of the Council. After discussion, a resolution was passed, approving of the idea of a petition to Parliament for the granting of power to obtain the proposed water supply. An amendment was moved deferring the matter for twelve months; but on being put, the resolution was carried.

**Salford Water Supply.**—Considerable dissatisfaction having arisen in Salford at the existing arrangement with Manchester for the supply of water to the borough, a special meeting of the Town Council was held last Wednesday, to consider the advisability of promoting a Bill next session in reference to the matter. Its principal objects will be the following: To amend the Salford Improvement Act, 1862, so as to place an obligation on the Manchester Corporation to supply to the Salford Corporation, at a price fixed by an independent authority, such quantity of water in bulk as they may require for all purposes, in addition to the 2 million gallons specified in the Acts contained in the schedule to the Salford Improvement Act, 1862; to fix or provide for the fixing of the point or points at which, and the pressure under which, such supply shall be given; to empower the Corporation to borrow money for, or in relation to, any of the purposes of the Bill, and to enter into and fulfil agreements for such purposes. The Mayor (Alderman Rudman) observed that, owing to the deficient pressure of water available at a recent fire, the brigade had been obliged to have recourse to a private reservoir supply near. There was a community with an enormous population, increasing every year; and they could not possibly go on under the present conditions. He moved that the Bill be sanctioned; and this was agreed to.

## NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

I think the most important subject for comment this week is the price of coal. "The price of coal is coming down, and frantic efforts are being made to conceal it," was the remark of a coal merchant to me two days ago. He informed me that he can buy coal for forward delivery 5s. per ton cheaper than he could two months ago; that he is being pressed to buy, as if somebody wanted to unload; and that one traveller in particular had endeavoured to get him to take a certain coal, and was non-plussed by the remark that the same coal could be had for 1s. 1d. per ton less than he was offering it at. The information is not mine; but it is concurrent with my observation of the coal market. The pity is that so much has been contracted for at a high figure.

To all appearance, the last has not been heard of the recent testing by Mr. John Hunter, of Edinburgh, Public Analyst for Dalkeith, of the gas supplied by the Dalkeith Gas Company. On Thursday, Mr. Hunter published in the "Scotsman" a letter in which he seeks to put right what he considers erroneous assertions. The statement that he had refused information as to where and how his tests were made he says is seriously misleading, because he informed the Manager that, if he got the consent of his client, he would most willingly give him all the information he desired. Well, if this is not refusing to give information, I cannot understand what it is. Mr. Hunter subscribes himself "Public Analyst," and he speaks of a client. If he tested the gas in his capacity of Public Analyst, his client could be no other than the Town Council; and the Gas Company can obtain from the Town Clerk a copy of Mr. Hunter's report to the Town Council, which should contain the particulars they want. A serious difficulty, however, arises when it is recollected that Mr. Hunter is not Gas Examiner for Dalkeith, there being no such office, but simply Public Analyst; and that the statutes which deal with analysis require that notice shall be given to the person whose goods are to be analyzed. This was not done in the present instance; and, without going the length of saying that Mr. Hunter has done anything which can be called blameworthy, I think he will himself see that he has not—perhaps he will say it is his client who has not—treated the Gas Company with perfect fairness. I understand it has been widely advertised in Dalkeith that the tests were made under the new conditions laid down by the London Gas Referees. That is very strange. Who, in Dalkeith, is so much interested in the purity of the gas supplied by the Company, as to be prepared to spend £200 or £300 in fitting up a photometer-station for, so far as is known, one test only? I imagine it was a portable photometer which was used; but I do not think the London Gas Referees have yet been permitted to found upon the results obtained by the portable photometer. I expect it comes to this—that Mr. Hunter was simply playing at analysis; and that there were so many essential conditions wanting from his process that, if he were to attempt to make the slightest use of his results, he would make a laughing-stock of himself. I do not say anything about such matters as the condition of the fittings, because these will occur to everyone as possibilities which would affect the illuminating power of the gas; but I wish to raise the question of how it would be possible to produce gas of 15·9-candle power from coal, of which there were three varieties, used in equal proportions, yielding 33, 25, and 18 candle gas respectively. These are the coal conditions in Dalkeith. The illuminating power might be reduced by the drawing in of air; but there is no air admixture at the Dalkeith Gas-Works. Is it possible, then, to get a photometer reading of 15 candles from a gas of 25 candles? If it be, Mr. Hunter should be aware of it; and his knowledge should make him cautious in putting forward his Dalkeith results. If the Gas Company cared, I think they could easily put a stop to the circulation of this accusation against their gas; but possibly their knowledge of the motive upon which it is founded may influence them to take no further notice of the matter. What this motive may be, I cannot say; Mr. Hunter not having disclosed who his "client" is. I observe that the Town Council of Dalkeith have given notice of an intention to apply for a Provisional Order empowering them to supply electric light within the burgh. Could this have anything to do with it? I hope not; for the day is surely past when such a benighted policy as this would be could be expected to work out beneficially to anyone.

I fear that the community of Falkirk are far from being stable in their ways. They speak, at election times, of an "old gang" and a "new gang;" the expressions, as I understand, being descriptive, the former of the party who favour a policy of large schemes, and the latter of the party who may be called "Little Falkirkers." These got into power about three years ago; but such has been the irony of their fate that, during all the days of their continuing in office, they have never been free from the necessity of considering schemes of public service involving large outlays. On their initiation, both new gas-works and new water-works are to be erected. Having received powers for their construction, and reached the point of considering details of the schemes, the community have appeared to turn round, and have refused to return Bailie Cook Rennie to the Town Council; and he accordingly falls out of the position of Convener of the Works Committee of the Gas Commission. Having effected this purpose, and defeated another member of the "new gang," the purpose for which these steps were taken became manifest at a meeting this week, when the subject of the site of the new gas-works was revived. I understood it had been agreed that they were to be erected at a place called Thornhill, outside the burgh. Now, when Bailie Cook Rennie is out of the Council, the proposal is made that they should be built at Parkhouse, a site within the burgh, where the new gasholder is. This site was bored and reported upon; one expert saying it was a bad foundation, and too small, and the other being in favour of it. The suggestion made this week was that the reports of the borers should be laid before the whole Gas Commission. The proposal was quite a fair one, if those reports had not hitherto been before the Commissioners. If they had, there was no need to ask for their production; if they had not, the discussion which took place as to the suitability or otherwise of the Parkhouse site was altogether irregular. This was pointed out; and on the new Convener of the Works Committee (Mr. H. Russell) undertaking to lay everything before the members, and expressing the opinion that, in the matter of site, they should be guided by some engineer of standing, the subject was allowed to drop. The new Convener's view is the one to be commended. The Commissioners have not,



however, gone so far as they have done without advice; and so I suppose what is suggested is that some engineer of outstanding experience should be called in to advise the Commissioners upon the sites, as they can be judged of from the reports which are called for. If this be the course followed, there will then be finality in the matter of site, and progress may be looked for in this great work. Whatever may be the decision, it will, in every sense, be to the advantage of the undertaking if the period of oscillation be past, and the Corporation, having made up their mind, should stick to it. They need be in no doubt as to going in for a most liberal scheme, because the district not only can well afford, but actually requires it.

Matters are not yet in shape in connection with the Greenock Corporation Gas Trust. At a meeting yesterday, Provost Black proposed that the Gas Trust be composed of the whole members of the Board, and that Bailie Campbell be appointed Convener. Mr. McCallum thought it a good suggestion that the Gas Trust should contain all the members; and this, after discussion, was agreed to. The question of the convener-ship was then considered. Provost Black said that Mr. Mitchell had been Convener for four years, and it was advisable that a change should be made. He moved that Bailie Campbell be appointed. Bailie Baxter moved an amendment. There had been a great deal of mud thrown at this Committee, and particularly at the Convener, who had not yet had an opportunity of clearing himself. If Mr. Mitchell came out, he would do so under false impressions. He (Bailie Baxter) thought three years a long time to hold a convener-ship, and he would vote against Mr. Mitchell on this point; but, on the other hand, he should be allowed to justify his position. He moved that Mr. Mitchell be retained as Convener. Mr. McCallum seconded. Mr. Mitchell said the inference to be drawn from the discussion was that he was considerably responsible for the state of affairs at the gas-works. He wished to say that a Committee of nine members had been appointed to inquire into the muddle; and he asked them if they had found anything which he had done to militate against the Gas Trust. He now wished to try and put himself right if he was Convener—not, however, that he admitted having put matters wrong. Bailie Campbell said he would have remained entirely passive in this matter; and if he consulted his own judgment he would not seek the position. No one doubted the abilities which Mr. Mitchell had shown in his duties as Convener. He himself had always been able to discern that his actions were actuated by the highest motives. He thought that Committees on all important points should have the fullest confidence of the Convener; and when matters were to be decided, the responsibility should be, not on single members, but on the whole Committee. Provost Black said it was quite true that Mr. Mitchell had lost the confidence of his Committee. On a vote being taken, Bailie Campbell was appointed Convener by 13 votes to 8. If ever a change of convener-ship could be justified, I think it is this one. The appointment of the Collector to be Gas Manager was sufficient to condemn the policy of the Gas Committee.

The Leven (Fife) Gas Company have resolved to increase their stock by £5400 in £1 shares. The existing capital is £3600. The Company are arranging to give a supply of gas to the neighbouring district of Methil, and have entered into contracts for the erection of a new gas-holder and tank, at a cost of £5000. For 22 years the Company have

paid a dividend at the rate of 10 per cent.; and since 1897 the dividend has been equal to 15 per cent. on the original capital.

The Dundee Town Council are giving notice of a Bill which may have a far-reaching effect upon the gas supply of the city. In view of recent "unseemly" discussions in the newspapers, it has been resolved to insert in the Bill a provision declaring that changes in the price of gas will be for the current financial year. This may or may not be the best way out of the difficulty which has been experienced this year over a retrospective increase in the price of gas; but whether it be or not, it assuredly will not do away with grumbling if, and when, an increase is made retrospective. Then the Corporation are to take authority to lower the illuminating power of the gas; 18 candles being fixed as a minimum. This power, it was explained, may not be exercised. It is wonderful how the desire to have gas of lower illuminating power has spread in Scotland. We are all, to a very large extent, the children of circumstances.

The Carnoustie Burgh Commissioners met on Wednesday to consider the resolutions adopted at the September and October meetings in favour of the adoption of the Burghs Gas Supply Acts. Provost Ramsay said there was an impression abroad that the proposal for the transfer had originated with the Directors of the Gas Company. This was not the case; it had originated entirely in the Commission. Bailie Winter remarked that the original cost of the gas-works was £4000; and they were now valued at £8000. Last year the price charged for gas was 4s. 2d. per 1000 cubic feet; ten years ago it was 5s. 10d. Mr. Soutar said that, so far as he could judge, the feeling in the burgh was in favour of a sale by mutual agreement, instead of arbitration; and he moved that they adjourn the meeting till Feb. 15 next, and that a Committee be appointed to request a conference with the Directors of the Gas Company, and to report. This proposal was unanimously adopted.

There is a strong Socialist element in the community of Aberdeen, which probably explains the boldness of the attitude adopted there by the Gas Workers and Labourers Union. A meeting of the Aberdeen branch of this body was held on Tuesday night, at which a discussion took place upon the manner in which their demands had been treated by the Corporation Gas Committee. About three months ago, it was said, the branch sent a petition to the Gas Committee, asking for an increase of 6d. per shift for night workers, and 2s. per week for day workers, and also dealing with other matters. Their "demands" were not recognized; and at the meeting it was agreed to send the following resolution to the Committee: "Seeing it is now over three months since we, the Aberdeen gas workers, presented a petition to the Gas Committee of the Aberdeen Town Council, we sincerely regret the dilatory manner in which our demands have been dealt with. We express our unanimous determination for these demands being conceded; and we have instructed our Secretary to send a copy of this resolution to the Gas Committee, and demand a reply within fourteen days." It will be observed that on one occasion the application is spoken of as "a petition," but that, in the resolution, it is "a demand." A demand truly, and one which they express their "determination" shall be conceded. Who manages the gas undertaking in Aberdeen? Unless they were sure of strong support in influential quarters, the workers would scarcely dare to address the Corporation in this way.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1258.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.															
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 8
100,000	10	"	7½	Do. 7 p.c.	18-14	..	5 7 2					People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	500,000	100	June 1	6	River Plate Ord.	10-10½	..	6 13 4
200,000	5	Nov. 14	6	Bombay, Ltd.	6-6½*	½	4 12 4	851,070	10	Oct. 12	7	Do. 4 p.c. Deb.	99-101	..	3 19 8
40,000	5	"	6	Do. New, £4 paid.	4-4½*	½	5 6 8	250,000	Stk.	June 28	4	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	250,000	10	Sept. 28	8	Sheffield A.	234-239	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	135,000	Stk.	Sept. 14	10	Do. B.	234-239	..	4 3 8
50,000	"	"	5	Do. 5 p.c. Pref.	187-142	..	3 10 5	209,700	"	"	10	Do. C.	232-237	..	4 4 5
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	447,427	"	"	10	South Metrop. 4 p.c. Ord.	125-128	-2	4 3 3
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	5,641,885	Stk.	Aug. 15	5½	Do. 3 p.c. Deb.	94-97	..	3 11 0
226,320	"	"	7	Do. A. Ord. Stk.	150-160	..	4 7 6	1,520,000	"	July 12	3	Southampton Ord.	107-112	..	4 9 3
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	117-118	..	4 4 9	380,940	Stk.	Nov. 14	5	Do. 4 p.c. Deb.	117-122	..	3 5 7
420,000	20	Sept. 28	10	British	38-40	..	5 0 0	70,825	"	July 12	4	Tottenham } A. 5 p.c. 112-117	..	5 2 7	
60,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	120,000	Stk.	Aug. 30	6	and } B. 3½ p.c. 80-85	..	5 5 11	
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 8	250,520	"	June 14	4½	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
500,000	Stk.	Oct. 12	6	Buenos Ayres (New) Ltd.	8-8½	½	7 1 2	61,550	"	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Cagliari, Ltd.	98-100	..	4 0 0	182,880	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Cape Town & Dis., Ltd.	23-25	..	6 12 0	149,900	10	"	5	WATER COMPANIES.			
100,000	10	Sept. 28	8	Do. 6 p.c. 1st Mort.	134-14½	..	5 10 4					Chelsea, Ord.	303-308	..	3 11 5
50,000	50	Nov. 2	6	Commercial Old Stock.	58-55½*	..	5 9 1	780,404	Stk.	June 28	11	Do. 6 p.c. Pref.	157-162	..	3 1 9
550,000	Stk.	Oct. 12	12½	Do. New do.	200-210	..	4 12 10	150,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
286,425	"	"	9½	Do. 4½ p.c. Deb.	133-138	..	3 5 8	1,750,540	Stk.	Oct. 12	4½	Do. 4 p.c. Deb.	143-148	..	3 0 10
288,237	"	June 14	4½	Continental Union, Ltd.	175-180	..	5 0 0	797,687	"	June 14	4½	East London, Ord.	198-198	..	3 10 8
600,000	Stk.	May 31	9	Do. 7 p.c. Pref.	168-173	-2	4 0 11	700,000	"	June 14	4	Do. 4½ p.c. Deb.	147-152	..	2 19 3
200,000	"	"	7	Croydon A 10 p.c.	—	..	—	310,000	Stk.	Sept. 28	4	Do. 5 p.c. Deb.	98-100	..	3 0 0
173,400	Stk.	"	11	Do. B 7 p.c.	—	..	—	708,000	Stk.	Aug. 30	14	Grand Junction 4 p.c. max.	110-113	..	3 10 10
550,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	117-122	..	4 6 1	1,043,800	100	June 28	10½	Kent	130-135	..	2 19 3
60,000	"	"	5	Do. 5 p.c. Pref.	130-135	..	3 14 1	850,000	Stk.	Sept. 28	4	Do. New, 7 p.c. max.	200-210	..	3 6 8
486,030	10	July 27	11	European, Ltd.	19-20	..	5 10 0	1,000,000	Stk.	Aug. 15	14	Lambeth, 10 p.c. max.	293-298	..	3 10 6
354,030	10	"	11	Do. £7 lds. paid.	14-15	..	5 10 0	902,300	Stk.	July 27	4	Do. 7½ p.c. max.	205-210	..	3 16 2
14,995,075	Stk.	Aug. 15	4½	Gas 4 p.c. Ord.	96-98	-2	4 9 9	489,200	100	"	7½	New River, New Shares	127-130	..	3 1 7
2,600,000	"	"	4½	light 3½ p.c. max.	92-94	..	3 14 6	1,000,000	Stk.	Aug. 15	14	Do. 4 p.c. Deb.	407-412	..	3 8 0
2,739,735	"	"	4	and 4 p.c. Con. Pref.	114-117	..	3 8 6	1,000,000	Stk.	July 27	4	South-Ord.	128-133	..	3 0 2
8,993,975	"	June 14	3	Coke 3 p.c. Con. Deb.	94-96	..	3 2 4	1,000,000	Stk.	Aug. 15	14	wark 7½ p.c. max.	203-208	..	3 12 1
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	15-14	..	5 14 4	1,000,000	Stk.	Aug. 15	14	and 5 p.c. Pref.	155-160	..	3 2 6
3,800,000	Stk.	Nov. 14	10	Imperial Continental	201-206*	-1	4 17 1	1,019,585	Stk.	Oct. 12	10	Vauxhall 4 p.c. A Deb.	128-133	..	3 0 2
478,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100-102	..	3 8 8	1,155,066	Stk.	June 14	10	West Middlesex	278-283	..	3 10 8
75,000	5	June 14	3	Malta & Medn., Ltd.	43-5½	..	5 14 5	200,000	"	Sept. 14	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 1
550,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	105-108	..	4 12 7					Do. 8 p.c. Deb.	97-99	..	3 0 7
250,000	100	"	4	Melbourne 4½ p.c. Deb.	104-106	..	4 4 11					* Ex. div.			
641,920	30	Nov. 14	3½	Monte Video, Ltd.	10-11*	..	6 7 4								
667,846	Stk.	Aug. 30	9½	Newcastle & Gateshead Con.	210-215	..	4 6 1								
239,855	Stk.	June 28	8½	Do. 5½ p.c. Deb.	104-107	..	3 5 6								
250,000	5	May 16	8	Oriental, Ltd.	7-7½	..	5 6 8								
135,000	5	"	8	Do. New, £4 10s. pd.	52-6½	..	5 15 3								
15,000	5	"	8	Do. do. 1879, £1 pd.	12-1½	..	4 11 6								

† Next dividend will be at this rate.



## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 17.

**Sulphate of Ammonia.**—There has been a firm market throughout the week; and, although prices have been somewhat irregular, values have improved—the closing quotations being £10 15s. to £10 17s. 6d. per ton f.o.b. at the ports. Consumers have been slow to follow the advance, and have done only a small proportion of the business, the bulk having again been taken for "covering" purposes. Scotch makers, being already well sold for the month, have been very firm; but elsewhere makers have offered their production freely. Direct inquiry has been mainly for delivery ahead; but, so far, buyers have for the most part declined to pay the prices required. There has, however, been speculative buying over the spring months at £11 5s. per ton, and at the close £11 7s. 6d. is required, ordinary terms. London, Beckton terms, has also been advanced to £11 7s. 6d. per ton in the same position.

**Nitrate of Soda** is quiet but steady at 8s. 4½d. to 8s. 6d. per cwt., according to quality, on spot.

LONDON, Nov. 17.

**Tar Products.**—The position, generally speaking, is not of an encouraging nature; the tendency being to lower prices. Many distillers are now bemoaning the excessive prices paid for tar a few months ago; and, in one instance at least, serious consequences have resulted. Pitch is moving off freely, but, in sympathy with coal and other fuels, is easier in value. Carbolic acid is a little stronger perhaps, although the quotations vary somewhat, having regard to the port of shipment and the position of makers. Benzol is steady. Creosote is weak. Naphthalene continues in good inquiry. Anthracene is in slightly better request; but quoted prices are only nominal, as very little business is being done.

The average values during the week are: Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 2d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 7d. Naphthalene, 85s.; salts, 65s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is firmer, with a good deal of inquiry; important business being reported for prompt and forward delivery at an average value at all ports of about £10 15s. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The question of prices has again been under the consideration of Lancashire coalowners during the past week; and the present list basis has been practically confirmed. Competition from outside districts, however, continues very keen; and one or two important Lancashire markets—such as Oldham and Rochdale—are being so vigorously attacked that consumers there are obtaining a large proportion of their supplies from Yorkshire, Derbyshire, or Staffordshire, at prices under the

quotations of local collieries. Lancashire coalowners, however, appear to be satisfied with their position; and as they are not accumulating stocks of any great weight, they see no reason why they should reduce prices with the object of securing more business. But in some of the more far-seeing quarters, rather a bad time for Lancashire collieries is being looked forward to in the not very distant future, unless some early steps are taken to meet the growing outside competition. The better qualities of round coal are not just now in more than limited request; and stocks are increasing, though they are still far below the average for the time of the year. Common round coals are in fair inland demand for steam and forge purposes; but the shipping trade has fallen off decidedly, and this class of fuel is becoming more plentiful on the market. Current prices for all descriptions of round coal are being well maintained on the basis of about 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. There is, however, little doubt that in many cases collieries would be disposed to entertain forward contracts at some reduction on present prices; but there is no great eagerness on the part of either merchants or large users to enter into any heavy forward engagements. As to engine fuel, supplies of the commoner sorts of slack continue plentiful, and are offered at very low figures; but the better sorts are fairly well maintaining late rates, and Lancashire collieries state that the position is rather improved than otherwise, owing to the larger requirements in the cotton trade now that the mills are again getting into work. At the pit, the Association list basis remains at about 10s. to 10s. 6d. per ton for the best qualities of slack; but important forward contracts have been settled during the past week, at about 9s. to 9s. 3d. For shipment, prices are easier; the commoner sorts of steam coal being obtainable at about 15s. 3d. to 15s. 6d. per ton, while the best qualities are to be bought at 15s. 9d. to 16s., delivered at Mersey ports.

**Northern Coal Trade.**—There is a steadier demand in the coal trade of the North; but the supply is fully adequate, and prices in some cases are a little weaker. In the steam coal trade, this is marked; and best Northumbrian steam coals are from 16s. 3d. to 16s. 6d. per ton f.o.b., second-class steams about 9d. lower, and steam smalls 8s. 6d. per ton. In the gas coal trade, there is now a very heavy delivery on the long contracts; and the quantities that have been sent out of late must have enabled the large consumers to accumulate considerable stocks. The supply of gas coals is not so limited as usual; but the contracts take up the bulk of the production. For odd cargoes, 16s. 3d. to 16s. 6d. per ton f.o.b. is now the current quotation. In coke, there has been a reduction of the output, which has steadied prices. Best Durham coke for export is quoted from 23s. to 24s. per ton f.o.b.; and blast-furnace coke is about 22s. at the furnaces. Gas coke is now in larger supply; but so far the production seems well taken up, and the price that is quoted is still from 24s. to 25s. per ton f.o.b., though contracts run at lower prices.

**Scotch Coal Trade.**—Trade is wavering. It is said by those who speak in its name, that it showed signs of weakness for about a week, but is now firming up again; that the reduced prices had brought out the orders which had been held up; and that the position is improving. On the other hand, prices are still on the decline; and those who are outside the

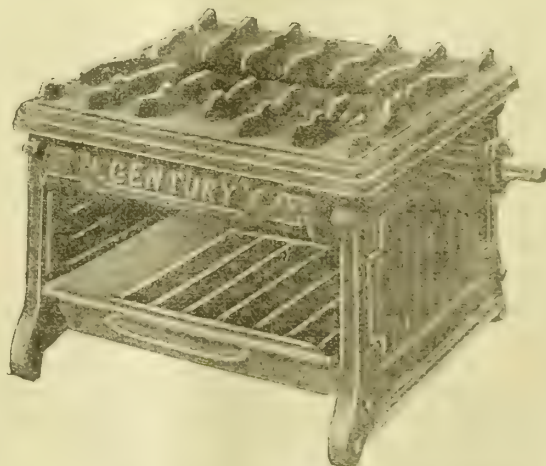
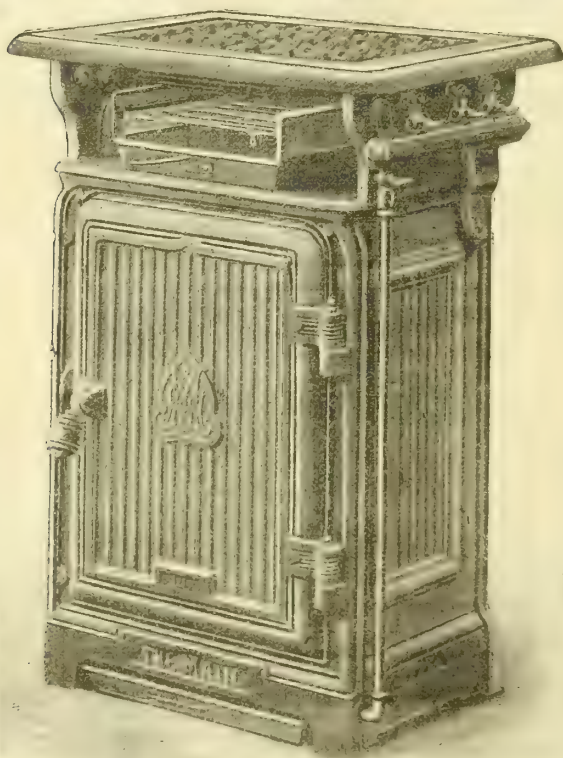
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trade see no indication of them firming up. The quotations are: Main 13s. to 13s. 6d. per ton f.o.b. Glasgow, ell 14s. to 15s., and splint 15s. 6d. to 16s. The shipments for the week amounted to 195,657 tons—a decrease of 24,687 tons upon the previous week, but an increase of 61,623 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,573,407 tons—an increase of 1,928,280 tons upon the corresponding period of last year.

**Reduction in the Price of Gas at Penistone.**—Like most other suppliers of gas, the Penistone Gas Company a few months ago were compelled to raise their price to the extent of 7d. per 1000 cubic feet. They have now notified their intention of taking the first step in the direction of a return to the old figure (4s. 2d.), by making a reduction of 3d. from the commencement of 1901.

**Abandonment of the Water-Gas Project at Darlington.**—In view of the resolution passed at the meeting of ratepayers held at Darlington on the 8th inst., objecting to water gas (*ante*, p. 1232), the Town Council have not confirmed the report of the Gas Committee recommending the introduction of plant for the manufacture of this gas. The Committee had made a thorough inspection of the different systems, and had accepted the tender of the Economical Gas Apparatus Construction Company, for plant equal to the production of 600,000 cubic feet per diem; but, as the result of the above-mentioned proceedings, the firm have lost it.

**Sales of Stocks and Shares.**—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, £30,000 of new ordinary stock of the Wandsworth and Putney Gas Company (being part of the additional capital authorized by the Company's Act of last session), ranking for a standard dividend of 3½ per cent., subject to the sliding-scale, and entitled, under the present price charged for gas, to a dividend of £5 1s. 6d. per cent. Purchasers were found for £28,400 of the stock; the prices realized being £100, £101, £102, and £103 (one lot) per cent. At Leamington, last Thursday, Mr. J. A. Locke sold some £20 "A" shares in the Leamington Priors Gas Company at £47 12s. 3d., £48 6s. 3d., and £48 apiece; some "B" shares in the Company fetching £36 and £36 1s. 3d. each. On the same day, Mr. C. Maude offered for sale at Northallerton, 14 fully-paid shares in the Northallerton Consumers' Gas Company. The first three £5 shares were sold for £8 2s. 6d. each, while the remainder fetched an average of £8 2s. 6d. per share. On Thursday, Messrs. Day and Son disposed of £4000 of ordinary stock and £225 of 3 per cent. debenture stock in the Maidstone Gas Company. Fifteen £100 lots of ordinary consolidated stock realized from £198 10s. to £200 each; forty £50 lots, from £99 to £100 each; and 26 £25 lots, from £49 10s. to £49 15s. apiece. Fifteen £100 lots of debenture stock realized £75 each; fourteen £50 lots, £37 10s. apiece; and one £51 lot, £39. Last Tuesday, some 7 per cent. shares in the Coatbridge Gas Company were offered for sale by auction at Coatbridge, in lots of 10. One lot realized at the rate of £14 11s. per share; four lots, at £14 10s. 6d.; 23 lots, at £14 10s.; 10 lots, at £14 9s. 6d.; and one lot of eight shares, at £14 11s. 6d.

**Public Control of Sources of Water.**—At a recent meeting of the Warwickshire County Council, the Sanitary Committee presented for consideration a scheme for the amendment of the law as affecting sources of water supply prepared by the County Councils Association. The proposals are: (1) The Local Government Board to have the power, on the application of the council or councils of one or more counties or county boroughs, after due inquiry held on that behalf, to (a) constitute an authority for the purposes hereafter mentioned; and (b) to define the area within which such authority shall exercise its powers and functions—the authority to include, in such proportions as may be agreed upon, or as the Local Government Board may determine, members elected by administrative counties, county boroughs, and non-county boroughs situate within the area. Urban district councils or rural district councils within the area may be represented either directly or indirectly by their representatives on the county council. (2) They will be powers and functions of authority to promote and oppose Bills; to levy rates and raise loans under proper safeguards; to enforce the Rivers Pollution Prevention Acts; to protect sources of water supply in the area; to create water districts; and to ensure any locality within the area being supplied at reasonable rates by any authority or company taking water for sale from within the area. The power of the authority to execute works or to undertake the supply or distribution of water to be excluded in terms. All existing undertakings, it is suggested should be saved from interference by the authority. The matter was referred to a Sub-Committee of the County Council.

**Lambeth Water-Works Company.**—The report of the Directors for the half year ended Sept. 30 states that during that period 2239 houses and other supplies of water, estimated to yield an annual rental of £4934 15s., were connected with the Company's works, as compared with 2406 houses, &c., producing a rental of £5580 9s., laid on in the six summer months of 1899. The revenue account, compared with the corresponding period of last year, exhibits an increase of £3744 in the water-rents, &c., and of £3661 in the ordinary expenditure. The surplus transferred from the revenue to the dividend and interest account is £88,670. There is to the credit of the latter account, after payment of interest on the debenture stock, and the Company's contribution towards the cost of works of intercommunication, an available balance of £83,849. The Directors have decided to transfer the sum of £3000 to the contingency fund (which will then stand at £43,000). They recommend that a dividend at the prescribed rate of 7½ per cent. per annum be paid on the shares issued under the Act of 1856; that a dividend at the prescribed rate of 10 per cent. per annum be paid on all the other share capital; and that a payment of 5s. per cent. (being at the rate of ½ per cent. per annum) be made on all the share capital of the Company on account of deficiencies of previous dividends—all less income-tax. A balance of £5966 will remain to be carried forward, after making provision for a payment of £1875 to the Chamberlain of the City of London under the sinking fund clause of the Company's Act of 1886, in respect of debenture stock issued under that Act; and a further sum of £1960, which will shortly become payable to the Chamberlain in respect of the first issue of debenture stock under the Act of 1896.

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SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHED (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETTFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
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BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.



**Bursting of a Tar-Main at Blackburn.**—Last Thursday, consternation was caused in Cardwell Place, Blackburn, by the bursting of a large main, used for carrying tar from the gas-works to a chemical-works, some distance away. The surface of the street was forced up, and smoking jets of tar rose in the air, flooding the street and emitting a very disagreeable stench. Traffic was quickly stopped, and the main shut off. No personal injury was sustained.

**Proposed Extension of the Halifax Corporation Gas Supply.**—At the last meeting of the Halifax Town Council, the Town Clerk was instructed to make application to the Local Government Board for a Provisional Order empowering the Corporation to purchase from the Sowerby Bridge District Council their gas undertakings in the Skircoat and Warley districts for £9181, and the interests of the Elland-cum-Greetland Gas Company in Skircoat for £1100.

**Sudbury Town Council and Oil Lighting.**—At the meeting of the Sudbury Town Council last Tuesday, the subject of the lighting of the Wents by oil was referred to, on the order for the payment of the contractor's bill, amounting to £1 15s. 6d. for lamps, &c., and 17s. 6d. per week for cleaning, lighting, trimming, supplying the oil, and keeping in repair. A member remarked that this was cheaper than gas. Alderman Mauldon called attention to a remark made by Mr. Constable at the last quarterly meeting of the Council, to the effect that by the adoption of oil lighting at the Wents they were "putting the clock back fifty years," and pointed out that in Paris gas was being superseded by oil. The squares and promenades, including the Bois de Boulogne, were very shortly to be illuminated by petroleum. The Mayor (Mr. F. Wheeler) said that the incandescent oil light was the most powerful one in use, and was being largely adopted for private houses. Mr. Constable added that in some places people were going back from electricity to gas.

**Mr. Justice Bigham on the Welsh Coal Trade.**—Mr. Justice Bigham, in opening the commission of the Glamorganshire Assizes at Swansea, last Thursday, referred to the Welsh colliers' stop-day. He said the proposal, as he understood it, was to limit labour with the object of restricting the output of coal, and by this means maintain or increase the high rates of wages. It was not for him, sitting there as Judge, to deliver a lecture upon political economy. Men were entitled in this country to manage their business as they thought fit. Working men who had their labour to dispose of were clearly justified in using all lawful means to get the best price they could for it. Whether abstaining from work was likely to secure a desirable result it was for the men themselves to consider. But his long experience, not only on the Bench but in business, told him that to attempt to control the laws of supply and demand only recoiled upon those who made the attempts. It was like trying to sweep back the sea with a broom. If they worked at this job long enough, the tide in the end would drown them. Better work with the tide than against it. When one remembered how every foreign country and our own Colonies were competing, it must be evident that every day, every hour, that South Wales ceased to produce its wealth, they put into the pockets of the stranger profits which workmen and capitalists in that part of the world ought to be making for themselves.

**Birkdale and the Purchase of the Southport Water-Works.**—Last Tuesday, the Birkdale District Council resolved to join the Southport Corporation and the West Lancashire Rural District Council in promoting a Bill in Parliament to form a Water Board, to acquire and purchase the undertaking of the Southport Water Company.

**Dunedin Suburban Gas Company, Limited.**—The report of this Company for the year ended the 30th of June, states that the balance to the credit of the profit and loss account amounted to £1058; making, with the balance brought forward, £1314. The Directors propose to distribute a dividend at the rate of 1½ per cent. per annum, and to place £400 to the reserve, which will then stand at £1600. There will remain a balance of £267.

**Town Councillors and Contracts.**—At the last meeting of the Bolton Town Council, Alderman Miles asked to be allowed to intervene in the ordinary business in order to move the following resolution: "That a Committee be appointed to consider and report upon the position of members of the Council having interest in contracts with the Corporation, either through a registered company or otherwise; and that the Committee consist of the following members of the Council: The Mayor, the Deputy-Mayor, and Councillors Bailey, Fielding, J. T. Cooper, Flitcroft, and Greenhalgh." He remarked that the matter had been recently discussed at a private meeting; and he said he thoroughly and heartily agreed with the appointment of a Committee for the purpose specified. The motion was agreed to.

**Gas Exhibition at the Drill Hall, Bristol.**—In the "JOURNAL" for the 18th of September, we gave a full account of the opening of a gas and general illuminating exhibition which Mr. T. G. S. Hersey, one of the organizers of the successful display at the Royal Aquarium early in the year, had arranged in Manchester; this being the first of a series to be held in various parts of the country. On Monday last week, a similar exhibition was inaugurated in the Drill Hall, Bristol; and it will remain open till the 6th prox. The special exhibits comprise gas cooking, heating, and lighting appliances by the well-known makers, gas plant, models and photographs, &c., the others being of a more general character. Various miscellaneous attractions have been provided which will tend to make the exhibition popular. An excellent selection of music is supplied by the band of the 7th (Princess Royal's) Dragoon Guards.

**General Gas Company of France.**—The report of this Company for the twelve months ending June 30 shows that the result of the working in that period was a sum of 3,134,037 frs. (£125,361), as compared with 3,028,566 frs. (£121,142) in the preceding year. Adding the balance brought forward (451,585 frs.), there was a total of 3,585,622 frs. (£143,425). Deducting the general expenses, the amount required to pay the interest on the bonds, the Directors' fees, and other charges, there was left a disposable balance of 1,146,957 frs. (£45,878). At the recent meeting of shareholders, the Directors recommended that 300,000 frs. should be distributed at the rate of 7 frs. 50 c. per share; and that the balance of 846,957 frs. should be carried forward, as compared with 451,585 frs. last year. This was agreed to. The dividend declared was 32 frs. 50 c. per share—the same as before; and the reserve fund was increased to 1,539,223 frs. (£61,569).



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AT  
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EXHIBITION.

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WARRINGTON,  
STRATFORD,  
PLYMOUTH,  
DUBLIN,  
BOURNEMOUTH.



**The Mildenhall Gas Company, Limited**, has been registered with a capital of £1635, in £5 shares, to take over the business of the Mildenhall Gas Company, constituted by Deed of Settlement in 1843.

**Price of Gas in London.**—At the usual fortnightly meeting of the Court of Common Council of the City of London last Thursday, the Lord Mayor laid before the Court resolutions from the Gas Consumers' Protection League, protesting against "the exorbitant charges for gas by the Gaslight and Coke Company." On being read, the communication was unanimously referred to the Streets Committee.

**New Water Scheme for Barrow.**—The Barrow Town Council, at a meeting held recently, considered recommendations of the Gas and Water Committee that powers be sought to obtain water from the River Duddon, and that Mr. Mansergh be retained to support the scheme in Parliament. The scheme provides for tapping the Duddon on its upper reach, and raising the level of Slathwaite Tarn by means of an embankment, so that the River Duddon will never be very much interfered with, as the waters of the Tarn flow into it. The cost of the scheme was stated to be about £150,000. The recommendations were agreed to.

**Aldeburgh Corporation and the Water-Works.**—At the last meeting of the Aldeburgh Town Council, a letter received from the Local Government Board on the proposed acquisition of the water-works, and a motion to make application to the Board for their sanction to the borrowing of £5000 for the purpose, to be repaid within 30 and 15 years respectively from the date of borrowing, were under consideration. The Town Clerk (Mr. H. C. Casley) read the letter, which had already been before the Council; and with regard to the other matter, the Mayor (Mr. G. H. Garrett) explained the position in which the whole matter stood. After some discussion, it was unanimously resolved that the Council should, in the ensuing session, promote a Bill authorizing and confirming the purchase, under the provisional contract already sanctioned by the Local Government Board, of the undertaking of the Water Company; and that the Mayor should be requested to convene a statutory meeting of the Council to sanction this step.

**Wath-upon-Deerne Water Supply.**—Mr. W. A. Ducat, one of the Local Government Board Inspectors, held an inquiry at Wath-upon-Deerne, on Nov. 6, in regard to an application of the Urban District Council for sanction to borrow £3000 for the purpose of a water undertaking, including an improved supply to a portion of the parish of Brampton Bierlow, which, though not in the urban district, is within the area of supply. The scheme for which the money is required includes the provision of a storage reservoir capable of holding 175,000 gallons, at the highest point in the district; the object being to improve the supply to an area of 200 houses and about 1000 inhabitants which has hitherto been indifferently served. In the event of any accident occurring to the works of the Deerne Valley Water Company, who, under agreement, furnish the greater quantity of water consumed in the Wath district, the new reservoir will be capable of supplying the entire district for two days. The Wath water undertaking was formerly the property of the West Melton Water Company, and was acquired by the Council nearly three years ago; the purchase-money being £13,250.

**Schemes of Water Supply for the Shifnal District.**—At their last monthly meeting, the Shifnal Rural District Council had before them a report prepared by their Sanitary Committee on the water supply of the district. They presented a series of plans with an estimate of £4984 for supplying the parish of Shifnal with water, and decided to submit them for the approval of the Local Government Board, and to apply for sanction to borrow £5000 to carry out the scheme. The work will include a supply to The Wyke and the village of Haughton. A scheme for supplying the parish of Kemberton with water was also adopted. The estimate was for £957; and it was decided to borrow £1000 for carrying out the work.

**Investigating London Fogs by Balloon.**—The Rev. John M. Bacon, whose article on "Fogs and their Teaching" was noticed in the "JOURNAL" for April 24 last, writes to the papers from Coldash, Newbury, as follows: "I am arranging to have a balloon, captive or otherwise, at my service to explore and investigate scientifically the higher limits and constitution of any dense London fog that may shortly occur; and I beg to invite scientific friends to suggest various ways in which the most useful work may be done. I should much like to fire a harmless charge of guncotton in space beyond the fog (similar to those which I have twice already fired harmlessly enough over London for acoustical purposes), so as to be able to note if the wave of explosion is followed by any dislodgment and dispersal of the fog."

**Leaky Water-Pipes as Land Drains.**—A correspondent lately wrote to the "Engineer" as follows: "The Local Government Board recently issued, for the guidance of sanitary authorities and their officers, a 'General Memorandum on the Proceedings which are Advisable when Attacked or Threatened by Epidemic Disease,' and in paragraph 5, which deals with water supply, the following occurs: 'The liability of leaky water-pipes to act as land drains, and to receive foul matters as well as land drainage through their leaks, is not to be overlooked; and such pipes running full of water with considerable velocity are liable to receive, by lateral induction at their points of leakage, external matters that may be dangerous. This latter fact is not recognized so generally as it should be; and ignorance of it has probably baffled many inquiries in cases where water services have in truth been the means of spreading disease.' May I ask if you, or any of your readers who are interested in towns' water supply, have ever come across a case such as is here described? My own experience with both leaky mains and service-pipes under varying conditions has so far been that the leaks have always been a source of waste of water; and I have never found one in which the supply was augmented by the injector-like action described in the circular quoted. Were the pressure shut off, one could understand liquids, under certain conditions, finding their way into faulty pipes or joints, or down through ball-valve hydrants; but this, of course, is quite another matter." The Editor of the "Engineer" remarked upon the subject of this letter as follows: "Theoretically the action described is possible. If the water in the pipe moved at a sufficient velocity, it would certainly take place; but it never does so move. We have never heard of a case in practice, and fancy that someone with imperfect knowledge of the subject has elaborated the theory out of his own internal consciousness."

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Tar-Distilling Plants.

Claus' Sulphur-Recovery Plants.

SULPHATE OF AMMONIA PLANTS.



**Rejection of the Falmouth Water-Works Purchase Scheme.**—The ratepayers of Falmouth have emphatically pronounced against the scheme for the purchase of the undertaking of the Falmouth Water Company. The votes taken in the poll which followed the recent town's meeting were counted last week, with the result that, while 348 were found to be in favour of purchasing the undertaking, 1620 were opposed to it. Of 2528 papers issued, 1662 were correctly filled in; the remainder being blank, spoiled, or undelivered. In face of the large majority of more than four to one who have voted against it, it is unlikely that anything more will be heard of the proposals for municipalizing the water-works which have been discussed for several years past.

**The Ironmongers' Federated Associations and Municipal Trading.**—At the autumnal conference of the Ironmongers' Federated Associations held recently at the Holborn Restaurant—the President (Mr. J. N. Greenall, of Nottingham) in the chair—a discussion took place on a statement made by Mr. Smith, the General Secretary, in his evidence before the Joint Committee on Municipal Trading, and it was resolved: "That this conference, having heard the evidence given by their Secretary on the subject of municipal trading before the Joint Committee of the Houses of Lords and Commons, heartily approves the same, and strongly opposes any additional powers being granted to municipal bodies, and condemns the principle of employing the ratepayers' money in competition with private traders."

**Damage to Gas and Water Pipes by a Sewer Explosion.**—About half-past eight last Thursday evening, residents in Smeed Road, Hackney Wick, and contiguous streets, were alarmed by a loud explosion followed by the upheaval of the roadway in the thoroughfare named, extending for many yards. A strong odour of gas suggested some accident to the gas-main; but the real cause of the disturbance was the bursting of a brick sewer, through an extraordinary accumulation of foul air, generated, it is supposed, by the discharge from numerous chemical and other works in the neighbourhood. As expeditiously as possible, the authorities were summoned, and a gang of men was soon at work repairing the damage. Not only had the gas-main been sprung, but leakages were found in the water-pipes, which caused some trouble. Fortunately there were no personal injuries through the explosion.

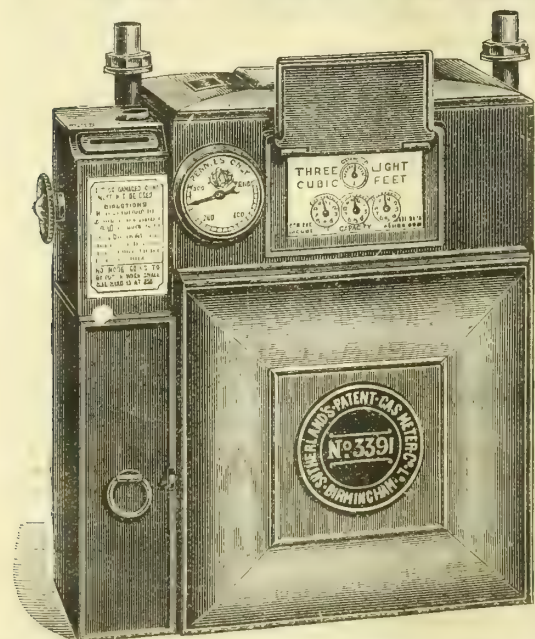
**The Dorking District Council and the Water-Works.**—In response to a requisition signed by ratepayers and owners resident within the urban district of Dorking, a specially convened meeting was held on Thursday evening for the purpose of formally passing a resolution in support of the Urban District Council's decision to promote a Bill next session to acquire the undertaking of the Dorking Water Company, in pursuance of the resolution passed by the Council on the 11th ult. (*ante*, p. 974). Mr. J. W. Palmer (Chairman of the Council) presided, and moved the resolution, and urged its adoption on the ground of the advisability of all such undertakings being in the hands of the local authorities. Mr. Clift seconded the motion. Mr. Jeal, one of the Directors of the Company, spoke in opposition to the proposal; arguing that the present was not a suitable time to promote the purchase. Mr. Cook agreed with the last speaker; remarking that the increase in the rates would

amount to about 9d. in the pound. He calculated that the cost of purchase would be as much as £50,580, and estimated the expense of the promotion of a Bill at another £5000. After further remarks for and against the motion, the Chairman replied, and pointed out that if the present opportunity were allowed to slip, and the Council had to commence *de novo*, they would have to contend with the full force of the Water Company's opposition. The resolution was then put, and lost by an overwhelming majority. Mr. Clift gave notice of a poll, which the Chairman said would be taken in due course.

**Margate Water Supply.**—The Borough Engineer of Margate (Mr. A. Latham, M.Inst.C.E.) lately presented to the Water Committee of the Corporation an exhaustive report on the water supply of the town. Their present need amounted, he said, to 1,225,000 gallons daily. The utmost they could safely depend upon from the Dane and Tivoli works combined was 650,000 gallons; leaving a deficiency of 575,000 gallons. If the resident population of Margate increased in the same proportion as of late, in about twenty years' time the consumption of water would have risen to 2,000,000 gallons daily; and if the old works were then retained, they would require an increased supply of 1,350,000 gallons per diem. If the old works were abandoned, the new supply must be capable of yielding 2,000,000 gallons daily. He was of opinion that while the site of the proposed works should be equal to the full demands which might be made in the future, the transition should be gradual. A present increased supply of 1,000,000 gallons in 12 hours, with an elastic plant, would make them quite independent of either of the old stations, but not of both, and meet all demands for years to come; but the site should be capable of furnishing the 2,000,000 gallons when required. He thought the district of Wingham presented very favourable conditions for procuring an abundance of good water, if drawn above any source of impurity. He presented an estimate for the scheme, amounting to £90,829, which would mean an annual cost of £5369 2s. 6d. At a recent meeting of the Town Council, a report was received from Messrs. Charles Hawksley, E. M. Eaton, and W. Whitaker on the scheme. They stated that they had, in conjunction with the Engineer, visited Wingham, and considered the scheme would afford "a good and ample supply of water, admirable in quality, and sufficient in quantity to meet the growing demands of Margate for many years to come." They were also of opinion that the Bill to be promoted by the Corporation to enable them to carry it out should contain powers to raise money for making ordinary extensions of pipes and other works chargeable to capital, for a long period; and they recommended that the borrowing powers be fixed at a sum of not less than £150,000. It was decided, with one dissentient, that a Bill should be promoted next session.

Mr. Oswald Turner, after 55 years' service, Mr. Charles Westoby, after 35 years' service, and Mr. William Horsfall, after 31 years' service, have resigned their positions as collectors in the Gas Department of the Manchester Corporation. They were recently recipients, at the hands of Alderman Gibson, Chairman, of illuminated copies of a resolution passed by the Gas Committee, expressing appreciation of their labours, and thanks for their faithful performance of duty.

# SUTHERLAND'S PATENT PREPAYMENT GAS-METERS



## SPECIAL FEATURES:

Accuracy of  
Measurement.

Simplicity  
of Construction.

Excellency of  
Workmanship and  
Material.

EVERY METER GUARANTEED.



# THE SUTHERLAND GAS-METER COMPANY

ESSEX WORKS, BIRMINGHAM.



The Cuckfield Rural District Council have resolved to apply for a loan of £11,000 for water-works and the extension of mains.

Calculated on the present output of coal, a rise of 1d. per ton represents nearly an additional million of money to the coal-owners.

At the meeting of the Wigton District Council last Tuesday, it was stated that the estimated cost of the trunk main, headworks, &c., of the Overwater and Head of Ellen water scheme was £40,000.

Mr. Wharham, who has been Deputy-Chairman of the Hull Corporation Gas and Water Committee for some years, has been selected to succeed Alderman Massey as Chairman, that gentleman having resigned the position.

Subject to audit, the Directors of the Grand Junction Water-Works Company will recommend a dividend on the 10 per cent. maximum ordinary shares of the Company at the rate of 8 per cent. per annum for the half year ended the 30th of September.

At a meeting of the Coventry Gas Fittings, Electrical, and Engineering Company yesterday week, resolutions were proposed in favour of a reconstruction of the Company; and it was decided that it be wound up voluntarily, with Mr. T. M. Daffern as Liquidator. A new Company is to be formed, to be called the New Coventry Gas Fittings and Electrical Engineering Company.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend to the proprietors, at the forthcoming general meeting, to be held on the 11th prox., dividends of 5 per cent. for the half year on the ordinary stock, free of income-tax, and 3½ per cent. for the half year on the preference stock, less income-tax; making 9 and 7 per cent. respectively for the year.

In the course of the demolition of the gasholder in the old town gas-works at Mayence, a large bale of cloth, well preserved, and a great number of French bayonets and chasseur rifles were found between the inner and outer lifts. These relics of the Franco-Prussian War must have been in their resting-place for at least thirty years.

The East Surrey Water Company announce, in another part of the "JOURNAL," particulars of a sale by tender of not exceeding 1500 of ordinary "B" shares of £10 each, in lots of ten, entitled to a dividend of not more than 7 per cent. per annum, which has been the rate declared for the past two years. The minimum price is £16 per share; and successful applicants will be allowed till Jan. 8 to complete the purchase.

A 2000-candle power Kitson light has been placed at the north end of South Avenue, Darlington; and according to a local paper, it is probably the most powerful light it has yet had. It sheds "a dazzling brightness." We question whether it gives, as the writer says, "a certain ghastliness to the scene;" but we quite believe that "if you look at the light and then turn round and look at the moon, the moon seems completely in the shade," and that "the common or garden gas-lamps are nowhere."

In the "JOURNAL" for the 9th ult., it was briefly recorded that the export of sulphate of ammonia from the United Kingdom had decreased to Germany about 3593 tons. We may supplement those figures by others showing a falling off to France, 5917 tons; to Belgium, 5046 tons; and to Holland, 1749 tons. Other countries, however—for example, Spain and the United States—show an increase in the imports from the United Kingdom. In Germany the consumption has increased, and the demand is supplied by the home production. The British import comes in principally *via* Hamburg, and during the last years has averaged £150,000. The greatest part of this remains in Hamburg; a small quantity goes inland *via* rail, or by ships on the Upper Elbe.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

#### GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

##### OXIDE OF IRON.

**O'NEILL'S** Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,  
160, 161, & 162, PALMERSTON BUILDINGS,  
OLD BROAD STREET,  
LONDON, E.C.  
ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

##### WINKELMANN'S

**"VOLCANIC" FIRE CEMENT.**  
Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,  
192, Palmerston Buildings,  
Old Broad Street,  
London, E.C.

"Volcanism, London."

#### BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS.  
Correspondence invited.

**ENRICH** your Gas with cheap Benzol,  
Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.  
Apply to SADLER AND CO., MIDDLESBROUGH.

#### AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

**SADLER & CO., Ltd., Middlesbrough,**  
Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

#### SULPHATE OF AMMONIA SATURATORS.

**JOSEPH TAYLOR & CO., Chemical**  
Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.  
Before placing Orders, please write for Estimate.  
Telegraphic Address: "SATURATORS, BOLTON."

#### GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

#### PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.  
Information and Handbook on application.  
70, CHANCERY LANE, LONDON, W.C.

**PORTER & CO., Gowts Bridge Works,**  
LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.  
Telegraphic Address: "PORTER, LINCOLN."  
[For Illustrated Advertisement, see Nov. 6, p. 1174.]

#### J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.  
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.  
Telegraphic Addresses:  
"Braddock, Oldham." "Metricus, London."

##### SULPHURIC ACID.

**JOHN NICHOLSON & SONS, Limited,**  
Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and good colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

#### SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers.  
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

##### TO GAS AND WATER OFFICIALS.

**HIGH-CLASS** Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.  
MELROSE CYCLE COMPANY, COVENTRY.

##### SPECIAL PAINT FOR GAS-WORKS.

**JOHN E. WILLIAMS AND CO.,**  
VICTORIA PAINT WORKS,  
MANCHESTER.  
Telegrams: "ENAMEL." National Telephone 1759.

**JOHN RILEY & SONS, Chemical Manu-**  
facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

##### HYDRATED OXIDE OF IRON.

#### PREPARED from Pure Iron.

Twice as Rich as Bog Ore.  
Gives no Back Pressure.  
The Cheapest in the Market.  
Can be Lent on Hire.  
Can be Exchanged for Spent Oxide.  
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

##### INCANDESCENT GAS-MANTLES.

**AN** important Berlin Firm, supplying Superior, Transportable INCANDESCENT MANTLES (about 110-Candle Power, Clear, White Light) at £7 per 1000 Mantles, want a few regular BUYERS. Sample on application.  
Address I. E. 3009, care of RUDOLF MOSSE, BERLIN, S.W.

**WANTED, a good Retort-House and**  
Yard FOREMAN (working). Must be good Blacksmith, and capable of doing General Fitting on Works. Wages 35s. per week.  
Apply, by letter, to No. 3599, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**A GAS Engineer in the Midlands has a**  
vacancy for a PUPIL in his Office. The Pupil will have every opportunity of obtaining a thorough knowledge of Building and Machine Construction and other Branches of Engineering connected with the Gas Industry. References given and required.  
Address No. 3597, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### GAS PURIFICATION.

##### OXIDE OF IRON BOG ORE.

**BALE & CO.'S** Oxide of uniform quality.  
SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.  
120 and 121, NEWGATE STREET, LONDON, E.C.  
Telegrams: "BOGORE, LONDON."

##### CANNEL, COAL, ETC.

**JOHN ROMANS & SON, EDINBURGH,**  
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.  
Prices, &c., will be forwarded on application.  
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.  
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

##### IMPORTANT NOTICE

TO ACCOUNTANTS OF GAS AND OTHER LARGE COMPANIES.

**A GENTLEMAN**, who has an Established Agency of Seven Years' standing for the CHANGING OF ENGLISH COPPER COIN, is prepared to take One Thousand Pounds' worth, or more, per week.  
Address for Interview and to arrange Terms, J. A., 65, Lancefield Street, WEST KILBURN.

**WANTED, a Working Foreman at the**  
Gas-Works, Newport, Salop. House and Garden, Gas, and Coals free. Married Man preferred. Apply, stating Age, Wages required, and References, to Mr. HEANE, Secretary, Newport, SALOP.

**WANTED, by a Gas Engineering Firm,**  
a thoroughly competent DRAUGHTSMAN, conversant with Retort-House Ironwork, Regenerative Settings, and Conveying and Elevating Plant.  
State Age and Salary required to Box 2791, SELL'S, FLEET STREET, E.C.

#### MILFORD HAVEN URBAN DISTRICT COUNCIL.

**WANTED, a Stoker for the Gas-Works,**  
used to Shovel Charging, Engine, and Exhauster. Wages 23s. per week, with House, Fuel, and Garden. Constant job to a steady and suitable Man.  
Apply to THOMAS JOHN, Superintendent.

**WANTED, a first-class Draughtsman**  
for a large Gas-Works in the South of England. Applicants must have a thorough knowledge of Gas-Works Construction; also preparing Quantities, Specifications, Stresses, and act as Clerk of Works if required. Age 30 to 35. Salary 50s. per week. Copies of Testimonials to be sent.  
Apply, by letter, to No. 3596, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by a large Provincial Gas**  
and Water Company in the South of England, a smart young CLERK. Knowledge of Book-keeping and Shorthand necessary. Age 20 to 25. State Wages required.  
Applications, by letter, in own Handwriting, with three copies of recent Testimonials, to be sent in not later than Nov. 27, to No. 3598, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, three or four Wrought-Iron**  
open-top TANKS, 20 ft. to 40 ft. long by 8 ft. to 16 ft. wide by 2 ft. to 3 ft. deep.  
SHARPNESS CHEMICAL COMPANY, Sharpness Docks, GLOS.



**WANTED, to purchase, One or Two TANK-TRUCKS** for cartage from Works of Gas Liquor and Tar. Must be in good condition and cheap.

Send full Particulars, with Description as to Size and Price, to H. C. SHEPHERD, Manager and Secretary, Gas-Works, Swindon, WILTS.

**"CUTLER'S" Condenser, 3 million day,** equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.

J. F. BLAKELEY, Thornhill, DEWSBURY.

**CORNISH Boiler for Sale, 15 ft. by 5 ft.,** insured 60 lbs. Pressure. Can be seen working. JOHN E. WILLIAMS & Co., Lower Tebbutt Street, MANCHESTER.

**FOR SALE—5000 feet Gasholder, equal** to new, with Four Columns complete, together with a quantity of Gas Plant. Any reasonable offer entertained.

H. GRAVES, Brandon, SUFFOLK.

#### HIGH-PRICED COAL.

**SMALL Gas-Works Authorities should** immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets in stock, both New and Second-hand.

Address J. FIRTH BLAKELEY AND Co., Thornhill, DEWSBURY.

**GAS PLANT for Sale—I can always offer** NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

#### NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

**FOR SALE—260 22 in. by 15 in. and** 135 20 in. by 14 in. second-hand  $\square$ -shaped Retort MOUTHPIECES, fitted complete with Tangyes Patent Lids, 18 inches diameter.

Can be inspected on application to Mr. T. Hardie, Manager, Gas-Works, Redheugh, Gateshead-on-Tyne. Offers to be addressed to the SECRETARY, 35, Grainger Street West, NEWCASTLE-ON-TYNE.

#### TO BE LET on Hire—

**FACING MACHINE**, for facing *in situ* Self-Sealing Retort Mouthpieces any shape or size,  $\square$ , Oval, or Circular.

**PULSOMETER**, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe  $\frac{3}{4}$  in. diameter. Discharge 10,000 Gallons per hour.

#### TO BE SOLD—

**GASHOLDER, 30 ft. diameter** by 10 ft. deep, with Five Columns, equal to new, only having worked Four or Five Years.

Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

#### J. FIRTH BLAKELEY & Co., Thornhill,

Dewsbury, have FOR SALE:—  
One Set of Three 6-ft. PURIFIERS.  
One " Two 8-ft. "  
One " Four 8-ft. "  
One " Four 16-ft. by 12-ft. PURIFIERS.  
Four 5-inch ANNULAR CONDENSERS.  
Four 10-inch " "  
Six 16-inch " "  
"Cutler" 3 million WATER CONDENSER.  
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.  
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.  
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.  
"Holmes" & "Clapham" WASHER-SCRUBBERS.  
"Livesey" & "Cripps" WASHERS.  
4-in., 6-in., 8-in., and 10-in. STATION METERS.  
Splendid GASHOLDER, 50 ft. by 20 ft.  
RETORT IRONWORK, MODERN HYDRAULICS.  
Telegrams: "BLAKELEY, THORNHILL LEES."

#### COUNTY BOROUGH OF OLDHAM.

**THE Oldham Corporation Gas-Works** Committee invite TENDERS for supplying a SINGLE-LIFT GASHOLDER, 81 feet diameter, and erecting same at their Hollinwood Gas Station.

Specification may be obtained and Drawings inspected on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders should be addressed on or before Tuesday, Dec. 4, 1900, endorsed "Tender for Gasholder."

A. NICHOLSON,  
Town Clerk.

Oldham, Nov. 14, 1900.

#### TYNEMOUTH GAS COMPANY, NORTH SHIELDS.

##### RETORT-HOUSE ROOF.

**THE Directors of the Tynemouth Gas** Company invite TENDERS for the supply and erection complete of a ROOF, for their No. II. Retort-House. The Span is 75 feet, and Length 297 feet.

Arrangement and full Detail Drawings, Specification, and Quantities, may be seen at the Engineer's Office, Gas-Works, North Shields, on and after Friday, the 16th inst., upon payment of £3 3s., which will be returned upon receipt of a *bona-fide* Tender.

Tenders, addressed to the undersigned, to be delivered not later than Friday, the 30th inst.

W. HARDIE,  
Engineer and Manager.

Gas-Works, North Shields,  
Nov. 13, 1900.

#### BRISTOL GAS COMPANY.

##### OIL OR SPIRIT FOR GAS ENRICHMENT.

**THE Directors are prepared to consider** OFFERS for the supply of the above for delivery during the period ending the 31st of December, 1901.

Particulars may be obtained from the undersigned, to whom also Tenders, must be delivered not later than Wednesday, the 5th of December next.

JOHN PHILLIPS,  
Secretary.

Chief Office: Canons' Marsh,  
Bristol, Nov. 8, 1900.

#### BRISTOL GAS COMPANY.

##### TENDERS FOR TAR.

**THE Directors of this Company invite**

TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three Years, commencing on the 1st day of January, 1901.

The annual quantities of Tar produced at each of the Stations at present are, approximately, as follows:—

Avon Street	700,000 gallons
Canons' Marsh	550,000 "
Stapleton	850,000 "

Further Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Tar," must be delivered not later than Wednesday, the 5th day of December next.

JOHN PHILLIPS,  
Secretary.

Chief Offices, Canons' Marsh,  
Bristol, Nov. 8, 1900.

#### SHEFFIELD UNITED GASLIGHT COMPANY.

##### TO ENGINEERS AND IRONFOUNDERS.

**THE Directors of the above Company**

invite TENDERS for the supply at their Neepsend Station of about 640 lineal feet of 30-inch, 24-inch, 18-inch, and 12-inch diameter STEEL PIPES, to form Foul Gas-Mains; also SUNDRY SPECIAL PIPES and CAST-IRON BRACKETS, &c.

Drawings may be seen, and Specification with Form of Tender obtained on and after Nov. 26, 1900, from the Engineer, Mr. J. W. Morrison, at the Company's Offices.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders marked "Tender for Foul Mains," must be delivered (by post) not later than the first post on Wednesday, Dec. 5, to the undersigned.

HANBURY THOMAS,  
General Manager and Secretary.  
Commercial Street, Sheffield,  
Nov. 14, 1900.

#### EAST SURREY WATER COMPANY.

##### SALE BY TENDER

##### OF NOT EXCEEDING

1500 ORDINARY "B" SHARES OF £10 EACH.

**COPIES of Particulars and Conditions,** with Form of Tender, can be obtained at the Company's Office, Redhill, Surrey.

Tenders to be delivered not later than Noon on Tuesday, the 11th of December.

By order of the Directors.

#### REDHILL GAS COMPANY.

**MR. HARRIE STACEY is favoured** with Instructions to SELL BY AUCTION at the Market Hall, Redhill, on Thursday, the 29th of November, 1900, at Seven o'clock p.m. precisely,

£7500

FIVE PER CENT. ORDINARY "B" STOCK, subject to the Sliding-Scale, in Lots of £50 and £100 each.

Particulars and Conditions of Sale to be obtained at the OFFICES of the COMPANY, Brighton Road, REDHILL; of MESSRS. RADCLIFFE, CATOR, & HOOD, Solicitors, 20, Craven Street, CHANCERY CROSS, W.C.; and of MR. HARRIE STACEY, Auctioneer and Land Agent, REDHILL and REIGATE.

Now Ready. Net Price: Cloth Bound, 12s. 6d.;  
Morocco Gilt, 18s.

#### GAS COMPANIES'

## BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

By

JOHN HENRY BREARLEY & BENJAMIN TAYLOR,  
OF LONGWOOD.

The only complete Treatise on Gas Companies' Book-Keeping ever published.

This book will be found invaluable to those desirous of obtaining a thorough grasp of Gas Companies' Book-Keeping and Accountancy.

A complete set of Transactions are dealt with; the same being entered into the various Books, and posted into the Ledgers. A Model Balance-Sheet is prepared from the set of transactions and postings.

Forms and subsidiary books are illustrated and described. The linking together of the various books is shown at a glance by means of a Chart.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

#### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MR. ALFRED RICHARDS begs to** notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

#### SOUTHEND GAS COMPANY.

NEW ISSUE OF £5000 NEW ORDINARY STOCK.

**MR. ALFRED RICHARDS will Sell the** ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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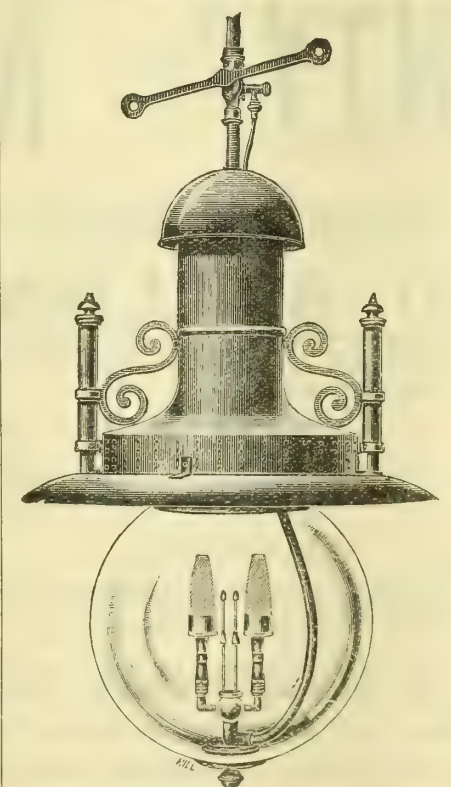
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## EDITORIAL NOTES.

## The Prospects of Coal Imports from America.

Not a little interest has been shown by the Newspaper Press in a message from the "Daily Telegraph" correspondent in New York to the effect that the Pittsburg Coal Company are considering the question of establishing a fleet of colliers for the purpose of conveying American coal to the English and European markets. The correspondent adds that "the first foreign order was from a London Gas Company, which was so well satisfied that it has begun negotiations for a steady supply." He also remarks that, "as there are prospects of British coal going to \$10 a ton, the possibilities of the English market for Pittsburg fuel are obvious." It cannot be said that the situation—either present or future—is very correctly outlined in this message; and it will certainly be worth while to point out its inaccuracies.

We do not doubt that the Pittsburg Coal Company are "considering" the advisability of inaugurating a constant supply of coal to European and English customers. Our Yankee cousins are too wide-awake to let the history of the coal trade on this side of the Atlantic during the past twelve months escape their notice, or to neglect any opportunity of turning the situation to their own advantage. It is also perfectly true, as "JOURNAL" readers are well aware, that the first English (not "the first foreign") order for American coal was placed by the South Metropolitan Gas Company. But we have doubts, amounting to a certainty, as to whether the South Metropolitan or any other English Gas Company have opened negotiations for "a steady supply" of Pittsburg coal. Of course, any offer of that or other coal would be considered by a gas manager on its merits; but, bearing in mind the present outlook in the home market, we do not think that any proposal for a contract of any considerable duration would stand a chance of acceptance except at a figure materially lower (gas making value for value) than the ruling prices of English gas coal. But it is when he speaks about the prospect of British coal going to \$10 a ton that the correspondent we have quoted gets most completely wrong. Even granting the possibility of a prolonged and severe winter sending coal up to that price, there would still be no ground of hope for the Pittsburg Company's fleet securing in England what it must obtain in order to justify its existence—a permanent market; for no one who knows anything at all about the coal trade of this country would invest a penny piece upon the chance of English fuel remaining at present prices—to say nothing about over 40s. a ton—for anything like the time it would take to build the fleet.

No; where the Pittsburg Company have the best chance of securing regular customers is not in the English markets, but in the markets of England—that is to say, among those customers who now buy large quantities of coal from this country; and it is to those quarters that, we believe, the United States merchants are directing their considerations and looking out for orders. The result of the capture of any substantial number of our customers by the Americans would, of course, be to hasten still more the downfall of prices here—a consummation that would be heartily welcomed by the gas industry. There are, however, reasons for doubting whether the captured customers would be held indefinitely by the States after English coal had got back to its former price; and it would, under any circumstances, be unwise to count too freely upon the competition of American coal preventing upward rushes of prices in this country on future occasions. It must not be forgotten that these rushes are caused by the demand expanding at a rate to which the supply is, in the nature of things, unable to readily respond. If, then, a fleet of American colliers should be built, and be able to bring coal regularly to the European market, their cargoes would become an integral part of the available supply; the English output would in time be adjusted to the reduced demand; and a sudden expansion of trade would have precisely the same effect as before. In short, the immediate result of the influx of American coal into Europe will be beneficial to English coal consumers; its ultimate result only to conserve our unmined resources, while being of no benefit to coal buyers of the present generation.

The competition of American with English goods, the manufacture of which involves the use of coal, is, meanwhile, having a more immediate and decisive effect on the coal situation than the importation of the mineral itself

## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.



into Europe from the States. The depression in the iron and steel trades deepens week by week—orders (in spite of further reductions in prices) becoming scantier instead of more numerous; and the outlook for the winter in these trades is as gloomy now as it was rosy a year since. The main reasons for this change are threefold—the injury done to trade by the ruthless bleeding it has undergone; the dearthness of fuel; and the incursion of foreign goods at much cheaper prices than those here ruling. The last named is freely admitted by the trade journals; and they are beginning to hint at that dissatisfaction with our Free Trade principles which is always to the fore when competition from abroad disturbs the “heedless self-confidence” of strength of our own manufacturers. We do not, however, think that a demand for a protective tariff, designed to maintain prices, would find much favour at the present time; and a reduction in the cost of structural materials, machinery, and fuel may be as confidently expected as it is urgently needed in the interests of the nation as a whole.

**Dr. Bunte on “The Supply of Mixtures of Coal Gas and Water Gas.”**

THE services rendered by Dr. Bunte to the illuminating gas industry are, as all the technical world knows, of quite incalculable merit. His penetrating insight into the essential character of gas-works processes has served to put technical practice on the right lines of more developments than can be recited here; and now, in the fine paper on “The Supply of Mixtures of Coal Gas and Water Gas,” of which a specially-prepared abstract translation appears in another column, Dr. Bunte has illuminated a difficult and withal pressing problem in a masterly way which is all his own. The object and scope of the paper are stated in the opening paragraph, which is so clearly expressed that we cannot refrain from repeating it here: “The introduction of the Welsbach light has placed the application of gas on quite a new footing within the last ten years. It has effected a complete revolution in methods of lighting; but, on the other hand, the processes of gas manufacture have continued, comparatively speaking, unaffected thereby. Of late years, the considerable advance afforded by the Dellwik process of water-gas manufacture has resulted in the introduction of new methods of gas production at certain German works. The question naturally presents itself whether the manufacture of water gas and the admixture of water gas, or carburetted water gas, with coal gas is a mere passing condition arising from local or transient circumstances, or whether we are on the eve of a new development, and the Twentieth Century will witness the relegation of the old coal carbonization process to the class of obsolete methods of gas making.” This appetizing preface, coming from Dr. Bunte, is enough to make every true gas engineer into whose hands the paper shall come forthwith shut himself up, and banish everything else from his mind until he has read what the Master has to say on so all-important a topic. Very early in his story Dr. Bunte has to confess that the import duty on foreign gas oil must prohibit its use for gas making in Germany. This might seem like striking the part of the Prince of Denmark out of “Hamlet,” so far as Germany is concerned; because carburetted water gas without cheap and abundant gas oil is, as English gas manufacturers are beginning to perceive, a commercial impossibility. It seems very mortifying, from the point of view of German technicians, that they might be able to procure any quantity of gas oil at 40s. or 50s. per ton from Galicia and Roumania, but for these prohibitive import duties. How we should like to see what they would do with them!

Failing carburetted water gas, the Germans have Dellwik water gas carburetted, after manufacture, with benzol. Dr. Bunte states what happens to the illuminating power of coal gas when plain Dellwik water gas is added to it. An admixture of 20 per cent. of water gas brings down the illuminating power 75 per cent. If desired, the mixed gases can be restored to the customary 13-candle standard expected of German town's gas by the addition of 40 oz. of benzol per 1000 cubic feet. Dr. Bunte shows that there is produced in Germany all the benzol that manufacturers of town's gas are likely to require; while the price which the latter could well afford to pay for it is a remunerative one to the coke-works producing the benzol as a residual. Hence there is no fear of the supply running short or becoming excessively dear. Nevertheless, Dr. Bunte is not particularly enamoured with the prospect of carburetting

by benzol remaining the only commercially possible expedient; and he would like to see the duty taken off gas oils. He admits, moreover, that the growing indifference of German gas manufacturers to the consideration of illuminating power puts all mere carburetting processes at a discount.

This state of affairs in the German gas industry naturally prompts Dr. Bunte to ask: If the gas makers do not regard photometry any longer, what is the kind of gas they really do want? This inquiry brings him into line with the position taken up in this column a fortnight ago, with reference to the true need of town's gas consumers. Dr. Bunte declares that “gas-works must aim at supplying the “gas which is most advantageous for the chief applications—lighting by incandescence and heating.” Bearing this principle in mind, Dr. Bunte proceeds to discuss the calorific power of coal gas, which is the point of departure, and its origin. The calorific power of good ordinary coal gas is about 600 British thermal units per cubic foot. Water gas, containing about 10 per cent. of impurities, is just one-half as strong. Consequently, if added to coal gas, water gas lets the mixture down, in its total heating power, as in normal illuminating effect, but not so much. Adding 20 per cent. of water gas to coal gas reduces the calorific power of the mixture 10 per cent; but there will be no change in the lighting duty of the mixture with an incandescent burner.

This admixture of 20 per cent. of plain Dellwik water gas to common coal gas, without carburetting the mixture by benzol or anything else, is Dr. Bunte's prescription for the German gas industry of the present and the immediate future. The weightiness of this counsel cannot be disputed. He shows that benzol carburetting is an expensive way of heightening the calorific value of coal gas, or a mixture of coal and water gases, and after all is not worth doing. Furthermore, the saturation-point of gas for benzol is easily reached; and in cold weather the gaseous benzol will condense in the mains. By his counter-proposition, other advantages can probably be secured. There will be a saving of gas coals, which is of special moment for Germany, where the production of good native coal barely keeps pace with the national requirements. Besides, when normal illuminating power is not a consideration, other gas coals than the class of coal usually so described becomes available. Not the lignites or the brown coals—Dr. Bunte will have nothing to do with them, on account of the poorness of the coke; but he says there are some older deposits of coal that can be drawn upon.

Here is the main point: If the German gas industry is to escape from a coal catastrophe, it must rely more and more upon water gas. Every ton of gas coal carbonized yields 10,250 cubic feet of gas, which quantity of water gas is producible from 0.115 to 0.170 ton of coke. Mark the difference! Every million cubic feet of water gas made sets free about 100 tons of gas coal. How much further it may be technically and economically possible to carry the manufacture of water gas, as an auxiliary process in town's gas-works, Dr. Bunte professes himself unable to say. The latter part of his paper, in which he discusses this fascinating question, and also that of possible modifications of coal-carbonizing methods with regard to the changed requirements of the gaseous product referable to the supremacy of incandescent gas lighting, will be found highly suggestive. It is noteworthy that he looks towards the coke-oven style of coal-carbonizing plant as offering a promise of fruitfulness under intelligent cultivation by the new light which has risen upon the gas industry. Altogether, this paper helps to deepen considerably the case for placing the manufacture of town's gas on a calorific basis.

**Trade Unions Irresponsible Bodies.**

THE anxiously awaited judgment of the Court of Appeal on the legality of Mr. Justice Farwell's refusal to absolve the Amalgamated Society of Railway Servants, as an organization, from responsibility for the unlawful picketing done in connection with the Taff Vale railway strike, was given last Wednesday. It is against the view taken by the learned Judge below, whose Vacation Court decision is consequently reversed, with costs. The judgment was a written one. The Court was unanimous; and it therefore stands, for the time being, that a Trade Union cannot be made legally responsible, in the way attempted in this case, for acts done notoriously by and for the members. The matter must not rest here; and as leave to appeal to the



House of Lords was given, the question will doubtless be carried to the highest tribunal with no unnecessary delay. If the law is as the Appeal Court appears to have laid it down, then the community is face to face with the prospect of a whole category of possible doings in our midst for which nobody can be made answerable to the law of the land. The ordinary layman usually has a vague impression that, for whatsoever he may do in contravention of the law, there is a remedy which those whom he has wronged are at liberty to seek. Apparently there is an exception to this rule, if it is a rule; and any number of men who choose to form themselves into a Trade Union can break the law with impunity. It is needful to make quite sure of the form in which this dictum stands. The motion brought before the Vacation Judge was to strike out the Trade Union from the list of defendants to an action for damages brought by the Railway Company in the Queen's Bench Division. It was objected that no such action is maintainable against a Trade Union by name, as such bodies can neither sue nor be sued. Mr. Justice Farwell thought differently, but with confessed difficulty in coming to a decision; and now a strong Court has declared him to have been mistaken in his law.

It cannot be denied that Mr. Justice Farwell's decision was a surprise to many people, lawyers and others, who imagined themselves conversant with at least the negative attributes of the legal status of Trade Unions. It will be remembered that the Royal Commission which reported on the subject expressly recommended the making of Trade Unions liable to sue and be sued, which obviously implies absence of this character at the present time. But, of course, a Judge is not bound to interpret the law by the opinions of a Royal Commission. What weighed with Mr. Justice Farwell was the plain matter of fact that the Legislature has sanctioned the creation of "numerous bodies of 'men capable of owning great wealth and of acting by 'agents with absolutely no responsibility for the wrongs 'they may do to other people by the use of that wealth 'and the employment of those agents.'" He declined to accept this theory, which the Appeal Court now says lies on the face of the pertinent statutes and the common law. It is necessary to speak of this judgment with the greatest reserve. It is probably correct in law, inasmuch as Parliament, in legislating for Trade Unions, has not enacted a line to the effect that they might sue or be sued by name. It is a remarkable exception for a property-owning body.

The only important question that remains for the House of Lords is whether a Trade Union, as such, is amenable to the law for illegal acts committed by its means and in its name, for which a private individual, a corporation, or a partnership could certainly be made to answer. Naturally, views on this point differ. "The Times" holds that if the law is as it has now been defined, it should be amended without delay. On the other hand, the "Daily News" professes supreme content with the judgment, in the interest of Trade Unionism. It declares that a Trade Union "is, in fact, a club. An action cannot be brought 'against a club.'" But what of a club that directed, and paid for, the unlawful besetting of another club? Clubs usually do not act in this way, of course—this circumstance differentiating them from Trade Unions, which do. To the ordinary lay mind, it seems anomalous that there should be this particular exception to the general rule that wealth and power have their duties and responsibilities as well as their rights. It may be thought, without offence to the Court, that the legal formula about suing and being sued can only apply to ordinary, legal, civil processes, and cannot be stretched to convey immunity from the ordinary consequences attaching to unlawful actions intentionally perpetrated.

#### Mr. R. G. Shadbolt on the Sunday Closing of Gas-Works.

THE Manchester District Institution of Gas Engineers were fortunate last week in obtaining a paper from Mr. R. G. Shadbolt, of Grantham, on the perennially interesting subject of "The Minimizing of Sunday Labour in Gas-Works." At a first glance, the flippant critic might see only the familiar, not to say stale, aspect of the title of Mr. Shadbolt's paper; but inasmuch as the full resources of Church and State everywhere are still painfully grappling with the task of enforcing the prescriptions of the Decalogue, the organization of a Gas Managers' Society can never be regarded as misapplied in considering ways and means for satisfying one of them. If particular justification for this paper were needed, it is to be found in the

author's deliberate statement that "it is no uncommon 'thing to find stokers engaged full seven days per week 'all the year round.'" This is a shameful confession to be made respecting the conditions of labour of one of the most prosperous industries of the country. How any man who is personally responsible for keeping fellow-men in this state of Egyptian slavery can sleep peacefully o' nights, to say nothing of taking an annual or occasional holiday, would really pass belief, were it not common knowledge how hard and selfish "financial considerations" can make some business men. One would fain believe that examples of this deliberate and intentional slave-driving are rare; but, unhappily, circumstances are often tyrannical, even where the human agent is just. There are, as Mr. Shadbolt admits, many conditions of gas making precluding the suggestion of systematic stoppings of manufacture, whether for Sunday rest or any other purpose. He said emphatically the right and the true thing in this connection, in linking the practicability of periodical stopping and starting the processes of the factory to a state of general efficiency. That is the point which requires to be pressed right home to the perceptions of reactionary directors and amateurish corporation committeemen.

Mr. Shadbolt's paper is pleasantly, even humorously, written, and moreover is inspired throughout with the very best goodwill to Sunday closing, and a most practical turn for dealing with the details which render such a proceeding possible and convenient. His statement of the actual cost of 38 twelve-hour stops during a complete year is one of the most weighty arguments in favour of the arrangement that has yet appeared in print. The manner in which he has worked out the experimental data in his own case is admirable. One of the curious points of his story, which is likely to especially interest those who are more attracted by the moral than by the technical aspect of the innovation, as it was at Grantham, is the evidence about the changed opinion of the stokers in regard to the "privilege" of working or resting on Sunday. This statement should be taken in conjunction with what happens when a Trade Union demands double pay for Sunday labour, and supplies a very powerful argument against the latter arrangement. It is satisfactory to notice, moreover, that Mr. Shadbolt does not claim that the work done shows any material improvement for the unaccustomed boon of a Sunday off. That is not the proper object of it. Deliverance from bondage is not an asset in the great account. Lastly, all possible stress is to be laid on Mr. Shadbolt's witness to the fact of regenerative retort firing being the key of the situation. This is another example, and a very striking one, of the rule of the fruitfulness of really good industrial developments in unexpected consequential benefits, as set forth in a "JOURNAL" article of last week. Altogether, Mr. Shadbolt is to be congratulated on having written the freshest, brightest, and one of the most helpful papers on the subject that has ever embellished the proceedings of a Gas Managers' Society.

#### Fresh Trade Unionist Outbreak at Bethesda.

THOSE pessimists who cannot bring themselves to believe that the Capitalist lion will ever be able to lie down in comfort and security beside the Trade Union lamb, will be confirmed in their opinion by what is now happening at the Bethesda slate quarries of Lord Penrhyn. It was only so recently as 1897 that we had occasion to repeat in these columns the moving story of the great Bethesda strike and lock-out, which turned upon the question of who was to be master of the quarry workings—the men who earned their livelihood by raising the stone, or the owner of the property. Encouraged by their Trade Union leaders, the quarrymen imagined they could do as they pleased with Lord Penrhyn's property, and dictate the conditions of their own and other men's employment on the estate. Lord Penrhyn took the opposite view, which happened also to be the position of right and reason. Of course, the line of division was made a political one, like all other differences in a Celtic community. An attempt was made to raise the country against Lord Penrhyn, the landlord, the capitalist, the employer of labour—the incarnate opposite, in a word, of Social Democratic, Trade Union ideals. And it failed, of course. The eternal verities happened to be on the employer's side; and he prevailed. The defeated strikers went back to their work, cowed, but, as it now appears, not cured of their disaffection. That rankling hatred of their industrial condition seems to have replaced in their Celtic minds the fidelity to "lost causes and



"impossible beliefs" which marks the Celt outside Great and Little Wales as a type apart from the practical-minded person of Teutonic extraction who may live beside him. At any rate, the smouldering fires of rebellion at Bethesda suddenly broke out some weeks ago in acts of rioting and cowardly assaults on individuals obnoxious to the Trade Union. The police were powerless to keep the peace of the country-side; and a military force had to be called in. Notice was issued to the quarrymen that if there were any more rioting the quarry would be closed. The warning was disregarded; and the quarrying industry of Bethesda has, in consequence, ceased to exist.

Naturally, this "high-handed" action on the part of Lord Penrhyn is denounced on all hands, by those platform speakers and newspapers who are not above cultivating a little cheap popularity by accepting the facile assumption that whenever employers and their workpeople fall out, the latter are always to be considered in the right. Even the "Daily News" thinks it fair to assert, without offering a shadow of proof, that "Lord Penrhyn is one of those landlords who strain the rights of property to the utmost." It does this though later on it is forced to admit that "the actual truth of the matter is rather difficult to discover." Fair-minded people might think that the existence of this difficulty, which the newspaper writer makes not the slightest attempt to clear away, ought to have deterred him from venting what must have been a prejudice against one party to the mysterious dispute. However, it matters little what the "popular" Press publishes in the shape of opinions on questions of this kind. It is a pretty clear indication of the nature of the forces that have brought about the desolation of Bethesda for the second time in four years, that the men who are turned away for rioting are being transferred from the North Wales Quarrymen's Union to the South Wales Miners' Federation. "During the day scores of quarrymen left for the South Wales coalfields, and hundreds more, it is alleged, will follow to-day and next week." Thus reports "The Times" of Saturday. It is to be hoped that the South Wales colliers, who have lately been perplexed at the aspect of the coal market, will fully appreciate the wisdom of the policy that has brought them this splendid reinforcement.

#### The Need of Codifying the Statute Law.

IN his very able speech at Leeds on Friday last, Mr. H. H. Asquith had many wise things to say upon the struggle for industrial supremacy, or, as some would have us believe, for industrial existence, which lies immediately before us as a nation, and upon the need of first-class business men to see us safely through. We have so recently dealt with the subject in connection with Lord Rosebery's address at Glasgow, that we do not propose to consider at any length that portion of Mr. Asquith's speech. We would rather refer to its conclusions, in which the speaker introduced a subject which has only an indirect bearing upon the former question, but which is of no little importance to the world of business—that is, the need for a codifying of the commercial laws in this country. "Where else in the world 'amongst civilized nations,' asked Mr. Asquith, 'is the codification of the mercantile law so backward and piecemeal?' We are not particularly concerned as to whether we are or are not worse off in this respect than other civilized nations; but it is possible to bear emphatic testimony to the need of great improvement in our statute-books in the direction of simplifying and codifying the law. What could be done has been clearly demonstrated by the Acts (largely due to efforts of the late Lord Herschell) embodying the law of sale, of partnership, and of bills of exchange. But what of the enactments dealing with, say, factories and workshops, joint-stock companies, railways, or mines? No one who has had any occasion to ascertain his exact legal position in regard to all or any of the foregoing, requires to be convinced of the need for the simplification of the statutes referring thereto. "It is no exaggeration," remarked Mr. Asquith, "to say that an ordinary English layman is hardly better off than an ancient Greek who had to resort to Delphi or Dodona. In these days the oracles are dumb, and the layman has to do the next best thing, which is to betake himself to his solicitor; and the solicitor, being a conscientious man, too often feels himself compelled to advise that, in view of the complex and confused enactments of the Legislature, it would only be safe to be fortified by the opinion of counsel." These remarks are reported as having evoked "laughter;" but

we do not think that many of those who laughed can have had much experience of litigation in regard to the matters referred to by Mr. Asquith, or they would have responded to this reminder of their tribulations by a heartfelt groan. If Mr. Asquith can only persuade Parliament to have the wisdom to consolidate into a simple and intelligible form some of the most important chapters of our statute law, he will save the time and the money, and deserve the earnest gratitude, of many a business man. But he will have to overcome the opposition of not a few of the members of his own profession. We pray more power to his elbow.

#### The Improper Naming of Gas-Lanterns.

IT should be one of the particular cares of writers and speakers upon technical subjects to keep the English language from suffering degradation at their hands. As a rule, well-educated Englishmen are laudably mindful of their duty in this respect, and contrive to express themselves with a high degree of clearness and exactitude, without falling into the horrible linguistic errors of second and third rate American technical scribes, who seem incapable of keeping words to their proper sense. Herein lies the sting of the sarcasm of a recent writer in the "Engineer," quoted in a "JOURNAL" article, in complimenting German technicians on their ability to read "even American" with ease. Apart from fantastic errors of construction of ostensibly English sentences, plainly due to defects of early training, the most irritating, because gratuitous, of American outrages in the way of pseudo-technical language consists in the reckless forcing of some innocent word, which already has plenty of meaning of its own, into some falsely conventional signification. Thus, in "American" the word "wheel" may mean "bicycle," when found in writings connected with this particular technic. Another abomination of a similar character has recently appeared in the advertisements of American vendors of lanterns for high-power incandescent gas lighting. They actually style these goods "incandescent arc lamps;" and the barbarism has even invaded the usually well-conducted "Ironmonger." This will never do. An electric arc lamp we know, and incandescent arc and electric lamps are familiar objects of the town; but "incandescent arc lamp" is too outrageously "wild cat" for any civilized community.

We suppose these particular misusers of the language started in this instance with the general notion that the term "arc lamp" might be forced to mean any kind of large lighting apparatus. But as they did not mean this production to have anything to do with electricity, they thought it would be "near enough" to call it an "incandescent" affair, and deemed it unnecessary to mention the word "gas" in connection with it. Thus we get the triumph of nomenclature in question. Some merchants do have the grace to put the word "arc" between inverted commas, when they prefix it to lanterns intended to accommodate incandescent gas-burners. No such banality, it is to be hoped, will ever be sanctioned by self-respecting English gas engineers. There is no need to drag in the word "arc," or any other foreign expression, to render gas lighting attractive to the British public. High-power gas-lamps for outdoor and general street lighting can stand their ground upon their own merits, and certainly do not need to advertise, in the name of the lanterns, another method of lighting which gas technicians know to be a more costly, and believe to be a less satisfactory, public servant.

## WATER AND SANITARY AFFAIRS.

THE notices of intended applications to Parliament which have reached us up to now furnish evidence, as will be seen from the selection given in another part of the "JOURNAL," that the first session of the newly-constituted House of Commons will be by no means a barren one in regard to schemes of water supply. Taking the Metropolis first, the London County Council will, as already intimated, make a show of pushing forward their scheme for the purchase of the undertakings of the Water Companies, though they cannot possibly expect it will be sanctioned. In fact, to use the now familiar phrase, they must be pretty sure that their Bill has not "a ghost of a chance" of passing. They have very wisely allowed their Welsh scheme to remain in abeyance for next session; but they will bring forward a measure for extending the time for the operation of the



"sterilization" clauses. We are not aware that any London Water Company will be in Parliament next year. In the neighbourhood of the Metropolis, the Rickmansworth and Uxbridge Valley Water Company on the west, and the South Essex Water Company on the east, will ask for extensions of their limits, so as to include, in the case of the former Company, a number of places in Hertfordshire and Buckinghamshire, and in that of the latter Company the parish of Havering. The West Surrey Water Company will seek power to supply Littleton, in the Staines district. Some important schemes will be brought before Parliament from the Provinces. Joint Water Boards are proposed for Aspatia, Silloth, and the West Cumberland district; for Southport, Birkdale, and West Lancashire; and possibly for the Hartlepoons—the Corporations of the latter being desirous of acquiring the gas and water undertakings. The Derwent Valley Board will apply for authority to make a change in their plans already sanctioned, and the Heywood and Middleton Board to construct additional works. The Leeds Corporation will bring up a large extension scheme, comprising no less than five reservoirs and auxiliary works, and will ask for power to abstract water from certain rivers and streams. The city was hardly pressed for water last year; and though, thanks to the recent heavy rainfall in the district, the quantity in store is now 2866 million gallons, as compared with 1372 millions twelve months ago—representing 111 days' instead of only 54 days' supply—it is advisable to make early provision for meeting future requirements. Another extension scheme of considerable proportions will be brought forward by the Stockport Corporation; and, judging from correspondence in the local papers, it is giving rise to some indignation in the town, as the need for the large expenditure contemplated, coming as it does within two years of the purchase of the water-works, has taken the ratepayers rather by surprise. The schemes here briefly referred to—to say nothing of others of which particulars may yet come to hand—will, at all events, furnish some work for the Committees.

In view of the depreciatory remarks made from time to time in regard to the Metropolitan Water Supply, those who have been entrusted with it have reason to thank Mr. Mansergh for devoting a substantial portion of his recent interesting Inaugural Address at the Institution of Civil Engineers to the general subject of the quality of water. While crediting sand filtration with doing much good work in preparing river water for consumption, he pointed out that the changes effected in it by the process were, from a chemical point of view, quite insignificant. It was not until the introduction of the bacteriological methods of water examination by Koch and Percy Frankland some years ago that the nature of the service rendered by the sand filter was revealed. The labours of these investigators not only brought out the reassuring and unexpected fact that the filtration processes which are employed by the London Water Companies very frequently remove 98 per cent. of the bacteria present in the original water, but also were instrumental in placing these and other purification processes upon a sound scientific basis. This was all very well; but Mr. Mansergh seemed to question whether such refinement was absolutely necessary. We "go for" a stray bacillus which has never been found in raw water, and in so doing remove 98 per cent. of bacteria whose presence may be beneficial—in other words, we possibly do more harm than good. Mr. Mansergh does not view river water with alarm; he sees far more danger to a community from upland water which may have become infected, especially if it is not passed through impounding reservoirs. We draw from this the comforting reflection that the so-called "dilute sewage" of rivers is not anything like so dangerous in domestic use as many writers and speakers would lead—or it seems mislead—the public to suppose; and that consequently the persistent detractors of the Metropolitan Water Supply are casting aspersions which are in every sense unjustifiable. One of the greatest offenders in this respect is the "Daily Chronicle," whose young lions are apt to allow their tails (or rather their tongues) to wag too freely. Our contemporary has just had to pay the penalty for this indiscretion in the shape of a fine of £1900 and costs for some observations reflecting upon the character of the goods supplied by a firm of meat preservers. Yet their remarks were mildness itself in comparison with some which have been made from time to time upon the London Water Supply—the latest being that it is "a disgrace to any civilized capital." It is therefore to be regretted that

those who give utterance to such calumnies cannot be rewarded for their misdirected energy by the imposition of a commensurately higher penalty.

One of the very interesting auction sales which Messrs. Edwin Fox and Bousfield are from time to time enabled to announce, took place at the Mart last Wednesday, when Mr. E. H. Bousfield offered, in one lot, an Adventurers' Share in the New River Company. Besides a present income of close upon £3000, with a prospective increase in the future, these shares qualify their owners for a seat at the Board of the Company; and there is also to be considered the reversion to the extremely valuable Clerkenwell estate. As there are only thirty-six of these shares in existence, it is not very often that one of them changes hands; and it is therefore not to be wondered at that the sale-room was crowded—though the bidding was, of necessity, confined to a few. Some of those present may possibly have been attracted merely by curiosity; while others no doubt came to enjoy the pleasure of hearing the Auctioneer dilate upon the many advantages offered by the New River Company's shares as an investment. After lightly brushing aside the spectres of the London County Council and the suggested Welsh water scheme, Mr. Bousfield went on to argue that, at anything less than £145,000, the share he had to offer would constitute a better investment than Consols. This may or may not be a too sanguine view of its value. At any rate, those present did not seem to agree with him, for the highest bid was £120,000, at which figure the share was knocked down. The last time a similar share was sold by auction, the sum realized was £122,500, though the income derivable from it was less then than now. The only reason to be advanced for the lower price on the present occasion is the heavy depreciation that has recently taken place in all gilt-edged securities, owing to the dearthness of money.

It is seldom that the proceedings at the ordinary meeting of a Provincial Water Company call for any notice in these columns, or for being reported to the extent we have done in the case of the Portsmouth Water Company in another part of the "JOURNAL." The reason is that they were of an exceptional nature, and afforded evidence that the conductors of a water undertaking in private hands are not actuated solely by a desire to make big dividends with which to fill the shareholders' pockets, in total disregard of the rights of the consumers, whether upon the score of the quality, the quantity, or the price of the commodity supplied. At Portsmouth, there cannot be very much amiss with the quality of the water, seeing that the death-rate averages only about 16 per 1000; while the quantity is ample—more than 30 gallons per day per head of the population being furnished for domestic purposes. With regard to price, hitherto it has been based on the annual value of the premises supplied, in accordance, as the Directors maintain, with the terms of their Act of Parliament. The Corporation, however, have taken a different view of the matter, in the light of the Dobbs case; and for some little time it has given rise to negotiations between the two bodies. To the credit of both it must be recorded that they were conducted in the fair and temperate spirit in which a dispute on a question of principle should be carried on. The difficulty was solved by the Directors deciding to recommend the shareholders to agree to their making the basis of charge, as from Michaelmas last, the rateable value of the premises, instead of the gross annual value as hitherto—being a reduction of 15 per cent. At the meeting last Thursday, the proposition was agreed to without a dissentient vote; and the outcome will be the relief of the consumers to the extent of something like £5000 per annum. Moreover—and this is the important point—it will stave off costly litigation, which, however decided, would have left behind it ill-feeling that certainly should not exist between a municipal authority and a company providing such a necessary of life as water. If the present reduction were the only consideration the Company had shown towards the consumers, it would be well worthy of note. But it is not. We learn, however, that their latest concession has been more highly appreciated than any other. It is remarked by a local paper that "it is not every rich Company, with a monopoly, who treat their customers 'with such liberality, and are anxious that they should 'share in the continuous prosperity' of the undertaking. For this reason the recommendation submitted to the shareholders, and so unanimously adopted by them, is justly regarded as 'highly creditable to the Board.'"



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1348.)

BUSINESS on the Stock Exchange last week was only moderately good, and the general tendency was shifty and fluctuating. It began well enough, but a strong speculative current set in from the American Market, and prices jumped about somewhat spasmodically. Steady business became disorganized, and in result prices lost all they had gained, and in some cases a bit more. In the Money Market also there was something of a change, for the easy condition which ruled at the opening did not last long, and rates both for short loans and for discount closed rather hard. Business in the Gas Market showed a decided improvement. Dealings were more free, and the tendency was favourable. The improvement in tone exhibits a marked contrast to the flat disposition of the preceding week or two. Why this oscillation should have taken place is not very evident; for nothing has recently occurred in connection with the companies to produce it. Perhaps the recovery now setting in is the prelude to a steady advance in values such as the present prospects of the leading undertakings would justify. They are doing very good business, and a considerable reduction in the prices of next year's coal contracts is inevitable. With this outlook in the near future, the present prices at which some excellent securities are sold must be regarded as very cheap. In Gaslight issues, the ordinary was moderately active, and improved—advancing from 97 at the opening to 98½ at the close. The secured issues were more animated, and the preference advanced a point. South Metropolitan opened very brisk, and showed at once that it was on the upward grade. On Friday, it touched 128½, and it made a gain of two points in the week. Commercial continued quiet and very firm; and the old stock had a nice advance. Hardly anything was done in the Suburban and Provincial group; but here the only retrograde movement occurred, Brighton ordinary relapsing. The Continental division was only moderately active, but closed firm. Imperial gained a point; and European first fell, and then recovered. Among the rest, the only move was an advance in River Plate debenture. The Water Companies had a very buoyant week, and several issues had a good rise; New River, which had been uncertain, leading the way.

The daily operations were: Business in Gas opened in a much more lively mood, and prices were good. South Metropolitan rose 1. In Water, New River gained 1, and West Middlesex 2. Prices marked were just as good on Tuesday; but Brighton ordinary was lowered 5, and European ½. In Water, New River rose 2. Wednesday's transactions were much quieter; but everything was firm. Gaslight ordinary, South Metropolitan, and River Plate debenture rose 1 each. Thursday was more active, and very firm. European recovered ½. In Water, Chelsea rose 4, and New River 2. Gas was steady and unchanged on Friday; but in Water, New River rose 1, and both Lambeths 2 each. Saturday was strong, but quiet. Commercial old moved up 2½, and Imperial and Gaslight preference 1 each.

### ELECTRIC LIGHTING MEMORANDA.

**How to Meet Electricians' Misstatements—The "Builder" on High-Pressure Electricity Distribution—Wasteful Lamps—The "Earthing" Problem.**

THE Engineer and Manager of the Redhill Gas Company—Mr. Douglas H. Helps—has just had an experience which is by this time common with his professional brethren. There is an electric lighting undertaking in the town; and a firm of electricians who had opened a branch shop in the neighbourhood have been circularizing the householders with the usual kind of "information" as to the comparative cost of lighting by gas and electricity. They start with the customary assertion (one might give it a shorter name) that "an 8-candle power electric lamp gives a light equal to that of an ordinary gas-burner." From this, it is easy to show that, at local prices, electric light is considerably cheaper than gas. Mr. Helps, however, lost no time in nailing this particular—misstatement—to the counter; showing in a letter to the local Press that, light for light, gas can be had for about one-ninth the cost of equivalent electricity. He also referred to Sir W. Preece's observations concerning the superior economy of incandescent gas to incandescent electric lighting at Maidstone, to Mr. W. A. Valon's criticism of the Bridgwater electricity supply scheme, and other witnesses to the same side of the question. This is what comes of regularly reading the "JOURNAL." We provide the professional guardians of the gas interest with any amount of ammunition for defence against those who would interfere with their business; but we naturally cannot make the local use of it that individual gas managers can, with the help of their papers.

The "Student's Column" of the "Builder" has recently been devoted to a very able description of matters connected with electric lighting, from the consumer's point of view. Among other topics of this nature, electricity distribution at high voltages has come under dispassionate review. The writer's opinion of it coincides with our own. There are certain very decided advantages, for the supplying company or corporation, in distributing current to the public at 200 or 250 volts pressure; the latter being the maximum. By raising the pressure from an original 100 volts to the maximum, the capacity of the mains is increased 6½ times. This fact explains the eagerness of the

supply companies to serve at high pressure. And to a certain extent, of course, what benefits the trader is also good for his customers. The company generally offer a high pressure supply a little cheaper than the low pressure; and slighter house-wires will suffice. These are all the advantages the consumer can expect from the new fashion in electricity supply; but its disadvantages are numerous. First, there is the much more unpleasant, and even dangerous, shock that can be got from the fittings. A sensible shock can hardly be experienced from wires at 100 volts; whereas a 200-volt shock is very disagreeable. Under some conditions, the shock might be at double this voltage, which would be dangerous to life. Another drawback is the necessity for more expensive switches and fuses. Special switch lamp-holders have to be employed; and the Insurance Offices insist that only the highest quality flexible wires shall be used.

The gravest drawback is the lamps. These are dearer and less efficient for high pressures. They are also larger and clumsier. The efficiency of the ordinary high-voltage lamp in the market is at least 10 per cent. worse than that of the 100-volt lamp. Its life is shorter; and it should as a rule only be used in a vertical position. Thus we have the remarkable difference between the latest gas engineering and electric lighting practice, that whereas high-pressure incandescent gas lighting is both cheaper and brighter than low-pressure lighting, in electricity the exact opposite prevails. In Glasgow, and other manufacturing towns which have adopted a 250-volt service on the three-wire system, trouble is experienced in arranging the arc lamps. If open arc lamps are required, it is necessary to put five of them in series on the circuit, because they will not work at the high pressure. This entails the use of all or none at a time. Enclosed arc lamps can be used in pairs on such a circuit; but they are only one-half as efficient as open lamps. Practically an enclosed arc lamp working at 250 volts is of no commercial use for light-giving purposes.

Still, notwithstanding all the drawbacks, the probability is that high-pressure electrical distribution will become general, especially as in this way a traction and a lighting trade can be done from the same generating station, using the same plant. This consideration lends additional interest to the unsolved problem of whether the middle wire of a supply system should be earthed or not. With alternating polyphase systems, the same objections do not apply. Where the direct current is distributed at 250 volts, the dangerous condition may be created that one of the wires may be at a 500-volt difference of potential from earth—a pressure that has often proved fatal. There is also the electrolytic trouble, if direct currents get into the earth. Altogether, therefore, it does not appear from this testimony that the progress of electrical engineering is greatly in the direction of saving the pocket or protecting the person of the user of electricity for the purpose of lighting. On the contrary, indeed, the newest lamps, whether arc or incandescent, are more expensive and greater eaters of current than the old; and the accidents possible with high-voltage currents, both in and out of doors, are not consoling to think about. It is notorious that the London County Council have not looked with much favour on the tendency of the Metropolitan Electricity Supply Companies to adopt the high-pressure system; but the Companies have had their own way in the end.

### THE RETIREMENT OF MR. TREWBY.

WE cannot allow Mr. George Careless Trewby to pass into retirement from active work in connection with the gas industry and the large concern with which he has been associated for between forty and fifty years without giving an account of his professional career, which pressure of other matters prevented us doing when making, in last week's issue, the brief editorial announcement of the imminent and important change. Looked at from the public side, his life cannot be said to have been a very eventful one; but on the other side it must have been full of incident such as one can imagine would be inseparable from the high office he held in an undertaking of the magnitude of the Gaslight and Coke Company. Anyway this much is true, that he will leave behind him a good and lasting record of hard, honest, and faithful work for those whom he served; and his name will take an honourable place among the leading gas engineers of the latter half of the Nineteenth Century.

Mr. Trewby's entrance into the gas industry dates as far back as 1853, when he became a pupil of the late Mr. F. J. Evans at the works adjoining the offices of the Company in the Horseferry Road. Mr. Evans, the older generation of gas engineers will know, was at the time the Chief Engineer of the Company; and under him the young engineer, who was destined in after years to fill the similar but immeasurably more onerous position, made rapid strides in obtaining knowledge of the work to which he had put his hand. Evidence of this is found in the fact that during the latter part of the period mentioned, Mr. Trewby was allotted the task, under Mr. Evans's guidance, of superintending construction work of no mean order—a notable example being a gasholder abutting on Page Street, which at that time (more than forty years ago) was considered something out of the ordinary run in such structures. The Company constructed the tank themselves; and Mr. Trewby had the entire responsibility of looking after the work connected with both tank and holder. The next step that the subject of this notice took was to fulfil an



engagement at Constantinople, as the Engineer to the Ottoman Government. On its termination, he found his way to the Brentford Gas-Works, where he served under Mr. George Evans, who was then Lessee of the undertaking. Mr. Trewby remained in that capacity until the Company undertook the control of the operation of the works; and he then became their Engineer.

The commencement of 1865 witnessed the return of Mr. Trewby to the Horseferry Road Station of the Gaslight and Coke Company; and he acted as Resident Engineer there until the latter part of 1870. In his transference to the same, but more burdensome, capacity at Beckton at that time, we have testimony of the trust reposed in him by the Board. The Beckton works were then in a partly finished condition; and upon him fell the duty of organizing that vast undertaking. This he had to carry out under abnormal conditions which would have completely discouraged a man of less intrepidity and stamina. The memorable Gas Stokers' Strike of 1872 was the event of those stirring times; and a strong, firm hand, such as Mr. Trewby showed that he possessed, was then, perhaps more than ever, an essential attribute of the Resident Engineer at Beckton. Every stoker employed at the time left the place; and such labour as could be obtained had to be secured, and the men lodged and fed on the works. The mere question of wages was not the point over which strife was raised; it was a far more momentous matter—being nothing less than an effort on the part of the men to gain supremacy over their employers. It was, in short, a question as to who should manage the works—the employers or the employed. The stokers at the other London works (with one or two exceptions) joined in the contest by leaving their employ. Right, however, gained the day. The men were beaten so thoroughly that for 17 years afterwards the works were conducted in peace and quietness, and brought to a high state of perfection.

March, of 1884, saw another change in Mr. Trewby's position. He was then appointed Constructing and Carbonizing Engineer to the Company; and he carried out the duties of that office, with noteworthy results, until August, 1891. During that period, the Company were able to bring the price of gas down to within 3d. of the South Metropolitan Company's charge. For this we do not ascribe the whole credit to Mr. Trewby, nor do we think he would have us do so. But we may, and do, unreservedly say that he introduced economies into the working of the Company which had the effect of substantially assisting in bringing the prices north and south of the Thames into closer harmony than they are now. For what he did in this direction, to him be all praise. In 1891, a further change was made in Mr. Trewby's official designation; it being altered to Consulting and Constructing Engineer. But all extensions and reconstructions, it should be mentioned, have been carried out under his supervision since 1884; and he has introduced labour-saving appliances to a large extent at the different works—the new pier at Beckton being one of the finest masterpieces in this line. Special reference was made to this work in the notice we recently published of a visit of the Society of Engineers to the station; and we may call to mind that the equipment of the pier includes powerful hydraulic cranes and grabs for unloading coal from the vessels in the Thames, and transmitting it to wagons for conveyance to different parts of the establishment. The result of this huge and magnificent piece of work has been that not only are the ships discharged with more promptness, certainty, and regularity, but a saving of fully 3d. per ton of coal has been effected, and the Company have reaped the benefit. This also applies to the other works where labour-saving appliances have been introduced for unloading and manipulating the coal. The Beckton installation has been copied by several other companies and firms—notably Cory and Co.—for unloading their ships. Without entering into details, enough has been said to show the extensive character of Mr. Trewby's work for the Company to whose service he has given more than forty years of his life.

Although Mr. Trewby will retire on a pension, he has a retaining fee as an advisory officer of the Company, so that he does not entirely sever his long connection; and the Company will have the advantage of being able to call upon him at any time to assist them in the duties appertaining to the office he now holds. And his ripe experience in the affairs of the undertaking will without doubt be most invaluable. No precise date has been fixed for Mr. Trewby's retirement. This will depend entirely upon the arrangements made for carrying on the work upon which he is at present engaged. The position is one for which few are eligible; and the Directors have before them in the appointment of a successor a very responsible task, which, as pointed out last week, is made the more difficult by the recent lamented death of Mr. Trewby's right-hand man (Mr. W. Sanicroft Randall). However, our wish that Mr. Trewby may live long in the enjoyment of his well-earned rest from the cares, burdens, and responsibilities of his eminent office will be echoed, we say with certainty, by not only his professional brethren, but by all who have been brought into contact with him in any way both in the private and business spheres of his life.

Apart from his connection with the Gaslight and Coke Company, it may be mentioned, in conclusion, that Mr. Trewby was elected an Associate Member of the Institution of Civil Engineers on March 6, 1866, and was raised to the rank of member on April 27, 1875. The British Association of Gas Managers claimed him as a member from 1870 down to the establishment of the Institution of Gas Engineers, of which he was the first President in 1891.

## HOW TO BRIGHTEN STREET FRONTAGES.

IN his time Sir Frederick Bramwell has done the British Public some service; and he has just placed to his credit another piece of voluntary work in the public interest, by arousing and focussing London opinion on the problem of the new Metropolitan street improvement. Mention was recently made in our "Editorial Notes" of the result of the limited architectural competition organized by the London County Council, with the object of eliciting definite suggestions for the treatment of the Strand embouchure of the new north to south street which ought to be for the London of the coming century what the Regent Circus was for the capital in the early years of the present century. That is to say, the new arterial street ought to mark the highest attainment of municipal engineering and town architecture for its period. So far as the engineering is concerned, there is nothing to fear. The municipal and sanitary engineers of the present day can hold up their heads with boldness, and await in confidence the judgment of posterity on their street making and equipment. Unhappily, the outcome of the County Council competition does not encourage a similar judgment on contemporary British architecture. The whole set of competition drawings are being published by the "Builder;" and a dismal prospect they present to Londoners, whose money has gone to pay for them.

It has always been the cry of the eminent Editor of the "Builder" that architects should be associated on terms of equality with engineers in the design of important public works. It has pleased this authority to assume, for the sake of that contention, that engineers are mentally incapable of giving artistic value to their works of construction, and that where this quality is desired none but a professional architect is competent to impart it. Not long ago the "Builder" had an article on the London bridges, in which the same theme was hammered out by a liberal application of the hardest words; and all because the London County Council had ventured to express the opinion that the design of the new Lambeth Bridge ought to harmonize somewhat with the style of the Houses of Parliament; and an architect is to be consulted on the matter. Really, the "Builder" is hard to please in this respect. The new Vauxhall Bridge will be all wrong because no architect was joined with the engineer in designing it; and the new Lambeth Bridge is to be unsatisfactory because an architect is to be called in, with a special suggestion. And the beauty of the whole tale is that the one Thames bridge with which a professional architect of eminence had to do—the Tower Bridge—is notoriously the chief abomination, æsthetically, of the City of London!

Now again, after the "Builder" had poured scorn on the crude notion that a bridge near a Gothic building should be harmonized architecturally with the dominant structure in the river vista—a blunder which, of course, no architect could fall into—here are all these Strand improvement sketches, by eminent hands, exhibiting precisely the same weakness. The vicinity of Somerset House has imposed the same imaginary obligation to "harmonize," on these architects, that the Gothic Houses of Parliament did on the London County Council; with less excuse. So far have some of them succumbed to the influence, that it is difficult to see any architectural distinction in their drawings between a corner wine shop and one of the Strand churches! This failure of the architects was Sir Frederick Bramwell's opportunity; and he sent to "The Times" an interesting proposal to build the new street of shops in two tiers, on the model of the famous Chester "Rows." It is unnecessary to particularize further than to state that the suggestion contemplates an 80-foot roadway, with a 10-foot footpath on each side, bordered by ground-floor shops. Carried over the front part of the shops would be a first-floor footpath 15 feet wide, bordered by shops. Above these shops the fronts of the houses would overhang, say, to one-half of the width of the upper footpath, thus giving a clear width of 114 feet between the upper story frontages.

A flood of interested and interesting correspondence ensued upon the appearance of this attractive communication. It is obviously one that is open to much criticism of a facile kind; but it has answered the purpose of drawing a great deal of attention to the whole subject. From all the letters that have elucidated different features of this vast building scheme, certain valid propositions emerge that are of sufficient importance to amply repay Sir F. Bramwell for his trouble in stirring up the question. One of these is that a business street in London should not be treated in the monumental manner, but the elevations should be fitted to the plans. Mr. Mark H. Judge fittingly lays great stress upon this rule, which architects are too apt to ignore. Another point that has been warmly debated is the suitability of an arcaded street for London. Some, out of consideration for architectural symmetry, have advocated this method of construction, of which the largest and most successful example is to be seen in the modern city of Turin. The architects declare that they could do something with an arcaded street frontage; but that their artistic souls abhor the usual British construction of plate-glass fronts 20 feet high, with slim pilasters, and a towering pile of upper stories impending over the glazed void.

This disparaging description of the modern British shop-front and its coping is just, in the main; but the only pertinent comment upon it is that it is the article that pays. People do not



keep shop for amusement; and if architectural propriety will not give shopkeepers the openness and brightness of shop-front that business considerations require, so much the worse for the architects. This is the difficulty with modern architecture. It has no correspondence with the actual needs of the people. An ordinary shop-front, a common lamp-post, are quite outside the scope of architectural design. In the case in point, if it is impossible to adapt the Chester Rows design to the necessities of shops 20 feet high, arcades are equally out of the question for the English climate. Mention of the device recalls the interesting fact, almost forgotten, that the Regent's Quadrant originally had a colonnade, of which a piece yet remains. It became a nuisance, and had to be sacrificed, notwithstanding its architectural value. Of course, nowadays the greater facilities provided for adequate public lighting remove much of the worst objections experienced in connection with the street arcades of the Regency period; but the "shadiness" of such streets, in more than one sense of the word, must ever be fatal to their general reputation in this country.

The most unsatisfactory thing in all these discussions, from our point of view, is the systematic neglect of all the important branch of the subject which is connected with the artificial lighting. The building of this particular new street in the West Central District of London might have been made to serve as the text for a disquisition upon the gloominess of London and most English towns, as compared with the brightness of Paris, Berlin, and Vienna—to name only a few Continental capitals well frequented by Englishmen. But nobody seems to have thought of this matter at all. It is a consideration that has been frequently mentioned in our columns of late, and will be kept to the front here so long as those who might be expected to think of it at the proper time and in the right place continue neglectful of it. London and English towns generally will never be bright while the architects persist in building in narrow and thronged streets with the same materials they might fittingly employ in the open country. On the other hand, the local authorities might encourage brightness in frontages more than they do at present, by better discharging their duty of keeping the footpaths clean. The filthiness of most English streets and their surroundings is a national reproach.

One of these improvements would help the other. If our architects cannot make London or any other great town a White City, like the one which is now being demolished in Paris, they can take a hint from that ephemeral "thing of beauty" of the possibilities of building in white. We do not despair of common lime white, which Dutch architects at least know how to employ with effect. This new Metropolitan thoroughfare, except at its junction with the Strand, is not likely to be a first-class shopping resort. Then why not try what concrete and rolled steel joists could do to reproduce, with advantages, the type of the old Holborn half-timbered houses? Nobody has ever said these looked out of keeping with their position and uses; and with such frontages, a high degree of light-reflecting power might be secured by simply lime-washing the panels. And besides, is it the fact that architects of street buildings make all the use possible of glazed bricks and majolica? London ought to be, with its low-priced gas for public lighting, the most brilliant of European cities after dark. It is, in point of fact, one of the dingiest; and the architects are to blame for this in the first place, with the large house-property owners in the second degree. It is all because the object of securing the greatest possible brightness has not been properly distinguished and systematically pursued.

#### THE "EDINBURGH REVIEW" ON MUNICIPAL TRADING.

THE subject of Municipal Trading is so frequently dealt with in the Press by writers whose one desire is to say that which they think will please the public, and who are as ignorant of the real issues involved in this question as are the readers they are supposed to enlighten, that every contribution to the discussion by an informed and level-headed writer is most welcome. Such a contribution is to be found in the current number of the "Edinburgh Review;" but it has passed unnoticed and unquoted by those journals who think that every problem of our social economy can be solved, and every difficulty removed, by a delegation of the task to a municipal authority.

The writer takes as his text the evidence so far laid before the Joint Select Committee on Municipal Trading, Sir Henry Fowler's address to the Royal Statistical Society, and one or two other articles dealing with the subject; and he clearly sets forth the real nature of the question to be determined in the near future. The appointment of the Joint Committee, it will be remembered, met with much opposition, and was regarded as evidence of hostility on the part of the Legislature to all municipal enterprise. But, as is pointed out, neither House has shown, nor is there to be found in the evidence of the departmental officers examined before the Committee, any desire to hinder the legitimate growth of the work of great local corporations. "The appointment of the Committee," says the Edinburgh Reviewer, "was more probably due to a feeling that Parliament required some guidance from within as regards a somewhat rapid extension of the matters with which corporations and some councils seek to deal within their own area, and as regards the conditions under which these bodies should be allowed and encouraged to

operate without their own area." That is to say, the Committee are asked to give Parliament some definition, more or less general, of the word we have italicized—namely, "legitimate."

The object which the writer of the article sets before himself, is "to consider how far any distinguishing line can be drawn between those matters which can best be entrusted to municipalities, and those which may safely be left to private enterprise, and whether there are any conditions which may properly be imposed on either in the general interests of the community." Such an attempt, however well-intentioned and ably conducted, is certain to result in failure, unless he who makes it be willing to include in his definition of what "can best be entrusted to municipalities" only such matters as are beyond contention—namely, the administration of local justice, the care of the public health, the management of thoroughfares, and so forth, which duties were "early entrusted to municipal councils as clearly essential to their exercise of powers of wise government." Beyond such duties, and before those which the majority of sensible men would contend that no municipality should be permitted to undertake, there is another class of duty, which can be defined as comprising matters which may, if expedient, be entrusted to municipalities—a very different thing, it will be seen, from saying that they "can best be entrusted."

The difficulties into which anyone attempting an arbitrary distinction between what enterprises should be undertaken by municipalities and what should not, are well illustrated in the article before us. The writer remarks that "it may be said with a great degree of accuracy that the duty of municipal bodies was in their inception limited to the supply of essentials." He admits the difficulty of defining essentials, but immediately proceeds to illustrate his notion of them. "Water and light," he says, "are clearly essentials." But if light be an "essential," how much more so is food; and if light, what of heat, or clothing? Why, then, if it be contended that the supply of light is "a matter which can best be entrusted to municipalities," should the supply of food, fuel, and clothes be left to private enterprise; and why is not the supply of oil for lighting purposes put on the same level with that of gas or electricity?

No; it is impossible to make the distinction one between essentials and non-essentials. The question of expediency must be the governing factor. What distinguishes between the supply of gas and the supply of oil for lighting purposes is the fact that, owing to various reasons, it has been found inexpedient to permit of competition in the supply of the one; whereas there is no reason for—no public advantage to be gained from—interfering with the fullest competition in the sale of the other. It is inexpedient to have more than one water company opening the roads in any district to lay or repair mains; there is no objection to any number of coal merchants sending their carts into the same neighbourhood. Fuel is as essential to life as water; but the supply of one is not on the same footing as the supply of the other.

Moreover, the difference we have shown to exist between the circumstances affecting the conditions under which two commodities, equally essential, can be most expediently supplied, does not bring us to any ultimate and definite distinction between what a municipality should and should not be asked or allowed to supply. The distinction we have indicated is merely one between that which it is clearly to the public advantage to leave in the hands of private enterprise, and that which might possibly be advantageously undertaken by the local authority. The onus still remains upon those who advocate the handing over of the duty of any such supply to the municipality, of proving that such a course would be more advantageous to the public than the continuance of the right to supply in the hands of a private undertaking. This has always been the contention of the "JOURNAL"—namely, that every case (though it fall within the category of supplies which can, without involving interference with the free play of competition, be handed over to a local authority) must be considered on its merits, and decided upon according to the balance of expediency. Who is there bold enough to say that, because Glasgow is well served by the Corporation Gas Department, it would be better for the public of South London to be supplied by the London County Council?

The mistake made by so many people—the Edinburgh Reviewer not excepted—in discussing what limitations should be set on the excursions of municipalities into the commercial world, is, in our opinion, that of trying to enumerate certain matters "which can best be entrusted to municipalities." The truth is that—outside the actual duties of local administration and sanitation—there is no matter that can be declared, out of hand, to be such as can in every case be most advantageously entrusted to the local authority. The suggestions made by Lord Avebury, in an article noticed in the "JOURNAL" for the 24th of July last, appear to be the most acceptable ones yet put forward for the purpose of constituting rules for the guidance of Parliamentary Committees. He proposed that no extension of municipal trading for purposes not yet sanctioned should be permitted, except after full notice and special parliamentary inquiry; that fresh undertakings by municipalities for purposes already sanctioned should only be authorized in cases where it could be shown that special reasons exist which render it more expedient that the undertakings should be carried on by the municipality than by private enterprise; and that ratepayers affected should have a right to be heard in opposition.

The writer in the "Edinburgh Review" refrains from any



expression of opinion upon the question of profits in aid of rates *versus* profits in reduction of price; he merely explains and contrasts the practice adopted in Birmingham with that of Glasgow. As to the housing of the poor problem, he says that it is "matter for grave doubt whether the action of municipalities in this particular sphere of work is really for the benefit of the poor, and whether by tinkering at an evil they do not make it worse than it would be if they left it alone." The experience in Shoreditch, when 533 persons were dispossessed and 472 housed, is instanced; and stress is laid upon the fact that the authorities were at once offered higher rents than they had intended to ask, and than the former class of inhabitant could possibly pay—putting the authorities into the quandary of either seriously aggravating the housing question in the district, or else throwing away the ratepayers' money.

The article proceeds to point out some of the dangers attending the indefinite extension of municipal trading. "The proportion of rich men, wholly free from calls on their time, who devote themselves to local affairs is small, especially in boroughs. It follows, therefore, that town councillors cannot give their whole time to municipal work, except in the case of men of comparatively advanced years; and even they are not likely to tolerate more than a certain inroad on their leisure. The danger, therefore, that if too much work is devolved upon local authorities it will be done with ever-lessening efficiency, is considerable." This is one danger; but it is "not so great a risk as would be undue interference with private enterprise. . . . Were the State to step in now, and, by giving largely extended monopolies for the supply of commodities where no monopoly is *ex necessitate rei* compulsory, oust private enterprise from any important sphere of usefulness, it would be taking a retrograde step of widely baneful effect." Again: "The stimulus of enhanced profit being lacking, corporations are tempted to go on with existing methods and devices as long as they possibly can."

These are all economical objections; but there are also, it is pointed out, social and political difficulties involved in the extension of municipal enterprise—the principal of such difficulties being the one upon which stress has often been laid in these columns. "Were corporations allowed to become traders on a widely extended scale, huge and ever-increasing numbers of the lower and middle classes would become salaried officials of the local bodies in whose election, as things are at present, they would have a considerable share. This would be desirable neither in their own interests nor in those of the general body of ratepayers. If they were allowed to continue in the enjoyment of the right to vote at municipal elections, they would be unable to resist the temptation of endeavouring to improve their conditions of employment by combined use of the franchise. They would believe themselves in the possession of a powerful lever which they would endeavour to use solely for their own benefit. From this danger, the Civil Service of the Crown itself is not entirely free. The danger would be more general, more influential, and more far-reaching in its effects in the case of municipal officers and workmen."

One has only to note the political agitation carried on by servants of the Post Office, and by the employees at the Government dockyards and factories, to say nothing about those of the London County Council, to realize the grave peril to our administrative integrity involved in the increasing commercial activity of not a few municipal authorities. Moreover, "the petty but very irritating friction even now produced by the temptation to abuse authority to which officers of railway companies and other large industrial undertakings are prone to yield, would be gravely increased were the authority wielded by officers, not of private companies, but public authorities." Those will appreciate the force of this argument whose concern it is to see that the customers of large industrial undertakings are treated with courtesy and consideration by the minor officials deputed to deal with the general public, and who therefore know how difficult it is to instil into the minds of those officials the necessity for treating an unreasonable consumer with the same forbearance as they would show to him if their livelihood depended upon retaining his custom.

Such are some of the points brought out in the able article before us. Many of them are already familiar to our readers; but the counsel's advice to "always repeat an argument three times," to ensure that it shall not be missed by any jurymen, well applies to the discussion of a subject the real inwardness of which differs widely from the superficial generalities that are patent to the casual observer, are frequently repeated by the parrots of the Press, and are widely accepted by that unconsidering but most powerful entity, the general public. Unfortunately, neither the general public nor its so-called instructors appear to have either inclination or patience to study articles that take time to read and to write.

The Corporation of Glasgow have arranged for the delivery during the winter months of a series of lectures descriptive of their schemes and work; the lecturers in every case being officials connected with the several departments. The first was delivered by Mr. Robert Wilson, Treasurer of the Water Department, on the evening of the 10th inst.; his subject being "Glasgow's Water Supply." The other lectures include "The Municipal Electric System," by Mr. W. A. Chamen, the City Electrical Engineer; and "The Gas Supply," by Mr. W. Foulis, the Gas Engineer to the Corporation.

## PROFESSOR LUNGE ON COAL TAR AND AMMONIA.\*

[FIRST ARTICLE.]

THIRTEEN years have passed away since we had the pleasure of reviewing the second edition of Professor Lunge's standard treatise on "Coal Tar and Ammonia." In the meantime, much has happened in connection with the coal tar and ammonia industries to make a thorough revision of the 1887 edition imperatively necessary, to keep the work abreast of contemporary changes. We refer not so much to technical improvements in the methods of utilizing tar and ammoniacal liquor for the production of commercial substances, as to the great changes in the quantities and sources of the raw materials and the relative market values of the different products obtained from them. It has not been Professor Lunge's practice to ignore the importance of these factors in determining the utility of an industrial textbook, and consequently there was much in his 1887 edition which needed amendment to bring the information up to date. Readers of German, indeed, were able to obtain a later edition of the book; and the third English edition which is now before us contains all the new information given in the latest German edition, in the preparation of which Professor Lunge was assisted by Dr. H. Köhler.

In 1887, we gave a full account of the scope and contents of the second English edition (see "JOURNAL," Vol. L., pp. 491, 534, and 575); and we cannot now do better than indicate the extent of the changes which have been made in the present enlarged edition. The work broadly may be considered as comprising an introductory chapter, and two distinct and independent parts, one dealing with "Coal Tar and Its Products," and the other with "Ammonia." The introductory chapter, which gives general particulars on destructive distillation and the quantities of coal raised and carbonized, has now grown from 15 pages in the second edition to 20 pages in the present one. Unfortunately, all matter has been retained from the old edition, and additions merely made where it was obviously out of date. But why are not the figures and facts of 1884 and 1885 simply discarded in favour of those of (say) 1898? One would suppose, from quotations from "Field's Analysis" giving the amounts of coal carbonized by leading English gas-works in 1884 and 1885 that later data from the same or other reliable sources were not available. To argue, on the basis of these out-of-date figures, that because Manchester and Liverpool then carbonized more cannel than common coal, and London only 2 per cent. of cannel, London tar is, and should be, much lighter than country tar, is palpably ridiculous now, in the light of the reduction which has been made in the amount of cannel carbonized since 1885. Matter such as this should have been excised in the revision of the work. A reader does not want facts and figures of a past age given with even greater emphasis and detail than those relating to the present day. In this introductory chapter, much remains that was valuable in 1887, but is now comparatively speaking useless; while later information is appended in a disjointed manner, and obtained apparently from less well accredited sources. If Professor Lunge did not think it worth while to give particulars of the amount of coal carbonized by the leading English gas-works during the last few years, it was certainly not worth while to repeat those for 1884 and 1885. He evidently has not had the inclination to revise his work in a manner which would make the third edition as good now as the second edition was at the time of its issue in 1887.

The part of the volume which deals solely with tar and tar products has grown from 499 pages in the second to 643 pages in the present edition; and the illustrations now number 201, against 138 formerly.

The first chapter of this part deals with "Processes for obtaining Coal Tar;" and the production at gas-works is considered at the start. There is little alteration here since the earlier edition. With reference to the Pelouze and Audouin extractor, we were under the impression that its use had spread of late years on the Continent, and are consequently somewhat surprised to see the following comments retained *verbatim* from the 1887 edition: "This apparatus is employed at many French gas-works, and it has also been introduced to a certain extent into other countries, for instance, into Germany; but it has not made its way there." We wonder if the author really thought this statement equally satisfactory now, in the light of the fact that the Pelouze and Audouin apparatus has since 1887 been introduced in many Continental gas-works, and notably in the new central gas-works at Vienna. Passing on to the recovery of benzol from coal gas, or rather coke-oven gas, we find that a good deal of information has been added in the new edition. The recovery of benzol from coke-oven gases commenced in Germany about 1890; and by 1895 the annual production there was from 4500 to 5000 tons. In an addendum, it is stated that the German coke-ovens in 1899 produced 32,000 tons, and that 22,500 tons were consumed in German colour works and 2500 tons in carburetting coal gas. It is computed that if all coke-ovens were fitted with the condensing plant, the amount recovered would be upwards of 80,000 tons per annum. These figures are an interesting adjunct to the particulars given by Dr. Bunte and others in connection with the benzolizing of water gas,

\* "Coal Tar and Ammonia." Third and Enlarged Edition. By George Lunge, Ph.D., Professor of Technical Chemistry in the Federal Polytechnicum, Zurich. London: Gurney and Jackson; 1900.

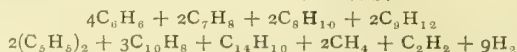


as reported in our columns to-day (p. 1332). The cost of benzol recovery, however, is not slight, for on Donath's authority it is stated that plant for dealing with the gas from 300 tons of coal per diem costs £4300; and the expense of working, inclusive of interest and amortization, amounts to about £4350 per annum. The yield of benzol is said to vary from 0.3 to 1.1 per cent. of the coal carbonized. The next branch of the subject dealt with is the older one of the recovery of tar from coke-ovens; and on this the bulk of the information given in the former edition remains unaltered. Some additional particulars are furnished of the adaptation of beehive ovens for the recovery of tar. Some later improvements of the Otto ovens are also now described. We are glad to see that a good deal of descriptive matter relating to the original Carvès ovens is omitted from the present volume, and that some information on the working of Semet-Solvay ovens is introduced. Apparently no progress has been made since 1887 in the recovery of tar from gas-producers; but there is more said about tar from blast-furnace gases, which now affords useful products, though it is different in character from gas-works tar. Then we find a new section on tar obtained in the manufacture of water gas. The information given is singularly disjointed and unsatisfactory; and it is evident that the author is without any practical acquaintance with this tar, and did not consult the best recent authorities on it. Anyone who may be tempted to refer to this work for particulars about the qualities and uses of water-gas tar will be grievously disappointed at the scanty treatment it receives. There are a number of new facts about the production of benzene from petroleum residues; and the chapter closes as before with an account of a method for testing coals for their yield of tar.

The next chapter on "The Properties of Coal Tar and Its Constituents" has been considerably enlarged by the fuller description of previously unimportant bodies, and by the introduction of some theoretical speculations on the formation of the constituents of coal tar. On the whole this chapter forms a useful and reliable collection of the more valuable facts concerning the carbon compounds which are found in coal tar. It is one of the best in the book; and we cannot well give it higher praise than this.

The next chapter, on "The Applications of Coal Tar without Distillation," is one of the most interesting to gas-works managers. It has been enlarged since the last edition of the work, and now contains, *inter alia*, a fairly good summary of the points for and against the Dinsmore process for obtaining gas from tar. The favourable views of Messrs. Isaac Carr and Watson Smith are quoted, and Kraemer's unfavourable results, which are supported by experiments made by Dr. Bueb, for the German Continental Gas Company. It is perhaps worth while, in view of the continual revival of attempts to make gas from tar, to reproduce a few sentences dealing with Kraemer's trials of the Dinsmore system. Thus it is said:

The increase of volume of the gas (found in that process) is caused entirely by the decomposition of the methane and the olefines; the gas becoming much poorer in these, and richer in naphthalene and phenanthrene. The decomposition of the benzenoid substances in the tar may be represented in the most favourable case as follows:



leaving the extensive separation of free carbon out of consideration. In 100 lbs. of tar, only 2.5 lbs. benzenoid substances are contained, which, if decomposed as above, would account for an increase of 0.66 per cent. of the volume of the gas. The increase would rise to 1 per cent. if the phenols were decomposed in the same manner. Naphthalene is hardly changed; the heavy oils are also very persistent against heat, and at most split off a little hydrogen and methane. The pitch and soot contained in the tar have no action whatever. Hence the Dinsmore process effects nothing else than a hot distillation of the coal—viz., increased production of gas, diminished illuminating power, obstructions by tar in the rising main and by naphthalene in the gas-pipes.

Having thus disposed of the Dinsmore and other schemes for making gas from tar, Professor Lunge proceeds to give, at great length, an account of the numerous methods for the combustion of tar and other liquid fuel in boiler and retort furnaces. His general conclusion appears to be that the *practical* heating value of tar is about 1.2 times that of good gas coke, weight for weight. Next other uses of raw tar are dealt with—such as the preservation of building materials and the manufacture of roofing felt and lampblack. Altogether this chapter is the one likely to be the most interesting to readers of the "JOURNAL," until the portion of the work which treats of ammonia is reached.

In the next chapter, on "The First Distillation of Coal Tar," after a few pages on the storage and transport of tar, the reader is taken into the domain of the tar stiller; and from this point to the end of the portion of the work which deals with tar, the matter is for the most part only indirectly interesting to the gas-works manager. We do not propose to follow Professor Lunge's account of the distillation of tar, &c., in detail, especially as we should have little to add to what we said in our notice of the second edition of the work.

After the chapter on the first distillation of the tar, follow chapters on "Pitch," "Anthracene Oil," "Creosote Oil," "Carbolic Acid and Naphthalene," "Light Oil and Crude Naphtha," and "Rectification by Steam" and "Final Products." These chapters are throughout very good; and the work is bound to be in the hands of every tar distiller and buyer of crude tar products. The revision of this part of the book appears to have been satisfactorily carried out. We can cordially recommend this

portion of the new edition to all interested in matters of which it treats.

We then come to the final part of the work—viz., that on "Ammonia"—and as gas liquor is now so generally worked up on gas-works, we must refer next week in greater detail to what Professor Lunge has to say on this branch of his subject.

### ELECTROLYSIS OF MAIN PIPES—NEED OF PROTECTIVE REGULATIONS BY THE BOARD OF TRADE.

THE subject of electrolysis of gas and water mains by wandering currents from overhead trolley-wire electric tramway systems, is fast becoming one that English gas and water works engineers will require to master. It is understood that the electric tramways actually working on this system in the United Kingdom have not hitherto given any trouble of this kind, thanks to the careful way in which the Board of Trade have regulated the construction of these lines. Besides, the work has in all cases been well and solidly done; and the tramway managers have a perfect knowledge of the fact that lost and unaccounted-for current is not only likely to bring trouble in the future, but also spells waste of fuel in the present. Notwithstanding these safeguards, a good many annoying accidents to tramway users, and wayfarers in streets dominated by the trolley wire, have occurred of late in different English towns, as though to show that the electricity supposed to be tamed to the work of car-propulsion will never lose a chance of breaking out and doing incalculable mischief. The same occurrences illustrate the need of complete comprehension of the nature of such of the consequences of electrical leaks as affect the responsible guardians of buried gas and water pipes.

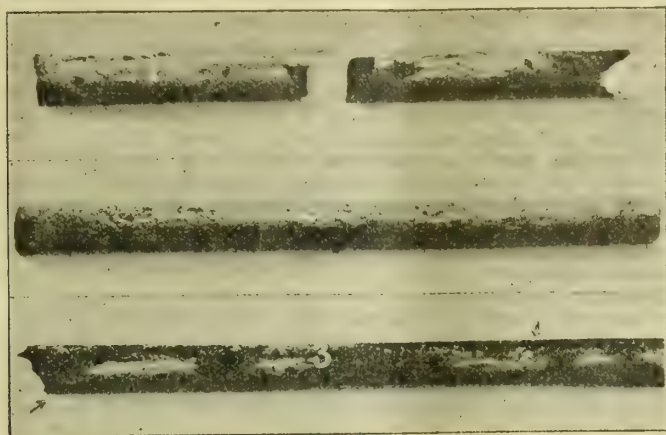
Whenever it suits the electricians to advertise themselves—which happens to be pretty often—one of their favourite boasts is of the tens of thousands of miles of electric railroads that cover the United States, and incidentally prove the vast superiority of that country to this, in that regard. They never remember to mention at the same time that this belauded result is the natural product of a set of local conditions that are not to be found elsewhere in the whole world. These are, the license enjoyed by the electric railway or tramway companies in running along any streets at will, and in laying down their plant and equipment anyhow. One result of this state of things is that the survey of towns for electrolysis of the gas and water pipes is a branch of electrical science which stern necessity has caused to be much cultivated in America. This incident of American electric tramway development is not advertised. Regular readers of the American engineering and electrical journals know how constantly this trouble of electrolysis is kept to the fore in the United States. It is the Nemesis that has attended, and overtaken, the slipshod, cheap, and ramshackle tramway practice that has alone enabled so big a mileage to be covered in so short a time. When electricians claim that there is scarcely an American village without its electric tramroads, they should be asked what sort of roads these are, and whether any self-respecting town in England would endure them and the consequences that follow in their train.

An instructive example showing the nature of some of these consequences of trolley-wire electric tramway working is given in a report, recently published in the "Engineering Record," of an electrical expert directed by the Board of Water Commissioners of Reading, Pennsylvania, to examine their distributing system for electrolysis. The formidable nature of such a survey, to begin with, and its costliness, appear from a map of the city prepared by the Electrician referred to—Mr. A. A. Knudson. Every main in every street where there was a tram-line was tested by the voltmeter between the hydrants and the rails. Also, mains were uncovered and their electrical state ascertained; and many examinations of the tram-rail joints were made to determine the efficiency of the electrical bonding. It is explained that the object of making the hydrant and rail survey was to locate the electro-positive and the electro-negative districts of the city. A positive district is where the current is passing from mains to rails or other metallic conductors, which is the dangerous condition. The negative district is where the current is passing from rails to mains; and at such places as it enters the mains no harm is anticipated. The positive district is usually in the vicinity of a power station, and the negative elsewhere; but there is no rule for this.

There appear to be any number of tram-lines running through and across the city of Reading, which, being laid out on the grid-iron plan of all American towns, affords a multiplicity of parallel tracks and crossings. Thus there is plenty of rail-area for the return current to get safely away by; but this is in some places neutralized by bad jointing. Here a difference of potential of 42 volts was detected; and the main was uncovered to see how it was faring. It was found to be pitted. Nothing was discovered, however, to show what became of the large amount of current passing into the main at the power station; hence it was cheerfully agreed that, unless matters were changed for the better, damage was certain to be done somewhere—possibly at distant and unsuspected spots. At certain places in the system, high positive readings were found, which pointed to the existence of danger to the mains. The suggestive remark is made in this connection, that these readings were held to indicate that the



rails had become unbonded through "wheel-hammer," which proved to be the case. Differences of potential ranging from 1 volt to 25 volts were found between the ends of these rails. As a difference of 0.1 volt is considered excessive round rail-joints, this condition amounted to an open circuit in the rail return; and the consequence to the mains in the vicinity is exhibited in the accompanying illustration.



PIPE DAMAGED BY ELECTROLYSIS IN READING, PENNSYLVANIA.

[The arrows in No. 3 points to holes entirely through the shell.]

The dark spots on these pipes are patches of soft graphite, capable of being dug out with a knife. When the piece numbered 3 had been removed for complete examination, it was found that there were two places where the iron of the pipe had been softened through its entire thickness, and at other places nearly through. The presence of these soft graphitic spots is characteristic of the process of electrolysis in cast iron.

Where heavy negative readings occur, though the mains are not directly attacked on their surface as they are in the case of positive readings, yet damage is done at the joints of the mains, owing to a shunting effect. Mr. Knudson reports that the officers of the electric railway companies implicated in his investigation were so far from feeling hostile towards it, that they expressed their willingness to carry out, in their own interest, any hopeful change that might be suggested for the better protection of the mains. Mr. Knudson therefore took advantage of this offer to deal faithfully with the tram-line interest. He points out the necessity of heavy rails and efficient bonding at the joints, and also suggests the provision of overhead return track feeders to relieve the rails of current where there is a long, straight piece of track. These recommendations, as a whole, however, are confessedly open to the criticism that they can only be regarded as a temporary and partial remedy for electrolysis. "Large escapes of current and immediate damage to mains can be modified; but a single overhead trolley system, with grounded returns, is always more or less a menace to water (and gas) mains."

This is a very grave statement, deserving of particular regard at the present juncture in British tramway affairs; the more so, perhaps, because there is a complete remedy for the evil under discussion—the double trolley, either overhead or underground. By this expedient, the return current is provided with a safe path, and kept out of the rails. On account of its comparative cheapness, the overhead return is found more desirable, except in large cities. This method has been in successful operation in Cincinnati, Ohio, for about ten years, and also in the District of Columbia for about two years, under compulsion by Act of Congress. There is, naturally, little other evidence of the success of this system, because the street railways will not adopt it unless obliged, on account of the greater capital cost. Yet where the leakage of the single trolley system is really heavy, as it is in Reading, the saving of fuel consequent upon stopping it would pay for the outlay in a very short time. Mr. Knudson's main point is, that so long as the single trolley system, using the rails and ground for a return, is in use, there can be no complete relief from electrolytic damage. This appears his deliberate judgment on the whole case.

It is scarcely necessary to emphasize the importance of this dictum of an electrician who speaks from ample experience of the facts of the matter. Another aspect of the same question has been brought into prominence of late in this country—the liability of electrical tramways worked on the single trolley-wire system to interfere with the national Magnetic Observatories at Greenwich and Kew. It is all of a piece with the unbonded presumption of the electricians engaged in exploiting this method of working tramways, that they should coolly suggest the removal of these establishments to a safe distance from their commercial undertakings. The Chairman of the London United Tramways Company had the effrontery to suggest this course to Sir Courtenay Boyle, at the Board of Trade, at a conference held on Oct. 31. The ever-courteous Permanent Secretary received the suggestion calmly; but Professor Perry must have repressed his indignation with great difficulty. He knew his turn would come, however; and in his own Inaugural Address to the Insti-

tution of Electrical Engineers, a fortnight later, he gave the trolley-wire exploiters "a bit of his mind."

Now, the interest in this matter of gas and water main proprietors and their advisers is different in kind, but quite as serious as that of the Government Observatory chiefs. In the particular case of the Kew district, the Tramway Company involved happens to be one of those octopus-like concerns that spread their limbs over a wide area. Their plan is simple. If the old members of the District Councils are obnoxious to them, they induce a sufficient number of amiable amateurs to promise to stand for election on the "tramway ticket;" and then they arrange to bring up in their support a large amount of voting strength (working-class voters who do not usually take the trouble to go to the poll), and so they carry the election. If it were not for the Board of Trade, these gentry would ride rough-shod over all the local authorities, and treat the gas and water companies' property as they pleased. Fortunately, Mr. A. P. Trotter is advising the Board of Trade on this matter; and he knows all about it. It can hardly be too strongly insisted upon that the Board of Trade must be regarded as the natural protector of all other interests against those of the trolley-wire electrical tramway speculators, municipal and otherwise. Parliament will not go behind the lawful representations of the localities threatened by this invasion—the District Councils. The Tramway Companies know this, and capture the District Councils accordingly. It is an importation of American street-railway politics; and the Board of Trade must checkmate the possible results, so far as this can be done.

### PERSONAL.

Mr. CORBET WOODALL has completed his journey round the world, and reached home safely last Saturday evening. His numerous friends will be pleased to learn that he is well, and has had an interesting and enjoyable trip.

Mr. R. HESKETH JONES has been elected as Chairman of the Oriental Gas Company, and a Director of the European Gas Company, *vice* Mr. J. Blacket Gill deceased. Mr. N. E. B. GAREY succeeds Mr. Gill as Chairman of the latter Company.

The Directors of the Monte Video Gas Company have appointed Mr. HENRY KEARNS Secretary of the Company, in succession to Mr. A. G. Hounsham, whose death on the 9th inst. was noticed in the "JOURNAL" a fortnight ago. Mr. Kearns has for nine months been discharging the secretarial duties.

Mr. DAVID MENZIES last Thursday completed a service of fifty years in the gas-works at Dundee; and on the following night a social meeting of the employees was held to celebrate the occasion of his reaching his jubilee as a gas worker. Lord Provost Hunter presided, and presented their guest with a gold watch and chain, a silver tea service, and a gold brooch for Mrs. Menzies. He stated that when Mr. Menzies entered the gas-works, the consumption of gas was only 300,000 cubic feet per 24 hours; now it was 3,600,000 cubic feet. The proprietors of the Dundee "People's Journal" also presented Mr. Menzies with a medal, in recognition of long service.

### OBITUARY.

Mr. JAMES TASSELL, the Chief Secretary of the Faversham Gas Company and a Director of the Water Company, died last Tuesday, after a very short and painful illness. Deceased, who was 81 years of age, was a Solicitor by profession, and held many public offices.

In the "JOURNAL" for the 13th inst., we noticed a presentation made to Mr. JOHN LOWE, by the employees at the Hollinwood Gas-Works of the Oldham Corporation, who had relinquished, through ill-health, the position of Resident Manager, which he had held for 26 years. It was mentioned at the time that Mr. Lowe was too ill to attend to receive the testimony of their esteem which the workmen had prepared for him; and we regret to announce that he died on the 17th inst., in his 54th year.

### NOTES.

#### The Chemistry and Physics of Cast Iron.

During the past year, the "Journal of the Franklin Institute" has contained a good deal of matter relating to the chemistry and physics of cast iron. Mr. Oughterbridge declares that there is no definite composition giving the strongest cast iron, because the composition must vary with the size and character of the casting. Cold-blast charcoal iron combines in the highest degree strength with ductility. This strong iron is comparatively rich in carbon, both combined and graphitic, and contains smaller proportions of silicon, sulphur, and phosphorus than pig iron made with coke in hot-blast furnaces. In the opinion of this authority, the strongest and most ductile cast iron is that which contains a maximum of carbon (about one-half combined and one-half graphitic) and a minimum of all other elements besides the iron. Questions having been asked as to the amount of information derivable from breaking tests of cast iron, applicable



to the results of using the metal in different sized castings, Mr. Oughterbridge states that his practice has been for many years to produce castings of all sizes of a strength as nearly as possible the same as that indicated by test-bars of the metal. Commonly a soft iron is used for making pulleys and light work, moderately strong iron for medium work, and the strongest iron procurable for special work, generally castings of large size. The transverse strength of 1-inch square test-bars 15 inches long, broken in the centre with supports 12 inches apart, varies from about 2000 lbs. for soft iron to 4000 lbs. for strong iron; and the tensile strength of the same material will range similarly from 20,000 lbs. to 40,000 lbs. per square inch. The presence of iron oxide dissolved in the molten metal is a source of danger often overlooked; but it can be cured by adding about 1 part in 600, by weight, of ferro-manganese, either in the ladle or in the cupola.

#### A Large Gas-Engine.

Large gas-engines for English use are oftener talked about than seen. For this reason, particular interest attaches to a 250-horse power engine made by the Premier Gas-Engine Company, of Sandiacre, and recently illustrated in the "Engineer." It is intended for use with Mond producer gas, and has indicated 278-horse power with this kind of gas, and over 300-horse power with town's gas. This small difference probably does not mean that town's gas is so little stronger a fuel than Mond gas, but only that the motor is better adapted to the latter than the former. The system on which the engine works is on the positive scavenger principle; and the engine is of a modified trunk design, on a horizontal model. The charge is compressed by one return stroke, ignited and expanded the next out stroke, and the following return stroke is the exhaust stroke of the motor cylinder. In it air is again compressed; but at about half-stroke a valve is opened, and the air rushes through the combustion-chamber. The succeeding strokes are a suction stroke for the charge, and then the cycle recommences. Various practical advantages are claimed for this positive scavenging arrangement. The lower side of the piston is borne on a shoe, which works in an oil-bath. In this engine the diameter of the motor piston is 24 inches, and the stroke 30 inches. The fly-wheel weighs 14 tons. The consumption of Mond gas is not stated; but the mean working pressure is recorded as having been 113 lbs. per square inch, and the indicator trace was of a good form.

#### The Water Power of the Alps.

The prospects of the utilization, by the agency of electricity, of the water power of countries destitute of coal are continually being ventilated. It is interesting to know, therefore, that since 1897 a French Government Commission has been investigating the possibilities of this development over the entire Alpine region, including the watersheds of France, Italy, and Switzerland. The report of the Commission appeared in the last quarterly issue of the "Annales des Ponts et Chaussées." Many wild statements have been published respecting the amount of water power available in these regions. Thus, it has been asserted that France possesses about 10,000,000-horse power undeveloped, Italy 2,640,000-horse power, and Switzerland 582,833-horse power. Actually, France utilizes only 113,364-horse power, Italy 250,000-horse power, and Switzerland 200,000-horse power. After a careful examination of the whole subject, the Commission adopted the following rule for estimating the hydraulic power obtainable from any given district: The flow of the streams under consideration was observed during the period of low water, which in the Alps is during the three winter months. For the remaining nine months of the year, the mean flow is taken. The low-water flow, multiplied by three, is then added to the mean flow multiplied by nine; and the sum is divided by twelve for the yearly mean. This flow is multiplied by the total available fall to get the power. The volume of water required for local irrigation has to be deducted. In the case of the Department of the Hautes Alpes, the result is to show a mean value of about 500,000-horse power. The cost of its utilization naturally varies. In France, the installation of water-power plants costs from 100 to 300 frs. per horse power; in Switzerland, it is held that a plant costing more than 1000 frs. per horse power cannot be worked at a profit; while in Italy, where coal is still more expensive, the profitable limit is higher. Assuming 8 per cent. for capital charges and depreciation, and 2 per cent. for operative charges, it follows that the annual cost of a hydraulic horse power ought to be 10 per cent. of the installation cost. To this must be added the expenses of conversion, transmission, and re-conversion.

**The Calorimetry of Coal.**—A new form of coal calorimeter, which is claimed to be specially adapted for technical use, is described by Mr. S. W. Parr, in a recent issue of the "Journal of the American Chemical Society." The principal novelty in Mr. Parr's procedure consists in the use of sodium peroxide to provide the oxygen necessary for combustion. The use of this chemical has the advantage that the sodium monoxide left combines with the steam and carbonic acid resulting from the combustion of the coal, so that it is unnecessary to provide any means of escape for the products. A large correction (27 per cent. of the total) has, however, to be made for the heat due to these combinations.

## TECHNICAL RECORD.

### MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Southport.

The Quarterly Meeting of the Institution was held on Saturday at Southport, Mr. T. N. RITSON, Assoc.M.Inst.C.E., of Kendal, in the chair. There was a good attendance.

On arriving at Southport, the party were conveyed by electric tram to the gas-works, where, under the guidance of Mr. John Booth, the Engineer, the Chairman (Mr. Trounson), and other members of the Gas Committee, a thorough inspection of the buildings and plant was made; special interest being taken in the various enriching processes which have been adopted. Leaving the gas-works the members proceeded to the Victoria Hotel, where they were entertained to luncheon by the Mayor (Dr. Isherwood) and Gas Committee.

The MAYOR remarked that he had great pleasure, on behalf of the Corporation and the Gas Committee, in welcoming the Institution to Southport. The members were all engaged in an interesting and useful work. His opinion was that gas was by no means played out. From the results of experiments he had seen made, and from what he had read, he believed they could to-day get more luminosity for the money out of gas than in any other way. Still, they were glad to have a rival working by their side; and he was sure they all wished electric lighting well, as it had many good points in its favour which they could not but acknowledge.

Mr. TROUNSON, in proposing prosperity to the Institution, observed that he gave them a hearty welcome, both on behalf of his Committee, and on personal grounds, as the present meeting had enabled him to renew acquaintanceship with many of the members whom he had met in London in connection with the annual meeting of the Gas Institute. He found the gas engineers at various works always very ready to communicate anything he wished to know, either of a technical or a commercial character. Such meetings as those of the Institution could not fail to tend greatly to the advantage both of themselves and the estates they represented. It was gratifying to know that, in spite of many competitors which had entered the field in recent times, gas had held its own, and had proved the most useful and economical form of artificial lighting, while also showing capabilities of employment for motive power which not very long ago were undreamt of. He thought this branch of the industry had not yet reached the development which its merits demanded. No doubt the competition of electricity had proved a splendid tonic to the gas industry, and had caused a general awakening of even the engineers themselves, with the result that to-day they could produce a light second to none, even when placed side by side with the most powerful electric arc. Referring to the display of high-pressure gas lighting at the Paris Exhibition, he said this system had practically unbounded possibilities, and it remained for them to take the matter up. If they did so, he was sure they would be able to obtain results that would surprise the world. With regard to the functions of a gas engineer, he had often thought this official should be so relieved from the commercial working of the estate that he would be able to devote his mind entirely to the technical and scientific portion, and the improvement of the means and methods of lighting, &c. If gas engineers would take their committees into their confidence, and invite them to participate in the work so far as the commercial part of it was concerned, the latter, he was sure, would always be sufficiently interested to encourage the engineer in anything he suggested for the benefit of the estate. He (Mr. Trounson) might add that in Southport the streets were particularly adapted for incandescent gas lighting, both of the high-pressure and the ordinary kind. They would probably be able to show next year as brilliantly lighted a town as any in the kingdom. By the end of April, their Engineer would no doubt be in a position to claim that his works were at any rate as up-to-date as most others in the country. They hoped to complete the installations of retort-stoking machinery and other improvements in the early part of the year.

The PRESIDENT, in responding to the toast, thanked the Chairman and his Committee for their kind hospitality. The object of the Institution was, he said, of a twofold character. There was, in the first place, the social side, whereby the members rubbed against each other and obtained as much information as possible; and this, in the end, proved very beneficial to their employers. Then there was the technical side, whereby they investigated matters connected with gas engineering, and then brought them, in the form of papers, before the Society, so that every member could get the benefit of what they had done. There had been a time when the nearest gas-works to his own were almost closed to him; but to-day all this was changed, and he would be able to obtain admission to almost any works in Great Britain. With regard to electric lighting, he understood, and was glad, that the Electrical Engineer, Mr. C. D. Taite, was present. He (the President) had had opportunities of mixing a good deal with electricians. They were going in for electricity at Kendal, and it was, he believed, in the first place, to be under his control. He had always found a spirit of *bonhomie* and readiness to give information among the electricians; and he thought that this feeling of community between the electric and the gas



engineer was only right and proper, as each wished to give the best light at the lowest possible cost. There was plenty of room for both gas and electricity. The latter had given an enormous impetus to the gas industry; and with the advent of the incandescent electric light came, almost on its heels, the incandescent gas-light.

Mr. R. G. SHADBOLT (Grantham) proposed prosperity to the Corporation, coupling with the toast the names of the Mayor and Mr. Councillor Trounson. He said the Institution had on no occasion been more heartily welcomed or better entertained than they had been that day; and he might mention that the Southport Gas Engineer (Mr. Booth) was one of the four remaining original members of the Institution, three of whom were present that day. The Southport works presented many interesting features. They saw there almost every sort of plant. One was struck with the different kinds of apparatus at the works; showing the progress made in gas engineering from time to time—a particularly noticeable feature was the number of enriching processes. He supposed this enabled them, whatever was the state of the coal market, to fall back upon one or other of the three processes which might be the cheapest for the time being, and thus maintain the quality of the gas demanded by consumers at a minimum of cost.

The MAYOR, in responding, referred to the rapid growth of the town, both as regards population and the scope of its undertakings. They possessed their own gas and electricity works; and they hoped before very long (at any rate jointly with one or two other authorities) to have their own water-works, which would be of great advantage to the town.

Mr. J. CHEW (Blackpool), in proposing the health of Mr. Booth, observed that he had known that gentleman for a great number of years, and thought he was to be highly congratulated on the present position of the gas undertaking in Southport, especially when they considered the obstacles he had had to overcome, and the severe criticism to which he had been subjected on the part of the Press and the public. As to the competition of electricity, all he could say was that it was a fair competitor, to be met on fair ground. When gas undertakings were not handicapped too heavily in paying a large amount towards the rates, they would go on prospering in spite of all obstacles.

Mr. BOOTH, in acknowledging the toast, observed that in looking up the matter, he was surprised to find that of those who met at the Mitre Hotel, Manchester, in 1870, to inaugurate the Institution, only four were left. As to his labours at Southport, he had certainly had much uphill work, but he was able to say he had come out at the top. He should continue in future to do his best for the interests of Southport, as he had done in the past.

After lunch, the business meeting was held in the hotel.

The HON. SECRETARY (Mr. S. S. Mellor, of Northwich) read a number of letters from gentlemen who were unable to be present.

Mr. J. W. MORRISON, of Sheffield, Mr. Harold Hutchinson, of Barnsley, and Mr. J. W. Turner, of Mirfield, were elected as members of the Institution.

#### ELECTION OF PRESIDENT.

The PRESIDENT said the next business was to elect a gentleman to occupy the chair during the ensuing year; and he had a name to propose for the office which he was sure would meet with the approbation of them all. He moved that Mr. Charles Wood, F.C.S., be elected President of the Institution for 1901.

Mr. H. TOWNSEND (Wakefield) seconded the motion.

Mr. W. W. HUTCHINSON (Barnsley), in supporting the proposition, observed that Mr. Wood had passed through the Committee and the senior vice-presidency, and was in every way competent for the office to which they proposed to elect him. Mr. Wood, although comparatively young in years, had had a wide experience of a very varied character, such as did not fall to the lot of many; and his general character and integrity were such as to justify them in electing him to the presidency of the Institution.

The motion was carried with acclamation.

Mr. WOOD, in accepting the office, observed that he would try to fulfil the duties of it to the satisfaction of the members.

#### THE SOUTHPORT GAS-WORKS.

Mr. BOOTH then read the following description of the Southport Gas-Works:—

The land on which the present plant of the gas-works stands is about 12 acres; a few years back we took in another 5 or 6 acres. We thus have plenty of room for development. The electric generating station already occupies a portion of the land; and the refuse destructor works are now placed on another part.

Three systems of gas-making plant are in use at the gas-works—namely, coal gas, oil gas, and carburetted water gas. For the coal gas there are 162 through retorts, 20 feet long, 36 through retorts 16 feet long, and 36 single retorts 8 feet long. They are set in beds of sixes, and all the retorts we have fixed for the coal gas are brick-built, with the exception of 24 clay retorts. They are  $\square$  shape, 20 in. by 15 in., the carbonizing power of which is equal to about 2 million cubic feet of gas per day. The retorts are all horizontal; and the working of them is done by hand labour. But this winter will be the last for the work to be performed in this way; a contract having been placed for an

installation of West's power machinery, which is to be completed early next year.

Eighteen cast-iron retorts have been fixed for the manufacture of oil gas, solely for enriching purposes; the plant being what is known as the Peebles system.

Plant having a capacity for a make of carburetted water gas equal to 750,000 cubic feet per day has been installed. This plant is complete in itself, having its own exhausters, purifiers, and station meter; the carburetted water gas and the coal gas combining at the outlet of the respective station meters. Wrought-iron condensing mains are inside the retort-house, and a cast-iron one outside. There is one of Cutler's vertical water condensers; also a Ford washer and an "Eclipse" washer-scrubber.

There are two exhausters, each of 40,000 cubic feet capacity per hour, for coal gas, and one of 8000 cubic feet per hour for oil gas. There are four purifiers, each 38 ft. by 24 ft. by 5 ft. 6 in., for coal gas and oil gas, fitted with hydraulic valves. These are elevated; openings being in the bottom for emptying. For conveying oxide into the purifiers there are two elevators worked by a steam-engine. For the carburetted water gas, four purifiers are used, each 20 feet square and 5 feet deep. For coal gas there are two station meters, of 20,000 and 40,000 cubic feet per hour capacity respectively, and one of 40,000 cubic feet per hour for carburetted water gas. The storage power consists of two gasholders, 100 feet in diameter, having two lifts of 20 feet each; and one 150 feet in diameter, having two lifts of 30 feet each—the total capacity being 1,600,000 cubic feet. There are two station governors—one 20-inch and one 36-inch—both of which are Cowan's water-loading arrangement.

The length of mains in the district of supply is equal to about 90 miles; the diameters varying from 2 inches to 42 inches. A Maxim carburettor of 1 million cubic feet capacity per hour has recently been added to the gas plant. Sulphate of ammonia plant equal to working 10,000 to 12,000 gallons of ammoniacal liquor per day is erected; and in connection with the waste gases from this plant, a Claus sulphur recovery kiln is used, as well as two oxide purifiers. Plant for the distillation of coal tar to the extent of taking off the crude naphtha and light oil is worked; the tar being used for asphalt road making. A small complete coal-test plant has been erected; and is in daily use. The coal storage is equal to about 7000 tons; and the tanks for the storage of oil have a capacity of about 180,000 gallons. The storage for tar and ammoniacal liquor is equal to about 170,000 gallons.

The make of gas for the year ending March 31 last was 405,128,000 cubic feet. The net profits of the gas-works are applied in the relief of rates; and the profits for the last five years averaged £10,265 per annum. The capital account at the end of the last financial year was £244,328; being equal to £7 1s. 6d. per ton of materials carbonized, and 12s. 3d. per 1000 cubic feet of gas sold.

The PRESIDENT observed that the paper gave a very interesting account indeed of the works under Mr. Booth's control.

Mr. J. CHEW (Blackpool) asked whether Mr. Booth thought the Peebles process was better than the benzol-enrichment method. Did he recommend one in preference to the other?

Mr. A. GRAHAM (Mansfield) asked for some information as to the make of sulphate at Southport.

Mr. H. KENDRICK (Stretford) said he would like to know if the £7 1s. 6d. mentioned at the end of the paper was taken upon the coal equivalent of the oil as well as the coal carbonized.

Mr. BOOTH had no hesitation in saying that, from his experience of enriching with cannel, carburetted water gas, and the Peebles process, benzol was the cheapest enricher at the present day. It was also very simple in operation, and could be applied at any moment with very little trouble. The make of sulphate at Southport last year was 26½ lbs. per ton of coal carbonized. As to Mr. Kendrick's question, he (Mr. Booth) was not quite clear himself as to what was the right factor to apply to oil as compared with a ton of coal. He had therefore not adopted any of the several equivalents that had been suggested, because he was not satisfied that any, or which of them, was right. He therefore gave simply the capital employed per ton of materials carbonized.

Mr. R. G. SHADBOLT (Grantham) read the following paper:—  
THE MINIMIZING OF SUNDAY LABOUR ON GAS-WORKS.

At first blush, it would almost appear that some apology was due for claiming your time and attention to a subject which must be ever-present in the minds of those responsible for the conduct of undertakings having for their object an efficient, constant, public supply—such as gas, water, electricity, &c. My only excuse lies in the universal desire of employers to ameliorate, so far as practicable, the lot of the worker, and the applicability of my own experience, more or less, to gas-works at large.

Of gas workers generally, it may truly be said that their lot is not by any means unduly hard; and their remuneration—particularly among the more arduously employed—will bear favourable comparison with other equally skilled, or semi-skilled, artisans in the country. So far as real grievance is concerned, I question whether one exists, unless it be in connection with the subject under notice. We may safely assume that there is scarcely a gas-works existent where some proportion of the total labour is not dispensed with on the Day of Rest. Still, it is no uncommon thing to find stokers engaged full seven days per week all the year round.

Local circumstance is a most persistent and variable factor,



and cannot in any case be ignored. The great master—public demand—must, of course, be met and satisfied, although his whims and fancies may at times become almost tyrannical. Again, there is the question of plant, with possibly obsolete or unsuitable methods of working; deficiency of good, sound valves; machinery that, like a work-worn horse, must be kept constantly going or utterly fail; shortage of holder room; and other difficulties which make a cessation of gas-making operations an event to be avoided if at all possible. When conditions exist such as to rule systematic stoppings out of the question, one is compelled to make the best of things as they are, and strive, as opportunity arises, for a better state of affairs. And that not on account of Sunday stopping alone, but also general working efficiency; for it will be readily conceded that the best plant for stopping and starting purposes is also the best for comfortable working.

In the writer's case, it is only during the last two years or so that systematic stoppings have been permissible. Prior to that time, conditions and circumstances were such as to permit of but little relief from the long, weary, interminable grind. At the first works placed under my control, the plant was in fairly good working condition, with the exception of storage capacity, which was lamentably inadequate, particularly for a manufacturing district—being, to the best of my recollection, equal to about 350,000 cubic feet, with a maximum day's output of half-a-million cubic feet. Under such circumstances, the great question was not how much stock could be accumulated by Sunday morning, but how little. Not should we put down for 12 or 24 hours on the approaching Sabbath, but to be sure and ground the holders on Saturday night that the maximum amount of room might be provided against Sunday's make. Indeed, the manipulation of the holders to ensure their being quite emptied on Saturday nights became almost a fine art, religiously practised for at least eight or nine weeks in the depth of each winter. Of course, occasionally we were compelled to slack off a little on the Monday; and that was the only ease we could well afford. After some little experience, however, further relief for the stokers was obtained by one gang dropping out entirely during the changing at the week-end; or, in other words, by changing backward instead of forward. This, of course, only when working 8-hour shifts. We thus secured double rest for each gang in turn once in three weeks; and this was the full extent of our success up to the time of my removal.

At Grantham, the conditions were the exact reverse—i.e., ample storage, but otherwise inadequate and unsuitable plant; not a very rosy outlook for Sunday rest. This was quickly brought home by one of the first conversations the writer had with his senior leading stoker, which was much as follows:—

Q.—Be you a Sunday man?  
A.—What do you mean?  
Q.—Do you believe in stoppin' Sundays?  
A.—I'm afraid not, just yet.  
REJOINDER.—H'm, I heard you was.  
And so, once more, hearsay was falsified; for however much one might feel inclined to do so, to interrupt the even tenor of the gas way under unsuitable conditions is an undertaking fraught with many unforeseen and dire results, as instance the following: We had hastily put in a washer to assist the scrubbing plant (all too small), and had ceased gas making for coupling-up purposes. Such an unusual event was the cause of much speculation, not to say trepidation, on the part of the workmen, which was more than satisfied on again putting the retorts to work. No sooner were the lids of the first charges sealed, than the remaining retorts belched forth fire, solid and gaseous, much to the consternation of those within range. Fortunately, the casualties were light, consisting of a few scratches, bruises, slight burns, and shocks, but quite sufficient to quench the ardour of the most zealous sabbatarian until a more favourable season, which arrived in due course.

The cause of the foregoing incident was not far to seek. Being valveless from retorts to exhauster, the hydraulic mains, unaccustomed to such a state of inactivity, had quietly emptied themselves sufficiently to unseal the dips; and the rest followed as a natural sequence.

I apologize for thus wasting time this afternoon over this little incident, which I relate as a typical instance of the impracticability of systematic closing down, under unfavourable conditions, and such conditions as still exist here and there, although their days are numbered. In course of time, works extensions were taken in hand; and after the completion of new carbonizing plant on the regenerative principle, several stops and starts were successfully made, which served to familiarize those concerned with the why and wherefore.

These facts, together with the perusal of that useful and interesting pamphlet on "Sunday Carbonizing in Gas-Works," circulated by Messrs. John Gritton, D.D., and Peter Steel, induced us to institute a system of Sunday stopping so far as should be found practicable. Before committing oneself permanently to any innovation, it is but natural to inquire the cost, even when, as some profess, the cost is no object; and I am prone to confess that, up to that time, I had not met with any statement setting forth the items of cost in such a manner as could be wished.

Sundry opinions had been hazarded from time to time; but as these varied from about a ½d. to 2d. per 1000 cubic feet, they were anything but satisfactory—indeed, the higher figure would, in many instances, prove quite prohibitive. Further, as no detailed statements showing how these figures of cost were made

up had so far come under my personal notice, after proving the practicability of stopping at various seasons of the year, observations extending over twelve months were determined upon.

We set out with the intention of effecting a twelve hours' Sunday stop once a fortnight, that being the duration of the day and night turns respectively, which would enable us to abolish the long turns worked at change time. In the earlier stages, the dampers to each bed were closed at 6 a.m.—when stopping—and opened again at times varying from 3 to 6 p.m., until the right time was determined for ensuring the retorts being at a proper working heat when wanted. Also the lids were struck, and the foul-main valves closed, as soon as the quality of the gas fell; but this arrangement did not answer very well, as retort cracks quickly opened, the coke lying in the retorts wasted visibly, and it was generally towards the middle of the week ere the dampers and heats were again properly adjusted. The latter was undoubtedly due in a large measure to the form of waste-heat main flue, an arrangement which works all right once the dampers are set, but renders their readjustment after disturbance, a matter of some care and attention. Not to weary you with every little change in the *modus operandi*, we eventually proceeded as follows:—

Night gang's last round (prior to stopping) put on between 3 and 4 a.m.

Primary and secondary air-flues closed at 6 a.m.  
Exhauster run at level gauge from 8 a.m. until station-meter almost ceases to register, which is generally from 9.30 to 10.

Exhauster then brought to a standstill; foul main and holder inlet valves closed; retort-lids and all else remaining close sealed until time of starting.

Producers replenished during the day as required.  
If a twelve hours' stop, primary and secondary air-flues are reopened at 3 o'clock.

First round goes on at 6 p.m.; all retorts of that round being drawn before charging any. The retorts for the next round remain close sealed until their time arrives, when they are treated in the ordinary manner.

As soon as charging commences, the foul main and holder valves are again opened, and the exhauster started with the same governor equilibrium as at the moment of stopping. Immediately the charges are completed, the exhauster governors are set at the normal; everything falling into its allotted place as though no interruption had occurred.

The same applies to twenty-four hour stops, excepting that it is found necessary to open the air-flues four hours before commencing instead of three.

During the earlier part of the time under observation, some little difficulty was experienced in keeping up the illuminating power of the gas for the last two to three hours before actually stopping, likewise the first hour or more of starting. The gas made during these periods was run into a reserve holder and dealt with afterwards. But this difficulty has disappeared with the advent of new exhausting machinery; and though the same treatment is still followed for the last and first hour, it is more as a safeguard than an absolute necessity.

As bearing upon the cost, the chief items have been carefully noted during the twelve months, and are shown in the accompanying Statement A.

STATEMENT A.

Date.	Length of Stop.	Wages.	PRODUCERS.		Gas Lost.	Number of Shifts Affected.
			At Work.	Per 12 Hours.		
1899.		s. d.				
July 23 .	24 Hours.	..	4	8	20,000 c. ft.	4
" 30 .	24 "	..	4	8	21,000 "	3
Aug. 6 .	12 "	..	4	4	8,000 "	2
" 13 .	24 "	..	4	8	15,000 "	4
" 20 .	12 "	..	4	4	..	..
" 27 .	24 "	..	4	8	..	..
Sept. 3 .	12 "	..	4	4	..	..
" 10 .	12 "	..	6	6	..	..
" 24 .	12 "	..	6	6	..	..
Oct. 1 .	24 "	..	6	12	14,000 "	2
" 8 .	12 "	2 0	6	6	6,000 "	2
" 22 .	12 "	2 0	6	6	..	..
Nov. 5 .	12 "	3 9	8	8	15,000 "	1
Dec. 3 .	12 "	4 6	10	10	4,000 "	1
" 25 .	24 "	9 0	10	20	37,000 "	3
1900.						
Jan. 14 .	12 "	4 6	10	10	..	..
" 21 .	12 "	4 6	10	10	..	..
" 28 .	12 "	4 6	10	10	28,000 "	2
Feb. 4 .	12 "	4 6	10	10	25,000 "	1
" 11 .	12 "	2 0	8	8	..	..
" 18 .	24 "	4 6	8	16	17,000 "	1
" 25 .	12 "	2 0	8	8	..	..
Mar. 4 .	12 "	2 6	8	8	..	..
" 11 .	12 "	2 0	6	6	13,000 "	1
Apl. 8 .	12 "	2 0	6	6	11,000 "	1
" 15 .	24 "	..	6	12	49,000 "	3
" 29 .	12 "	..	4	4	..	..
May 6 .	12 "	..	4	4	..	..
" 13 .	12 "	..	4	4	..	..
June 17 .	12 "	..	3	3	14,000 "	3
Totals .	30 stops.	54 3	191	..	297,000 "	34
Equivalent	38 12-hour stops.	..	..	237	..	..



Those items calling for special notice are: (1) The extra wages expended in connection with replenishing producers. This item may at first appear unduly small; yet it is all that can fairly be charged, as boiler and engine attendant must be on duty whether gas making proceeds or not, and has ample time, at least during the summer six months, to do what little is necessary in keeping up the fires—the charges shown being practically confined to the winter half year. (2) The number of producers in use at the time of each stop. The quantity of coke consumed per producer during a twelve hours' stop averages, on an actual weighed test, with four producers, 7 cwt. per producer; hence the following column, which equals the number of producers kept up for twelve hours  $\times 7$  cwt. = the total coke used for this purpose. (3) The gas lost through cracks that have opened in retorts through standing. This depends largely upon the condition of the retorts themselves, as with new retorts, or retorts that have been recently repaired and pointed, the loss is trifling. The quantity lost is ascertained by taking the average make of gas per shift prior to stopping, and accounting for all below that quantity until the average is again reached. The last column indicates the number of shifts thus affected.

Loss of gas in the setting involves loss of tar and liquor; and this loss has been estimated in Statement B. The value of the gas lost is reckoned at the cost price of manufacture less residuals. Thirty stops are recorded during the year, as against 26 stops anticipated; 22 being of twelve hours' duration, and 8 of twenty-four hours. This does not, however, fully represent the Sunday rests secured to the stokers, as on several occasions, when the stock of gas was insufficient to warrant a stop at the time of changing turns, a scratch gang has been got together for six or twelve hours as occasion required.

For the sake of simplicity, we will assume that Statement A represents 38 twelve-hour stops, the cost of which is shown and analyzed in Statement B.

STATEMENT B.  
*Cost of Stopping, as per Statement A.*

Labour . . . . .	=	£2 14 3
237 producers, at 7 cwt. = 82 tons 19 cwt. of coke, at 13s. . . . .	=	53 18 3
297,000 cubic feet of gas, at 1s. 1½d. per 1000 . . . . .	=	16 14 1
Tar lost, 1'45 tons, at 25s. . . . .	=	1 16 3
Liquor lost, 4'35 tons, at 9s. . . . .	=	1 19 1

$\text{£}77 \text{ rs. } 11 \text{ d.} \div 9000 \text{ tons of coal carbonized} = 2'05 \text{ d. per ton of coal.}$   
 $\text{£}77 \text{ rs. } 11 \text{ d.} \div 93,000,000 \text{ cub. ft. gas made} = 0'19 \text{ d. per 1000 cubic feet.}$

This is the result of an equivalent to 38 12-hour stops, whereas there would be 52 stops if the system was adopted altogether—*i.e.*, every Sunday in the year. Further, Statement B does not include any item of cost representing the increased number of retorts used; and this is a matter that cannot in fairness be overlooked. If gas-making operations are suspended for twelve hours per week the year round, it follows that there is one-fourteenth less working time, and that there must be an equivalent increase in the generating plant in use. This equivalent is equal to 7·7 per cent., or, allowing for the gas loss according to Statement A, about 8 per cent. increase. If we take the sum of £300 per annum as representing the repairs, renewals, and maintenance of generating plant at a works of the size of Grantham, we arrive at the figure of £24, which must be added to the cost. It may be objected that the whole manufacturing plant is involved; and if it was customary to allow no margin over and above the maximum day's make, the objection would be a very serious one. But as a works in such a condition would, in all probability, be on the verge of enlargement, such a state of affairs can only be regarded as temporary; and, under normal conditions, the repair, &c., items should, in the writer's opinion, cover all.

At any rate, the endeavour to project the total cost over 52 Sundays is expressed in Statement C.

## STATEMENT C.

*Cost of Stopping for Twelve Hours per Sunday all the Year Round.*

Labour . . . . .	=	£3	14	2
113 tons 10 cwt. of coke, at 13s. . . . .	=	73	15	6
406,000 cubic feet of gas, at 1s. 1½d. per 1000 . . . . .	=	22	16	9
Tar lost, 2 tons, at 25s. . . . .	=	2	10	0
Liquor lost, 6 tons, at 9s. . . . .	=	2	14	0
Repairs, renewals, &c., 8 per cent. on £300 . . . . .	=	24	0	0

$\text{£}129 \text{ 10s. 5d.} \div 9000 \text{ tons of coal carbonized} = \text{3'45d. per ton of coal.}$   
 $\text{£}129 \text{ 10s. 5d.} \div 93,000,000 \text{ cub. ft. of gas made} = \text{0'33d. per 1000 cubic feet}$

Of the total here shown—viz., £129 10s. 5d.—the respective items bear the following proportions:—

Labour	2'87	per cent.
Coke	56'96	"
Gas	17'63	"
Tar and liquor	4'01	"
Repairs, &c.	18'53	"

100' 00

From the question of use of more generating plant, arises the query: How far is Sunday stopping practicable with plant barely equal to the maximum demand? I have endeavoured to answer this from my own carbonizing book, assuming the maximum week's output to be also the maximum works capacity.

Four weeks in the depth of winter is the only time it would be absolutely necessary to work through without stopping, thus—

Maximum week's output : . . . = 3,000,000 cubic feet.  
Less 7½ per cent. for 12-hour stop = 2,775,000 "

Then 2,775,000 cubic feet is the maximum week's make that can include a 12-hour stop. Compare this with five heaviest weeks thus:—

First heaviest week	" " " " " "	2,650,000	cubic feet.
Second	" " " " " "	2,800,000	"
Third	" " " (Maximum)	3,000,000	"
Fourth	" " " " " "	2,700,000	"
Fifth	" " " " " "	2,775,000	"

The second, third, fourth, and fifth of the heavy weeks only being prohibitive. Of course, for 8-hour stops on the one hand, and (say) 16 or 24 hours on the other, the period would be decreased or increased *pro rata*.

From the foregoing facts and figures, it will be readily seen how little there is that is really prohibitive of a short Sunday rest in a general way—either on the score of cost or works capacity. The greatest obstacle, as has been previously pointed out, is unsuitable plant; and the sooner such works are overhauled the better, for they are bad commercially, and reflect credit upon no one.

Before dismissing the subject, it may not be without interest to touch upon a few advantages to be derived from these periodical stops, and such as cannot well be expressed in £ s. d.; likewise sundry general observations. Many small works repairs that can only be properly effected when the works are at a standstill, are easily arranged for and carried out during the Sunday stop; again and again proving the old adage that a stitch in time saves nine. The somewhat risky practice of flushing or sludging steam-boilers at working pressure—so generally in vogue on gas-works from sheer necessity—is avoided, as steam may be let down and the boiler or boilers receive the benefit of a good, full, flush at each stop. I find this is very acceptable to the Boiler Insurance people, who consider it by far the most efficient method where a boiler cannot be actually cooled and opened. Perhaps the greatest advantage of all, from the gas manager's point of view, is that, in the event of a sudden heavy demand (owing to a spell of bad weather, or any other cause), by working through an odd Sunday instead of stopping, he is enabled to meet it without rushing up retorts with undue haste.

As to general observations, it is interesting to note that whereas the innovation was received at the outset with grumbling on the part of the men, and an amount of jealousy displayed if one gang was allowed the "privilege" of working through and another not, the reverse now applies; the Sunday rest being eagerly looked for. Undoubtedly better time is kept; and the men show a decided improvement in general health and appearance. One curious result of the stop is that the oldest hands, who otherwise keep excellent time, when they fail at all in this respect, do so the shift after a stop, although that is somewhat rare. The men are certainly the greatest gainers by the system; for I cannot say that any material improvement is noticeable in their work, and they certainly require quite as much supervision as before. The manager who imagines he is about to get seven days' work crammed into 6 or  $6\frac{1}{2}$  days with the same number of men by adopting Sunday stops is greatly mistaken. I have seen this claim persistently made; but so far as my own experience goes, it is "all moonshine."

It will be noticed in Statement A that we managed to put in a 24-hour stop on Christmas Day. Needless to say, this was a unexpected, up to a few days before the time, as it was welcome. It is certainly an unique occurrence in my own experience, and may never happen again. It is not likely that it would have occurred with us, had we not sufficient retorts under fire to meet Sunday stops; and as Christmas Day followed Sunday, we worked through Sunday, and set down on Christmas Day instead.

As to holder room, we have about the nominal provision—viz.,  $1\frac{1}{2}$  days' maximum output—and we find it quite ample for the purpose of Sunday stops. In a general way, it is quite safe to make a 12-hour stop with a stock of about three-fourths of the maximum day's output of that week—in fact, it is more a matter of carbonizing plant than of holders.

Last, but not least, let me add, the regenerative system of firing retorts is the principal factor, if, indeed, it is not the key to the situation.

### Discussion.

The PRESIDENT said that, as a whole, few authorities catered more for the welfare of their workmen than gas authorities did. He regretted, however, that he had not been able to steer clear of Sunday labour at his works. This was largely due to insufficient holder accommodation. It was not easy at their works to organize a cessation of Sunday labour; but they did arrange for certain men to be off every alternate Sunday. They would, however, have a new gasholder by next winter; and he hoped to be then able to close the gates, and give the men the benefit of Sunday rest. He was sure Sunday rest would improve the moral tone of the men, and induce them to work better during the rest of the week.

Mr. T. DUXBURY (Middleton) said he had for the last six months been devising some method by which they could at least release the stokers for eight or twelve hours on a Sunday. He thought that the question of Sunday stoppages was to a great extent a question of capital. If they had sufficient retorts and holders, there would be no very great difficulty in stopping one or two of



the stokers' shifts on Sundays—almost every Sunday in the year, excepting a few about Christmas time. If they made up their minds to stop on Sundays, they must provide sufficient plant to enable them to do so; and he thought their Committees would generally back them up. If they had more retorts, they could make gas more quickly during the week—particularly in the event of foggy weather; and with greater storage capacity, they could provide for the Sunday requirements. He had now one or two extra beds working during the week, which enabled him to get his holders full on Friday or Saturday, or pretty nearly so, unless there was a very foggy week. By doing this, they were bound to stop on Sunday for eight hours. So far as it had gone, the scheme had worked very well; and he intended to try Sunday stopping, at any rate, for one shift, during the whole of the winter. With regard to the men, he certainly saw a decided improvement. They had lost one shift in the week, and took good care not to lose another. The thing was to have sufficient plant to meet all the demands in the week time, and get the gasholders full, so that they could arrange a stoppage on Sundays. The advantages of the scheme would outweigh any drawbacks; and he was sure that if they tried it, a great many gas-works would be able to stop—more or less—almost every Sunday in the year.

Mr. ISAAC CARR (Widnes) asked how the make per ton the first shift after resuming work compared with the average make during the rest of the week.

Mr. H. TOWNSEND (Wakefield) said he had had a good deal of experience at various works on this question of stopping on Sunday; and he certainly thought they ought as far as lay in their power, give the men the day off. One thing which made it easier to shut down on Sundays was to have efficient main-flue dampers between the retort-benches and the chimney. If they shut the dampers to each setting, and also the primary-air and secondary-air flues, there was a good deal of adjusting to do when they started again; and they might or might not get it just to their liking. But if they had efficient chimney-dampers, they need not touch the dampers belonging to the beds or the primary-air and secondary-air slides. They could effect their object by totally or partially closing the chimney-dampers. This would make the Sunday stopping much easier. What he did when he stopped on Sundays was to shut the chimney-dampers down at the time that was found most suitable; shut the hydraulic main valves off; and take a plug out of the hydraulic, to let foul gases escape. Then, when starting again, he opened the main-flue dampers at the time experience had shown to be the best for the purpose; and, when about to charge the retorts, he put the plugs in, and opened the hydraulic main valves. This was easily effected.

Mr. H. KENDRICK (Stretford) observed that, in large manufacturing towns, Sunday stoppages would seem to be almost a necessity. His experience in connection with such works was that there was so great an increase of stock on the Saturday, owing to the factories and workshops having a half-holiday, and on the Sunday there was such a diminution in the demand owing to places of business being closed, that it was found necessary to shut down for a certain period, or the holders would not take in the excess gas made. The works he was now connected with were not in a manufacturing district; but a residential part. Saturday was with him the heaviest day of the week; and the difference between Sunday and the heaviest day of the week was only 15 per cent. This meant that, either the retort capacity must be very much in excess of the average demand, or his gasholder room must also be in excess. As a matter of fact, his gasholder room was only 80 per cent. of the daily output in mid-winter; and at the present time, owing to unforeseen circumstances, they were working up to the hilt with every retort. Up to now, however, they had invariably shut down for eight hours every Sunday. As to the Sunday make, they got a certain quantity of gas from the retorts which were charged really on the Saturday night shift; and adding this to what they got from the actual coal put in on Sunday, there was a surplus over the average make during the week. There was, he took it, no loss at all upon the actual Sunday charging. They got the benefit of having every fraction of gas that could possibly be obtained from the coal left in the retorts on Sunday mornings. With increased gasholder capacity, he was hoping, before the end of the next twelve months, to be able to stop at least sixteen hours every Sunday, unless there was a very bad series of fogs.

Mr. W. CARR (Stalybridge) said that if they asked the question "Is it worth while?" the answer was, in his opinion, that it was well worth while. If their retorts were properly manipulated and constructed, he did not think there was much risk in letting them stand—especially if, as Mr. Townsend had said, they had a main-flue damper, which could be shut down without much inconvenience, and there was no need to be afraid of any loss in the make per ton in the next shift. In fact, they might get a much greater make through the retorts being so much hotter. He did not believe any man was made to work (day in, day out) without any rest at all. It was not correct, in his opinion, to say that they wanted extra gasholder room in order to arrange for Sunday closing. If they did not work on Sundays, they must approximate the capacity of the plant more nearly to the consumption; and thus they would require less gasholder room. The gasholders at his works would normally be full at 6 o'clock on a Sunday morning; and they would thus require extra gasholder room if they were to work on the Sunday. He found that the men would attend to their work more regularly during the week if they were allowed a rest at the week-end; and those

who had tried it had come to the conclusion that Sunday rest was a good thing to adopt.

Mr. C. WOOD (Bradford) said they found in Bradford that the average consumption of gas on the Sunday was about 57 to 58 per cent. of an average day during the week; and if they were to work through every Sunday, they would really require more gasholder room than if they were to stop for one shift of eight hours on Sunday. They had for many years ceased work for 16 hours on the Sunday during the summer and for part of the autumn—averaging 26 to 30 Sundays in the year. He found the men were in a better condition to do their work when they had this rest.

Mr. W. WHATMOUGH (Heywood) asked for some information as to any possible decrease of illuminating power consequent on Sunday stoppages. Had the author made any allowance for enrichment?

The PRESIDENT said the question of Sunday stoppages had occupied a good deal of attention for many years past; and it was refreshing to find present experience on the subject tending in the direction indicated.

Mr. SHADBOLT, in reply to the discussion, said, as he had remarked in the paper, the men were the great gainers by the stoppage, as it was right they should be; but work for work, and shift for shift, the carbonizing results did not seem to be any better than before. The men attended more regularly, and there was less trouble in filling up vacancies; but in the total carbonizing results, there was no gain. As to the necessity for enlarging the plant mentioned by Mr. Duxbury, he (Mr. Shadbolt) had tried to show that, with a plant barely equal to the maximum demand, it would only be necessary to work through without stopping for four weeks in the year. In regard to the question about the make of gas per ton of coal immediately after starting as compared with the remainder of the week, he might say that they did not weigh their coal per charge; but they inferred from readings of the station-meter that there was some gas lost on account of the stoppage. With regard to main-dampers, the closing of the dampers to the beds was equivalent to having a main-damper. They had no chimney-damper, because the difficulties of the geographical site of his works precluded an arrangement that would render it practicable to have an ordinary chimney-damper. As to loss in illuminating power, this, as he had remarked, was not experienced when they used more modern exhausting plant.

On the motion of Mr. GRAHAM, a vote of thanks was accorded to the readers of papers.

Mr. R. PORTER proposed, and Mr. HUTCHINSON seconded, a vote of thanks to the Gas Committee of the Southport Corporation and to Mr. Booth for the reception they had accorded to the members of the Institution.

This motion was unanimously adopted, and Mr. TROUNSON briefly acknowledged the vote.

A vote of thanks was accorded, on the motion of Mr. HARRISON VEEVERS, to the President, the Hon. Secretary, and Mr. Booth for their services as the Sub-Committee who had in hand the arrangements for the day's proceedings, which had been carried out so satisfactorily.

## THE SUPPLY OF MIXTURES OF COAL GAS AND WATER GAS.

By Dr. H. BUNTE, of Carlsruhe.

[Abstract Translation of a Communication to the German Association of Gas and Water Engineers.]

The introduction of the Welsbach light has placed the application of gas on quite a new footing within the last ten years. It has effected a complete revolution in methods of lighting; but, on the other hand, the processes of gas manufacture have continued, comparatively speaking, unaffected thereby. Of late years, the considerable advance afforded by the Dellwik process of water-gas manufacture has resulted in the introduction of new methods of gas production at certain German works. The question naturally presents itself whether the manufacture of water gas and the admixture of water gas or carburetted water gas with coal gas is a mere passing condition arising from local or transient circumstances; or whether we are on the eve of a new development, and the Twentieth Century will witness the relegation of the old coal carbonization process to the class of obsolete methods of gas making.

The question is one of vital importance, as gas undertakings have lately had before them, in many instances, the necessity of extending or completing their manufacturing plant; while the present scarcity of coal has brought it into yet greater prominence. The answer is naturally one which only protracted experience can furnish; and the treatment of the subject at the meetings of the German Association has been consequently deferred from year to year. As the introduction of water-gas plant as an auxiliary to coal-gas works proceeds apace, it seemed to be undesirable to let the matter be adjourned to another year without giving an opportunity for an exchange of views on so important a subject. The author, however, recognizes that a technical man of great practical experience is really alone capable of dealing adequately with it; and he therefore proposes only to review it generally, in order to bring into contrast opposing facts and opinions.



The question to be discussed is the production and distribution of a mixture of coal gas and water gas or carburetted water gas. Installations for producing such a mixture have been in operation for some time in the United States of America and in England, and also in some other places; and their technical and economical success under the conditions obtaining there is beyond question. That this production of water gas had not found introduction in Germany was due to the different conditions, and in particular to the fact that the oils which are used in those countries for carburetted water gas manufacture are not available in Germany on account of the heavy import duty. In England and America, the residual oils from the manufacture of lamp petroleum from crude oil are used for making carburetted water gas. The crude oil contains a large percentage of light oils with which the danger of fire would be too great for them to be applied as lamp oil; and they are therefore distilled off in the refining of the latter. The distillate between 300° and 570° Fahr. only is, after chemical treatment, put on the market as lamp oil; and the higher, as well as the lower, boiling fractions are used for the production of oil gas in water-gas installations. In Europe—especially in England—the high-boiling so-called "Solar Distillate" is applied to gas making, as it is not fit for use in lamps; but in America, the light, very volatile fractions are chiefly utilized in gas manufacture. Hundreds of thousands of tons of such oils are produced in America and Russia in the refining of lamp oils; and in those countries, and in others where there is no import duty, they are obtainable at a low price. The petroleum monopolies, indeed, restrict the free competition between America and Baku; but nevertheless large quantities of such oils are available everywhere where there is no duty on them, at from 50s. to 70s. per ton. As the production is enormous, and is constantly growing, an increased demand for gas making can only advance the price by a little. In Germany, however, the conditions are unfavourable to their use, because of the special duty, which amounts to 60s. per metric ton on the gross, or 75s. on the net weight, and is leviable on gas oils as well as on burning oil. These gas oils can actually be landed at German ports at a cost of 50s. per ton, and taken inland at a total cost of (say) 80s. per ton at the most. The addition of the duty, therefore, practically doubles the cost of the oil, and quite prohibits its use for gas making.

Petroleum is found in Alsace and a few other parts of Germany; but it supplies only the strictly local requirements. Artificial gas oils are, however, produced at Halle, in the working-up of the crude distillate from Thuringian lignites into paraffin and other commercial products. These gas oils are applied for making oil gas for railway-carriage lighting. The total quantity of such German oils available for gas making amounts to only 12,000 tons per annum; and this is practically all required by the railways. Electric lighting has so far failed to take the place of gas lighting for railway carriages, and the mixture of acetylene and oil gas which is employed now in some cases has rather increased than diminished the amount of oil used, as it has served to raise the standard of illumination all round. Apart from the high price of 120s. to 150s. per metric ton which these oils realize, it is clear that there is no surplus available for use in gas-works. Gas consisting of three-fourths of water gas and one-fourth of oil gas requires 25 lbs. of oil per 1000 cubic feet for its production. The whole amount of these German gas oils would only serve for a production of 1060 million cubic feet of carburetted water gas, and would consequently be wholly absorbed by one large town, if the gas were made in place of coal gas. Hence the native gas oils would serve the gas industry but little. Foreign petroleum is saddled with the high duty of 60s. or 75s. per metric ton, though usable oil could be obtained from Galicia and Roumania at 40s. to 50s. per ton, if no duty were exacted on it.

But on the introduction of the Dellwik water-gas process in Germany, another method was presented of producing an illuminating water gas—viz., carburetting by means of benzol. The addition of simple uncarburetted water gas to coal gas causes a great diminution in the illuminating power of the latter, when consumed in a flat-flame burner. An addition of 20 per cent. of water gas will reduce 14 to 15 candle gas to 4 or 5 candle power, and 30 to 40 oz. of benzol are needed per 1000 cubic feet to raise the gas again to 13-candle power. The proportion of carbonic acid in the water gas has a marked effect on these figures.

An inquiry as to the quantity of benzol which is available for carburetting purposes reveals very different figures from those given for gas oils. Though not many years ago benzol was produced only from coal tar from gas-works, it is now removed from coke-oven gases in enormous quantities by a washing process. These gases are used for heating the ovens; and for this purpose the valuable illuminants, such as benzol, are not required. The benzol is therefore removed from the gases before they are burnt. The coking works which exist on a very large scale in Westphalia, Silesia, and the Saar district, are in reality immense gas-works. The German coke-works use 20 million tons of coal per annum; the gas-works only 3½ millions. But barely half the coke-ovens have plant for the recovery of ammonia and benzol; and many which have ammonia-recovery plant have no provision for extracting the benzol. Nevertheless, the quantity of benzol brought on the market amounts to 32,000 (metric) tons per annum, and is chiefly derived from the coke-ovens. About two-thirds—say, 20,000 tons—is used in the colour industry; and thus 12,000 tons remain available for other purposes. It is not now readily bought up by gas undertakings, as the municipal works in par-

ticular no longer attach importance to the maintenance of a high illuminating power, since the incandescent system of lighting has been adopted so extensively. Other uses have been sought for it—such as mixing with spirit (alcohol), to form a mixture for lighting in the same fashion as petroleum is employed.

If we consider how much gas can be carburetted by means of the 12,000 (metric) tons of benzol, and assume that 40 oz. are needed per 1000 cubic feet of mixed gas, it will appear that 10,600 million cubic feet of such gas could be produced therewith, or ten times as much as the German gas oils would have yielded. The price of benzol would be, at the highest, about £10 per ton (or 9½d. per gallon); and as this rate is remunerative to the coke-works, an increased demand would result in a greater production, and an excessive rise in price would be avoided. Seven years ago, however, the author showed that even at the then prevailing price of £20 per ton (or 18s. 6½d. per gallon), benzol was the cheapest carburetting agent for coal gas.\* After that, the employment of benzol on gas-works caused the price to rise to over £50 a ton. A reaction followed; but, in the meantime, many works had ceased to distribute gas of high illuminating power, owing to the spread of incandescent lighting.

The foregoing indicates that in Germany the oil gas and benzol processes for the enrichment of gas by the use of water gas stand on a different economical basis, chiefly because of the high import duty on petroleum residues, which are classed with burning oils. As it is highly undesirable that the gas industry should be restricted to one method of carburetting (which might possibly be controlled by a benzol ring), and in view of the scarcity of good gas coal, efforts should be made to get the duty removed so far as these gas oils are concerned; or at least the oils should be obtainable duty free by gas-works which are engaged in the public supply of towns. The two methods of producing a mixed gas to supplement the coal-gas production would then compete on equal terms; while the home oil industry, which is unable to supply oil in the required quantities, would suffer no injury.

It has been hitherto assumed that gas is still required to afford a certain illuminating power in flat-flame or argand burners, though the spread of the incandescent system of lighting has rendered this standard for the valuation of the gas no longer appropriate. Herr von Oechelhaeuser has already shown that coal gas of which the illuminating power has been reduced from 16 to 1 or 2 candles when consumed in flat-flame burners, will not have an appreciably lower efficiency in the incandescent burner.† Indeed, if the proportion of air admitted to the burner is properly regulated, the lower value gas shows a higher efficiency in the incandescent burner. If, therefore, it is granted that gas is almost universally consumed for lighting purposes by means of the incandescent burner, and that flat-flame and argand burners have become the exception, then it follows that photometric tests of the gas when burnt in the latter burners no longer form a useful criterion of the value of the gas. The gas-works must aim at supplying the gas which is most advantageous for the chief applications—viz., for lighting by incandescence and for heating.

Bearing this in mind, the calorific power of the gas must be regarded carefully. A chief constituent of coal gas is methane or marsh gas, which forms about 40 per cent. by weight, or 33 per cent. by volume, of the coal gas. It is a gas of unusually high calorific power, and is responsible for the superior calorific power of coal gas as compared with the other gases which have to be considered. Coal gas has a calorific power of 136 to 141½ calories per cubic foot, according to the quality of the coal used and the method of carbonizing. Water gas, with 10 per cent. of impurities—nitrogen and carbonic acid—has a calorific power of 68 to 73½ calories per cubic foot, or about half that of good coal gas. If water gas is added to coal gas, a reduction of calorific power necessarily occurs. Thus, if 20 per cent. of water gas is added, the calorific power will be reduced by about 10 per cent., or from 141½ to 127½ calories per cubic foot. But there will be no change in the illuminating duty obtainable from the gas in the incandescent burner.

An admixture of 25 per cent. of water gas reduces the normal illuminating power, as already stated, of coal gas to about 4½ English candles; and this may be raised to the original value of about 12 candles by the employment of 30 to 40 oz. of benzol per 1000 cubic feet. Taking 35 oz., the benzol will increase the volume of the gas by only about 0·1 per cent.; but the calorific power will be considerably improved. The mixed gas enriched with benzol will have a calorific power of 136 calories per cubic foot.

But this improvement of the calorific power is expensive compared with the cost of the gas, even when the price of benzol is low. On comparing merely the calorific power of coal gas with that of benzol, the cost of a given number of heat units will appear to be about the same. For instance, 1000 cubic feet of coal gas, at a price of (say) 2s. 10d., will yield 141,500 calories. Benzol, as used for carburetting, will have a calorific power of 4536 calories per pound, or (say) 38,556 calories per gallon; and a gallon will cost 9½d. Consequently, 141,500 calories are also obtainable by the combustion of benzol for 2s. 10d.; but there should be added the expenses of carburetting, which amount to a further 2d. per 1000 cubic feet of gas carburetted, or per 35 oz. of benzol used. Therefore the benzol becomes a more costly source of heat than the coal gas.

\* See "JOURNAL," Vol. LXII., p. 717.

† *Ibid.*, Vol. LXXV., p. 1641.



Furthermore, a limit to the employment of benzol for carburetted gas is very soon reached, as in cold winter weather the saturation-point is easily passed, and then the gaseous benzol condenses in the mains. Enrichment with oil gas is superior in this respect; for its chief vehicle of illuminating and calorific power is ethylene, which is a gas, and consequently permanent at low temperatures. Oil gas has, on the average, a calorific power of 277½ calories per cubic foot. On mixing one-third oil gas and two-thirds water gas, as is done in England and America in the Humphreys and Glasgow plant, a gas is obtained having about the same calorific power as coal gas, and fit for mixing with it without appreciably affecting its calorific power. The cost of such a mixed gas depends, to a very great extent, on the price of oil; and consequently the oil must be duty free.

Another aspect of the manufacture of a mixed gas by the employment of water gas, which has lately been brought into prominence, is the saving of gas coals. The German coal mines have lately barely kept pace with the needs of the country, which may be taken at about 100 million tons per annum. Of this total, only about 3½ million tons of gas coal, or 3½ per cent. of the total output of coal, are required by the gas-works. But the coal must, on carbonization, afford a gas of 14 to 16 candle power, when tested in flat-flame or argand burners; and therefore the descriptions suitable for gas making are few, and are obtainable only in small quantities. As soon, however, as we cease to estimate the quality of the gas made according to this photometric standard, other coals become available for gas making. Coals of more recent formation, indeed, give on carbonization a gas containing much carbonic acid, which is deleterious to illuminating power, and can be removed only at considerable cost. For the most part, therefore, these coals are avoided. The quality of the coke also affects the choice of coal; for it will only be considered suitable for household use, and fetch a good price, if it is not too friable. The more recent the coal, the less dense and hard, as a rule, is the coke. But among the older coals also some may be found which may be employed for gas making, where high illuminating power is not essential. If, therefore, only the scarcity of gas coals is in question, any difficulty can be overcome by using other descriptions of coal and applying carburetted processes. As, however, a general scarcity of fuel now prevails, this proposal at the present time is not very helpful.

But the water-gas process, for instance, affords a means of economizing the raw material—coal—and the German gas industry may avail itself of it to escape from a coal catastrophe, and an unreasonable rise in the price of gas coal. A ton of coal yields, on carbonization, about 10,250 cubic feet of gas, which quantity of water gas would be produced by a consumption of 0·115 to 0·170 ton of coke. Consequently every million cubic feet of water gas made means the setting free of about 100 tons of gas coal. Clearly, therefore, the introduction of the water-gas process as an auxiliary diminishes the coal requirements of a gas-works. Now, if the scarcity of coal and the growing demands for gas compel us to resort to this auxiliary, it is incumbent on us to secure cheap oils; and the German Association of Gas Engineers ought to petition the Imperial Government to sanction the introduction of oils suitable for this purpose, either duty free or with a rebate of the duty to gas-works using them.

So far the carbonization and the water-gas processes have been considered as working in conjunction, as they have done quite recently in Germany, and for a longer period in other countries. But if we go on to discuss the question which of these two processes will be the predominant one in the future, in order to determine in what direction the technical advances of the gas industry must be made, we shall find it impossible to give a definite answer. Some points, however, are worth discussion now. The water-gas process, by its mechanical arrangements, simplicity, and saving in wages and working expenses, is undoubtedly a welcome aid in the development of gas manufacture; but there is still great uncertainty as to its economy in comparison with the carbonization system.

The developments of the water-gas process have resulted in a considerable advance in its efficiency compared with the method as it was known twenty years ago. At that early time, a heat-balance showed that only about 50 per cent. of the calorific value of the coke was utilized in its conversion to water gas; but now the efficiency has risen to 70 per cent. This statement applies only to the work of the water-gas apparatus proper, or generator. If the whole water-gas process has to be compared with the old retort carbonizing system, in respect of economy of heat, we must go a step farther. For carrying out the water-gas process, liquid water has, in the first place, to be converted to steam, in order to effect the decomposition in the generator. The heat thus expended must be lost, as in the usual heating appliances we are able to burn the water gas formed to steam merely, and not to liquid water again. The loss thereby is considerable, and must be taken into account. It is seen in the simplest manner by regarding the heat of combustion of hydrogen. Per cubic foot burnt to liquid water, it amounts to 86·8 calories; burnt to steam, to 73·1 calories only. Thus, while 86·8 calories must be applied in order to produce a cubic foot of hydrogen from liquid water, only 73·1 calories are recovered when the gas is burnt. The loss is 13·7 calories per cubic foot of hydrogen, or about 15 per cent. of the heat of combustion. If, therefore, a comparison is to be drawn between the water-gas system and the carbonization process, the efficiency of 72 per cent. which is

obtained in the water-gas generator must be taken in conjunction with the loss of 14 per cent. incurred outside the generator.

With reference to the heat-balance of the carbonization of coal, Mahler, in 1893, determined how much heat was needed to decompose the coal and to convert a small portion of it—15 to 17 per cent.—into gaseous products. He made his observations in the laboratory of the Villette works of the Paris Gas Company. He found that 96 per cent. of the calorific value of the coal carbonized was represented by the heats of combustion of the products—gas, coke, and tar. M. Euehène has quite recently dealt with the same subject in a very exhaustive manner.\* The carbonization process, therefore, entails but a very small expenditure of heat. By far the greater portion of the heat which is used up in the distillation of coal in retorts—the fuel amounting in good settings to 10 to 12 per cent.—is needed to recoup the great loss from the hot bench of retorts, and to raise the coal to the temperature of carbonization. The other phenomena of carbonization—viz., the conversion of a part of the solid mass of coal into the liquid or gaseous state and the expenditure of energy thereon, the evaporation of the water which escapes on the heating of the coal, which includes both the moisture originally present and the water formed by the combustion of the elements within the fuel—require only a comparatively small expenditure of heat. The carbonization process is therefore, theoretically, an almost perfect system. The chief loss, which has to be met by the fuel consumed, does not pertain to the actual carbonization, but arises chiefly from the unavoidable losses of working settings at a high temperature.

On the other hand, the water-gas process has also another attractive aspect, which will undoubtedly find it further employment—viz., the saving in working expenses and wages. The working expenses in the carbonization of coal are always extremely heavy; and the wages paid are a great drain. They constitute a very considerable portion of the cost of production of the gas, even when either mechanical stokers or inclined retorts are adopted.

But the conditions change greatly if a comparatively high illuminating power in the flat-flame burner is not required. Then not only is greater freedom in the selection of coal secured, but also considerable facilities in the manufacture of the gas. Both small and large works hitherto have had to adhere to small retorts, in order to maintain a high candle-power gas; and these retorts have to be charged and drawn every four or six hours. Large works have such an enormous number of these small retorts that the question may be reasonably put whether they could not advantageously resort to larger distillation chambers—such as coke-ovens—which need less frequent attention, and distil a far larger amount of coal at a single operation. As soon as a comparatively high candle-power (which becomes less valuable as incandescent lighting spreads) is discarded, there is no real obstacle to a development of gas manufacture in this direction.

Out of Germany, earnest attention has been directed to the question of a reduction of illuminating power on account of the difficulties presented by the dearth of coal, as the action of the South Metropolitan Gas Company shows. This Company supply gas in London, which is the classic stronghold of stringent testings and rigorous control under Acts of Parliament of the quality of the gas. Mr. George Livesey, the controller of this Company, has carried through a Bill by which the illuminating power of the gas is to be reduced from 16 to 15 candles on July 1, and subsequently to 14 candles. This is a start in the direction suggested above, which is of great consequence to the gas industry. There is no doubt that other methods of gas manufacture besides those referred to will, under these conditions, become possible, from both a technical and an economical standpoint. To instance one method only, though there are two reactions which may occur in the water-gas generator, hitherto only one has been practically utilized. This is represented by the equation—



while the second reaction, which is shown by the equation—



has not been made use of technically, because of the large quantity of carbonic acid, which deteriorates the illuminating power. Water gas made in the ordinary way according to the first equation, consists of half its volume of hydrogen and half of carbonic oxide. Now a high proportion of the poisonous carbonic oxide is undesirable on several grounds, and especially for hygienic reasons. But disregarding the illuminating power of the gas in a flat-flame burner, it will be found that a certain proportion of carbonic acid is of very little disadvantage in the Welsbach burner. If, moreover, simple and less costly means should be found for the removal of carbonic acid from gas, then the admixture of hydrogen in any desired quantity could not be opposed on hygienic grounds. Such speculations as these need not, however, be pursued further on this occasion.

The foregoing shows that there is no question that, with the régime of incandescent lighting, a new sphere for the development of the gas industry has arisen, which affords quite a fresh basis for gas manufacture. In order to pursue this new path, it is essential that the old standards of the quality of gas be discarded; that every obstacle to the progress of the industry

\* See ante, pp. 1080, 1141.



caused by tariffs on the raw materials be removed; and that a cheap gas suitable for lighting by incandescence and for heating be provided in accordance with the requirements of the present day. To this end, the carbonization system, which industrially and economically is by no means out of date, must be further developed, and the more recent processes welcomed as useful allies. The supply of towns with gaseous fuel for lighting, heating, and power purposes will then have before it a grand and developing career.

#### Discussion.

The PRESIDENT (Herr W. von Oechelhaeuser) having said a few words on the aptitude with which Dr. Bunte applied the teachings of scientific research to technical and industrial questions, he invited a full discussion on the paper, which was at once commenced.

Dr. A. SPILKER (Berlin) remarked that, as Dr. Bunte had asserted that benzol was the cheapest carburetting material, even when its price was over £20 per ton (rs. 6½d. per gallon), there appeared to be no reason for adopting any other, as for some years, with the exception of a short time in 1894-5, the price had been considerably less than this figure. There was no longer any fear that the price could again rise above that, as coke-ovens were now equipped for the recovery of benzol to a much greater extent than in 1894-5. Many coke-ovens had recovery plant, but did not use it so long as the price of benzol was only about 8d. per gallon, as at this price it did not pay to work the plant. About one-fourth of the coke-ovens in Germany were now recovering benzol; but probably one-half could do so—and would, as soon as the price reached about 9½d. per gallon. The production would thus be increased immensely, and a further rise in price prevented.

Dr. STRACHE (Vienna) referred to the want of thermic efficiency of the water-gas process, due to the fact that water had to be evaporated. But the loss from this cause, though theoretically amounting to about 10 per cent., practically scarcely needed consideration, because the amount of fuel used in the boiler was quite small. In his own form of water-gas apparatus, the steam used amounted to from 31 lbs. to 37½ lbs. per 1000 cubic feet of water gas made. Theoretically the amount should be 25 lbs. Now, using a good boiler, the 37½ lbs. of steam would be obtained from a consumption of 5 lbs. of coal. The total consumption of coal per 1000 cubic feet of gas would thereby be increased from 31 lbs. to 36 lbs. But actually the chimney gases from the present types of water-gas generators possessed heat enough to provide the whole of the steam required in the generator; and he had constructed apparatus in which the heat of the chimney gases was in this way utilized. Thus the loss of 10 per cent. became completely covered by the 20 to 30 per cent. heat of the chimney gases which otherwise was lost. On the other hand, care was requisite to see that no steam passed undecomposed through the generator. In the course of a somewhat lengthy investigation which he made, in collaboration with Dr. Jahoda,\* it had been demonstrated that the decomposition of the steam was dependent, not merely on the temperature in the generator, but also on the rate of flow of the steam through it. With a low rate of flow of the steam, it had been found possible to effect complete decomposition at a lower temperature, and thus to conduct the whole process with lower heats in the generator, and consequently with appreciable diminution in the loss of heat therefrom. At the lower temperature, the coke was burnt with a diminished blast, not to carbonic oxide, but to carbonic acid; and a high duty was thus obtained from it. The rate of flow of the steam through the generator chiefly determined the extent of its decomposition. Whether the generator were cold or ever so hot, if the rate of flow of the steam were low, there would be neither carbonic acid nor undecomposed steam in the water gas. If, however, a high rate of flow were used, then carbonic acid and undecomposed steam would always occur. The carbonic acid formed, and the steam which passed through undecomposed, were always in the same relative proportions. Dr. Bunte had concluded that the carbonization process was theoretically the best of all. In his (Dr. Strache's) water-gas apparatus, coal was carbonized at the same time that water gas was produced. The production of a gas consisting of carbonic acid and hydrogen would, in ordinary generators, be attended by great loss of heat, as very much undecomposed steam would pass through. It would be a more rational process to convert water gas made in one generator into carbonic acid and hydrogen in a separate chamber. He had made experiments in this direction; but the illuminating power of the gas in the Welsbach burner was so greatly deteriorated by the carbonic acid, that its removal became imperative. Effecting this by means of lime was costly; but perhaps some new process might be found. Water gas containing 3 per cent. of carbonic acid gave a light of 50 candles † for a consumption of 3 cubic feet per hour; but with 5 per cent. of carbonic acid, a consumption of 3.18 cubic feet per hour was required to afford the same light. Consequently, endeavours should be made to prevent, as far as possible, the occurrence of carbonic acid in water gas.

Dr. LEYBOLD (Hamburg) stated that two years ago he had

chosen to adopt the Humphreys and Glasgow system of carburetted water-gas manufacture, because hundreds of plants on this system were in use; whereas there were then only two on the Dellwik-Fleischer system, and one on Strache's system. The manufacturing capacity of his plant was 1¼ million cubic feet per diem. Last winter's working proved that the system had ample scope in Germany. Gas of the same candle power as ordinary coal gas was made, and was mixed with the latter after the station-meter. In order to obtain the full illuminating duty from the water gas, it had been found necessary to change the relative proportions of the internal and external air supplies to the standard Elster argand burner. This burner, as ordinarily used, showed an illuminating power of 13 candles for water gas which, by the change, was shown to be of 20-candle power. The cost of manufacture in regard to both the oil and the coke consumed had proved to be exactly what had been anticipated; but a valuable tar—amounting to 26 per cent. of the oil used—had been unexpectedly obtained from the Thuringian oils which had been employed. This had considerably cheapened the cost of the water gas. Galician oil was used with considerable success at the Brussels works; but it could not be applied in Hamburg, because of the heavy duty in Germany on imported oils. It seemed absurd that oil could be carried from Austria to Belgium and Holland for use there, and yet be not available in the intervening country of Germany because of the duty. The proposed petition for the removal of the duty from gas oils was therefore to be commended at the present time.

Herr DICKE (Frankfort-on-the-Maine) pointed out that Dr. Strache's procedure, of blowing up the fuel in such a manner that carbonic acid was produced in place of carbonic oxide in the exit gases, was in reality covered by the Dellwik-Fleischer patents.

Herr SOHN (Bochum) wished to correct an erroneous impression which he thought might be gathered as to the market position of benzol. About one-sixth of the West German coking installations recovered benzol; and the bulk of the remainder used the gas as boiler fuel, and were not provided with benzol-recovery plant. This plant was costly; and a selling price of about 9½d. per gallon would be no inducement to producers to increase the output. Moreover, a surplus production of 12,000 tons above the requirements of the aniline works did not exist; and at the moment it would be wrong to speak of a surplus at all. If benzol was required by gas-works, then, in order to avoid rises in price, contracts should be made for a given quantity within a stated period.

Dr. STRACHE desired to explain that his process in no way infringed the Dellwik patents.

Dr. BUNTE, in replying to the discussion, observed that what Herr Sohn had said supported his contention that it would be impolitic to rely on benzol only as an enricher. It was quite necessary to have removed the prohibitive duty on oils suitable for gas making. He thought, however, that benzol could not rise to a very high price, as foreign competition would come into play; there being no import duty on benzol. Benzol recovery was being largely adopted at coking works in England and America. With reference to Herr Strache's contention that the consumption of fuel in the production of steam was negligible, the figures Dr. Strache quoted made it as much as 16 per cent. of the total. This was the loss, which had been taken in the paper at a lower figure, based entirely on theoretical considerations instead of practical results, which would, of course, make it higher.

The meeting subsequently decided to instruct the Committee of the German Association of Gas Engineers to take steps to obtain for public gas-works in Germany power to procure gas oils duty free.

**Electricity and Water-Mains.**—A recent number of the "Electrical Review," of New York, reports the occurrence of a rather novel accident to a water-main at St. Paul, Minnesota. On digging down to investigate a leak, the workmen discovered that an earth-lead from the local tram service had been wrapped round the main. The leak was found to be directly due to a part of the pipe near a brass shut-off cock having been melted to such an extent that a considerable stream of water was escaping.

**The Coal Resources of Victoria.**—In the course of a lecture on this subject delivered on Monday last week at the Imperial Institute, Mr. James Stirling, Mining Representative of Victoria, stated that the Australian colonies have large areas of coal-bearing territory, and up to the present have produced 100 million tons for the world's consumption. In the Latrobe Valley, in Gippsland, the existence of deposits more than 267 feet in thickness has been proved. From borings carried on over a distance of 50 miles in the valley, the lecturer estimated that there could not be less than 31,144½ million tons of brown coal. In several places shafts have been sunk through beds of from 20 to 200 feet thick; and at the Morwell Company's mine, on the banks of the Latrobe, a coal-bed 70 feet thick is being worked as a quarry by open face. Various analyses of these coals have shown them to be superior to the average German brown coal, and to have a much smaller percentage of ash. How to utilize these magnificent deposits of tertiary fuel is the problem of the hour in Victoria.

\* We hope shortly to give a summary of the exhaustive thesis by Dr. Strache and Dr. Jahoda on "The Theory of the Water-Gas Process."—Ed. J.G.L.

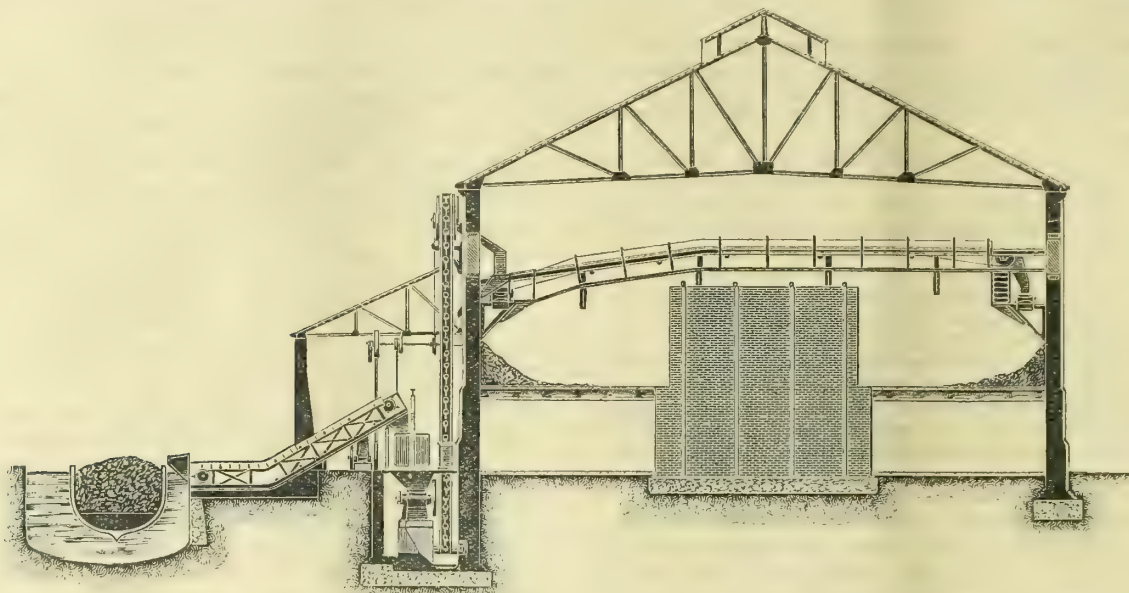
† Probably Hefner units.



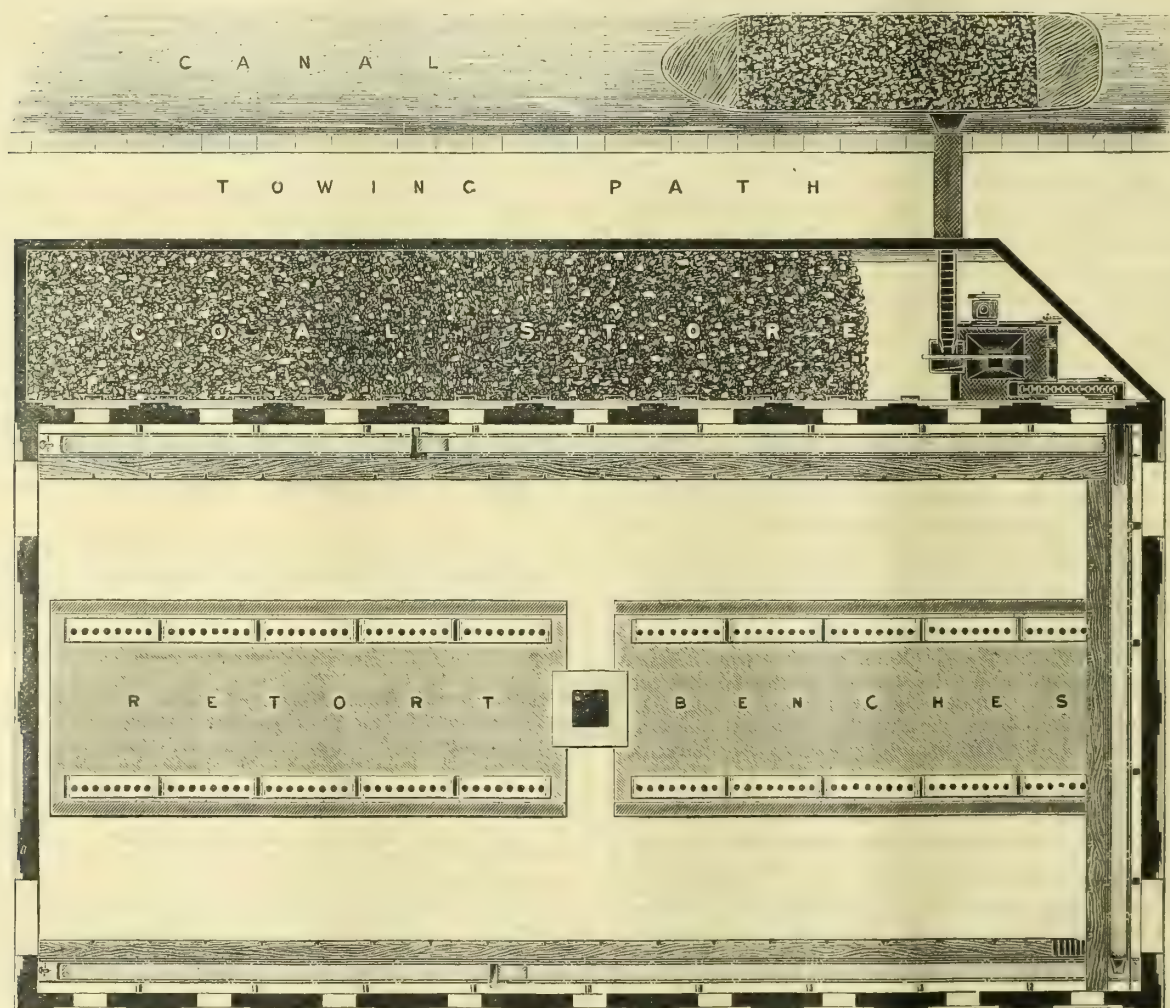
### COAL-HANDLING PLANT AT THE STOKE CORPORATION GAS-WORKS.

The Stoke Corporation Gas Committee last year resolved to remodel the whole of their existing carbonizing plant, to enable them to cope with the increasing demand for gas in the district. After careful consideration, they decided to entirely dispense with, and take down, the existing retort house and bench, and

replace them by a modern house to contain regenerators on the horizontal system, with special coal-handling appliances. Owing to half of the new coal-store and retort-house occupying practically the whole of the space on which the old house stood, half of the new house had to be built, and the new installation of five arches put into operation, before the old one could be pulled down and the new building completed. The retort-house is 29 feet high to the eaves, with stage-floor 10 feet above the yard level. The span of the house is 62 feet; and the total length



SECTION THROUGH CANAL, COAL-STORE, AND RETORT-HOUSE—SHOWING COAL CONVEYORS, BREAKER, AND ELEVATOR.



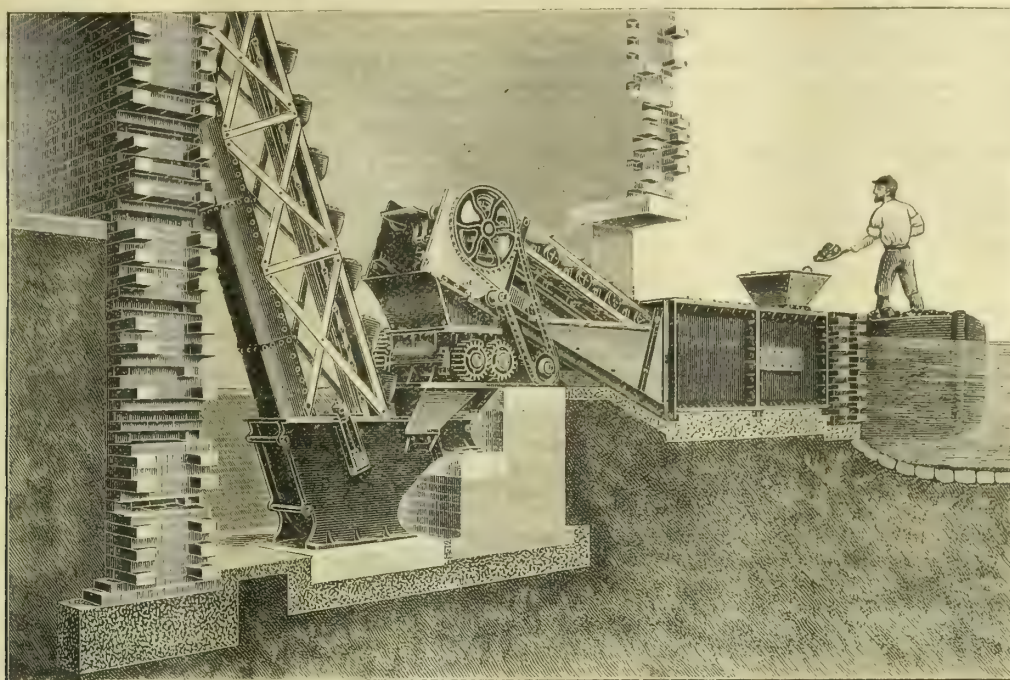
PLAN SHOWING COAL-BARGE, COAL-STORE, AND RETORT-HOUSE, WITH CONVEYORS, BREAKER, AND ELEVATOR.

123 ft. 8 in., with a coal-store running the full length of the house on one side, with a span of 16 ft. 3 in. At present, the new retort-house contains five through settings of eight retorts, with regenerator furnaces; but the building is sufficiently large to hold five more arches and settings, with a chimney between the two stacks. The retorts are  $\square$  shaped, 22 in. by 16 in., and 20 feet long, and are so arranged that the hot coke can be drawn direct into the furnaces. The retort-house and coal-store are built

along the towing-path of the canal; and as practically the whole of the coal is delivered by canal, the site adapts itself to the employment of special appliances for cheap unloading and storing. The illustrations show the general arrangement adopted.

There are several installations at work where the coal is delivered from the barge into the coal-store and retort-house by means of moveable elevators, jib-cranes, &c. In this instance, however, the coal is conveyed into the store by means of an





ENLARGED VIEW SHOWING CONVEYOR ACROSS TOWING-PATH, COAL BREAKER, AND ELEVATOR BOOT.

underground push-plate conveyor fixed into a strong cast-iron box let into the ground, with the top flush with the top of the towing-path. The canal end of this trough is fitted with a moveable hopper into which the bargemen throw the coal direct from the boats, which are drawn up alongside, as shown. The coal is conveyed by this means under the towing-path until it reaches the inside of the store, where, by means of the same push-plate, it is slightly elevated and deposited into the breaker, which delivers it into the elevator boot. The elevator then carries the coal on to a band conveyor running along either side of the retort-house wall parallel to the front of each bench, similar to an installation in use at the Skipton Gas-Works. The conveyors are connected together by means of a cross conveyor, also of the belt type. The coal is thrown from the longitudinal conveyors by means of a moveable throw-off carriage on to the charging-floor, where a considerable quantity can be stacked against the retort-house wall ready for the stokers' use when charging the retorts. Arrangements have been made so that the coal-store can be filled from the same belt by discharging the coal through a number of openings into the store; and a by-pass has been fitted to the breaker, so that the coal wheeled to the elevator from the store does not pass a second time through the breaker.

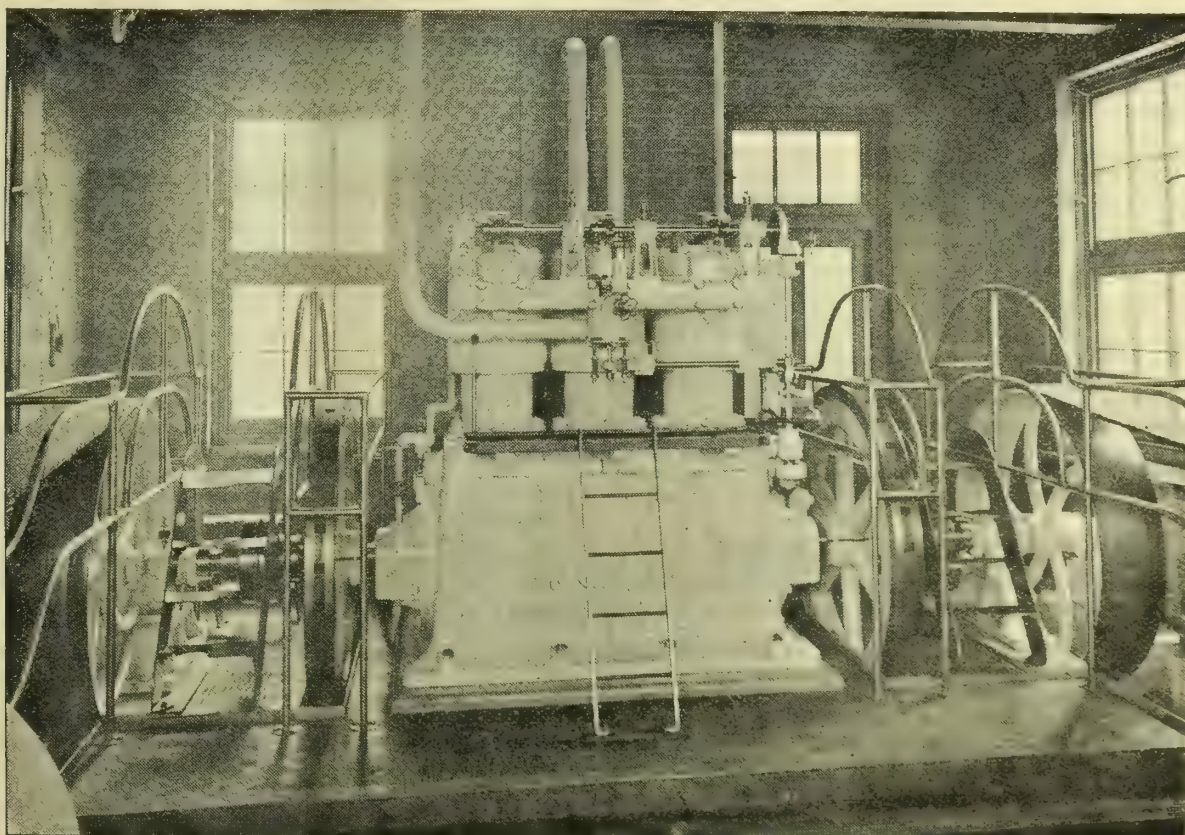
The entire arrangement has now been brought into operation,

and admirably answers the purpose intended. The whole of the work is in accordance with the designs and specifications of Mr. W. Prince, the Corporation Gas Engineer, and has been carried out by Messrs. R. Dempster and Sons, of Elland.

#### RAISING THE DELIVERING CAPACITY OF GAS-MAINS IN SOUTH LONDON BY CENTRIFUGAL FANS.

The use of centrifugal fans for the purpose of increasing the delivering capacity of their gas-mains by the South Metropolitan Gas Company was referred to by Mr. George Livesey in the discussion on Mr. Fletcher W. Stevenson's paper on the "High-Pressure System of Distribution," read before the Institution of Gas Engineers in 1898. The plant proved so successful that the application of these fans has since been largely increased.

The illustration below shows a plant, capable of dealing with  $2\frac{1}{2}$  million cubic feet of gas an hour, which has been in operation for the past twelve months at the Old Kent Road works of the South Metropolitan Company. The plant consists of a Westinghouse three-cylinder vertical gas-engine driving the fans through pulleys carried on extensions of the crank-shaft on either side of the engine. Gas is supplied to the fans through a 4-feet main, which bifurcates into 24-inch pipes forming the inlet connections





to the fans. The outlets of the fans are similarly arranged, and deliver into the 4-foot main, which supplies the district governors. The engine runs at a normal speed of 260 revolutions per minute; the speed of the fans being 1400 revolutions per minute, at which rate they will handle the quantity of gas stated.

The engine itself has many features of interest, the chief of which are doubtless familiar to our readers by the descriptions which have from time to time appeared in our columns and elsewhere in the technical press. It runs with extreme smoothness and steadiness, has given no trouble in repairs, and its speed is so remarkably controlled that the whole work to be done may be thrown fully on or off without difficulty or danger.

The fan inlets are normally working on the gasholder outlets; and in order to prevent any injury to the crowns which might come about if the plant were kept running after the holder had been emptied, an automatic appliance (which is not shown in the illustration, as it was removed while taking the photograph) is used. This appliance consists of a bell supplied with gas from the inlet side of the fans, and which is weighted to fall when the pressure drops below a pre-determined point. The bell is connected by suitable levers with an equilibrium valve on the gas supply. In the event of the automatic apparatus coming into action, the engine is stopped by reason of it getting no gas.

The great advantage of the fans over any positive appliance is that, in the event of their accidental or intentional stoppage, their full area for the passage of gas is maintained.

Similar fans are already in use at the Kennington and East Greenwich stations of the Company, and others are being installed at the other works. The whole of the gas sent from the East Greenwich works to the distributing-stations of the Company is pumped up by these appliances, using in this case a 60-horse power Crossley high-speed engine.

For the foregoing interesting information and illustration, we are indebted to Mr. C. C. Carpenter, the Chief Engineer of the Company.

## PHOTOMETRICAL STANDARDS IN THE UNITED STATES.

### The Harcourt Ten-Candle Lamp and the Edgerton Standard.

At the recent Meeting of the American Gaslight Association, the report presented by the Committee on Research intimated that during the past year they had undertaken experiments "to determine a useful working standard for the measure of the illuminating power of gas; and a report of this work is contained in the appendix. The indications are that, with proper treatment, the Harcourt ten-candle power standard and the Edgerton chimney, with the Sugg 'D' argand, are both highly satisfactory."

### THE HARCOURT TEN-CANDLE POWER PENTANE LAMP.

The first part of the appendix referred to was read by Mr. Rollin Norris, the Third Vice-President of the Association. In it, he alluded to the paper he presented at last year's meeting, giving the results of a somewhat extended series of investigations into the accuracy of the Edgerton slot, and of candles, as standards of light—covering the use of the Edgerton slot with coal gas and with water gas of varying candle power. The paper was not, he said, intended to be a complete and conclusive report on the entire field of photometry, but merely a sort of "Report of Progress," covering one portion of this important subject. During the past year, these investigations have been carried further; and the Research Committee considered the work of sufficient value to warrant its presentation at this year's meeting.

In the work described last year, the standard of comparison was the Harcourt ten-candle power pentane lamp; and all tests were based on the assumption that the light given out by the pentane lamp is constant under all ordinary variations of temperature, barometric pressure, and humidity. Granted the truth of this premise, the report continued, last year's tests showed that, as used by the ordinary practised observer, the Edgerton slot gives a constant average light value when using carburetted water gas for any ordinary range in the candle power of the gas used. With coal gas, the value of the Edgerton slot slightly decreases with a decrease in candle power. Even with gas of the same candle power—with both coal gas and water gas—however, there was a variation in the value of the Edgerton slot in different observations. The amount of this variation in the light value of the Edgerton slot was approximately 5 per cent. above and below its average value. The variation in the case of candles was considerably greater.

These conclusions, as just explained, were based on the assumption that the pentane lamp has a constant light value, and the work of last year was devoted to an examination of this assumption. In doing his work, Mr. Norris had at his disposal the laboratories and apparatus of the United Gas Improvement Company, and the assistance of its corps of skilled photometrists. The observations in regard to the effect of temperature, pressure, and artificial humidity were made principally by one of his assistants, Mr. Fred A. Welles, M.E., checked by Mr. C. O. Bond, the Chief Photometrist of the Philadelphia Gas-Works. In the work against the electric lamp as a standard, he was assisted by one of his associates, Mr. John B. Klumpp, M.E., and the Company's Electrical Engineer, Mr. Paul Spencer, M.E.

These details were mentioned at the suggestion of one of the

Council merely to emphasize the fact that the experiments to be described were not a few superficial observations, but were carefully conducted by men of experience and scientific attainments, and cover about six months of more or less continuous experimental work.

In trying for the past three years or more to methodically and patiently work out to a conclusion this problem of photometry and standards, Mr. Norris had, of course, accumulated a large amount of digested data; but in his report it seemed well to confine himself rather closely to the work bearing directly on the foundation premise of his paper of last year. The possible disturbing elements that might affect the constancy of the value of the pentane lamp were: 1. Variations in the quality of the pentane. 2. Deterioration of the burner in continued use. 3. Variations in atmospheric conditions, as regards temperature. 4. Barometric pressure. 5. Humidity.

*Variations in the Quality of the Pentane.*—In several years' experience, it is found that pentane, as commercially supplied by the manufacturers for this purpose, and its quality checked by analysis, shows no measurable difference in light-giving quality. It has, however, been found that where a lamp is in constant use, and after a large quantity of pentane has been evaporated in the carburetter, the residue is somewhat heavier than the original pentane, and the light given by the lamp is slightly affected. It is necessary, therefore, to empty the residue from the carburetter occasionally and start with fresh pentane.

*Deterioration of the Burner in Continued Use.*—Among the pentane lamps in Philadelphia were three called No. 1, No. 2, and No. 3. No. 1 is used only once a day; while Nos. 2 and 3 are burned continuously night and day. Lamps Nos. 2 and 3 were tested in 1899 against lamp No. 1, and the tests were repeated in 1900, with the following results, assuming the value of No. 1 to be ten-candle power:—

Date.	Lamp No. 2.	Observer.	Average.
Oct. 25, 1899 . . .	9'860 . . .	Bond.	9'888
Nov. 7, " . . .	9'915 . . .	Dashiell.	
Aug. 7, 1900 . . .	9'860 . . .	Robinson and Bond.	9'885
Aug. 20, " . . .	9'909 . . .	Robinson.	
Lamp No. 3.			
Nov. 7, 1899 . . .	10'032 . . .	Dashiell.	10'032
Aug. 7, 1900 . . .	10'032 . . .	Robinson and Bond.	

In other words, almost a year's continuous night and day burning has not caused the values of these two lamps to fall off.

*Variations in Atmospheric Conditions; Temperature Changes.*—In order to determine the effect of different temperatures on the value of the lamp, a standard bar photometer was equipped with a pentane lamp at each end of the bar; and the photometer room was divided by a partition so placed as to put each lamp in its own room, but at the same time not interfere with the movement of the sight-box. A small window was cut in the partition, so as to allow the light from both lamps to reach the disc, and, with the temperature the same in the two rooms, the sight-box was adjusted, and the comparative values of the two lamps recorded under identical temperature conditions. The temperature in one of the rooms was then raised, and the lamps again compared. The tests made covered a range of temperature of from 75° in one room to 100° in the other; and the relative values of the lamps remained practically unchanged.

*Changes in Barometric Pressure.*—In order to determine the effect on the lamp of changes in barometric pressure, two pentane lamps were again compared—one of them being placed in an iron tank some 5 feet in diameter by 8 feet high. The tank was fitted with a glass window opposite the lamp. Arrangements were made for ventilation and a pressure-gauge; and, by connecting the tank to a source of air under pressure, the "barometer" in the tank could be raised at will. The sight-box on the bar was then adjusted, and the relative values of the lamp determined when two lamps were under the same pressure. The pressure in the tank was then raised by successive increments, and the lamps again compared. These tests showed that, for a range in pressure of 1½ inches of mercury, the light given by the pentane lamp remains constant.

*Changes in Humidity.*—The experiments made to determine the effect of humidity were both more difficult to make and more unsatisfactory in their results. Efforts to artificially raise the humidity by the introduction of steam into one side of the divided photometer room resulted in a mist which obscured the light; and it was difficult to tell when the mist was cleared away by absorption and ventilation, without waiting until the air in the room had got back to practically the condition of the outer air. However, such results as were obtained indicated that the amount of moisture in the air affected the value of the lamp considerably—about 10 per cent.; but no reliable quantitative results could be determined. The idea of artificially altering the humidity was, therefore, abandoned, and it was arranged to make a series of tests covering a sufficient length of time to ensure a wide range of moisture conditions. Under this plan, it was necessary to test the lamps against some standard whose value should be constant, and entirely unaffected by atmospheric conditions. The standard selected was a low candle power, low efficiency, incandescent electric lamp, operated by a storage battery. Resistance coils and a voltmeter enabled the experimenters to run the lamp at a constant determined voltage. An electric lamp of this character falls off in efficiency very slowly, especially if it has previously been burned long enough to settle down to its normal value. Under the conditions of the tests, the electric lamp was burned only about ten minutes a day; but



in order to check against any unexpected drop in efficiency, there were a number of lamps, some of which were kept as checks, and the working lamps were from time to time compared with these. It is evident, Mr. Norris points out, that the actual candle power of the lamp used in these experiments had no bearing on the tests, so long as the light given remained constant under the given voltage. A dozen of the electric lamps were obtained from the General Electric Company, and each lamp was carefully standardized by the makers and marked with the direction in which the test was made, and the voltage necessary to make the lamp exactly ten-candle power. Experiments have been made on these lines for some time, covering a range in humidity ranging from 48 to 87 per cent. of saturation; and the value of the pentane lamp has apparently varied from 9.37 to 10.42 candle power, as shown in the table below, calling the average observed value ten-candle power:—

Temperature Fahr.	Percentage Humidity.	Pounds of Moisture in 100 Cubic Feet of Air.	Variation of Pentane Lamp Against Electric No. 3.
72°	48	0.0585	10.42
72°	53	0.0646	10.35
74°	70	0.0910	9.94
70°	80	0.0912	10.15
78°	69	0.1007	10.00
74°	78	0.1014	9.79
80°	68	0.1061	..
76°	87	0.1200	9.37

The tests made were not sufficient in number to average out the error of observation in reading the portable graduated voltmeter employed, and consequently the figures given above may vary slightly from the real facts. But they are sufficiently accurate to prove that the light given by a pentane lamp is affected by the percentage of moisture in the air. This may not be a disadvantage.

Apparently the variation depends upon the amount of moisture per cubic foot, and not on the degree of saturation. The higher the temperature of air, the greater the weight of water it is capable of carrying in solution; and if air of a given degree of saturation is heated up, the weight of water per cubic foot remains fairly constant, but the percentage of saturation decreases rapidly. The extent of the falling off in light-value of the pentane lamp is probably dependent upon the weight of water that the flame has to heat up; and consequently the weight of water per cubic foot of air is what determines the variation. This opinion is confirmed by the results of the experiments on the effect of changes in temperature. Two lamps were compared with both in air of 75° temperature. Then one room was heated by a steam-coil to 100°; and the value of the lamp was not changed. In this case, the weight of the water per cubic foot of air was not seriously altered by the rise in temperature. But if the humidity was (say) 70 per cent. at 75°, it was about 34 per cent. at 100°; and yet there was no effect on the value of the lamp. Such experiments as have been made abroad on the effect of moisture, have generally, Mr. Norris believes, shown the importance of this consideration; but the description of the methods has been so meagre as to make it difficult to judge how much dependence is to be placed on the figures given.

To summarize, Mr. Norris said, it would appear: 1. That pentane is commercially obtainable of practically constant quality. 2. That the burners do not fall off in efficiency in more than a year's constant burning. 3. That the light-value of the pentane lamp is not affected by temperature changes within a range of from 75° to 100° Fahr. 4. That its light-value is not affected by a range in barometric pressure of  $\frac{1}{4}$  inches of mercury. 5. That its light-value is appreciably affected by the amount of moisture in the air.

It is usually customary to assume (Mr. Norris concludes) that the ideal standard of light for photometric purposes would be one which gives an invariable amount of light under all atmospheric conditions. While a standard of this sort would undoubtedly be useful, it is questionable whether it would be just what is wanted for ordinary commercial use in connection with gas supply. Experience has shown that the light given by a flame burning a stated quantity of a given gas varies if there be a change in the amount of moisture in the air supporting combustion. It is evident, therefore, that the quality of a gas measured against a standard giving an unvarying amount of light would apparently vary with an increase or decrease in moisture in the air. In other words, if an open gas-flame be tested against such a standard, the apparent quality of the gas would vary with variations in the amount of moisture in the atmosphere, even though the gas being tested remained unchanged. If it were practicable, the perfect standard against which we should compare our gas would be a sample of gas of the prescribed quality. Against such a standard, any given gas would show a constant value under any atmospheric conditions, so long as the gas remained unchanged. Of course, a standard sample of gas for such use is a practical impossibility; but whatever substitute we use for this ideally perfect standard has its value measured by the closeness with which its results accord with those that would be given if the gas sent out were measured against a gas of standard candle power. It is evident that a standard of unvarying light-value does not answer these conditions. A perfect standard will be a flame which is affected by humidity to the same extent as an open gas-flame would be, burning a sample of standard gas. The indications are that the pentane lamp answers these conditions more closely than any other standard that is at present available. It has been shown to be independent of temperature

and barometric changes; but it is affected by variations in humidity. If this variation in light-value equals the variation due to the same cause in the case of the open gas-flame, the pentane lamp is an ideal standard for gas-testing purposes. Our experience indicates that the flat-flame and the pentane lamp are thus similarly affected by humidity changes, though no careful experiments have yet been made to check up this point. In the ordinary operation of a large gas-works, a holder full of gas takes some time to run out; and, of course, there are frequently rapid changes in humidity conditions during this time. We have never found that these humidity changes had any effect on the observed candle power of the gas, when measured against the pentane standard. It is, therefore, fair to assume—unless and until otherwise proved—that the pentane lamp is affected by humidity to the same extent as is the open gas-flame. It would, therefore, seem that the pentane lamp fulfils all the conditions of an ideal standard for gas-testing purposes. If, on the other hand, it is desired to have a standard whose value can be expressed in absolute light-units, continued experiments would give us correction factors which could be used to correct the average value of the lamp to some empirically chosen datum line of humidity; and I would suggest some other name than "candle power" for such absolute light-units. The necessity for a reliable official standard of some sort gets yearly more urgent; and I would like to see the American Gaslight Association take steps towards the adoption of the pentane lamp as the standard of candle power. This would involve some system of original lamps against which all official standards could be compared, and the certifying by some reliable authority to the candle power of each lamp.

#### THE EDGERTON STANDARD.

The second part of the appendix to the Research Committee's report—on the Edgerton Standard—was read by Mr. Alten S. Miller, of New York. It was as follows:—

At our last meeting, the question of determining a satisfactory working standard was referred to your Research Committee. As Mr. Norris had arranged to continue tests of the Harcourt Standard, it was determined to confine these experiments to the Edgerton. The work (which is of two kinds) was done by Messrs. W. C. Morris, M.E., and Howard Bruce, C.E. Tables A, B, C, and D show the averages of a number of comparisons made between Edgerton standards. One burner was kept steady in each case, and the other moved as described. Table E gives every individual test of the working standard used in the photometer room, between Sept. 18, 1899, and Oct. 1, 1900. The values of the standard enclosed by brackets should be the same. The variations are probably due more to the candles than to the burner.

TABLE A.—Results of Tests to Determine the Difference in Intensity of Various Portions of the Sugg "D" Flame when Used as a Photometric Standard with the Edgerton Shield.

[Standard v. Standard Burner No. 1 to No. 5.]

No. 1 v. No. 2. No. 1, Rotated. Position.	No. 2 v. No. 1. No. 2, Rotated.	No. 3 v. No. 1. No. 3, Rotated.	No. 4 v. No. 1. No. 4, Rotated.	No. 5 v. No. 1. No. 5, Rotated.
A 1'116 .. 1'122 .. 1'115 .. 1'117 .. 1'127	B 1'217 .. 1'107 .. 1'052 .. 1'107 .. 1'150	C 1'183 .. 1'138 .. 1'140 .. 1'110 .. 1'127	D 1'210 .. 1'171 .. 1'140 .. 1'090 .. 1'150	E 1'139 .. 1'162 .. 1'090 .. 1'107 .. —
F 1'141 .. — .. — .. — .. —				

\* In each case the chimney was kept in one position in reference to the bar; the burner alone being rotated.

1'116 .. 1'107	Minimum Value.	1'052 .. 1'090 .. 1'127
1'217 .. 1'171	Maximum Value.	1'140 .. 1'117 .. 1'150
0'101 .. 0'064	Extreme Difference.	0'088 .. 0'027 .. 0'023

Percentage Variation from Minimum Value.

$$\frac{0'101 \times 100}{1'116} = 9.05 \text{ per cent.} \quad \frac{0'064 \times 100}{1'107} = 5.78 \text{ per cent.}$$

$$\frac{0'088 \times 100}{1'052} = 8.37 \text{ per cent.}$$

$$\frac{0'027 \times 100}{1'090} = 2.48 \text{ per cent.} \quad \frac{0'023 \times 100}{1'127} = 2.04 \text{ per cent.}$$

TABLE B.—Results of Tests to Determine Errors that may Occur, Due to Variation of Chimney and Shield, from the Position they were in when Burner was Standardized.

[Due to change of position of chimney with respect to centre of burner greatest eccentricity being about  $\frac{1}{4}$  inch.]

A, 1'120	Original position.
B, 1'126	
C, 1'124	
D, 1'122	
Minimum value	1'120
Maximum value	1'126
Original value	1'120
Extreme variation from original value	0'006
Percentage variation	$\frac{0'006 \times 100}{1'120} = 0.530$



TABLE C.—Variation Caused by Different Position of the Chimney.  
[Burner kept steady, and chimney rotated around vertical axis.]

A, 1'120 . . .	Minimum value . . . . .	1'120
B, 1'134 . . .	Maximum value . . . . .	1'144
C, 1'144 . . .	Extreme variation . . . . .	0'024
Percentage variation $\frac{0'024 \times 100}{1'120}$		2'140

TABLE D.—Variation Due to Raising and Lowering Flame Half an Inch Above and Below Correct Position.

Correct position 1'122		
Flame high . . 1'138 . . .	Minimum value . . . . .	1'116
Flame low . . . 1'116 . . .	Maximum value . . . . .	1'138
Greatest variation from original position		0'016
Percentage variation $\frac{0'016 \times 100}{1'122}$		1'430

TABLE E.—Test of Sugg "D" Argand Burner.

Number.	Date.	Value.	Remarks.
1	Sept. 13, 1899	6'42	
2	" 23 "	6'42	
3	Oct. 17 "	6'37	
4	" 27 "	6'35	
5	Nov. 9 "	6'29	
6	" 9 "	6'29	Chimney not clean.
7	" 13 "	6'28	
8	" 18 "	6'38	Chimney cleaned.
9	" 20 "	6'15	
10	" 23 "	6'24	
11	" 28 "	6'21	New chimney put on, and burner rotated slightly.
12	" 28 "	6'25	
13	Dec. 1 "	5'92	
14	" 1 "	5'99	
15	" 2 "	6'02	Burner cleaned, new chimney.
16	" 3 "	5'98	
17	" 4 "	6'06	New chimney, burner rotated.
19	" 8 "	5'78	
20	" 8 "	5'75	Burner rotated.
21	" 14 "	5'97	
22	" 14 "	6'01	
23	" 17 "	6'07	Burner cleaned.
24	" 23 "	5'99	
New Burner "B."			
25	Dec. 28, 1899	5'54	
26	" 29 "	5'53	
27	Jan. 11, 1900	5'55	
28	" 16 "	5'53	
29	" 19 "	5'99	
30	" 19 "	6'03	
31	" 20 "	5'06	
32	" 20 "	6'04	Chimney cleaned, burner rotated slightly.
33	" 27 "	5'92	
34	" 27 "	6'01	
35	" 30 "	6'00	
36	Feb. 4 "	6'11	
37	" 4 "	6'14	
38	" 9 "	6'13	Burner rotated.
39	March 1 "	6'16	
40	" 1 "	6'16	
41	April 24 "	6'12	
42	May 2 "	6'11	Burner rotated.
43	" 17 "	5'76	
44	" 17 "	5'68	Chimney cleaned, burner rotated.
45	" 17 "	5'68	
46	" 22 "	5'82	
47	" 22 "	5'82	
48	" 30 "	5'77	
49	June 6 "	6'31	New burner, chimney shifted.
New Burner "C."			
50	June 9, 1900	6'00	
51	" 16 "	5'96	
52	" 21 "	6'17	
53	" 28 "	6'16	
54	July 10 "	6'17	
55	Aug. 16 "	6'00	New burner "D."
56	" 17 "	6'44	Burner "C."
57	Sept. 11 "	6'33	Chimney cleaned, burner rotated.
58	" 20 "	5'95	Burner rotated, new chimney.
59	" 20 "	6'03	
60	" 23 "	5'94	
61	" 23 "	5'91	
62	" 29 "	6'01	
63	" 29 "	6'02	
64	" 30 "	5'97	
65	" 30 "	6'03	Burner rotated, new chimney.
66	Oct. 1 "	6'00	
67	" 1 "	6'66	

Note.—In every case the figures which should be the same are bracketed.

## Summary.

Burners "A," "B," "C."	Maximum Variation for Set of Values taken under Same Conditions.	Maximum Variation for Different Positions of Same Burner.
1, 2, 3, 4, 8 . . .	should be the same	1'1 per cent.
5, 6, 7 . . . . .	"	1'0 "
9, 10, 11, 12 . . .	"	1'8 "
13, 14, 15, 16 . . .	"	1'7 "
18, 20 . . . . .	"	0'5 "
21, 22, 23, 24 . . .	"	1'7 "
25, 26, 27, 28 . . .	"	0'4 "
29, 30, 31, 32, 33, 34, 35 . . . . .	"	1'9 "
36, 37, 38, 39, 40 . .	"	0'8 "
41, 42 . . . . .	"	0'2 "
43, 44, 45, 46, 47, 48	"	2'5 "
50, 51 . . . . .	"	0'7 "
52, 53, 54 . . . . .	"	0'2 "
58, 59, 60, 61, 62, 63, 64, 65, 66, 67 . . .	"	2'5 "

The extreme variation shown in Table A is 9'05 per cent. ;

that in Table B, 0'53 per cent. ; in Table C, 2'14 per cent. ; and in Table D, 1'43 per cent. The extreme variation of tests in Table E that should be alike is 2'5 per cent. The maximum value of the burner that varied most is 14 per cent. above its minimum.

These tests would seem to indicate that the Edgerton standard is highly satisfactory, provided it is not touched after being tested. If it is disturbed in the slightest degree after being tested, a new test should be made.

## THE MIXING OF COAL GAS AND CARBURETTED WATER GAS.

At the recent Meeting of the American Gaslight Association, the Research Committee presented a supplementary report on this subject, in the course of which they stated that they had not succeeded as yet in persuading anyone to take up and experiment upon the subject of the proper point at which coal gas and carburetted water gas should be mixed in a combined works, in order to secure the largest yield of gas of the highest candle power possible from a given quantity of materials. It had, therefore, been thought well to treat the subject from a theoretical standpoint, in the hope that such treatment might form a basis upon which some of the members of the Association could found practical experiments. There must be some one point, it was shown, at which the mixing should take place, to obtain the best results; and an appreciable gain in candle power would no doubt follow the determination of this point by careful experiment.

The practically universal custom, the Committee suggested, was to mix the two gases after both had been condensed; but, on theoretical grounds, this does not seem to be wise. The heavy hydrocarbons in the two kinds of gas are not identical—especially if the coal gas be the result of high temperature distillation, and the carburetted water gas be made with a superheater temperature adjusted to avoid the production of naphthalene. Under these conditions (which are those commonly found), the heavy hydrocarbons of the coal gas will belong principally to the benzol series; while those of the water gas will be largely olefines and paraffins. A gas saturated or nearly saturated with hydrocarbons of one series, can take up and hold those of the other series without interference. It is well known that, during the condensation of an illuminating gas (especially if it takes place abruptly), some hydrocarbon vapours are condensed before their points of saturation are reached—owing to the action upon them of the heavier vapours which have arrived at the condition of saturation. The farther the vapours are removed from this point, the less probable is it that such action will occur. Since the vapours in the coal gas and those in the carburetted water gas belong to a great extent to different series, almost all the vapours in the mixture formed by mixing the two gases before either is condensed, will be farther from the point of saturation than would be the case with either gas singly, and would, therefore, be more apt to stay in the gas during condensation. The finished gas would thus possess a larger percentage of illuminating vapours than it would when each gas is condensed by itself. As the heavy tar of either gas might exert a harmful solvent action upon the hydrocarbons in the other gas, this tar should be removed in each case (before the gases are mixed) by means of a friction condenser; the temperature of the gas being maintained during the operation. The result would be obtained in a less degree by taking one gas after the operation of condensation had been completed, and mixing it with the other while the latter was still hot. There is no question, the Committee remark in conclusion, that from the candle power standpoint the plan of mixing the gases cold is wrong; and that the cost of the experiments required to discover the proper point of mixture would be fully repaid by improved results.

**Wigham's Lamp-Wick Device.**—A device in connection with the construction of oil-lamps to burn for long periods without trimming, has been applied by Mr. J. R. Wigham, of Dublin, to the lighting of buoys. Hitherto most illuminated buoys have been lit by compressed oil gas; the difficulty of the wick charring and needing trimming having prevented the use of oil-lamps for this purpose. According to "Engineering," this difficulty has been overcome by Mr. Wigham, who makes the wick revolve continuously over a roller at the burner, so that the flame does not spring from an end of wick at all, but from the side which comes uppermost at this point. And as the length of wick is being regularly and slowly passed over the roller, the flame is always springing from a fresh and clean place. Consequently, a lamp on this principle will go on burning for months, or as long as the oil supply lasts, without requiring attention. This is one of the most striking novelties in lamp construction that has come to the front in recent years. The movement of the wick in the case of the buoys is caused by the sinking of a float to which one end of it is attached. The other end is in a tube which opens at the top into the oil-reservoir of the lamp, which is of considerable area, so as to maintain the oil at a working level. As the contents of the float-chamber constantly escape, so the float descends and pulls the wick over the roller. It is an ingenious plan, which will probably find other applications, as few lamps with wicks adjusted to burn in the ordinary way will go many hours without needing to be trimmed.

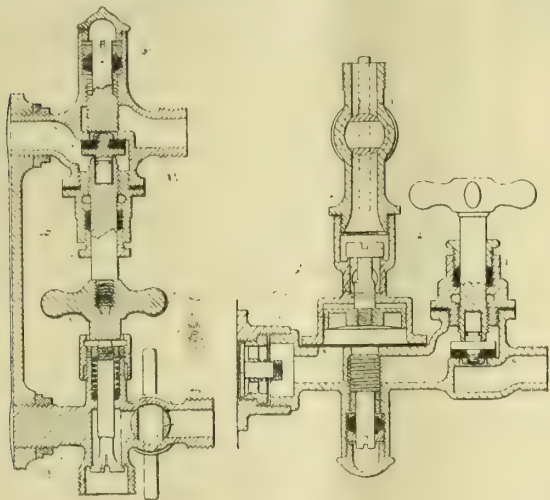


## REGISTER OF PATENTS.

**Gas and Water Supply Valves for Water-Heaters.**—Doulton, H. L., of Lambeth. No. 22,606; Nov. 13, 1899.

This invention (relating to gas and water valves for supplying water-heaters) has for its object the automatic closing of the gas-valve on the water supply being turned off.

The gas-cock is formed, in the first arrangement shown, by a diaphragm held to a seating by a spring. To the diaphragm is attached one end of a spindle, the other end of which passes to the exterior of the gas-cock, and, on being depressed, causes it to open. The water-valve is of the screw-down pattern; the head being adjusted to act upon the spindle of the gas-cock, which is opened by this means and closed again by the spring when the pressure is released.

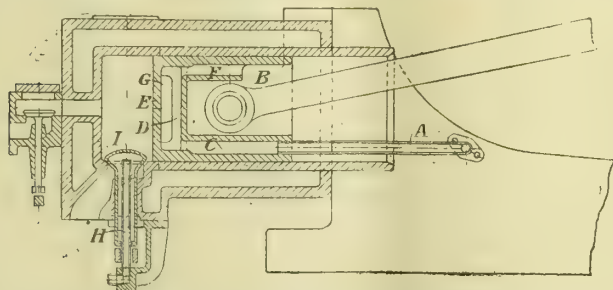


In the second form shown, the gas and water valves are so arranged that, on water passing to the heater, it first acts upon a disc which, in its turn, controls a spindle connected with the gas-valve, causing the latter to open or close according as the water is flowing or not. By this means, the gas would be lowered should the water fail while the water-valve is still open.

To prevent steam passing from the heater to the valves after use, and thus possibly acting upon the gas-valve, a valve is fixed at the point where the water enters the heater; and this is pressed open when water is passing, but closes should force be applied in the opposite direction. The usual method is adopted in each case for supplying a small light only until the water-valve is turned on.

**Internal Combustion Motors.**—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 23,265; Nov. 22, 1899.

The object of this invention is to cool the heated parts of internal combustion motors (which cannot conveniently be cooled by means of a water-jacket) by the use of jets of air. It is applicable chiefly to the end of the piston which is exposed to the heat of the combustion of the ignited charges, and to the head of the exhaust-valve; these being moving parts not so conveniently cooled by means of water, nor requiring to be cooled to the extent possible by this means—"a more moderate degree of cooling being advantageous and sufficient."



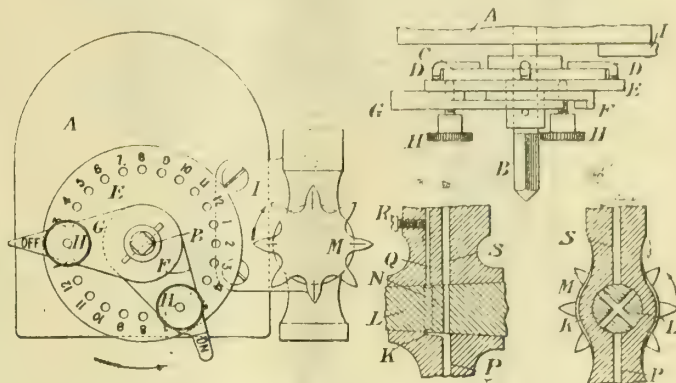
To move the cooling air, any ordinary type of fan or blower, driven by the engine itself, is used. The fan is not shown in the engraving. Air delivered by the fan is conducted by the pipe A to the inner end of the piston B; a channel C guiding it to a chamber D in the piston. The air is heated by contact with the hot end-plate E of the piston, and passes away through the upper channel F, after having cooled the end-plate of the piston to a sufficient extent. Gills G may be cast on the end-plate, as shown. Another portion of the cooling air may be conducted by the internal fixed pipe H to the inside of the exhaust-valve I; the stem and head of the valve being cast hollow so as to accommodate the pipe H, and to provide an outlet for the return heated air.

**Explosion Engines and Utilizing the Heat and Products of Combustion therefrom for the Generation of Gases or Vapours.**—Renault, L., of Paris. No. 25,266; Dec. 20, 1899.

This invention consists of an "auto-generating apparatus for gases and steam"—that is, an apparatus by means of which it is possible to obtain, without the use of either a compressor or a burner, a mixture of heated gases from the cylinder of an explosion motor, and of steam produced by utilizing the heat obtained on the one hand from the wall of the cylinder, and on the other hand from the heated gases which escape from it, and of which a portion is made to circulate in contact with the free surface of the mass of water to be vaporized—the mixture being intended to be employed in a motor, steam turbine of any kind, or other apparatus, in place of steam produced by an ordinary steam-generator.

**Automatically Lighting and Extinguishing Lamps at Predetermined Times.**—Gunning, J., of Bournemouth. No. 25,567; Dec. 27, 1899.

This invention relates to apparatus by means of which, day after day, a lamp, or a set of lamps, is automatically lighted and extinguished at predetermined hours. For gas-lamps, a stopcock is arranged with passages through its plug—such that, on turning it partly round, the gas can pass; on turning it another step round, the passage is closed; and so on (there being, however, in the latter case, a small bye-pass to maintain a kindling light). The turning movement of the stopcock is effected by means of clockwork of an eight-day clock, which will go a week or more with one winding; and parts of the clock are adjusted to act on the cock, so as to partly turn it at the hours to which the parts are adjusted.



The illustrations show a front view and a part plan of the apparatus for lighting and extinguishing a single set of lamps; also longitudinal sections (at right angles to each other) of the stopcock employed for gas-lamps.

A is the clockwork case, arranged to work by applying a key to the arbor B, which is timed to make one revolution in 24 hours. On the arbor is fixed a disc C, to which is loosely held, by clamps D, another disc E, which has in it 24 screw-threaded holes marked with two sets of numerals each from 1 to 12 (indicating hours). This disc is centred, but free to turn on the arbor B; and so also are two arms F and G, each of which has through it a screw H with a milled head, to be turned by the finger and thumb. On a bracket I projecting from the clock-case is fixed the gas-cock, having a shell K and a plug L; and on the plug is a star-wheel M having eight arms. Through the plug there are two passages, crossing each other at right angles; and the plug has also a groove N, which is always in communication with the supply-pipe P and with a passage Q, provided with a regulating screw R, and leading to a pipe which communicates with small kindling jets, one at each lamp. The passage S of the stopcock leads to a pipe which communicates with the main jets of all the lamps.

The apparatus operates as follows: The attendant winds up the clock and turns the star-wheel M to such a position that the gas-passages are closed, as in fig. 3 (of which positions there are four indicated by marks on the arms of the star-wheel). He then moves the arm F round to the hour at which the lamps are to be lighted (say, 6 o'clock), and enters the screw H into the hole of the disc E which is marked with 6. He in like manner moves the arm G round to the hour at which the lamps are to be extinguished (say, 2 o'clock), and enters the screw H into the hole of E marked 2. He now observes the hour of the day at which he is operating (say, 2 o'clock), and turns the disc E, along with the arms F and G as they have been set, round until the hole 2 comes opposite the arm of the star-wheel, which points towards the centre of the disc. He then clamps the disc E firmly to the disc C, by the screws H. The clock, as it goes on, brings the arm F round to act on the arm of the star-wheel at 6 o'clock, turning the wheel one-eighth part of a revolution, and thus opening one of the passages through the plug so that gas flows to the lamps, which are lighted by the small kindling jets. The clock still going on, brings the arm G round to act on the arm of the star-wheel at 2 o'clock, and turns the plug again one-eighth round, thus closing the passage and extinguishing the lamps. This action, of alternately lighting and extinguishing, is repeated once every 24 hours, as long as the clock continues to go.

**Gas-Burners.**—Humphreys and Glasgow; a communication from W. E. Gibbs, of Fanwood, N.J., U.S.A. No. 12,333; July 7, 1900.

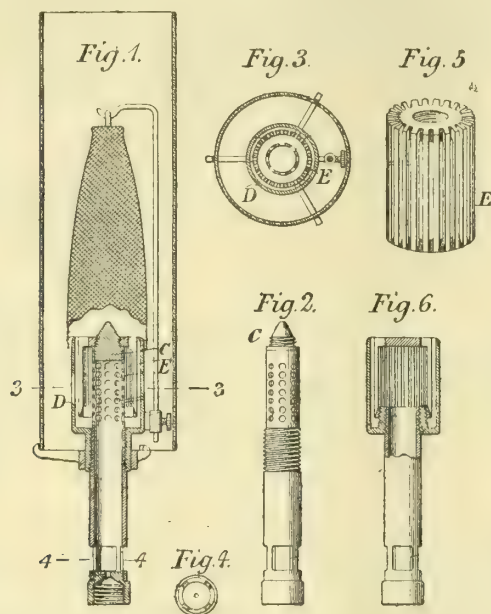
This invention relates to an incandescent burner which permits of "a thorough intermingling of the gas and air and an energetic heating of the mixture," before it is ignited or comes into contact with the flame, "by utilizing the heat which is usually lost by conduction and radiation for heating the gases in the burner."

Fig. 1 (p. 1342) is a longitudinal central section of the burner in what the patentee considers its best and most effective form. Fig. 2 is an elevation of the bunsen tube used in connection with the burner. Fig. 3 is a cross-section on the line 3 of fig. 1. Fig. 4 is a cross-section on the line 4 of fig. 1. Fig. 5 is a perspective view of the "mixing and preheating cage." Fig. 6 is an elevation, partly in longitudinal central section, of a modified form of burner.

The nipple which is screwed on to the gas-pipe is provided with an opening by which the gas is thrown into the bunsen tube, provided with openings for the admission of air. C is a plug closing the upper end of the bunsen tube, as shown in figs. 1 and 2. It is provided with a thread upon which the cage (to be described later) screws, and is formed with an upwardly projecting conical part. D is a casing forming the outer portion of the burner proper, and having a threaded extension which screws upon the threaded portion of the bunsen tube. In the construction shown in fig. 6, the casing is provided with an upwardly extending flange, which is threaded and screws upon the threaded portion of the tube. E is a mixing and preheating cage, which (as shown in figs. 1 and 5) is provided with a threaded portion at its top, which screws upon the threaded part of the plug C. The cage is thus supported from the bunsen tube, and extends down into the casing D without coming into contact with its sides or bottom. This is said to be a "highly



important feature of construction, as it prevents loss of heat from the cage by conduction, and ensures that all the heat imparted to it by the flame acting upon its top will be communicated to the gases passing through, and in contact with, it on the inside of the burner." It is also said to be important that the upper end of the cage should be directly exposed to the flame of the burner; and preferably the cage is constructed, as shown best in fig. 5, of an integral piece of metal slotted



vertically. It thus, in effect, consists of a number of parallel bars, the upper ends of which are directly exposed to the heat of the flame; the remainder of the bars lying in, and extending through, the casing D, so as to afford large surface-contact for the gases which issue from the bunsen tube, and necessarily pass through the slots of the cage on their way to the outlet of the burner.

**Igniting Gas-Burners.**—Gray, H. E., of Brooklyn, U.S.A. No. 12,390; July 9, 1900.

This invention (relating to gas-burners provided with igniting-devices) consists in the combination with a burner having a valve and operating lever, of a moveable arm carrying the igniter arranged to be so operated by the lever that the ignition takes place only when the gas is partly turned on, while the gas is fully turned on only after the igniter is carried away from the burner.

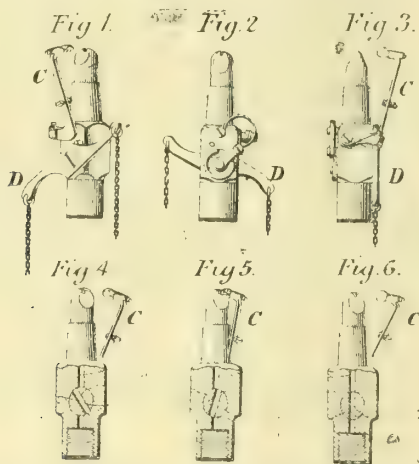


Fig. 1 is a perspective elevation of the burner; fig. 2 is a rear view; fig. 3 is a side view; fig. 4 shows the valve and igniting-devices arranged when the gas is cut off; fig. 5 is a similar view when the igniter is in position to light the gas; and fig. 6, when the gas is fully on.

With the usual parts of a burner, the patentee combines an arm C, pivoted at the lower end to the body of the burner; the upper end being provided with a body of material which will become incandescent in the presence of a stream of gas, and ignite the latter. Upon a lug on the arm bears a spring that tends to carry the arm away from the burner-tip; and it is also provided with a bearing (arranged to work against the upper edge of the lever D) in the form of an adjustable screw, extending through the lug of the arm, and so set as to secure the desired movement of the arm in respect to the changing positions of the valve. As the bearing of the arm C is arranged, the swinging of the lever D to a position to fully open the plug-valve does not affect the position of the arm C, which remains away from the tip; but as the chain is further drawn upon to carry the valve towards the position shown in fig. 5, the lever D makes contact with the bearing of the arm C, so that the latter is carried to its closest point to the tip as the lever reaches the position shown when the gas is almost wholly cut off. As a result, the igniter is brought into action to ignite the gas only when there is a very light flow of the latter; so that "the ignition is rendered more certain and instantaneous, while danger of smoking or burning the igniter or forming any deposit thereon is greatly obviated." When the gas is lit, the pull upon the chain is released, when the force of the spring throws the arm C outward, and also exerts a pressure upon the lever D that will bring the valve to its fully open position—shown in fig. 6.

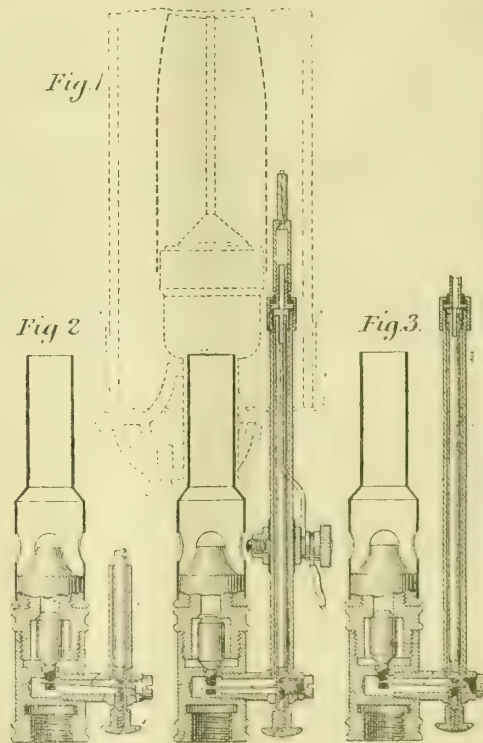
**Gas-Burner Regulators.**—Lake, H. H.; a communication from G. S. Terry, of New York. No. 12,438; July 10, 1900.

In carrying out this invention, a drawn sheet-metal cup-like regulator-body is employed (cylindrical in cross section), formed at its lower end with a shoulder larger in diameter, and at its upper end having a flat top containing a centrally-arranged valve-seat, which constitutes the sole passage-way for the gas. The seat is opened and closed by means of a valve A, formed with a long stem extending upwards through the valve-seat, and attached at its extreme upper end to the dome-like centre of a drawn sheet-metal cup-like regulator-float, cylindrical in cross section, and sufficiently larger in internal diameter than the external diameter of the body to form an annular passage-way for the escape under its lower edge of the gas, which, after passing upward through the valve, is deflected by the top of the float, and caused to flow downwards through the passage-way and under the lower edge of the float, after which it passes upwards through another annular passage-way formed between the outer face of the float and the contiguous portion of the inner face of the burner-tube.

Although the body of the burner, and the cylindrical float and the burner-tube, are sufficiently differentiated in diameter to provide the two annular gas-passages mentioned, the diameters of the parts conform closely enough to each other to cause the body and burner-tube to guide the float as it rises and falls, whereby it is prevented from canting. If desired to increase the flow of gas, small gas-perforations B may be formed in the top of the burner-float, as shown; but these are not imperative, as it is designed that the main escape for the gas shall be around the lower edge of the float.

**Means for Lighting Gas.**—Borchardt, H., of Berlin. No. 12,786; July 16, 1900.

This invention relates to means for igniting an auxiliary jet or flame of gas by the aid of electricity, in the manner described in patent No. 7015 of 1900—a kindling or fuse wire first subjected to preparatory heating by electricity, and afterwards heated to the proper igniting temperature by the gas-current flowing towards it. But in order to ensure equable ignition, neither attended with explosion nor apt injuriously to affect the mantle, the patentee points out that it is necessary to cause the secondary or pilot jet to be ignited before sending gas through the main-jet pipe. In other words, the main-jet gas supply has to be cut off during the process of ignition of the pilot-jet, and must not be re-opened until after the pilot-flame has been kindled.



According to the present invention, this object is attained by the arrangement shown, whereby the first stage of operation of the part which serves to make electrical contact, prior to the closing of the circuit required for the ignition of the pilot-jet, has the effect of cutting off the main-jet gas supply; while in the next or final stage of operation of such part, contact is made and the pilot-flame is kindled. Then the moment the spring contact-piece is released, and allowed to return to its initial position, it will, as it does so, once more automatically turn on the main-jet supply, when the ignition of the gas, as it issues from the burner, will take place unaccompanied by any explosion. Hence in this gas-lighter, by a single action of the hand, contact is made, and at the same time the gas-current is directed to the main-jet or the pilot-jet as required; and thus "reliable and accurately-timed ignition is secured."

The invention also relates to a special method of securing the support of the igniting body or fuse—retaining it in its sleeve by means of the lateral resilience of part of such sleeve—which mode of attachment admits of the ready fitting and removal of the fuse, or its support, without the necessity of resorting to special means for fastening it.

Fig. 1 is a sectional elevation showing the kindling-device in the inoperative state—all parts being in the initial position. Fig. 2 is a

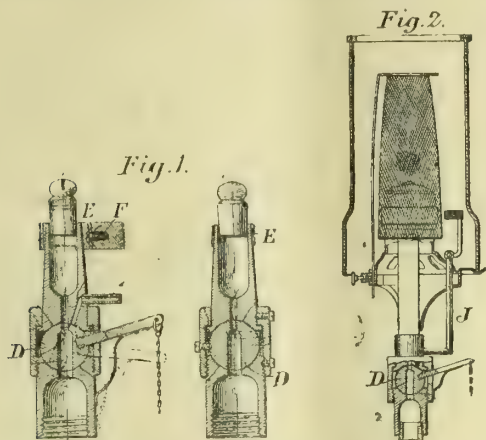


sectional elevation showing the parts in the place they occupy after the main-jet gas supply has been cut off, but before the circuit required to effect the ignition of the pilot-jet has been closed. Fig. 3 is a sectional elevation, representing the parts in the terminal or "contact" position wherein, while the cut-off of the main-jet gas supply is maintained, the electrical contact is made.

**Gas-Cocks for Self-Igniting Burners.**—Wiegand, A. J., of Baltimore, U.S.A. No. 13,340; July 24, 1900.

This invention relates particularly to that class of self-lighting gas-cocks in which the gas is ignited by impinging upon an igniting substance like platinum sponge.

In the construction shown in fig. 1, the burner tip is provided at its lower end with a lateral flange and a seat for the valve D; while the main port and the igniter-port lead from the seat, as shown. The main port leads to the burning-tip, while the other one leads preferably to a short tube having a discharge below the igniting substance used, and in such position that the gas will attack the extreme end of this substance F,



which is carried in a holder E, provided with a tubular portion to embrace its support. The holder also has a tube-like guard portion (which partially encloses the igniting substance, and which operates to protect it), of gauze or other "foraminated" material, to permit the ready passage of air to the igniting substance.

The valve is spherical in form, so that it readily fits the seats of the main and base sections of the burner, and will always find its seat. It has a port in constant register with the gas-inlet, and contracted at its upper end so that it may be moved, by depressing the handle out of register with the main port and into register with the igniting-port and back again after the igniting operation is effected. When moved into register with either of the ports, it moves out of register with the other one, so that gas is never supplied at the same time through both ports. In other words, when the gas is feeding through the igniting-port, the main port is closed, and *vice versa*.

The handle is usually held in the position shown by a spring bearing at its free end against the base section of the burner, so that it will operate when the handle is moved to the dotted position and released, to instantly return to its normal position indicated in full lines.

In fig. 2 is shown an extended tube J leading from the igniting-port to a position adjacent to the mantle, so that the invention may be employed for lighting burners of the incandescent class.

**Explosion Engines.**—Burger, F., of Fort Wayne, Indiana, U.S.A. No. 15,702; Sept. 4, 1900.

The object of this invention is said to be "to avoid the loss of power resulting from the ordinary methods of utilizing the heat energy of fuel in that class of explosion engines in which combustible gas and vapour or air are mixed together and introduced into, and exploded in, a cylinder, and to also avoid the consumption of energy requisite in other classes of like engines to subject air to an excessive pressure, as well as to avoid the difficulties incident to operating valves under high pressure."

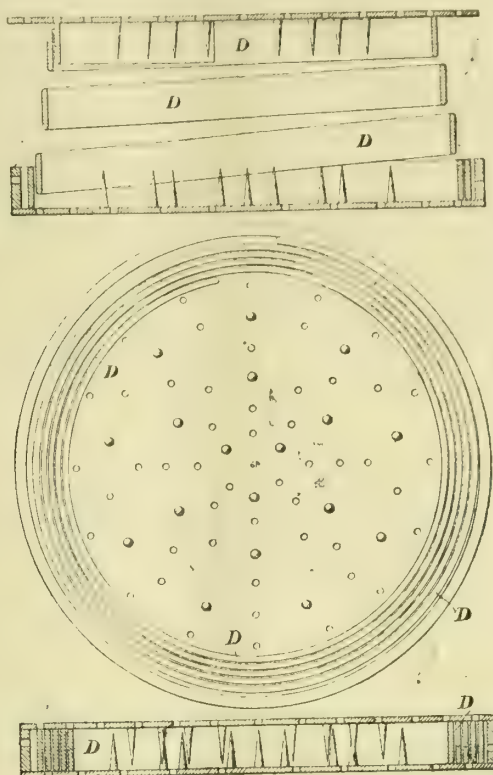
To this end, the invention consists in first compressing the air to a pressure of about 100 lbs., more or less, which is much less than what the patentee says he means by "excessive pressure" (which is sometimes as high as 500 lbs., as in the "Diesel" engine). The compressed air is stored in a reservoir; and the pressure should be maintained therein substantially uniform with the working pressure desired in the cylinder. Air from the reservoir is introduced alone into the cylinder at the beginning of the forward stroke; and when the piston has moved a predetermined distance, fuel in either liquid or gaseous form is injected into the cylinder, through a separate passage, in close proximity to the air-passage, and a portion of the incoming air is mixed with the fuel, and the mixture ignited within the cylinder. The remainder of the incoming air mixes with and causes the burning fuel to follow up the moving piston; and thus "every particle of carbon is consumed and converted into work, thereby preventing any waste of fuel, and producing a non-visible, odourless exhaust." When the piston has moved a predetermined distance, the supply of fuel is cut off, and subsequently the supply of air, before the piston has completed its outward stroke. By this means the patentee claims that he avoids the loss of energy from highly compressing the air; there is no difficulty in manipulating the valves; and he is enabled to maintain the pressure against the piston for a much greater proportion of the stroke with a much less consumption of fuel than has heretofore been practicable.

**Pressing Cakes of Anthracene.**—Burt, Boulton, and Haywood, Limited, of Cannon Street, E.C., and Standfast, T. S., of Totton. No. 15,519; Oct. 13, 1900.

This invention (of apparatus for pressing cakes of anthracene of uniform thickness) is shown in the engraving—in a plan with the upper plate

removed, and a section of the apparatus in its expanded condition and when closed.

The apparatus consists of an upper and a lower disc, the latter surrounded by a flange. Both discs are perforated with numerous holes for the escape of liquid. Between the discs is placed a spiral spring D, which, when the apparatus is relieved from pressure, raises the upper disc; and on it being removed, the anthracene to be pressed is piled upon the lower disc within



the coils of the spring. The upper disc being replaced, the whole is subjected to pressure, until the upper disc and spring are pressed quite down, as shown in the bottom view. During the application of the pressure, the coils of the spring prevent any escape of the material laterally. When the material has to be heated while it is being pressed, the discs are provided with numerous spikes which, projecting into the material, conduct heat from the discs into it.

**Incandescent Gas-Mantles.**—Pikhart, E., of Vienna. No. 16,473; Sept. 15, 1900.

This invention relates to an incandescent mantle in which, instead of fastening the head to the incandescent mantle proper, parallel or not parallel, zig-zag, loop-formed, or wavy threads or sewings are provided and worked in the fabric of the mantle to strengthen it at the top; the threads being in the form of seams or ribs, and making a connection between the mantle body and the head of the mantle, which is connected with the mantle body by transverse threads or sewing. This arrangement is suggested to overcome the drawback that the incandescent mantles at present in use are weak and liable to break at the head or upper part, so that, as the patentee remarks, it "is often necessary, after a short time of use, to remove the mantle, although the main part of it is still in good condition." Various attempts have been made to overcome this drawback by extending the weaving or knitting of the head from the latter over the top of the mantle; but these and similar experiments had the objection of preventing the free passage of the gases, whereby a layer of soot soon becomes formed on the upper part, and the mantle is spoiled for use.

#### APPLICATIONS FOR LETTERS PATENT.

- 20,315.—HUNTER, G. W., and McLAREN, D., "Regulating the consumption of gas in railway-carriage lamps." Nov. 12.
- 20,341.—CARPENTER, C., "Lighting gas-burners." Nov. 12.
- 20,353.—KASPER, M., "Purifying gases." Nov. 12.
- 20,359.—BROWETT, A., "Generating and burning acetylene gas." Nov. 12.
- 20,369.—THIERSANT, H. DE, and COULSON, W. A., "Acetylene gas-generators." Nov. 12.
- 20,376.—SHARMAN, W., "Generating acetylene gas." Nov. 12.
- 20,412.—JACKSON, F. W., "A chemical-gas engine." Nov. 13.
- 20,441.—DENT, A., and GRINDLAY, W. R., "Conveying coke, coal, and other materials." Nov. 13.
- 20,478.—JONES, P. C., "Incandescent gas-burners." Nov. 14.
- 20,483.—PERKS, E., and BIRCH, F., "Carburettors for explosion motors." Nov. 14.
- 20,484.—CLAPHAM, T. S., "Purification of gas." Nov. 14.
- 20,514.—POTTER, W. G., "Fuel economizers for gas-stoves, &c." Nov. 14.
- 20,557.—SCOTT-SNELL, C., "Compressing gas, air, and the like." Nov. 14.
- 20,574.—HERSEY, S., "Gas washers or scrubbers." Nov. 14.
- 20,588.—COE, F., "Incandescent gas lighting and burners." Nov. 15.
- 20,627.—MURRAY, T. R., "Conveyors for coal." Nov. 15.
- 20,653.—RÉE, R., "Acetylene apparatus." Nov. 15.
- 20,669.—HEX, S., "Device for igniting coal gas." A communication from A. Wauters. Nov. 16.
- 20,759.—SCHWARZ, H., "Gas petroleum and like engines." Nov. 17.
- 20,812.—TIERO, P., "Application of antiseptic and hygienic ingredients to lighting and heating materials." Nov. 17.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## The "Corner" in Oil and Political Economy.

SIR,—In the interesting editorial, in the last issue of the "JOURNAL," on the "corner" in oil and its results, you speak of there being no political economy in the matter, and refer to the law of supply and demand as though it were somewhat discredited by the recent experience of oil-buyers. May I venture to champion the unpopular cause of political economy, which some people appear so anxious to discredit in these days, and to point out that the course of events in the oil-market is strictly in accordance with the law that prices depend upon the relation of supply to demand? The mistake lies in confusing *available* with *existing* supply. There are, the geologists tell us, about 140,000 million tons of coal in the coal-beds of the United Kingdom. That, however, did not prevent coal prices going up with a run last winter. Those prices went up because the available supply was not equal to the demand. Just so with oil. It does not matter the least little bit how much oil exists in the recesses of the earth; if the owners of those recesses do not choose to put as much oil on the market as consumers are willing and wishful to buy—if, that is to say, the supply be not equal to the demand—up will go the price, in strict accordance with the aforesaid law. The world's stock of oil may be "practically unlimited;" the supply is very carefully limited. For that, the oil cornerers are to blame, not poor political economy.

Nov. 21, 1900.

G. B.

## The Occasional Failure of Sulphur Purification.

SIR,—I have read the remarks at the meeting of the Southern District Association, reported in the last number of the "JOURNAL," on the occasional failure of sulphur purification, and would like, with your permission, to draw the attention of your readers to the article on "Purification" contributed by me to the issue for July 25, 1899 (p. 232). I venture to think that sufficient information will be found there to prevent the occurrence of these mysterious failures; but, if not, I shall be pleased to furnish more at the cost of paper and postage.

East Ham, Nov. 23, 1900.

S. CARPENTER.

## PARLIAMENTARY INTELLIGENCE.

## NOTICES GIVEN FOR BILLS (SESSION 1901) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

**Aldeburgh Corporation.**—Application will be made by the Aldeburgh Corporation for authority to purchase the undertaking of the Aldeburgh Water-Works Company, Limited, in accordance with the terms of an agreement dated the 12th of May last year, or any other which may be entered into in relation thereto. Provision will be made for the winding up of the Company. The Corporation will ask for power to carry out new works, and to raise the necessary money for these and for the purchase of those now in operation.

**Aldershot Gas and Water.**—The Aldershot Gas and Water Company intend to apply for power to enter into an agreement with the Yorktown and Blackwater Gas Company, Limited, for the purchase of the whole or part of the Company's undertaking, and for an extension of their limits of supply so as to include the parishes of Cove, Fleet, Crookham, and Ewshot, in the county of Hants, such parts of the parishes of Yateley and Hawley as are not included in the Yorktown Company's district, and the parish of Seale, in Surrey, with authority to exercise in the enlarged district all their existing powers as to the supply of gas and the levying of rates and charges. Authority will also be sought to acquire additional land and to erect thereon works for the manufacture and storage of gas. More capital will be required.

**Alfreton Gas.**—The Alfreton Gas Company will seek dissolution and re-incorporation, and apply for power to regulate their present capital and raise more. The usual provisions in regard to the supply of gas and the sale or hire of fittings, meters, stoves, &c., and their inspection, will be included in the Bill.

**Aspatia, Silloth, and District Water.**—Application is to be made by the Urban District Councils of Aspatia and Holme Cultram and the Rural District Council of Wigton for sanction to the formation of a Joint Water Board to construct works and impound the waters of the River Ellen, the Overwater Lake, and their tributaries, and supply water within the urban districts of Aspatia and Holme Cultram, and certain parishes, or parts thereof, in the rural district of Wigton. The applicants will ask for all the powers usually granted to owners of water undertakings. Provision is to be made for the raising of the necessary money for carrying out the project, for the application of the revenue and the profits, and for meeting any deficiency that may arise.

**Bath Gas.**—The Bath Gas Company will apply for an extension of their limits of supply so as to include the parishes of Langridge and Woolley; also for authority to manufacture, sell, or let on hire meters and apparatus for warming, lighting, cooking, ventilating, and motive power purposes, provide materials and services in connection therewith, and make charges therefor. The several classes of the Company's stock are to be consolidated, and more capital will be asked for. The other provisions of the Bill to be promoted relate to the establishment of an insurance or reserve fund and a renewal fund, the inspection of meters, pipes, and fittings, &c.

**Bingley Urban District Council.**—Application will be made for authority to purchase the undertaking of the Cullingworth Gas Company, and extend the Council's limits for the supply of gas so as to include all or any of the districts or parts thereof now served by the Company. Provision will be made for the maintenance, improvement, and enlargement of the existing works, and for the dissolution of the Company.

**Bradford Corporation Improvements.**—In an Improvement Bill of which the Bradford Corporation have given notice, power will be

sought to make and store gas and convert and manufacture residual products on certain lands adjoining others belonging to the Corporation on which similar work is now carried on; also to extend the boundaries of the borough so as to include the urban district of Baildon. More money will be required.

**British Gaslight Company.**—Authority will be sought by this Company to spend further capital on the construction of works and the purchase of lands in connection with their Hull station.

**Burton-upon-Trent Corporation.**—In a General Powers' Bill to be promoted by the Corporation, authority will be sought for their officers to enter on premises the water supply of which is wholly or partially derived from a well, and take samples of the water, and to execute and recover the cost of any works for laying on water under section 62 of the Public Health Act, 1875.

**Chester Gas.**—The Chester Gas Company will apply for power to acquire certain additional lands for the construction and maintenance of gas and other works. Authority will be sought (among other things) to supply and let meters, &c.; to prescribe and regulate the position of consumers' meters, pipes, and fittings; to enforce the use of anti-fluctuators or other appliances in connection with gas-engines, and to make provision for their inspection; and to convert and consolidate the various classes of stock. Additional capital will be asked for.

**Colwyn Bay and Colwyn Gas.**—The Urban District Council of Colwyn and Colwyn Bay intend to apply for authority to purchase the undertaking of the Colwyn Bay and District Gas Company, maintain and improve the existing works, and supply gas for all purposes within the urban district of Colwyn Bay and Colwyn and the parish of Llysfaen, in the county of Carnarvon. The Council will ask for an extension of their borrowing powers, and for the privileges usually conferred upon owners of gas undertakings.

**Crawley Gas.**—The Crawley Gas Company will apply to be dissolved and re-incorporated with power to supply gas and residual products within the townships or parishes of Crawley, Ifield, and Worth, in Sussex, or parts thereof. In the Bill to be promoted, provision will be made for the maintenance and construction of gas-works, the supply of fittings, the breaking up of streets, and the levying of rates and charges. The Company will seek to be authorized to apply for a Licence or Provisional Order, under the Electric Lighting Acts, and to carry it into execution. It is proposed to exclude from the limits of supply of the Horley District Gas Company, Limited, the area comprised in the intended Act, repeal so much of the Horley District Gas Order, 1886, as relates to that area, modify the provisions of the Order, and empower the two Companies and their successors to enter into contracts and agreements, and confirm any entered into prior to the passing of the intended Act.

**Derwent Valley Water Board.**—Application will be made by the above-named Board for permission to abandon the construction of the Derwent reservoir authorized by the Derwent Valley Water Act of last year, and to make in lieu thereof one partly on the same site. The Bill to be promoted will contain a number of general provisions in regard to way-leaves, the protection of waters, the prevention of "plumbism," &c. Additional borrowing powers will be required, both for the Board and the constituent Local Authorities.

**Devonport Corporation Gas.**—Power will be sought by the Devonport Corporation to acquire the undertaking of the Devonport Gas Company, purchase land, continue and extend the works, and manufacture and supply gas throughout the borough. In the Bill to be promoted, provision will be made for enabling the Corporation to inspect the Company's works and property and examine their books. The necessary money powers will be applied for.

**Devonport Gas.**—The Devonport Gas Company will apply for parliamentary sanction to the purchase of the reversion in fee of the lands on which their works and other property are erected, to the consolidation of the capital, and to its increase. The limits are to be defined and extended so as to include the existing borough, or the borough for the time being, or some part or parts thereof. Provision is to be made for prescribing and regulating the position of meters, fittings, &c., and for the exemption of the Company from penalties for the non-supply of gas in certain cases. It is proposed to substitute a sliding-scale for the present fixed maximum price, and to amend the provisions of the Company's Act of 1853 with respect to the illuminating power of the gas and the payment of interest on deposits. Authority will be asked to sell or let stoves, &c., as well as to form insurance, accident, and reserve funds, and deal with the profits of the Company.

**Dorking Gas.**—Application is intended to be made by the Dorking Gas Company for power to enlarge their existing works, to purchase certain lands for the purpose, and to manufacture and store gas (including carburetted water gas) thereon. They will ask to have the present limits of supply extended so as to include the parishes of Mickleham, Fetcham, Great and Little Bookham, Eftingham, Abinger, Wotton, Ockley, Capel, and Newdigate, all in Surrey, or some portions thereof. Further capital will be needed, and that already existing is to be consolidated and converted. The Company's Act of 1871 is to be altered in respect of the charge for gas and the dividends, which will be based upon a sliding-scale; and further provisions are to be made in regard to the quality of gas, defective meters, &c.

**Dover Gas.**—The Dover Gas Company will apply for authority to change their name, use certain land now in their possession for the construction and maintenance of additional works, and purchase other lands by agreement. The capital is to be converted, and more will be required. In the Bill to be promoted, provision will be made for the discontinuance of the supply of gas in certain cases, and regulations inserted in regard to meters, stoves, and fittings and their supervision. It will likewise contain a clause to enable the Company to purchase by agreement the undertaking of the Dover Electricity Supply Company, and apply for the purpose any capital that may be authorized.

**Elland Gas.**—Application will be made by the Elland-cum-Greetland Gas Company for authority to consolidate and convert their existing capital, raise more, and alter and extend their works. It is proposed to alter the existing or to make further provisions in regard to the pressure at which gas is to be supplied, the quality and the testing of gas, the prescribed burner, the charge, and the sliding-scale in respect of the standard price and dividend, as well as in regard to the Company's insurance and reserve funds.



**Faversham Water.**—The Faversham Water Company will seek to be dissolved and re-incorporated with power to maintain the existing works and construct new ones in the parishes of Ospringe, Faversham Without, and South Preston Without, in Kent. Authority will be sought to acquire lands, easements, waters, &c., by compulsion, or by agreement, levy rates and charges, make regulations as to fittings, &c., and supply water in bulk.

**Gaslight and Coke Company.**—The notice given by this Company for a Bill to sanction the raising of additional capital was dealt with last week (p. 1280).

**Golborne Gas.**—The Golborne Gas Company will seek to be dissolved and re-incorporated with increased capital. The present works are to be maintained and enlarged. The usual powers now granted to gas companies will be applied for, as well as the repeal of so much of the Westleigh, Pennington, and Bedford Local Boards (Gas) Act, 1874, as relates to the supply of gas within the township of Golborne.

**Gravesend Gas.**—Application will be made by the Gravesend Gas Company for authority to consolidate and convert their present capital, and raise more. New reserve and other funds are to be formed, and a sliding-scale of price and dividend is to be adopted. It is proposed to extend the Company's limits so as to include the parish of Chalk, and to alter the illuminating power of the gas from 16 to 14 candles. Authority will be sought to make regulations as to the supply of gas by prepayment meters, and as to the fittings connected therewith.

**Handsworth Urban District Council.**—In a General Powers Bill of which the Handsworth District Council have given notice, authority will be sought to allow discounts on sums payable for the supply of electrical energy, to provide electrical fittings, to make and enforce bye-laws and regulations in respect thereof, and to vary and enlarge the powers of the Council in relation to their electric light undertaking.

**Hartlepool Gas and Water Transfer.**—The Corporations of Hartlepool and West Hartlepool intend to apply for authority to purchase the undertakings of the Hartlepool Gas and Water Company, which it is proposed to vest in the Corporations or in a Joint Committee or Board. Power will be sought to maintain, continue, and extend the existing works, and purchase additional land. Permission will be asked for the Corporations or the Committee or Board, as the case may be, to enter into agreements with local public bodies for the supply of gas or water beyond the limits, or in bulk. Borrowing powers will be required.

**Heywood and Middleton Water.**—The Heywood and Middleton Water Board will apply for power to carry out a number of works, comprising an extension of the No. 1 reservoir authorized by the Heywood Water-Works Act, 1877, three catchwaters and aqueducts, and a new road; also for an extension of the time allowed for the works already sanctioned. Provision will be made for the preservation of the purity of the water, the prevention of waste, the testing of fittings, and the sale of water in bulk. Borrowing powers will be sought.

**Leeds Corporation.**—In a General Powers Bill to be promoted by the Leeds Corporation, provision will be made for any surplus or deficiency in the revenue of the gas, water, or tramway undertaking of the Corporation being carried to the credit or the debit of the consolidated fund or rate, and for the application of such revenue and of the city and consolidated funds or rates.

**Leeds Corporation (Water).**—Application will be made by the Leeds Corporation for authority to carry out a number of new works, comprising five reservoirs, aqueducts, catchwaters, road diversions, and so forth, which are to be constituted part of the water undertaking. In connection with these works, the line of pipes belonging to the Masham Water Company, in the parish of Healey-with-Sutton, will be diverted. Power will be sought to take the waters of the Rivers Burn, Laver, Skell, and other streams, enter into agreements for the temporary discharge of water thereinto, and make provision for securing the purity of the water. The taking of water from the drainage area of the Burn will be subject to an agreement with the Corporation of Harrogate. Borrowing powers will be applied for.

**Limpfield and Oxted Water.**—Application will be made by the Limpfield and Oxted Water Company for power to construct additional works—comprising a reservoir in Limpfield, pipe-lines, and wells and a pumping-station in Tatsfield—and purchase more land. It is proposed to extend the limits of supply to the parish of Cowden. More capital will be required.

**Llandrindod Wells Water.**—Authority will be sought by the Llandrindod Wells Water Company for the construction of new works, comprising several collecting tanks, a high-service reservoir, pumping-stations, and aqueducts or pipe-lines, and for the extension of the limits of supply so as to include certain adjacent parishes and places, all in the county of Radnor. Additional capital will be required.

**London Water (Purchase of Companies).**—The London County Council have given notice of their intention to apply to Parliament for power to acquire the undertakings of the eight Metropolitan Water Companies, and of the Staines Reservoirs Joint Committee, by agreement or by arbitration. The Bill to be promoted will define the undertaking of each Company as including their water-works and works connected therewith, and all property, both real and personal, money, securities, and effects, and all rights, powers, authorities, and privileges of the Company, of whatever nature and description, or some part or parts thereof. It will make provision for the appointment and procedure of the arbitrator or arbitrators, and indicate the method of arbitration and ascertaining the amount of the purchase-money and the settlement of the terms of purchase. In the event of the transfer, the several Companies and the Staines Reservoirs Joint Committee will be dissolved. Arrangements will be made for the management and administration of the water supply; for the appointment of a Water Committee of the Council, and the representation of the Corporation of London and other bodies thereon; for the transfer of parts of the undertaking to extra Metropolitan County Councils or Local Authorities, who are to have power to promote Bills for the application of the sinking fund; and for the conversion, redemption, or extinction of debentures and debenture stock, &c. Arrangements will be made for the creation of stock or securities, and for charging all costs and expenses upon the water and county rates.

**Metropolitan Water Companies (Amendment of Acts).**—Application will be made by the London County Council for leave to bring in a Bill next session to extend the provisions with respect to the purchase

of the undertakings of the Metropolitan Water Companies by a public body or trustees which have been made in recent Acts of Parliament whereby new concessions or powers have been granted to the Companies; also to prolong the period during which, in the event of purchase by a public authority, the Companies are prevented from claiming compensation against the purchasing body in respect of advantages conferred on them by, or resulting from, the passing of these Acts. A further object of the Bill will be to extend the period defined in section 3 of the Metropolitan Water Act, 1899, during which, in the event of the undertaking of any of the Metropolitan Water Companies being purchased, nothing in that Act is to authorize the Company to bring into account, or to make any claim in respect of, any advantages conferred on them by, or resulting from, the passing of that Act; and it will define the period for which the enactments shall be extended.

**Newcastle and Gateshead Gas.**—The Newcastle-upon-Tyne and Gateshead Gas Company will apply for an extension of their limits of supply so as to include a number of parishes in Northumberland, and Ushworth, in Durham. It is proposed to acquire additional lands and raise further capital; the existing capital to be consolidated, converted, and re-arranged, and the sliding-scale and price of gas altered. The provisions of the Company's Acts which refer to stock not sold by auction or tender are to be modified so as to allow of its being offered to the holders of ordinary stock or to the consumers. Meters, fittings, pipes, &c., are to be subject to supervision.

**Newport (Isle of Wight) Gas.**—The Newport Gas Company will ask for power to acquire certain land for the erection of works, to extend their area of supply so as to include the parishes of North and South Arretton and part of Northwood, and to lay mains in streets not dedicated to the public use. The present capital is to be consolidated and converted, and more will be applied for. A sliding-scale of price and dividend will be adopted.

**New Swindon Gas.**—Application will be made by the New Swindon Gas Company for authority to consolidate and convert their capital, and raise more money. The qualification of the Directors is to be altered, and the voting power of the holders of ordinary stock of the Company defined.

**Otley Gas.**—The Otley Gas Company will seek to be dissolved and re-incorporated with increased capital and an extended area of supply, to include Otley, Newallarth-Clifton, Farnley, and Weston. The usual powers granted to gas companies will be applied for; and authority will be sought to manufacture water gas and oil gas.

**Petersfield and Selsey Gas.**—Application will be made for the incorporation of a Company for the supply of gas in Petersfield, Selsey, and other parishes in the counties of Southampton and Sussex. The new Company will acquire the undertakings of the Petersfield Gas, Coke, and Oil Company and the Selsey Gas and Lighting Company. In addition to the powers usually conferred on gas companies, authority will be sought for the construction and acquisition of works and machinery for the production and supply of electricity for lighting and other purposes.

**Poulton-le-Fylde Gas.**—The Poulton-le-Fylde Urban District Council will apply for power to purchase the undertaking of the Poulton-le-Fylde Gas Company, maintain and improve the existing works, and supply gas in their own district as well as in the urban district of Thornton and the parish of Carleton, in Lancashire. The usual privileges accorded to suppliers of gas will be sought, and also additional money powers.

**Richmond Gas.**—The Richmond Gas Company will apply for power to purchase certain lands by agreement and to construct thereon works for the manufacture and storage of gas. The capital is to be consolidated and converted, and more will be applied for. The Bill to be promoted will contain provisions in regard to the adoption of a sliding-scale of dividends and price of gas, the sale of shares and stock, the quality and testing of gas, and the sale or letting on hire of stoves, fittings, &c. Authority will be sought to acquire and exercise patent rights and licences for, or in relation to (among other things), the production, storage, supply, and utilization of electrical energy for lighting and other purposes.

**Rickmansworth and Uxbridge Valley Water.**—The Rickmansworth and Uxbridge Valley Water Company will apply for an extension of their limits so as to include a number of places in the counties of Hertford and Buckingham, and for authority to carry out certain new works, comprising two aqueducts in the latter county. Permission will be sought to lay mains through the districts of the Amersham and Beaconsfield Water Company, the Burnham, Dorney, and Hitcham Water Company, and the Slough Water Company, and to enter into agreements for the purchase of the undertaking of the last-named Company.

**Salford Corporation.**—Application will be made by this Corporation for a Bill requiring the Corporation of Manchester to supply such quantity of water in bulk over 2 million gallons a day as may be considered necessary for the supply of the township or parish of Salford, on terms and conditions to be agreed upon or settled by arbitration. The Bill to be promoted will or may enable its provisions to be carried into effect together with the powers of the Public Health, Local Loans, Local Government, and Municipal Corporation Acts, with such modifications as may be deemed necessary. It is proposed that each Corporation should have additional borrowing powers.

**Sheffield Corporation.**—In a General Powers Bill to be promoted by the Sheffield Corporation, application will be made for a further extension of the time specified by the Sheffield Corporation (Water) Act, 1893, for the construction of the Broomhead and Moorhall reservoirs and the Wadley service reservoir authorized by the Sheffield Water (New Works) Act, 1867.

**Shrewsbury Gas.**—The Shrewsbury Gas Company intend to apply for power to convert their existing capital, and raise more by the issue of ordinary and preference shares and stock. The present 7½ per cent. stock of the Company is to be changed into a 5 per cent. stock. The Bill will include provisions with respect to the reserve fund, the accounts, and the votes of proprietors at meetings; and it is proposed to relieve the Company from liability to supply gas to persons who have made default in payments.

**South Essex Water.**—Application will be made by the South Essex Water Company for authority to construct certain works, comprising



two wells and pumping-stations in the parish of Ilford, two aqueducts or pipe-lines, and several adits; also to purchase or lease the water-works on part of the Linford Estate, in the parish of Mucking. It is proposed to extend the Company's limits so as to include the parish of Havering-atte-Bower, in Essex, and to alter their rates and charges and conditions of supply. Parliament will be asked to sanction the payment by the Company, out of their capital, of the costs incurred by them in connection with the promotion of the South Essex Water Bills in the sessions of 1899 and 1900, and the opposition to the South Essex Water Board Bill, 1900; also to empower the Councils for the urban districts of Ilford, Barking Town, Grays Thurrock, and Romford, and the Councils for the rural districts of Orsett and Romford, to borrow money, on the security of the rates leviable by them, for the purpose of paying the expenses incurred by them in the opposition to the first two Bills and the promotion of the last. Additional capital will be required.

**South Metropolitan Gas.**—The scope of the notice given by the South Metropolitan Gas Company for a Bill to sanction the acquisition by them of the works and property of the Gaslight and Coke Company south of the Thames was indicated in the "JOURNAL" last week (p. 1280).

**Southport Water-Works (Transfer).**—Application is to be made by the Corporation of Southport, the Birkdale Urban District Council, and the West Lancashire Rural District Council for authority to form a Joint Water Board to acquire the undertaking of the Southport Water-Works Company. The limits of supply are to be defined and extended, and provision will be made for the application of revenue and profits and for making good any deficiency, as well as for the raising of money. Certain agreements entered into between the constituent authorities are to be confirmed.

**Stockport Corporation Water.**—The Stockport Corporation will apply for authority to construct certain new works, comprising storage and compensation reservoirs at Hayfield, service reservoirs at Disley and Nether Alderley, a pumping-station at Disley, and various conduits, &c., including the diversion and closing of footpaths. In the Bill to be promoted, provision will be made for protecting the drainage area from pollution, preventing waste of water, increasing the water-rates, and supplying water in bulk. Borrowing powers will be sought.

**Stratton and Bude Improvement.**—The Urban District Council of Stratton and Bude will apply for authority to construct additional water-works, comprising a service reservoir and filter-beds, and various aqueducts, conduits, and a road diversion. It is proposed to extend the limits of supply so as to include some neighbouring parishes in the county of Cornwall. Certain lands and easements are to be acquired. Provision will be made for the prevention of pollution and waste, and for the sale of water in bulk; also for the supply of sea water. Additional borrowing powers will be required.

**Stroud Gas.**—Authority will be sought by the Stroud Gas Company to purchase certain lands compulsorily and by agreement for the construction of works for making and storing gas. In the Bill to be promoted, provision will be made for the consolidation and conversion of the existing capital, and the raising of more, the sale of shares and stock, the quality and testing of gas, and the regulation of the dividends and price according to a sliding-scale. Powers in regard to electric lighting will be included.

**Tees Valley Water Board.**—Application will be made by the above-named Board for power to supply water in bulk at any point within or on the boundary of their statutory limits, and to make agreements with local authorities, companies, &c., as to such supply—these authorities to be allowed to raise money. Provision will be made for defraying the costs of the Bill by the Joint Board in the first instance, and afterwards by the Local Authorities of Stockton, Middlesbrough, and Thornaby-on-Tees.

**Tendring Hundred Water.**—Application will be made by the Tendring Hundred Water Company for power to make a service reservoir in the parish of Lawford, carry out other works, and extend their limits of supply so as to include the parishes of Little Bromley, Ardleigh, and Little Clacton. Additional capital will be required.

**Wallasey Improvement.**—In a General Bill of which notice has been given by the Urban District Council of Wallasey, authority will be sought to make and maintain a railway, commencing by a junction with the line of the Mersey Docks and Harbour Board, and terminating at the gas-works of the Council. Additional money powers will be applied for.

**Weston-super-Mare Gas.**—Application will be made by the Weston-super-Mare Gas Company for authority to acquire additional lands, adjoining those now in their occupation, for the erection of works; and also for the usual powers in regard to the supply of stoves, meters, &c., and the levying of rates and charges. The Company will seek to be exempted from any penalty for insufficiency of pressure, defect of illuminating power, or excess of impurity in their gas, when resulting from unavoidable cause or accident; and they will ask to be empowered to examine consumers' pipes and fittings. The capital is to be consolidated and converted; and more will be applied for.

**West Surrey Water.**—Application will be made by the West Surrey Water Company for power to raise additional share and loan capital, and extend their limits of supply so as to include the parish of Littleton, in the rural district of Staines. Authority will be sought to sell water in bulk.

**Wisbech Water.**—The Wisbech Water Company will apply for power to acquire certain lands in the parish of Marham, in Norfolk, for the construction of a pumping-station. It is proposed to extend the present limit of supply so as to include several parishes in Norfolk, the Isle of Ely, and Cambridgeshire. Additional capital will be required by the Company.

**Wolverhampton Corporation Water.**—The Corporation of Wolverhampton will apply for an extension of their area so as to include the parishes of Patshull and Pittingham, in the county of Stafford, and the parishes or townships of Badger, Boscobel, Claverley, Rudge, Ryton, Shifnal, Tong, and Worfield, in the county of Shropshire; also for power to construct works comprising two reservoirs, two aqueducts, wells and boreholes, and pumping-stations. The Bill to be promoted will contain provisions for securing the purity of the water, raising more money, and increasing the reserve fund.

## NOTICES OF APPLICATIONS TO THE SECRETARY FOR SCOTLAND FOR PROVISIONAL ORDERS UNDER THE PRIVATE LEGISLATION PROCEDURE (SCOTLAND) ACT, 1899.

**Dundee Corporation.**—In an "Omnibus" Order of which the above-named Corporation have given notice, application will be made to amend, alter, or repeal section 64 of the Dundee Gas Act, 1868, with reference to the quality and illuminating power of the gas supplied by the Commissioners, and to reduce the candle power prescribed by that Act, and make such further or other provisions with respect to these matters, and also to the pressure at which gas is in future to be supplied, as the Order applied for may prescribe. They will further ask that the Order shall remove doubts as to the meaning and operation of section 69 of the Act, by declaring that the estimate therein mentioned shall be for, and apply to, the financial year of the Commissioners—viz., from the 30th day of April of one year to the corresponding day of the following year; and that the sums to be charged by the Commissioners, as mentioned in the section, including the rates and charges to be made by them for, and in respect of, a supply of electric energy or electric light, shall be for the financial year, and "may be fixed and laid on and charged retrospectively or prospectively." Borrowing powers will be sought for the Corporation and the Gas and Water Commissioners.

**Edinburgh and District Water Trust.**—Application will be made by the Edinburgh and District Water Trustees for an extension of the time limited by section 29 of the Edinburgh and District Water-Works (Additional Supply) Act, 1895, and by section 16 of the Edinburgh and District Water-Works Act, 1898, for the construction and completion of the works authorized by those Acts, or any part thereof. The Trustees desire to have the period for the payment into the sinking fund required by these Acts postponed to the time allowed for the completion of the works. They also wish to be relieved from the obligation of furnishing a constant supply at constant pressure within the limits of those Acts until the works sanctioned by the Act of 1895 are finished, and the water therefrom has been introduced for domestic purposes. It is proposed that the limits of compulsory supply shall be extended so as to include the city of Edinburgh as defined in the Edinburgh Corporation Act of last session. Further borrowing powers will be applied for.

**Glasgow Corporation.**—The notice given by this Corporation is dealt with in our "Notes from Scotland" to-day.

**Irvine Corporation.**—The Corporation of Irvine intend to apply for authority to construct additional works, comprising two reservoirs in the parish of Dalry, and conduits, bye-washes, &c., in connection therewith. Provision will be made for the prevention of waste, and the area of compulsory supply defined. Further borrowing powers will be sought.

**Kilmarnock Corporation.**—Application will be made by the Kilmarnock Corporation for power to acquire a site and construct additional works for the manufacture, storage, and supply of gas, and to make, maintain, and work a railway in connection therewith. Further borrowing powers will be required in respect of the gas, water, and electric light undertakings of the Corporation. Provision will be made for the alteration and reduction of the illuminating power of the gas, as fixed under section 114 of the Kilmarnock Municipal Extension and Improvement Act, 1871, and the prescription of such other power as may be determined.

**Kirkcaldy and Dysart Water.**—The Water Commissioners of Kirkcaldy and Dysart intend to apply for authority to raise additional capital for the purposes of their undertaking. They will also ask to be relieved of the obligation to furnish a constant supply at constant pressure within the limits of their Special Acts until the completion of the works authorized by the Kirkcaldy and Dysart Water-Works Act, 1896, and the introduction of the water therefrom for domestic purposes within the limits of the Acts.

**Paisley Police Public Health.**—The Paisley Corporation intend to apply for an Order to (among other things) amend the Paisley Water-Works Acts in various particulars, and likewise section 74 of the Paisley Gas Act, 1870, so as to allow of the reduction of the quality of the gas to be supplied under that Act. They also wish to be enabled to supply electricity beyond the limits of the borough; and to raise more money by the issue of promissory notes.

**Omagh District Council and the Gas-Works.**—A deputation of the Omagh District Council is to wait on the Directors of the Gas Company with the view of discussing the question of the purchase of the works. If the Company are not prepared to meet the Council, it is suggested that the application of the former for parliamentary powers shall be opposed. Electric lighting schemes are also under the consideration of the Council.

**Gas-Works Extensions at Leigh.**—Mr. W. A. Ducat, Local Government Board Inspector, held an inquiry last Thursday into the application of the Leigh Town Council to borrow £40,500 for gas-works extensions. Mr. P. Thomas, Town Clerk, stated that the rapid growth of the population was one reason why the application had to be made. In 1875, the Leigh Local Board purchased for £48,000 the old Gas Company's undertaking. Money had been borrowed at intervals until in 1895 the total capital was £125,000. The Council now wished to borrow £40,500 more. A sum of £6000 had been put down for meters; but it would save further inquiry if it were raised by £1500, as the money would soon be required. Since March of last year, 1560 gas-stoves and 700 grilles had been fixed by the Corporation, and no less than £6947 had been expended; so that it would be necessary to add a further £2500 to that amount. Among other items to make up the £40,500 were £6500 for six new purifiers, £7000 for telescoping No. 3 gasholder into four lifts with a capacity of 800,000 cubic feet, £2700 for new offices and store-room, and £1000 for draining and paving. To show the enormous increase in the number of gas consumers and the amount of gas made, Mr. Thomas said that in 1888 there were 1820 gas consumers; now there were 5151. The gas made amounted to 132,016,000 cubic feet per annum. There was no opposition.



## MISCELLANEOUS NEWS.

### SALE OF NEW RIVER STOCK AND SHARES.

#### Disposal of an Adventurers' Share.

At the Mart, Tokenhouse Yard, E.C., on Wednesday last, Mr. E. H. Bousfield (of the firm of Messrs. Edwin Fox and Bousfield) offered for sale by auction various shares and some 3 per cent. debenture stock in the New River Company. By far the most important item of the sale was Lot 1, which consisted of "an entire freehold share in the adventurers' moiety of the estates and interests in the New River." The Auctioneer pointed out that the dividend in respect of this share for the year ending Midsummer last was £2994, with a prospective increase for the present and future years. In addition to this, there had to be considered the reversion to the important freehold estate at Clerkenwell (the leases of which will shortly commence to run out), and the fact that the possessor of the share was qualified to take a seat at the Board. The income of the New River Company twenty-five years ago was £369,886; while last year it had increased to £623,000. There was no limit whatever to the possible future increase. On the last occasion that an adventurers' share was sold by auction, the price realized was £122,500; and the interest paid on these shares was larger now than it was at that time. Taking everything into consideration, he thought a fair value to place upon the share would be £145,000. He trusted that none of those present were afraid of the London County Council. The Council were going to spend more of the ratepayers' money in promoting another Water Bill; but one of their own members had said that there was not a ghost of a shadow of a chance of such a measure becoming law. They had no more need to fear the London County Council or the carrying out of a scheme for bringing water from Wales, than they would have to fear the loss of their money if it was invested in Consols. The bidding started at £95,000, and went rapidly to £110,000. Ultimately the sum offered reached £120,000, at which figure the share was sold. We understand that the purchaser was a private gentleman, who did not wish his name to be divulged. After this, twenty-five lots were offered, each consisting of a one-hundred-and-twentieth part of a King's share. Of these, one lot realized £860, seven lots £850 each, three lots £845, five lots £840, and nine lots £835. Three lots, each consisting of a one-hundredth part of a similar share, fetched, two of them £950 apiece, and the third £930. A one-hundred-and-eightieth part of a King's share was next sold for £520, and a two-hundred-and-fortieth part for £430. Of £3000 of 3 per cent. debenture stock, £1100 realized £102 10s. per cent., £800 fetched £102 per cent., and £1100 sold for £101 10s. per cent. The sale was concluded by the disposal of five new £100 shares in the Company, at the price of £430 each. Several lots were withdrawn owing to the reserve price not being reached.

### THE KEIGHLEY ARBITRATION CASE.

The arbitration proceedings arising out of the dispute between Messrs. Newton, Chambers, and Co., Limited, of Sheffield, and the Keighley Corporation in respect of a coke-conveyor supplied by the former to the latter (see *ante*, p. 1158), were resumed on Monday last week at the Hotel Métropole, Leeds, before Mr. Thomas Newbigging. Mr. William Froggat, the Assistant-Manager, was the first witness called, and his examination (commenced at the previous sitting) completed. He was followed by Tom Parkin, formerly employed by the plaintiffs, who said that the coke was not slaked till some time after it had left the retorts. Next came John Dayson, engineer in the employ of the plaintiffs, and in charge of the conveyors at their collieries and works, who said they carried from 1800 to 2000 tons of coke per week without any difficulty. Mr. H. Habershon, mining engineer at the Rockingham Collieries of the firm, stated that they had no difficulty in conveying coke by mechanical means, and that the cost of repair was not excessive. Mr. George Dawson, Managing-Director of the Company, was examined and cross-examined at great length. He declared—and he would not deviate from the statement—that the machinery had never had a fair chance of working at Keighley; and he blamed the Corporation for this. His firm had lost money over the job; and he never wanted another of the same sort. The other witness was Mr. Charles E. Hall, of Sheffield. He said that the strength of the plant and its principle of construction met with his approval; but a plate conveyor, such as that at Keighley, was not a proper type for dealing with hot coke. The result would be buckling of the plates. The quenching of the coke with cold water while it was on the conveyor would have the effect of intensifying the buckling, and making the plates more brittle. If the coke was thoroughly slaked at an earlier period, the plant would work satisfactorily. The presence of water in the pit of the elevator was objectionable; and the effect was to do harm to the machinery by coating the working parts with a pasty material. Mr. Hall was under examination when the Arbitrator rose for the day.

The proceedings were continued on Tuesday, when the examination of Mr. Hall was completed; and this finished the case for the plaintiffs. Mr. Waugh then opened the case for the Corporation. He said the foundation of the whole difficulties which had arisen was the undertaking by the plaintiffs' representative, the late Mr. Platt, to supply machinery which would convey hot coke, without any reservations as to the slaking of the coke, and then the firm putting in conveyors which had been proved to be suitable for cold coke only, and useless for the work for which they were required. The firm designed the machinery after having been informed of the purposes for which it was intended. They gave an express undertaking that it would perform certain work, and that work it had proved utterly unable to accomplish. The firm had been paid the greater part of their account; but they were really not entitled to those sums, for they had supplied useless machinery. He contended that the conditions and reservations which the firm now set up as those that they required for the working of the machinery, were mere after-thoughts. The Arbitrator raised a point about the presence of water in the elevator-pit, and said that when Mr. Laycock, the Gas Engineer, discovered this water, he ought to have acquainted the plaintiffs with this fact. Mr. Waugh

replied that Mr. Laycock did so; and he was told by the plaintiffs that a pulsometer would deal with the water. He would prove that a pulsometer was put down, and was quite effective. Mr. Laycock was called, and denied that it had ever been suggested to him that plate conveyors would not deal with hot coke. If it had been, he would never have had the machinery. Witness was under examination when the proceedings were adjourned.

The following morning, Mr. Laycock's examination was continued; the point sought to be made being that the machinery was valueless from the fact that it would not convey hot coke. The witness was under cross-examination when the hearing was further adjourned till the 20th prox.

### THE PROJECTED NEW WORKS OF THE PORTSEA ISLAND GAS COMPANY.

The Directors of the Portsea Island Gas Company having given notice of their intention to apply to the Board of Trade for a Provisional Order to authorize the purchase of 33 acres of land at Copnor, in the parish of Cosham, for the erection of additional works for the manufacture and storage of gas and residual products, and for providing dwellings for the workmen and other persons employed by the Company, also to sanction the raising of further capital, not exceeding £250,000, by the creation and issue of ordinary or preference shares and debenture stock, a special meeting of the shareholders was held last Thursday for giving formal assent to the proposal. Alderman Sir John Baker, J.P., occupied the chair, and explained that the application had been necessitated by the great increase which had taken place not only in the manufacture of gas but in the hire of cookers—5000 more of the latter having been placed within two years; while the prepayment meters had gone up from 160 in 1898 to 1096 now. By the proposed new works, the Company were not only providing for the present but for the future. Having related the favourable circumstances under which the site had been obtained for £8352, he moved a resolution formally approving of the action of the Directors. The Vice-Chairman (Alderman Sir W. D. King) seconded the motion; remarking that the Company were sending out daily an increase of 56,000 cubic feet of gas, and that the automatic meters were yielding £360 per week. Mr. Richardson complimented the Directors on their foresight in placing the Portsmouth public in the highly favourable position of getting their gas at 2s. 4d. per 1000 cubic feet, in view of the price now being charged all over the country. The motion was carried unanimously.

### SUBWAYS FOR LONDON STREETS.

At the First Ordinary Meeting for the present session of the Society of Architects on Thursday, the new President (Mr. Walter L. Emden) delivered his Inaugural Address, in the course of which he touched upon the question of subways for London Streets. He said that in the crowded City of London it was one of such vital and immediate importance that the new Municipalities should at once take the matter in hand. He had attempted, by proposing resolutions in the London County Council, to bring the question into a prominent position, and into what might be called the region of "practical politics." So far, however, little had been done. It always appeared to him that there was a vast waste of useful space in the ground beneath the streets and roadways. The pipes, tubes, and sewers which were under them, scattered about all over the surface, would occupy an extremely small space if all were brought together into a convenient subway. It could not be argued that it was necessary for them to occupy the entire surface of the road, or even to such an extent as to prevent or interfere with any thorough scheme. The method of dealing with subways should be by excavating the whole of the ground between the houses on either side of the road to a sufficient depth, and then arching over to the road level. Such space as was now allowed for vaults would still belong to the houses on either side, and there would be a further amount of cellage which could be let at fairly remunerative rents, particularly as the work of construction would be carried out at the low rate of interest which was paid by a public body. There would remain space for one or two side-walks (according to the width of the street) down which the public could pass, much to their personal safety and convenience, particularly in crowded thoroughfares. The middle portion of the subway would be retained as a tunnel, in which all the various pipes and tubes belonging to water, gas, electric, hydraulic, and other companies, could be laid; and under it the sewer, with the requisite manholes, &c., for entering. There might, and necessarily would, be difficulties in carrying out such a scheme of subways; but this would be compensated for by the many advantages which would be gained to the public when they were once constructed. At present, the loss to the shopkeepers and owners of businesses on roads which were constantly up, and partially, if not wholly, closed, was a very serious matter of ever-growing importance. He did not suggest that the system of subways in a great city like London could be carried out in every street at once; but certainly the leading thoroughfares might reasonably be dealt with without delay. The advantages in constructing a comprehensive scheme of subways were numerous. There was not only the fact that the probable rentals obtained from the various companies occupying them with their tubes and pipes, and from the cellage, would be sufficient to pay a good interest on the outlay, but the roads would last longer, the public would be rarely, if at all, inconvenienced by any taking up and relaying of roads, and all the powers of the numerous companies which were so harassing and difficult for a public authority to deal with, and by which they could, and did, constantly pull roads up, would be done away with, and the expense incidental to the superintendence, &c., of all these disturbances and relayings would be saved to the public authority, and hence to the public rates.

In connection with the above subject, the following notice of motion stands upon the *agenda* of the London County Council in the name of Mr. R. Parker (Walworth): "That, to mark the importance of the addition to the civic interests of the Metropolis by the creation of the new Borough Councils, it be referred to the General Purposes Committee to consider the best manner of bringing before those Councils the imperative



necessity of making subways under at least all the leading thoroughfares of the Metropolis, to contain all the gas and water pipes and telephone and telegraph wires; and, if necessary, to summon a conference to formulate some comprehensive scheme for remedying the scandalous and ever-increasing inconvenience to pedestrian, omnibus, and mercantile traffic caused by the constant tearing up of the footways and roadways for the purpose of inserting or removing the pipes, wires, &c., above referred to."

### DUNEDIN SUBURBAN GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Wednesday, at the London Offices, No. 2, East India Avenue, E.C.—Mr. F. Dutton in the chair.

The report and accounts having been taken as read,

The CHAIRMAN moved their adoption. He first referred to the loss the Company had sustained by the death of the Secretary (Mr. E. W. Layton), who had been connected with the concern since its inception. He had seen the Company through various stages—early stages of great disaster, and present stages of gradual improvement; and he had been a staunch and loyal friend in every conceivable way. Regarding the business, the Chairman said progress was being made, but not so fast as the Directors would like it to be. The profit earned in Dunedin in the past year was £1612, as against £1489. Looking at the figures which resulted in this profit, they found they had a substantial increase in the volume of business, because, taking the receipts from all sources, they amounted to £4704, as against £4278; so that, had their expenses been normal, there would have been a substantial addition to the profits. The expenditure totalled to £3091, as against £2789. Deducting the increase in outlay from the increase in receipts, they arrived at £123 as the net additional profit earned. The quantity of gas delivered was above a million cubic feet in excess of the preceding year; and the total number of meters fixed had advanced from 728 to 763. These were signs that the Company were going on in the upward direction. The increase in expenditure was unavoidable, though most regrettable. Coal had risen in price in New Zealand as well as here; but notwithstanding they could not raise the price of gas. The present price was not the maximum which, according to the literal interpretation of their concession, the Company were entitled to charge; but the Directors were satisfied that it was the maximum which, from any principles of commercial prudence, they would be justified in charging. What the Directors would like to do would be to reduce the price if they felt that there would be an accession of business, and that they could do it without detriment to the shareholders. Alluding to the increased cost in the Colony of some of the requirements of the Company arising from the increase in the tariff rates, he said that, apart from coal, the price of wrought-iron pipes had increased considerably. What used to cost them £5 now cost as much as £8 2s. 6d. This was partly due to increased duties. Then, in the revision of the tariffs, the Government of New Zealand had taken the duty off kerosene, which was objectionable so far as the Company were concerned, as this was their great

competitor. They had no considerable consumers; and their business was largely made up of consumption on a small scale. It was difficult, on account of the character of the population, to draw the residents from the use of kerosene; but by degrees the Company were doing it. It was not, however, encouraging when the Government took the duty off kerosene, to find that on such articles as coal and wrought-iron pipes the Company had to pay increased prices. While the cost of their production was being increased, the prime cost of their competitor was being reduced. The local management had addressed a remonstrance and details of the facts to the local member, who apparently was quite alive to the position, and was anxious to help the Company. The point they drew his attention to was that it was not right the tariffs should be so arranged that imported articles should come in duty free, whereas a local industry was being hampered with extra duties and difficulties in the conduct of their enterprise. Some information was then given by the Chairman as to the management expenses; and incidentally he remarked that he thought possibly a little economy could be effected in the London expenses. Against revenue, an amount had been charged for the extension of mains and services and for a new exhaustor; and £400 had been carried to the reserve fund, making it £1600.

Mr. ERNEST WOOLLEY seconded the motion, which was carried.

Mr. T. BROWN, a member of the Local Committee, now on a visit to England, gave the shareholders some general information concerning the undertaking and the district of supply. Among other things, he stated that the utmost economy was exercised by the Company's representatives at Dunedin; and everybody was putting forth his best efforts to increase the business. Although he did not appear to look for rapid progress, he spoke hopefully of the future. The shareholders might, too, see the opportunity arise for disposing of the undertaking. The City of Dunedin might desire to add it to their works, or there might be an amalgamation of the surrounding boroughs, who would perhaps wish to take it over. The Company had a very wide area, and hundreds of yards of mains without a single consumer; the houses being widely scattered. As to the Chairman's remarks regarding kerosene, he believed sufficient pressure had been brought to get the duty reinstated.

The retiring Director (Mr. Allan Campbell) and the Auditor (Mr. W. Stansfield) were re-elected. The usual complimentary votes of thanks concluded the proceedings.

### ELECTRIC LIGHTING NOTES.

Electric lighting works have been constructed at Beckenham at a cost of £37,000; and they were formally opened last Thursday. Combined with the works is a large dust-destructor. The ceremony was followed by a public dinner, at which Mr. H. W. Forster, M.P., was present, and presumably many promising customers.

The electric light was in a playful humour at a dance in Lincoln the other night. Three times the dancers were plunged into pitch darkness; and each time the desperate situation was tackled by one of the gentlemen present, who, though not an electrician, had fortunately had some practical experience of electrical fittings.

### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1322.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	104	Alliance & Dublin 10 p. c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 8
100,000	10	"	7½	Do. 7 p. c.	13-14	..	5 7 2	500,000	100	June 1	6	People's Gas & 2nd Mtg. of Chicago Bonds	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb.	101-103	..	4 17 1	851,070	10	Oct. 12	7	River Plate Ord.	10-104	..	6 13 4
200,000	5	Nov. 14	6	Bombay, Ltd.	6-6½	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p. c. Deb.	100-102	+1	3 18 5
40,000	5	"	6	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	10	Sept. 28	8	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	185,000	Stk.	Sept. 14	10	Sheffield A.	234-239	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	209,700	"	"	10	Do. B.	234-239	..	4 3 8
50,000	"	"	5	Do. 5 p. c. Pref.	137-142	..	8 10 5	447,427	"	"	10	Do. C.	232-237	..	4 4 5
159,375	"	June 14	4	Do. 4 p. c. Deb.	116-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p. c. Ord.	127-130	+2	4 2 0
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	1,520,000	"	July 12	3	Do. 8 p. c. Deb.	94-97	..	3 1 0
226,320	"	"	7	Do. A. Ord. Stk.	145-155	-5	4 10 4	880,940	Stk.	Nov. 14	5	Southampton Ord.	107-112	..	4 9 3
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max.	117-118	..	4 4 9	70,825	Stk.	July 12	4	Do. 4 p. c. Deb.	117-122	..	3 5 7
420,000	20	Sept. 28	10	British	38-40	..	4 12 4	120,000	"	Aug. 30	6	Tottenham A. 5 p. c.	112-117	..	5 2 7
60,000	10	Aug. 15	12	Bromley, Ord. 10 p. c.	24-26	..	4 5 8	250,520	"	"	4½	and B. 3½ p. c.	80-85	..	5 5 11
79,000	10	"	9	Do. 7 p. c.	19-21	..	7 1 2	61,550	"	June 14	4	Edmonton 4 p. c. Deb.	111-115	..	8 9 7
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8-8½	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Do. 4 p. c. Deb.	98-100	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	5 10 4								
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	134-144	..	5 9 1								
60,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	53-55½	..	4 12 8								
550,000	Stk.	Oct. 12	12½	Commercial Old Stock	270-275	+2½	4 12 10								
236,425	"	"	9½	Do. New do.	200-210	..	3 5 8								
288,237	"	June 14	4½	Do. 4½ p. c. Deb.	133-138	..	5 0 0								
800,000	Stk.	May 31	9	Continental Union, Ltd.	175-180	..	4 0 11								
200,000	"	"	7	Do. 7 p. c. Pref.	168-173	..	—	780,404	Stk.	June 28	11	<b>WATER COMPANIES.</b>			
51,600	Stk.	"	14	Croydon A 10 p. c.	—	..	—	150,000	"	"	5	Chelsea, Ord.	307-312	+4	3 10 6
178,400	"	"	11	Do. B 7 p. c.	—	..	—	160,000	"	"	4½	Do. 5 p. c. Pref.	157-162	..	3 1 9
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p. c.	117-122	..	3 14 1	175,785	"	Sept. 28	4½	Do. 4½ p. c. Pref. 7½	143-148	..	3 0 10
60,000	"	"	5	Do. 5 p. c. Pref.	130-135	..	5 10 0	1,720,560	Stk.	Oct. 12	7	Do. 4½ p. c. Deb.	143-148	..	3 0 10
486,090	10	July 27	11	European, Ltd.	19-20	..	5 10 0	554,740	"	June 14	4½	East London, Ord.	193-198	..	3 10 8
854,060	10	"	11	Do. £7 10s. paid.	14-15	..	4 8 10	797,687	"	"	8	Do. 4½ p. c. Deb.	147-152	..	2 19 3
14,993,075	Stk.	Aug. 15	4½	Gas- 4 p. c. Ord.	97-99	+1	3 14 6	700,000	60	June 14	8½	Do. 8 p. c. Deb.	98-100	..	3 0 0
2,600,000	"	"	8½	light 8½ p. c. max.	92-94	..	3 7 10	810,000	Stk.	Sept. 28	4	Grand 10 p. c. max.	110-113	..	8 10 10
8,799,785	"	"	4	and 4 p. c. Con. Pref.	115-118	+1	3 2 6	708,000	Stk.	Aug. 30	14	Junction 4 p. c. Deb.	190-195	..	2 19 3
8,993,975	"	June 14	8	Coke 8 p. c. Con. Deb.	94-96	..	5 14 4	160,000	"	"	7	Kent	300-305	..	4 11 10
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13-14*	..	4 12 7	1,043,800	100	June 28	10½	Do. New, 7 p. c. max.	200-210	..	3 6 8
3,800,000	Stk.	Nov. 14	10	Imperial Continental	202-207	+1	4 16 7	406,200	100	"	8	Lambeth, 10 p. c. max.	295-300	+2	3 10 0
473,600	Stk.	Aug. 15	8½	Do. 3½ p. c. Deb. Red.	100-102	..	5 14 3	500,000	Stk.	Sept. 28	4	Do. 7½ p. c. max.	207-212	+2	3 15 6
75,000	5	June 14	6	Malta & Medn., Ltd.	42-54	..	4 12 7	500,000	100	Aug. 15	14	Do. 4 p. c. Deb.	127-130	..	3 7 0
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105-108	..	4 11 1	1,000,000	Stk.	July 27	4	New River, New Shares	413-418	+6	3 1 7
250,000	100	"	4½	Melbourne 4½ p. c. Deb.	104-106	..	6 7 4	902,300	Stk.	June 14	7½	Do. 4 p. c. Deb.	128-133	..	3 12 0
541,920	20	Nov. 14	8½	Monte Video, Ltd.	10-11*	..	3 5 5	126,500	100	"	7½	South-Ord.	203-208	..	3 17 9
667,946	Stk.	Aug. 30	9½	Newcastle & Gateshead Con.	210-215	..	4 11 1	489,200	Stk.	"	5	vark 7½ p. c. max.	189-193	..	3 2 6
299,855	Stk.	June 28	8½	Do. 8½ p. c. Deb.	104-107	..	6 15 3	1,019,585	"	Oct. 12	4	and 5 p. c. Pref.	156-160	..	3 0 2
150,000	5	May 16	8	Oriental, Ltd.	7-7½	..	4 11 6	1,155,066	Stk.	June 14	10	Vauxhall 4 p. c. A Deb.	128-133	..	3 0 2
135,000	5	"	8	Do. New, £4 10s. pd.	54-61	..	—	200,000	"	"	4½	West Middlesex	280-285	+2	8 10 2
15,000	5	"	8	Do. do. 1879, £1 pd.	12-13	..	—			Sept. 14	5	Do. 4½ p. c. Deb.	140-145	..	8 3 1
				* Ex. div.								Do. 8 p. c. Deb.	97-99	..	3 0 7

† Next dividend will be at this rate.



A further £20,000 is to be borrowed for the Barnsley Corporation electricity undertaking. Explaining the necessity for the increase at the meeting of the Council on Tuesday, Mr. Brady stated that already £7000 had been spent on increased plant; and the money now asked for would be required by the end of 1902. But the spending would be so conducted that there would be no incubus on the rates. The Committee began to supply current on Feb. 17 with 48 consumers, equivalent to 3800 8-candle power lamps. Now they have 177 consumers, equivalent to an output of 12,000 8-candle power lamps.

It appears from the annual report of Mr. Horace Boot, the Borough Electrical Engineer of Tunbridge Wells, that the expenditure during the twelve months covered by it was £5170, and the total income £8493. Allowing £201 for bad debts and 3 per cent. each for the capital and redemption funds, the profit works out at £764. To a company, the profit available for distribution would be £3120. These figures are not quite so satisfactory as in the previous year—a circumstance due to the reduced rates now charged for current. The price for public lighting at Tunbridge Wells, Mr. Boot states, is now lower than in any other town in the kingdom. To generate a unit of electricity costs 1·63d. at the works, and 0·839d. subsequently for distribution.

Mr. F. H. Tulloch held a Local Government Board inquiry at Mextonborough last Tuesday relative to an application by the District Council for power to borrow £18,000 for the purposes of electric lighting. It was pointed out that the expenditure in connection with the undertaking was estimated to be £1400 (exclusive of land), and the income £1670 per annum. The price of gas was stated to be 3s. 6d. per 1000 cubic feet. It was urged that the electric light would not only be an advantage for town illumination and for public buildings, including places of worship, but that it would tend to bring more trade to the shopkeepers. The advantages attributed to electric lighting are truly on the increase; but so far they have not succeeded in staggering the gas industry.

The Manchester Corporation Electricity Committee appear to be in a perfect quagmire of difficulty; and they have appointed from their own body several Sub-Committees to deal separately with the various troubles in which they are at the moment floundering. The chief difficulty confronting the Committee at present comes from the obligation to supply motive power for tramway purposes by specified dates. The Committee find the arrangements so far behind that very great effort will be required to keep faith with the Tramways Committee in this matter. The Contractors have promised to push on with all speed the work remaining to be done at Dickinson Street. Two new engines have been constructed by Messrs. Ferranti, and are at the present time in course of erection at the Dickinson Street station. Directly the two additional generators, each of 1000-horse power, are in full use, the Committee will be able to proceed with the building and equipment of the station in Bloom Street. As a matter of fact, the work is so far behind there, that the Committee have no place wherein to put the machinery, which was ready to the order of the Corporation months ago—last Whitsuntide, indeed. Engines are stored in this country and generators in America, waiting for a place to put them in and cranes to handle them when they arrive. Then there is the new station to be built in Stewart Street. This work ought to

have been well advanced by now. The ground was secured three years ago; but none of it has yet been turned up. With reference to the agreements made with neighbouring authorities, the Committee fear they will not be able to carry them out within the periods fixed upon. It will, in fact, be simply impossible to do so in some cases. Last, but not least, changes in the staff have to be made. The Chief Engineer is going next March. The second Engineer left a few weeks ago to take up an appointment as Chief Engineer at Bolton. The Superintendent of Mains has resigned, and leaves at the end of December. The Chief Rental Clerk died recently. The Committee's position is not to be envied; and the appointment of a new official staff qualified to take up the work at such a juncture is not by any means the easiest surmountable of the difficulties. The Electricity and Tramways Committees have, after consultation, decided to call in the aid of an expert to consider the situation generally, and advise as to the best course to take.

There was a curious investigation in Dublin last Wednesday in connection with objections by ratepayers, through one of their body (Mr. George Thompson), to certain expenditure appearing in the accounts of the Corporation now under audit, and incurred in supplying new fittings for electric light in private consumers' houses. The inquiry was conducted by Mr. James W. Drury, Local Government Board Auditor; the Corporation being represented by Mr. Seymour Bushe, Q.C., and Mr. P. White, and the objectors by Mr. D. O'C. Miley. The point of the case of the latter was that the Corporation had no power in their Provisional Order, or under the Acts incorporated therewith, to make payments on account of fittings such as were covered by a sum of £58 1s. 7d., which was taken as a representative item. It was understood that between £3000 and £4000 had been spent in this way on the property of consumers, which, of course, was a matter of importance to the rates. Real light was not thrown on the matter, however, until Mr. Bushe spoke for the Corporation. He contended that, under the Electric Lighting Act of 1882, the Corporation had the amplest power for supplying electricity, and doing all such acts as might be necessary and incidental to such supply. On a report by Professor Kennedy in 1897, it was decided to effect changes in the distribution system so as to enable the voltage to be raised from 100 to 200, in order to work a great financial improvement. A certain number of private consumers had already put up their electric fittings to meet the 100 voltage; and as a matter of scientific fact, the effect of turning a 200 voltage from the main into electric fittings which were only suited for a 100 voltage would be dangerous. Professor Kennedy's advice, therefore, was that the Corporation should not let the fact that certain private consumers had erected 100-voltage fittings stand in their way, but that they should indemnify these consumers for the outlay which they had undergone. The Corporation acted upon the advice; and this was how the charges objected to arose. The Auditor complained that, so far as he could find, the subject of the re-wiring of premises had never come before the Local Government Board officially or unofficially; but Mr. Bushe called attention to correspondence with the Board dealing with a number of documents bearing on the subject. The arguments were carried on at great length and, at their close, Mr. Drury reserved his decision.

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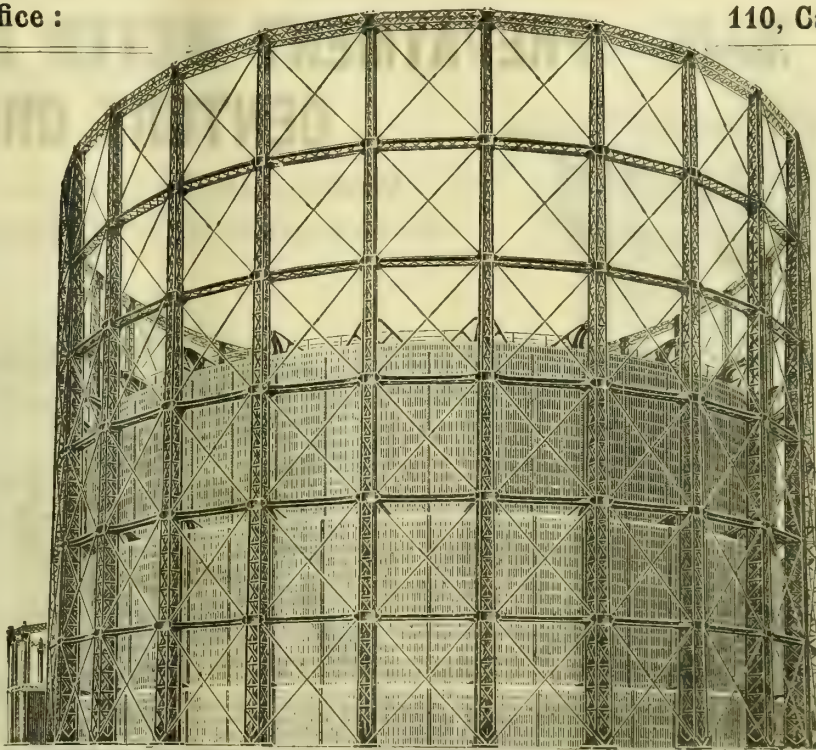
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## PORTSMOUTH WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday—Mr. W. GRANT, J.P., in the chair.

The notice convening the meeting having been read, the report of the Directors, the principal portions of which were given in the "JOURNAL" last week (p. 1285), was presented.

The CHAIRMAN, in moving the adoption of the report, referred to the deaths of Colonel Edwin Galt and Mr. R. W. Ford, who had been connected with the Company from its origin—the former being a Director, and the latter holding the position of Secretary until his retirement a few years ago. With regard to the affairs of the Company, he said, the undertaking had continued its career of unabated usefulness and unchecked prosperity during the past six months; but the subject upon which the proprietors would naturally wish him to make a few remarks was the very important step which the Directors proposed should be taken of altering the basis of their charges for water for domestic supply from the gross to the rateable annual value. As they were aware, it had always been the practice of the Company, fully authorized by their Act of Parliament, to base their charges on the gross annual value; but in the memorable case of *Dobbs v. The Grand Junction Water Company*, it was ruled that "annual value" must be held to mean the net or rateable value. As they knew, this was held in Portsmouth to be 15 per cent. less than the gross annual value; and a short time back the Corporation raised the question with the Company whether the basis of their charges should not, by this ruling, be 15 per cent. lower than the gross value of the premises. But there was in the Company's case this most important peculiarity—namely, that their Act of Parliament contained certain special words which, the Directors were advised, prevented the ruling in the case in question being applicable to the Company. They naturally took ample time for consideration before they decided what course to recommend to the proprietors; and they hastened to acknowledge the fair and temperate spirit in which the Corporation had raised the question. No kind of legal action had yet taken place; and the course the Directors suggested would obviate the necessity for anything of the kind. They proposed that they should, without prejudice, voluntarily make the concession. It might be that if they fought the case out to the bitter end they would gain it. But law was uncertain; and the only thing that was quite sure was that the litigation would cost both the Company and the town a very large sum of money, and that if the Company were successful it would leave behind ill-feeling and a sense of exasperation. Moreover, there was another consideration—and it had been the governing one with the Directors in recommending the course they did. It was this—that the financial position of the Company was assured, that its growth had been marked and continuous, and that, whatever might be said, the Directors, and they believed the great body of the shareholders, had always desired that the town should share in the success of the undertaking. It was in this spirit that they had from time to time made large remissions in the charges for extras, amounting to about £1600 per annum. The proprietors

would naturally look to him to indicate what, in the Directors' opinion, would be the financial results of this great concession to the town. It would mean a sacrifice of income on the part of the Company of nearly £5000 per annum. It might be that, if it were made, the net income of the Company would not, just at first, be sufficient to provide of itself the full statutory dividends on the shares which had now been regularly paid for so many years. But he assured the meeting that, in the belief of the Directors, they would nevertheless continue to be paid with perfect regularity; and for these reasons. In the first place, they proposed to carry forward an estimated undivided balance of about £12,500. This, of course, would be available to meet any future deficiency in the net income for payment of the dividends. Moreover, the net income of the Company at the present time was more than sufficient to pay the full statutory dividends on all classes of shares; so that the deficiency could not be so large as the amount of the concession. Further, the reserve fund now amounted to about £17,000, at the current prices of the Consols in which it is invested; and this was also, by the Company's Act of Parliament, available, if wanted, to make up any deficiency in the net profits for payment of the full statutory dividends. They had this further most important consideration to bear in mind—namely, that the water-rental of the Company had constantly and continuously increased. If, then, it was to be assumed—and the Directors believed it could safely be assumed—that the net profits would continue to increase with the growth, based on past experience of the water-rental, it became merely a question within what time the increase in the net profits would make good the amount of the concession they advised the proprietors to confer. They would thus see why, in the belief of the Directors, this step could be taken without peril to the uninterrupted payment of the full statutory dividends; because the Directors were of opinion that within a few years the growth in the net profits would make good the amount of the concession, and that, in the interval, the balance carried forward and the reserve fund combined would amply provide, and far more than provide, for any deficiency which might for a few years exist. It would be their duty to watch with redoubled care that the assessment of every property was in accord with its true value, and that the regulations of the Company as to proper fittings and efficient workmanship were strictly adhered to. The Directors advised the proprietors to take this step on the broad principle that it was true wisdom on the part of any public undertaking to deal with its customers not only honestly but generously, and because it was right that the great town of which they were all proud to be citizens should share in the prosperity of the Company.

Lieut.-Col. C. L. OWEN, J.P., in seconding the motion, said the concession marked an epoch in the history of the Company; but the Directors had had the matter under consideration for two years, and had no hesitation in recommending the course they proposed.

The motion was carried unanimously; and the meeting closed with a vote of thanks to the Chairman and Directors.

The Keighley Town Council have agreed to a recommendation of the Gas Committee that new offices, shops, &c., for the department be erected at a cost of £5200, including the site.

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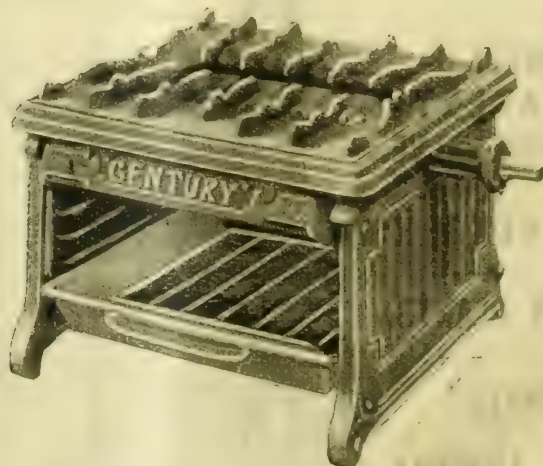
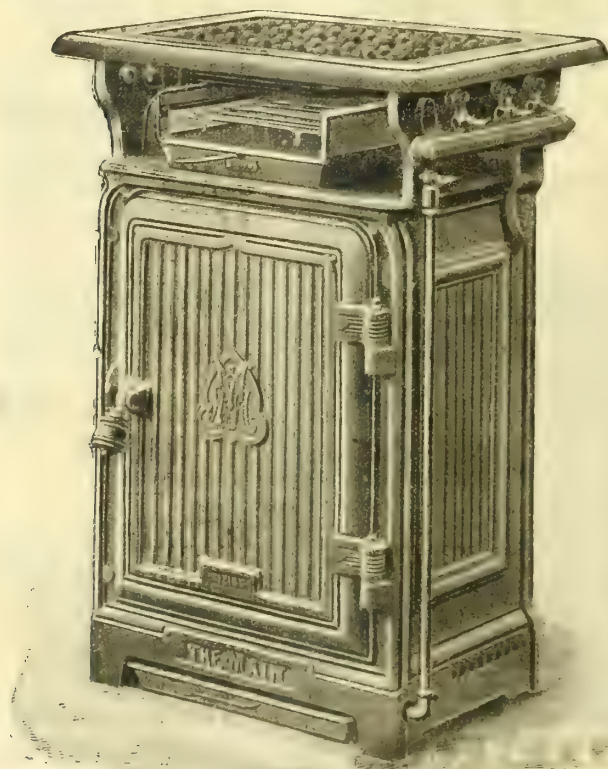
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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

What is described as a mass meeting (number not given) of Edinburgh and Leith gas workers was held on Monday night, under the auspices of the Gas Workers and General Labourers' Union, to consider the reply of the Gas Commissioners to the men's demands. The answer was to the effect that the Commissioners did not incline to give the concessions asked. The meeting was addressed by the District Secretary, and by the General Organizer of the body, after which it was decided to request the Commissioners to reconsider their decision, and to press for a reply. There is a strong flavour about this announcement, not of the men being dissatisfied with their conditions of labour, but of their being worked up into a state of discontent, which is the case everywhere. The Union is not confined to the ranks of gas workers, and is thus most admirably adapted for one of its primary purposes, which is to give trouble to all employers of unskilled labour.

The altered method of procuring legislative powers in Scotland comes in force this session. Several notices have now been given of application to the Secretary for Scotland under the statute, for leave to proceed with a Provisional Order or Private Bill, as may be determined in the course of the procedure. One of these is by the Corporation of Glasgow, who seek powers dealing with public lighting and the treatment of sewage. In the matter of public lighting, it is proposed to consolidate all the charges into one fund, and to assess for it in equal proportions between owners and occupiers. At present, there is a complicated method of recovering the cost of lighting in private streets and common stairs. The cost of lighting private streets and courts last year was £5689; and the amount recovered was only £3439—leaving a deficit of £2250, which it was necessary to make up out of the general rate. The cost of lighting common stairs amounted to £33,052; and there was a loss to the Corporation upon it of £9684, which also had to be made up out of the public rate. It is estimated that the whole lighting of the city will cost £71,826 a year, to meet which an assessment at the rate of 4d. per pound will be required. It is not expected that any other light than gas will be employed in common stairs for many years to come; but as in some of the better quarters of the city electric light may be used, it is proposed to use the general term of "the lighting assessment." The application is to be opposed by the landlords. A meeting of their Association was held yesterday, at which the President's Committee were empowered to institute a vigorous opposition to the proposed measure. At present they recover the whole cost of common-stair lighting from their tenants, and hand it over to the Corporation; deducting 20 per cent. as remuneration for collection, and to reimburse them for losses by defaulting tenants and the like. The suggestion is that owners shall bear half the cost of the entire lighting of the city. Hence the opposition, which might be expected in a case where it is proposed to make such a radical change in the incidence of assessment.

Another part of the measure deals with the disposal of sewage. Power was obtained by Sewage Acts in 1891, 1896, and 1898, for the construction

of works for the treatment of sewage. One of these is at Dalmarnock; and the method adopted has given so much satisfaction that it is proposed to erect similar establishments at Dalmauir for the northern portion of the city and district, and at Shieldhall for the southern district. Arrangements have been made with the contiguous burghs, of which there is quite a cluster; and in this measure it is proposed to take power to recover from the County Council Committee a proportionate charge for the use of the treatment process, they having right to use the sewers, under the Act of 1891, but having no power to assess for treatment.

Another body who have given notice of their intention to promote a Provisional Order or Bill are the Corporation of Kilmarnock. The principal proposal in their notice is to acquire land for the erection of additional gas-works, and a railway into the works, which they may work themselves, or which may be worked, under agreement, by the Glasgow and South-Western Railway Company. Authority is also to be taken to alter and reduce the illuminating power of the gas supplied, and to borrow money.

In Paisley, as well as in Glasgow, Edinburgh, Dundee, and Kilmarnock, the proposal is made to apply for authority to reduce the illuminating power of the gas supplied by the Corporation. A report was made to the Corporation this week, to the effect that during the past year the average illuminating power of the gas was equal to 23·066 candles, as compared with 25·57 candles in the year ending October, 1899, and 25·43 candles in the year ending October, 1898. The Gas Committee, having in view the proposal by the Glasgow Corporation to get power for the reduction of the quality of gas to 16 candles, recommended that in the Provisional Order which the Corporation of Paisley are about to promote, authority be asked to reduce the illuminating power to 16, instead of to 20 candles, as intended. The prescribed illuminating power at present is 25 candles. The alteration was moved in the Corporation this week, and though opposed, was agreed to by 19 votes to 4.

In Dumbarton, the Corporation gas undertaking is managed by the Town Council as a Committee, which has the effect of reducing the publicity of their proceedings to the lowest possible limit. An attempt was made this week to have the present state of matters put an end to. Dean of Guild Miller moved that the Committee be dispensed with, and that the affairs of the gas undertaking be transacted publicly by the Town Council. Provost M'Farlan thereupon moved the previous question, which was carried by 8 votes to 2.

A never-ending source of complaint in all towns is the continual opening of the streets. In his annual report to the Corporation of Glasgow, the Master of Works states that, in a length of thoroughfares extending to 214 miles, there were last year 5394 openings made. Of these, 1213 were by the Water Department, 974 by the Gas Department, 904 by the Electricity Department, and 2031 were made by owners of property under authority from the Master of Works.

The stokers employed in the Forfar Gas-Works have petitioned the Town Council for an increase of 1d. per hour in their wages; and in support of their petition, they state that in Dundee, Broughty Ferry, and other places increases have been granted. When the petition came before the Town Council this week, a member remarked that it was not stated

TWO WARM MEMBERS.

RICHMOND'S  
"LOUIS XIV."



THE ORIGINAL  
"LOUIS XIV."



LONDON,  
WARRINGTON  
STRATFORD,  
PLAMOUTH,  
DUBLIN,  
BOURNEMOUTH,



what wages were paid in Brechin and Montrose—towns which are, of course, more comparable to Forfar than is either Dundee or Broughty Ferry. The petition was sent to the Gas Committee to report upon.

The following announcement was made in the "Dundee Courier" of Wednesday: "At a meeting of the Water and Gas Committee of the Dundee Town Council last night, consideration was given to an allegation made that the coal supplied from certain collieries was of an inferior quality. The Town Clerk submitted an opinion on the subject as to the Commissioners' rights in the matter; and he was directed to write the parties supplying the coal, and to claim compensation."

For a year or two now the Commissioners of North Berwick have been looking out for a site on which to transfer the gas-works, which are too prominently situated and too close to the residences of the great people who now frequent the burgh. A site was all but agreed upon near to Dirleton Railway Station; but when the Commissioners consulted Mr. J. M'Gilchrist, of Dumbarton, upon the subject, he reported, in August, 1899, that the place was unsuitable for a gas-works. Dirleton lies inland from North Berwick; and I understand that it would be costly to take water to it, as well as to get a drainage scheme for it. The Dirleton site has therefore been given up; and the Commissioners have now turned their attention to a site near the sea, upon the farm of Ferrygate, to the west of the town. The proprietor of this site has offered, through her agents, to feu 2 acres of land to the Commissioners, for the erection of gas-works and manager's and workmen's houses only, at the rate of £16 a year per acre. The terms were communicated to the Commissioners this week; and the opinion was freely expressed that the sum asked was too much. The proposal was made that the subject should be considered in private; and this, after much discussion, was agreed to—the meeting being then adjourned till next week.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 24.

**Sulphate of Ammonia.**—The market has assumed a quieter tone, and prices declined from the highest points touched; the closing quotations being £10 13s. 9d. to £10 16s. 3d. per ton, delivered f.o.b. at the ports. Makers have for the most part maintained a firm attitude; but second-hand selling has caused them to give way towards the close. Consumers have been indifferent about prompt and near delivery. For delivery over the early spring there has, however, been good inquiry; but the firmness of makers has hindered business—London, Beckton terms, being quoted £11 7s. 6d. per ton, and Leith £11 7s. 6d. to £11 10s. for delivery over the same period, ordinary terms.

**Nitrate of Soda** is a shade easier on spot; the quotations being 8s. 3d. and 8s. 4½d. per cwt. for good and refined qualities respectively.

LONDON, Nov. 24.

**Tar Products.**—There is no change of any moment in the position or value of products. Benzol is said to be scarce; and important stocks which weighed on the market have entirely disappeared. Unfortunately,

the better value of benzol is not reciprocated by improved prices of aniline. Solvent and heavy naphthas continue in fair request at old rates. Creosote and tar oils are offering at low prices. Carbolic acid is quoted lower—an apparently determined effort to depress that article still further. Pitch is not so firm as it was. Most makers, however, are well covered by previous sales in the meantime.

Prices during the week average out as follows: Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 85s.; salts, 65s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is moving off freely; and in some quarters buyers are evidently anxious to cover. The improved value of nitrate of soda is undoubtedly having its effect on the price of sulphate, which is quoted at £10 15s. per ton in all positions, less 3½ per cent.

#### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—If anything, there is rather a steadier tone in the coal trade here. House-fire requirements have shown a tendency to increase; and with regard to the lower qualities of fuel for engine purposes, Lancashire colliery owners are not displaying so much anxiety about forward prices as was the case a few weeks back. In the better qualities of round coal, there has been a steady business coming forward; and although the output of collieries continues ample, quantities going into stock have been small. Prices are firmly maintained on the list basis of about 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Common round coals are in moderate inland demand for steam and forge purposes; but shipping inquiries have not been so active, and at the ports rather lower prices have been ruling. On inland sales, the average basis quotations remain at 12s. 6d. to 13s. per ton. For shipment, from 15s. 3d. to 15s. 9d. per ton has represented the average figures, according to quality, for steam coal, delivered at the Mersey ports. There is still a good deal of cheap slack coming in from other quarters, especially of the lower qualities; and as some of the largest contracts, which are usually settled at this time of the year, are still held in abeyance, it is evident that the principal consumers are not at all prepared to pay the prices the Lancashire collieries are asking. The current basis pit prices for the better qualities of Lancashire slack remain at 10s. to 10s. 6d. per ton. On forward contracts over the ensuing twelve months, 9s. to 9s. 3d. would seem to represent about the figures that collieries are holding for, but which so far have only resulted in contracts to a limited extent being settled. Good foundry cokes remain firm at recent quotations—averaging 28s. to 30s. per ton. For ordinary furnace cokes, 15s. is the minimum basis at the ovens.

**Northern Coal Trade.**—There has been continued dullness in the coal trade of this district—partly because there is a scanty supply of steamers,

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## TUBES AND FITTINGS

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and the shipments are consequently lessened, and partly because the expectation of lower prices induces buyers to hold off as long as they can. Best Northumbrian steam coals are weak. About 16s. per ton f.o.b. is now the price of the best qualities, 15s. 3d. for second class, and from 8s. 3d. to 8s. 6d. for steam smalls. In the gas coal trade, the deliveries are at about the maximum, and are well held to; the supply being much more adequate than a year ago. The price of gas coals is easier; and occasional cargoes are obtainable at from 14s. 3d. to 15s. per ton f.o.b., which is below the average of many of the large contracts that are now running. The coke trade does not show so much alteration this week; demand and supply having been largely equalized. Best Durham coke is from 23s. to 25s. per ton f.o.b. for export; and blast-furnace coke is 21s. to 22s., free at the Teesside blast-furnaces. Gas coke is still quoted at 24s. to 25s. per ton f.o.b.; but contracts that are running at lower prices lessen the average price.

**Scotch Coal Trade.**—Prices still have a downward tendency; and the outlook otherwise is unchanged. The quotations are: Main 13s. 3d. to 13s. 6d. per ton f.o.b. Glasgow, ell 14s. to 15s., and splint 14s. 6d. to 15s. The shipments for the week amounted to 207,105 tons—an increase of 11,448 tons over the previous week, and of 19,860 tons over the corresponding week of last year. For the year to date, the total shipments have been 9,779,511 tons—an increase of 1,939,915 tons over last year.

**Complaint of Offensive Smells from the Manchester Gas-Works.**—Considerable complaint has recently been made as to the condition of the atmosphere in the Ancoats district of Manchester; and at the last meeting of the Ancoats Healthy Homes Society resolutions were passed asking the Gas Committee to take immediate steps to prevent the escape of offensive gases caused by careless or inefficient manufacture of the gas residual products, and also insisting that it is most undesirable that members of the Council who are interested in chemical manufacture should sit on any Committee that might be called upon to deal with complaints of nuisances arising from chemical works.

**Proposed Federation of Gas-Works Employers in the North of England.**—It will doubtless be remembered that at the half-yearly meeting of the North of England Gas Managers' Association held at Durham on the 6th ult., it was proposed by Mr. T. Bower, of West Hartlepool (see ante, p. 903), that some sort of Conciliation Board or Reference Committee should be organized to deal with the labour question pertaining to all the gas-works connected with the Association; and the matter was referred to the Committee to see if they could formulate a suitable scheme, or make a report upon the subject at a future meeting of the Association. The Committee recently held a preliminary meeting to consider the question. But, before going more fully into the subject, they would like to have some expression of opinion from the members generally to guide them in the matter. The Hon. Secretary (Mr. J. H. Penney, of South Shields) has therefore been requested by the Committee to ascertain whether or not it is considered desirable to establish such a Board or Committee as that proposed; and he has issued a circular inviting from members in favour of the scheme suggestions likely to be of service to the Committee.

**Ceara Gas Company, Limited.**—The report of the Directors of this Company for the year ended June 30 last states that the result of the working is a net profit of £3650, which, added to the balance brought forward, gives a total of £4108. Deducting the interim dividend (£1611), there remains £2497 available for division. Out of this sum, the Directors recommend the payment of a dividend for the six months ended June 30, of 5 per cent. on the preference shares (less income-tax) and of 4 per cent. on the ordinary shares (tax free), making together £1911. These payments, with the interim dividend, will make 10 per cent. for the year on the preference shares and 7 per cent. on the ordinary shares. The balance carried forward will be £586. The Directors greatly regret that during the year the Company sustained a serious loss through the death of Mr. Horatio Brothers, who, for the lengthy period of 18 years, occupied the position of Chairman. The vacancy thus created on the Board has been filled by the election of Mr. Thomas Guyatt, who held the post of Secretary for more than thirty years.

**Sales of Shares.**—At Bristol last Thursday, £13,000 of the Bristol Gas Company's general capital stock, carrying a maximum dividend of 5 per cent., was sold by auction. There was a brisk competition, and several large amounts were purchased. The first parcel of £1000 worth sold at £122 5s. per £100, and other lots realized £123, £123 10s. (the highest price), and £120 10s. (the lowest). The total amount paid for the £13,000 worth of stock was £15,754, giving an average of £121 3s. 8d. per cent. This shows an improvement of 18s. on the price given for the last issue in June—£120 5s. 8d. The debenture stock was not so much sought after, £1400 only being sold at about £110 per £100. The total paid was £1540 10s. A parcel of "B" £10 fully-paid shares in the Camborne Water Company (the dividends on which have for several years been £6 6s. per cent. per annum) was sold a few days since at prices varying between £14 17s. 6d. and £15 1s. Last Wednesday, 1000 new £5 shares in the Langley Mill and Heanor Gas Company, Limited, were offered for sale by auction; and a large number were disposed of at prices ranging from £9 10s. upwards.

**Conveying a Cargo of Spent Oxide by Sea.**—In the Queen's Bench Division of the High Court of Justice, last Wednesday, Mr. Justice Mathew had before him, in the Court for Commercial Cases, the action of *Field v. McCall and Co.* The plaintiff was the owner of the ketch *Eily*, which had been chartered by the defendants to carry a cargo of spent oxide, purchased by the defendants from the Exeter Gas Company, from Exeter to Llanelly; and his complaint was that the defendants loaded as part of the cargo oxide of iron which had only just been removed from the purifier, and still contained sulphuretted hydrogen, and was therefore in a highly inflammable state, whereby fire broke out in the course of the voyage, causing damage to the ketch. This part of the cargo was not, according to the plaintiff's contention, "spent" oxide at all; and he claimed damages for breach of the charterparty. The defendants did not seriously deny that part of the cargo was loaded in a dangerous condition; but they said they had told the captain that it was dangerous, and that he agreed to take the risk. The master denied that the full extent of the danger had been explained to him. His Lordship gave judgment for the plaintiff for the amount claimed, with costs.

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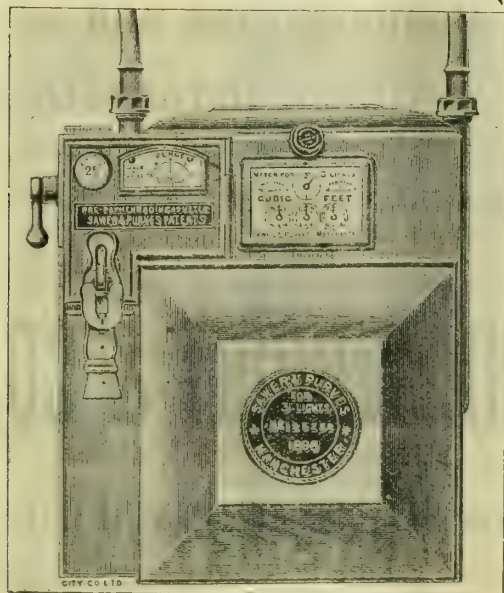
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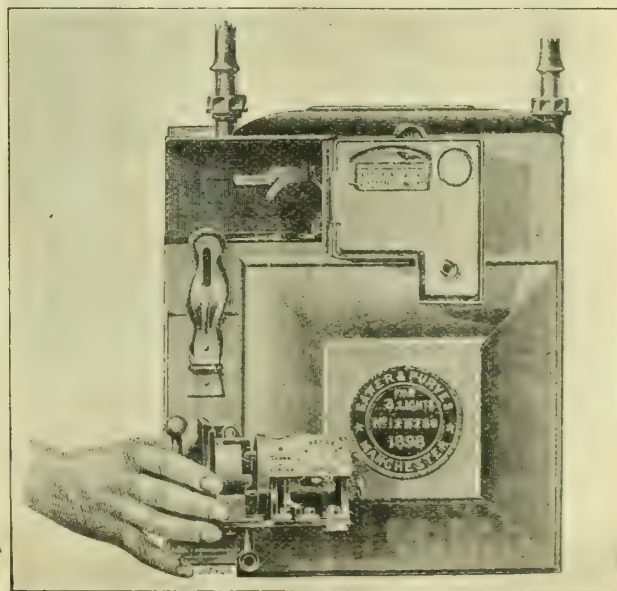
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**Vyrnwy Water for Wallasey.**—The scheme for providing Vyrnwy water for Wallasey is being actively forwarded by the Liverpool Corporation Water Committee, who, at their last meeting, decided to apply for powers to borrow £146,000 for the execution of the necessary works, in accordance with the agreement with the Wallasey District Council.

**Llandudno District Council Gas-Works.**—It was explained at the meeting of the Llandudno District Council last Tuesday, that the accounts of the gas undertaking for the year ending March last showed a deficiency, after providing for repayment of loans, of £1074, due to the increased cost of coal, &c.; but there were meters in stock of the value of £1165, after deducting 20 per cent. for depreciation, so that the accounts did not stand in an unhealthy condition.

**The Wages of Newcastle Lamplighters.**—A deputation representing the lamplighters of Newcastle waited on Sir W. H. Stephenson and the Secretary of the Newcastle and Gateshead Gas Company last Tuesday, with reference to an application for an advance of 2s. per week; their present rate of wages ranging from 21s. to 23s. Statistics were produced showing the wages paid in other towns in the kingdom, and were duly considered. It was declared that, taking into account the work done, the men in Newcastle were better paid than in the places cited. Under these circumstances, the representatives of the Company intimated that they could not see their way to recommend the Directors to accede to the application for an advance.

**Local Authorities and the Cumberland Water Scheme.**—At a meeting of the Wigton Rural District Council, last Tuesday, it was reported that of the nine parishes provisionally scheduled for the purpose of promoting the Overwater and Head of Ellen Water Bill, seven refused to join, and the other two (Allhallows and Allonby) were only willing if the majority of the parishes were. Mr. Pickering (who is in charge of the scheme) pointed out that, where a parish had an inadequate supply of water, it was the Council's duty to schedule it. The Council, however, declined to take this step, and passed a resolution withdrawing from the scheme, which, however, will still be promoted by the Holme Cultram and Aspatria Urban District Councils. The estimated cost is £30,000.

**Public Lighting in Bristol.**—Notwithstanding (says the "Bristol Times") that gas lighting was introduced into Bristol something like ninety years ago—even in advance of London—and that electricity has been familiar to us for several years, we go on lighting some of our thoroughfares by means of oil-lamps, and have been, apparently, obliged to increase the number recently. The explanation, of course, is that in certain undeveloped districts the Gas Company do not yet see their way to lay down mains. And so we get, in the quarterly report of the Gas Examiner, mention of 84 oil-lamps, which cost £1 per quarter each to keep burning. Our 41 million odd cubic feet of gas, at 2s. 1d. per 1000 cubic feet, cost us £4365 for the quarter ended September last—one of the lightest quarters of the year. To light, extinguish, clean, and repair the 7743 public gas-lamps, it was necessary to pay £1631. Certain other items brought the public lighting bill for the quarter up to the respectable total of £6219, to which must be added a proportion of the £7043, which is the annual cost of the electric street-lamps.

**Neath Gas Workers' Wages.**—It is understood that the Neath Corporation have conceded a demand for an increase in the stokers' wages from 4s. 8d. to 5s. per day.

**Borrowing Powers for the Fylde Water Board.**—At Blackpool last Thursday, Mr. H. H. Law conducted an inquiry into an application made to the Local Government Board by the Fylde Water Board for sanction to borrow £63,484 10s. 9d. for the following purposes: New main to Lytham, £27,000; water-mains to various villages and extensions of mains in Blackpool and other urban districts of the Fylde, £15,000; cottages, stable, yard, &c., Blackpool, £4100; house, workshop, and land at St. Anne's, £1000; cottage and telephone at Crosseby Gate, £500; land, Blackpool, £2700; and £13,184 10s. 9d. for expenditure by the old Company between Feb. 28 and the date of purchase by the Board. The Town Clerk (Mr. T. Loftus) said the Board asked that the repayment of the loan should be extended over fifty years.

**Leeds Corporation Gas and Water Supply.**—Last Wednesday, Mr. W. O. E. Meade-King, one of the Inspectors of the Local Government Board, held an inquiry at Leeds into four cases in which the Corporation sought sanction to borrow money for municipal purposes. In one case, £161,400 was required in respect of the gas undertaking; and in another, £146,420 for the water-works. There was no opposition. With regard to the former amount, which the Corporation had decided to borrow so far back as April 5 last year, the Town Clerk (Mr. W. J. Jeeves) explained that the long time which had elapsed between the decision and the inquiry was due to the enormous quantity of information which the Board required in regard to mains being put down. Moreover, a large sum of money had been expended on special maps which, he submitted, were unnecessary, as the Inspector could have examined the borough maps. He said the amount of "red-tape" existing at the Board was as harassing to the Inspectors as to the Corporation officials.

**Cape Town District Water-Works Company, Limited.**—An extraordinary general meeting of this Company was held on Monday last week at the Cannon Street Hotel, to consider resolutions (1) for paying to the Directors out of the purchase-money received a sum equal to 5 per cent. on the amount of the award, as additional remuneration for their services and for carrying out and completing the sale to the Municipalities of the Company's undertaking, &c.—the Board to pay out of this amount compensation to members of the staff for the loss of their offices—and for authorizing such payment to be made to the Directors; (2) for winding up the Company voluntarily; and (3) for appointing Mr. J. S. Prince and Mr. J. H. Brodie, two of the Directors, Liquidators. Mr. Prince presided and explained the objects of the resolutions; concluding by moving the first. After some discussion, it was voted upon, and the members were equal for and against it. The Chairman said that he would not give a casting vote, and a poll would be necessary. Some further discussion having taken place—it being pointed out that the shareholders would have the right to reject the resolution at the confirmatory meeting if they desired to do so—the motion was again put, and was declared carried on a show of hands by more than the requisite three-fourths majority. The other resolutions were afterwards passed.

## SEASON 1900-1.

### WRIGHT'S

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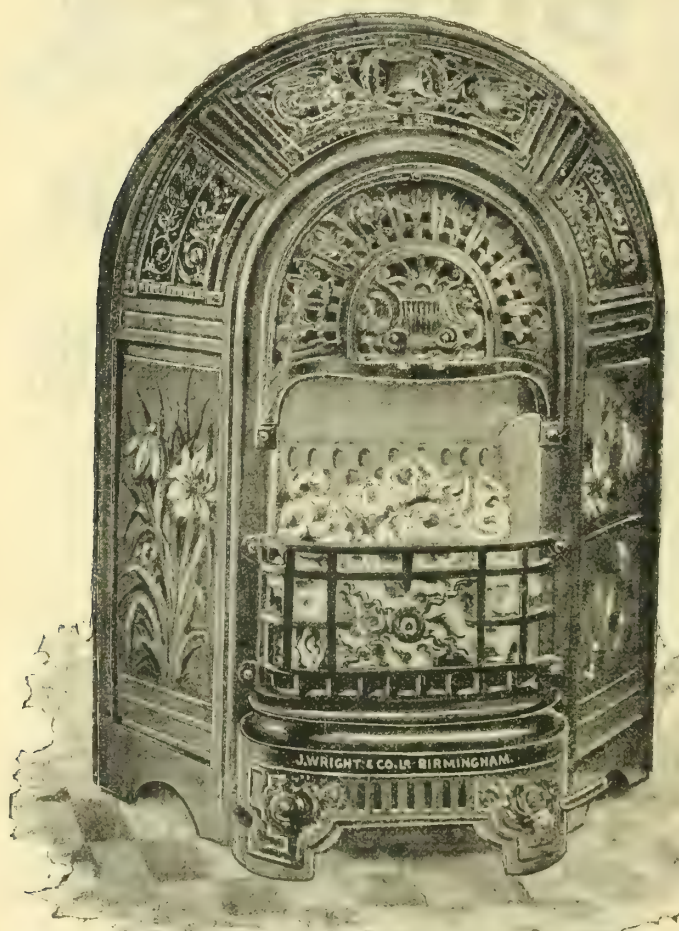
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The "CZARINA."



**Well Water Puzzles Analysts.**—The "Daily Express" of yesterday contained the following paragraph: "Suspecting the water in a well in their district, the Newmarket Urban Council sent samples to two different county analysts. 'Polluted with sewage and unfit for drinking purposes,' said one; while the other, in direct contradiction, declared it 'free from dangerous pollution.' Three fresh analysts are now being consulted by the Council, in order, doubtless, to secure at any rate a majority on one side or the other."

**Coal in Spitzbergen.**—A correspondent at Christiania has written to the "Financial News" as follows: "Prospecting was busily carried on during the past summer in Spitzbergen, in order to trace coal, which has repeatedly been found on the west coast. A number of companies were founded for that purpose; but only one ship, sent out by a Drontheim concern, brought back a coal cargo of any value, which has been thoroughly examined by the State Railways, as well as by interested factories. The samples proved to be very powerful as combustible; but they left a considerable amount of porous sediment on the grate. Should such coal be used for railway-engines, they would have to be fitted with a moveable grate in order to crush the sediment. Anyhow, prospecting will be continued; for Norway, lacking hitherto coal deposits, has the greatest interest in opening a Spitzbergen supply. It is hoped in the country that, if systematically worked, the Spitzbergen mines would turn out coal at a much cheaper price than that imported from England."

**Mr. Douglas Helps on the Cost of Gas and Electric Light.**—In the course of the letter on the above subject addressed by Mr. Douglas H. Helps, of Redhill, to a local paper, to which reference is made in our "Electric Lighting Memoranda," he compares as follows the cost of the electric light with gas consumed in the Welsbach burner: "The Welsbach Company claim 27 candles per cubic foot of gas, and at Woolwich Arsenal the Government Gas Engineer is obtaining over 30 candles with the gas consumed at a high pressure. I will, however, for the purpose of this comparison, take only 20 candles per cubic foot. Then, as a Board of Trade unit of electricity equals 1000 watts, and as  $3\frac{3}{4}$  watts are required for one candle per hour, one Board of Trade unit equals 266 candle-hours; 1000 cubic feet of gas at 20 candles per foot equals 20,000 candle-hours, and therefore 1000 cubic feet of gas equals  $75\frac{1}{4}$  Board of Trade units. The cost of 1000 cubic feet of gas at present is 3s. 8d.; and  $75\frac{1}{4}$  Board of Trade units of electricity cost, at  $5\frac{1}{4}$ d., £1 14s. 6d. Therefore, electricity costs, light for light,  $9\frac{1}{4}$  times more than gas."

Messrs. Kirkham, Hulett, and Chandler, Limited, have received from the Bury Corporation an order for a patent "Standard" condenser for one million cubic feet of gas per day.

The Baillieston (Lanarkshire) Gas Company have completed the erection of a gasholder, which was inaugurated last Wednesday. The Contractors were the Airdrie Iron Company.

The Whessoe Foundry Company, of Darlington, have in course of construction a gasholder for Tokio, Japan. It will be a steel tank; and the holder will have a capacity of 500,000 cubic feet of gas.

Mr. F. Edwards, of the gas and acetylene department of Messrs. Falk, Stadelmann, and Co., Limited, has transferred his services to Messrs. Robert W. Blackwell and Co., Limited, of the City Road, E.C.

The Yeadon District Council, having decided in favour of the municipalization of coal mines, are inviting the approval of other District Councils in Yorkshire. Bingley has given its adherence to the principle.

We learn that the responses to the invitation for subscriptions to the capital of the Irish Provincial Gas Company, Limited, the prospectus of which appeared in the "JOURNAL" for the 23rd ult., were not sufficiently numerous to justify the Directors in going to allotment.

Husson's Safety Acetylene Syndicate, Limited, has been registered with a capital of £5000, in 4950 ordinary shares of £1 each and 1000 founders' share of 1s. each, to acquire the business carried on at No. 28, Victoria Street, as "Husson's Safety Acetylene Syndicate," and to carry on the business of manufacturers of, and dealers in, carbide of calcium, acetylene, acetylene and other gas-lamps, burners, mantles, glasses, shades, and all gas and electrical fittings, &c.

The last quarterly report of the Gas Workers' Union shows that the total receipts amounted to £5762, of which £5732 came from the branches. The General Secretary (Mr. W. Thorne) says this was an increase of £362 as compared with the September quarter of last year. The membership is now 50,250; being an addition of 4581. The Union recovered £1114 for the members during the quarter, in compensation and wages claims; and the total recovered now reaches £11,402.

The report of Messrs. Fletcher, Russell, and Co., Limited, for the year ending the 31st of August states that, after paying the interest on debentures and a dividend of 6 per cent. on the preference shares, it is proposed to pay a final dividend on the ordinary shares at the rate of 10 per cent. per annum; making, with the interim dividend, a distribution of 10 per cent. for the year. It is also proposed to pay a bonus of £1 per share upon the fully-paid £10 ordinary shares, and 15s. per share on the £7 10s. shares.

By an announcement which appears elsewhere, it will be seen that the Hoyle and West Kirby Gas and Water Company, Limited, are inviting tenders for 1000 £5 shares (standard dividend 7 per cent.) in their gas and 1400 £5 shares (maximum dividend 7 per cent.) in their water undertaking; also mortgage bonds for a term of seven years to the extent of £1250 and £1750 upon the two undertakings. The issue represents the additional capital authorized by the Company's Provisional Order of 1899.

We have received from Messrs. Arden Hill and Co. (now John Wright and Eagle Range, Limited) their recently complete catalogue for 1900-1901 of "Acme" gas-cookers, hot-plates, fires, baths, laundry and other stoves, &c. A very appropriate preface has been furnished by Mr. H. J. Yates, under the title of "Some Facts about Gas Fuel." The book is very well printed, and altogether tastefully got up. Accompanying the catalogue is a little pamphlet on "The Coal Famine," in which the advantages of the "Acme" dual burner and triplex tap as an economizer of gas in stoves are illustrated.

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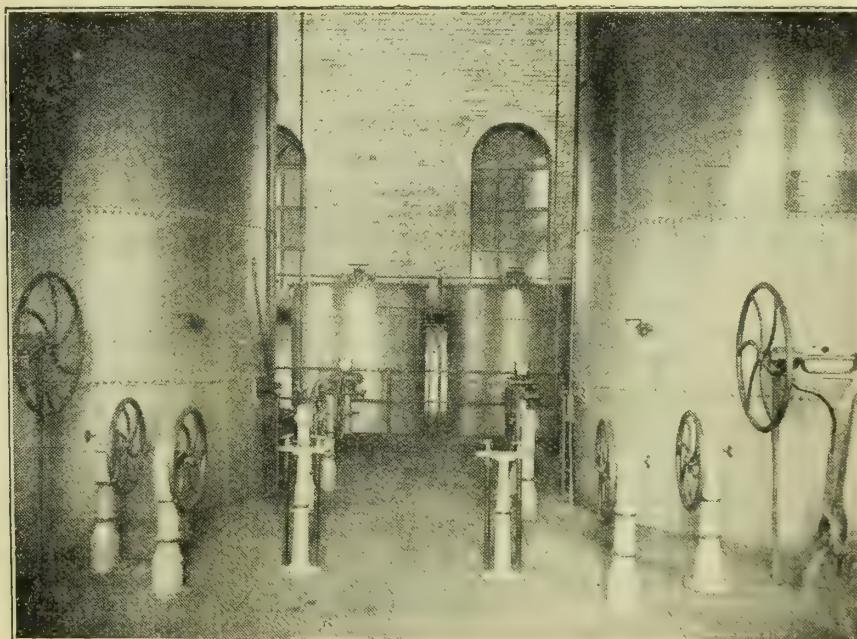
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Orders for Alterations in, or Stoppages of, **PERMANENT ADVERTISEMENTS** should be received not later than the **FIRST POST on SATURDAY**.

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[For Illustrated Advertisement see Nov. 6, p. 1174.]

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For all Gas Joints.

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## EDITORIAL NOTES.

## Brightening of the Coal Outlook.

EVIDENCE reaches us daily, from both public and private sources, in proof of the steady, though not as yet rapid, downward movement of coal prices, and of the striking difference between the position of the gas industry in regard to coal supplies at the end of 1900 from what it was at the commencement and throughout the first four months of the year. It is now literally true that gas coal is going begging. There were recently, we are informed, barges in the Thames containing some 600 or more tons of gas coal for which no buyer could be found within the space of three weeks. Last December, they would not have wanted a customer for three minutes. But then, last December the London Gas Companies were beginning to be seriously alarmed at the rapid depletion of their coal-stores, and the lagging of contract deliveries; whereas now they hold stocks fully the double of those that were ebbing away this time last year, and supplies are pouring in freely from every contractor. We should say that there are not less than 350,000 tons of coal in the stores of the London Gas Companies to-day more than there were twelve months ago; and, as the perversity of fate, or of the oil merchants, will have it, the supply of oil is just now so abundant that the available tank storage is inadequate to contain the quantities the contractors are desirous of delivering. It is not, therefore, surprising that the faces of all gas managers who have not committed themselves far ahead in their coal purchases are somewhat of a contrast to the weather in regard to cheerfulness.

Among the public indications of the "creep" in coal prices may be mentioned the reduction of 2s. in their household rates by the Forest of Dean collieries as from the 1st inst., and of a simultaneous reduction of 1s. in the list price of Scotch splint coal. The 1st of December is indeed a most unusual date on which to witness a marking-down of house coal; but the state of the trade leaves the owners no option if they wish to see the coal removed from the pit-head. And, unless there soon comes a spell of very severe weather, the owners in the other districts, and the merchants everywhere, will shortly have to follow suit. The railway sidings are choked with coal-laden waggons; and the consignees are thus between the "devil" of demurrage charges and the "deep sea" of lowered prices. As many of the merchants to whom the coal has been forwarded are under contracts with the collieries or factors at "boom" prices, this is a more serious matter for them than may at first sight appear. The smaller fry among the merchants are not men of unlimited capital, nor all of them of very far-seeing policy; and it is more than doubtful whether the unusual profits that some have made during the past year are still available to enable them to stand the racket of a drooping market. If, further, they have bought coke for future delivery at top prices—as, in fact, many of them have—there will be not a few collapses and unfulfilled contracts before many months go by. Gas managers will in some cases find it no less difficult than did Shylock deem it to obtain the pound of flesh that is in the bond without bleeding the contractor to death. They will be ill-advised to wreak upon the coal merchants vengeance for the extortionate policy pursued this year past by certain of the coal-owners.

To revert to the existing situation in the coal market. The railway companies are reported to have taken recently a sounding, but to have found the water to be still too deep. The owners, it is said, offered a reduction of 1s. a ton on present contract prices—which, be it remembered, are more than 5s. above the normal. We are glad, though not by any means surprised, to learn that the railway companies did not think it quite good enough. Indeed, to use a school-boy's phrase, we can only say of the coalowners that it was "like their cheek" to make such a proposal. They will have to climb down considerably lower than that to find buyers, who, fortunately, appear to be fighting shy of contracts for next year with practical unanimity. Hand-to-mouth buying is, in fact, the order of the day, not only as far as home consumers are concerned, but also as regards most foreign purchasers, and with the output expanding, demand falling, and stocks heavy, coal buyers will very soon be able to name their own terms, instead of having to accept those inflicted upon them by the collieries.

We have spoken of an expanding output. The writer of a decidedly able article on the "Decline in Coal" in the



"Economist" of the 24th ult., expresses the opinion that "this year there will be no increase, and it is even doubtful if the output of 1899 will be equalled." This must, of course, only be a matter of conjecture, as, unfortunately, no statistics of output are published except the annual. But we do not for a moment think the opinion quoted will be substantiated by the event. The writer, in his calculations, assumes a decreased home consumption of  $4\frac{1}{2}$  million tons, to set against the increased export of 2 millions. We fail to see any ground for the assumption. He estimates a reduction of 630,000 tons in the railway companies' requirements. Do the traffic returns support this view? We think not; for trade, until quite recently, was fully as active as in the corresponding period of last year. And what of the increased stocks held by everyone at the end as compared with the beginning of the year? So far as the gas industry alone is concerned, this must represent an increased output of well over half-a-million tons in all. Moreover, householders' cellars are well supplied; merchants have big stocks; and everywhere coal stores are better filled than a year ago. We shall, therefore, be much surprised if the output for the twelve months now drawing to a close does not prove to have been considerably in excess of that for 1899.

Fresh sources of supply are, moreover, now being freely tapped; and the influx of the output from these additional seams and pits will tend to counteract any attempted restriction of tonnage by the miners. With the number of men seeking employment—among whom the Penrhyn quarrymen will be prominent—increasing steadily as trade slackens down, there will be no lack of miners in the immediate future. The situation during the first year of the New Century is, then, most likely to be one of glut in the coal market. We are afraid there are some quarters of the gas world in which the event will prove a source of a certain amount of mortification, by reason of not having been earlier foreseen.

#### The Mond Fuel-Gas Scheme.

NOTICE has been given of an intended application to Parliament, by a Company to be incorporated, for power to manufacture and distribute "gas, and particularly the pro-  
"duct commonly known as 'Mond Gas,' for motive or other  
"power, heating, or for any other purpose to which such gas  
"can be applied, except illumination." The works are apparently to be situated at Tipton, Bilston, Darlaston, Kingswinford, and Smethwick; and the area of supply is to embrace the whole of this particular "Black Country." We give the details of the "Gazette" notice in another column, where they will doubtless be attentively studied by the curious. For this proposed scheme is a highly interesting survival of the almost prehistoric period when technical persons yet fondly imagined that there might be "something in" the dream of "cheap non-illuminating  
"fuel gas." It is almost an insult to gas engineers to remind them of the vain tentatives that have been made in quest of this commodity—as something to sell and distribute to a distance. Naturally, the non-expert does not see at a glance why, if it is commercially possible to make and use Siemens gas, Dowson gas, or Mond gas on the spot, for heating and generating motive power, it is commercially impossible to distribute the same descriptions of gaseous fuel. He cannot be expected to understand the technical and commercial significance of the one word "distribution," nor to see in it all the difference it introduces into the problem. The most potent argument with such a person, on such a point, is the simple statement that, notwithstanding the amount of ingenuity and money that has been applied to the practical solution of this apparently simple problem, here and in America, it has never been done. Many fuel-gas companies have been started in the United States; not one is now in existence. Mr. George Westinghouse spent £40,000 on experiments of the same kind, without obtaining other than a negative result—which was perhaps worth the money.

To this flat negative it may be objected that Mond gas is something new, and different from all these gases that failed. In reply, it is enough to say that it is only a semi-water gas made from bituminous coal instead of anthracite or coke. For this reason it contains more residual products; but the gas is no stronger than Dowson gas. That is to say, it possesses a calorific power of about 150 British thermal units per cubic foot, as against 600 British thermal units for ordinary coal gas. It must be burnt in commensurately greater bulk to produce the same effect.

How are 4 cubic feet of gas to be distributed for 1 cubic foot, without largely increased expense, to say nothing of any advantage. Are the mains to be four times the sizes or charged at sufficient pressure to pack 4 cubic feet into the space occupied by 1 cubic foot of coal gas at atmospheric pressure? Mr. Bryan Donkin has discussed Mond gas for power generating in the new edition of his book on "Gas, Oil, and Air Engines," in which he remarks, that, although the plant is rather complicated, if properly worked, and a good price is obtainable for the by-products, "it may be said to give power for practically  
"nothing." As much may be asserted of the blast-furnace, if all the working expenses are charged to the iron. In another place, Mr. Donkin talks of the possibility of selling even the sulphur from this gas, at £8 10s. per ton, to cover the whole cost of the coal and the working expenses. Here, again, it is the sulphur, the paying product, which is supposed to be sent away, not the gas. The latter simply is not worth carrying to any distance. The subject, it will be remembered, of how to make the best use of bituminous slack was discussed at the last Engineering Conference, on the initiative of Mr. W. Foulis. This discussion certainly created the impression that, if it was to be a case of gas making as well as other processes, the superior economy of the Mond system over other methods of carbonization was not to be taken for granted. Transmission, or distribution, it must be maintained, is of the essence of the present parliamentary project; and upon this rock the scheme must split. If the projected undertaking ever starts, within three years it will either be in liquidation or selling 600-unit gas like any other gas company in the district, and no cheaper.

#### Mr. A. G. Glasgow on the Prospects of Carburetted Water Gas.

THE somewhat indignant tone of the letter in which Mr. A. G. Glasgow replies to-day to our recent note on the "cornering" of gas oil in the English market is pardonable in the writer's circumstances. To his complaint that we have never warmly commended carburetted water gas to the affections of British gas managers, we have the easy and obvious answer that such advocacy is none of our business. Mr. Glasgow cannot charge the "JOURNAL," now or at any time, with denying him a fair field; and he must know better than to expect favour. Our recent denunciation, however—if it should be so regarded—was addressed, not to the order of carburetted water-gas engineers (of which Mr. Glasgow is an ornament), but to the dealers in the new raw material of gas manufacture, who appear to have the prospects of this branch of industry entirely at their mercy. The gravamen of our remarks is in the statement that "the oil cornerers have spoilt the  
"prospects of carburetted water gas for this country." We are pleased, of course, to learn that the improvement of the apparatus and of the character of the oil supply since 1891 has been such as to more than compensate for the advanced price of oil which has so strikingly coincided with the dearness of coal. Let us hope, nevertheless, that Mr. Glasgow's prognostications will prove correct, and that a return of oil to the three-penny rate of 1891 will enable gas makers to rejoice in the whole benefit of the technical improvements referred to. If we were disposed to argue the point, we might say of this prophecy that it really proves our own case; for, if Mr. Glasgow pledges his judgment for it, the circumstance is a strong indication that he heartily desires to see such a result brought about. He must realize that with gas oil at about 5½d. per gallon, which means carburetted water gas at about 1s. 7d. per 1000 cubic feet (the Crystal Palace District Company's figure), this branch of the gas industry of the country is in a precarious state. If he wants to save it, he must attack the "cornerers" of oil. We understand from another source that some oil can be obtained independently by encouraging small importers, especially in the matter of time; but there are no means of ascertaining the extent of this relief.

#### The Parliamentary Notices for the Next Session.

IN another part of the present issue of the "JOURNAL" will be found the completed list of the Parliamentary Notices for next session in regard to gas supply. Although most of the promised Bills are of an ordinary character, some of them will arouse a good deal of interest, not all of a friendly nature. We have already mentioned the legislative proposals of the Gaslight and Coke Company; and it only remains to add that the South Metropolitan Company are



also in Parliament, but merely for powers to acquire the Surrey-side portion of the district of the Gaslight and Coke Company, if Parliament should approve of the transfer. This Bill in no way raises a fresh question of policy; but if it passes it will give the South Metropolitan Company similar powers to those already possessed by their northern neighbours. The Aldershot district is becoming a very populous one in these stirring times; and the Company require further powers. The Bath Gas Company desire to have their statutory facilities brought up to date; and the British Gaslight Company want to enlarge their Hull undertaking. The Chester Gas Company are in the same case as the Bath Company; and a like observation applies to the Companies in Devonport, Dorking, Dover, Elland, Richmond, Newcastle and Gateshead, Shrewsbury, Weston-super-Mare, and several smaller towns.

The Devonport Corporation desire to purchase the undertaking of the Company; and the District Council of Colwyn Bay have similar aspirations. At Hartlepool, a Joint Board purchase scheme is on the stocks. Gravesend is to ask for a reduction of illuminating power from 16 to 14 candles; and several other notices may cover the same design. Dover contemplates municipalizing the gas and electricity supply. An old limited Company—the Leatherhead—will seek statutory rank. Portsea, Pinner, Slough, and Woking, with other undertakings, are applying for Provisional Orders. Only one Irish application—from Omagh—appears in the notices; but it will be seen that the new Scotch Private Bill procedure comes into operation for the first time. Henceforward all Scotch business of the kind will be in the shape of Provisional Orders, and will be dealt with under the Act of 1899. Dundee and Kilmarnock join with Glasgow in proposing to reduce the illuminating power of their gas. These applications will be an easy introduction for the new system of legislation, inasmuch as they are not likely to be opposed strongly, if at all. It will be better for the new arrangement to feel its way with unopposed Bills at first.

#### A Coal Contract Custom.

THE case of *La Société Anonyme l'Industrielle Russo-Belge v. Scholefield*, decided in the Commercial Court of the Queen's Bench Division on the 23rd ult., is of interest to gas companies as determining a question of custom in the coal trade. The action was brought to recover damages from the defendants for alleged breach of two contracts under which plaintiffs purchased, in April and October of last year, "about" 10,000 tons of Northumberland steam coal and "about" 8500 tons of Northumberland duff coal for delivery to Antwerp. Defendants having only delivered 9592 tons and 8453 tons under the respective contracts, plaintiffs claimed damages on the ground that the defendants should have delivered the balances—equal to 455 tons. Prices having risen considerably since the contracts were entered into, the undelivered quantities could only be bought at enhanced cost to the plaintiffs. Defendants pleaded that, owing to the introduction of the word "about" into the contracts, they were given a moderate and reasonable latitude in the performance of the contracts; and they relied upon a custom of the coal trade, by which the word "about" in such a case is interpreted as allowing a margin of at least 5 per cent. in quantity either way. Mr. Justice Mathew, having heard evidence in support of the existence of the custom, gave judgment for the defendants—stating that he was satisfied that the word "about" in such contracts had the customary meaning ascribed to it, and that the vendors were entitled to the advantage of shipping more or less than the specified quantities (within a margin of 5 per cent.) according as the state of the market made it desirable for them so to do. There is little comment to make upon this judgment; but it is one that may be noted for the guidance of coal buyers, who will be well advised to see that their contracts contain more specific terms where large quantities are involved. We should say that, generally speaking, the term "about" is to be found more frequently in agreements for the purchase of single cargoes than in contracts for extended periods.

#### Another Check to Progressivism.

THE ebbing of the tide of Progressivism in civic affairs continues. Last week the triennial election of the London School Board was held; and, notwithstanding the frantic endeavours of the newspapers identified with the Party to drum up votes for its candidates, the aggregate Progressive poll fell off by 157,000. The system of this School Board

election is peculiar. The constituencies are very large; and the voting is cumulative. Under this arrangement, the individual voter feels that his share of power is so infinitesimal that he does not care to vote at all, unless he happens to hold strong opinions on School Board questions—which is only the case with a very small minority. Besides, the constituencies are so unwieldy that the pretence of local representation is a farce. Nobody knows who the candidates are; and hardly anybody cares. The British public only appreciate broad political issues. When once a clear dividing-line has been drawn between opposing policies, the British public will take sides and make their power felt. We all know what happened at the Parliamentary election; and the same thing was repeated at the recent Metropolitan Borough elections. In the case of the School Board election, however, there was no such plain issue; though some of the candidates published their connection with the Progressives of the outside political world. They usually suffered for it.

Progressivism on the School Board is not exactly the same as Municipal Progressivism; being professed, in the educational field, by some good and true servants of the public who are not politicians. Still, the name has become unpopular with Londoners, as being mixed up with faddism, socialistic folly, and extravagance. Some of the most hopeless blockheads in public life pass for Progressives, because Socialism is the easiest of doctrines to prattle, and there is no fear of its ever coming to anything. It is far more difficult, and pays less in newspaper advertisement, to strive after practical efficiency at the cheapest price. The national system of public elementary education has disappointed the hopes formed of it at first, largely because its direction has been confided to the wrong hands. The ordinary ratepayer has no confidence that the election of a new School Board will mend matters; and therefore he stays away from the polls. 'Tis a mad world! The British Empire has been pouring out blood and treasure like water, because certain people domiciled in a part of South Africa were deprived of votes and had no voice in the direction of scholastic affairs. In London, and all over the Kingdom, the trouble is of the opposite kind—the people who have votes will not take the trouble to use them.

#### Some Experts' Views of Municipal Trading.

THE question of Municipal Trading was recently discussed in the "Engineer," and also in the "Engineering Magazine." It is significant, by the way, how utterly unsympathetic with regard to this principle are most of the best organs of specialist opinion. Its really blatant advocates are the most trumpery of the daily and weekly papers, which are not worth taking seriously on any subject except (say) horseracing and football. Municipalities, remarks the "Engineer," might as logically provide all the necessities of life and do all the industrial work of a district, as limit themselves to such matters as electricity supply and gas lighting. The usual plea, that local authorities ought to have the command of their own streets, is, our contemporary shows, not devoid of reason; but the argument founded upon it is out of proportion. The pulling up of streets, or rather the difference of inconvenience to the public due to the streets being pulled up by one body or another, is too minute in comparison with the important question of municipal or private ownership of a supply system to be allowed to weigh down the balance. We are reminded in this connection of Mr. Livesey's statement to the Municipal Trading Committee, that if municipal workmen did not earn their money more honestly than seemed to be their present habit, it would be better for the public that companies alone should touch the pavements.

The "Engineer" proceeds to explode the pretension that local authorities can get money cheaper than companies. What with interest and the redemption of loans, this is not true; but, in any case, it is wrong to claim such an advantage, because the security is not the same in each case. Shareholders get a dividend, or not, as their fortune is. Ratepayers, on the other hand, always pay interest, no matter whether the investment is a profitable one or not. "There is little doubt the company in reality gets its money cheaper." To the oft-heard claim that municipal trading undertakings are successful, our contemporary answers: "We do not know; it is very much a matter of account-keeping."

Mr. W. H. Booth, writing in the "Engineering Magazine" on the same point, comments bluntly on the decision



of the House of Lords Committee last session that a particular corporation tramway should pay no profit, but expend all its surpluses in reducing fares. This order, he observes, was no doubt intended as a check on the worst fault of municipal trading. "It opens a door, however, for an abuse that has been all too common in municipal affairs; for it will tend towards the payment of excessive prices for stores and other materials . . . there will be very little difficulty in making no profit." This is unkind; but it needed saying by somebody.

#### The True Cause of the Trouble at Bethesda.

THE development of the Bethesda quarrymen's strike is well worth following, as an object-lesson in the active operations of militant Trade Unionism. Readers of the "JOURNAL" may be supposed to know pretty well which side, in any industrial dispute, is more likely to tell the truth, and will not believe very easily that the owner of any valuable mineral rights which are in course of realization has a prejudice in favour of shutting down the works without sufficient cause. The fact is that the usual stock reproaches about the grasping capitalist, the hard taskmaster, and so forth, are so obviously inapplicable to the present case, that the hack newspaper writer to Trade Union prompting has been sorely put about to find another stick wherewith he may belabour the Bethesda management. The "Daily News" has afforded some choice entertainment in this way. The Editor sent somebody down to the quarry to obtain "accurate information"—that is to say, some positive confirmation for the preconceived notion that in industrial disputes the men are always in the right and the employers in the wrong. The mission was not a conspicuous success. Skimming quickly over the several breaches of the peace with which the new outbreak began, the reporter was compelled to fill his notebook with descriptions of the reluctance of the strikers to leave their homes, and so forth. He had an interview with Mr. Young, Lord Penrhyn's Manager, and recorded his innocent amazement at the discrepancies between this gentleman's story and the men's statements. Not one word of the true rights of the matter was allowed to find publicity through this source. Lastly, from another report we get the following significant declaration: "This quarrel has been forced upon us; and we shall never yield as long as the right of combination is denied to us. If Lord Penrhyn will recognize the Union, the quarries may be opened to-morrow." It is not difficult to perceive from this artlessly contradictory statement where the tyranny lies. Mr. Young declares that the management neither know nor care who among the men belongs to a Union; but they will not have Union subscriptions collections in the quarry during working hours, nor accept Union dictation as to how the undertaking is to be carried on. So the matter stands. It is a quarrel over "recognition," of the familiar kind; and there is nothing for it but to fight it out.

### WATER AND SANITARY AFFAIRS.

THE further list of notices of intended applications to Parliament in connection with water supply which appears elsewhere, taken in conjunction with that given last week, furnishes a complete presentment of the schemes which will be more or less before our readers in the course of the next nine months. Endeavours will be made by the Local Authorities of Aldeburgh, Broadstairs, Dorking, and Wells, among other places, to obtain possession of the water supply—in the first-named case in accordance with the terms of an agreement. The Dorking Urban and Rural District Councils are both concerned in the acquisition of the local water-works, and if they succeed they will carry them on jointly or separately. There may possibly be a tussle in Wells, as the Water Company are applying for incorporation. The largest scheme for extending existing works is that of the Leeds Corporation, referred to last week; but those of the Barrow, Harrogate, and Ripon Corporations, and the Kettering District Council, are of some significance. More time will be applied for by the Edinburgh and District Water Trustees for the completion of works already sanctioned; and an enlarged area will be sought by the Wolverhampton Corporation. A new Company is to be formed for the supply of Oakham; and

incorporation will be asked for by the Faversham and Swanage Companies. An attempt will be made by the Local Authorities of Ilkeston and Heanor to form a Joint Water Board to acquire the water undertaking in their district. The applications for Provisional Orders are not very numerous. Certain private parties at Bearsted and Hungerford are desirous of being invested with legislative authority to supply water; and other applications relate to extensions of limits or increase of capital. The proposals do not appear likely to cause much opposition.

However tranquil may be the progress of the measures above referred to, that of the Stockport Corporation, should it ever get into Parliament, will certainly not be particularly smooth, judging by what has lately transpired in the town. We mentioned in the last number of the "JOURNAL" that the proposal of the Corporation to carry out a large extension scheme in connection with their newly-acquired water undertaking had given rise to some indignation among the ratepayers, which had found expression in some letters to the local papers. Last week it burst out with tremendous force. On Tuesday afternoon, the Town Council had a special meeting to consider the formal resolution sanctioning the promotion of a Bill to carry out the scheme, the cost of which is estimated at £820,000. But it was by no means formally passed. Complaints were made that full details had not been furnished, and that the whole thing had been "sprung" upon the Council, and was being "rushed through." It must be acknowledged that, inasmuch as the proposal was not submitted until the end of October, and then only in a crude form, and not brought up for public discussion till the 27th of November, there was some justification for the complaints. In fact, on this matter as on the question of purchase the Council appear to have been kept somewhat in the dark. Before the acquisition of the works, a member of that body raised his voice against the Corporation embarking upon an undertaking which would involve an immediate expenditure of £800,000—more than the Government had paid for an empire during the preceding twelve months—without a single opportunity being afforded for the matter to be fully considered. The purchase, however, was duly sanctioned by the ratepayers.

This was done in the belief that the works and sources of supply would be adequate for some years to come. Now the town is suddenly called upon to face the large outlay above alluded to; for Mr. Mansergh, who is advising the Corporation, told the Council plainly last Tuesday that they must go immediately to Parliament for authority to construct new works—in fact, that they ought to have included them in their Purchase Bill of last year. He warned the Council that the Water Committee would have "a terribly trying time," and their Manager "all his work set out," to keep up the supply during the eight or nine years required for the construction of the reservoir he proposes to make at Kinder; and he added that it would be the "supremest folly" to refrain from getting the necessary powers next year. A suggestion was made that no proceedings should be taken until another and "experienced" (!) water-works engineer had been appointed to examine other schemes. But it only found six supporters; while the resolution had six times as many. Shortly after this decision was arrived at, the resolution was submitted to the ratepayers at the statutory public meeting. It was very warmly discussed for about three hours without result; the Mayor adjourning the proceedings for a fortnight, in face of the expressed opinion of the Town Clerk that any postponement beyond a week might be detrimental to the Bill. The interval will, however, allow of fuller consideration of the scheme and of the position generally. The issue before the ratepayers, as the Mayor put it, is simply this: They must have water, and they cannot go on until such time as they absolutely need it. They must look ahead. The most eminent Water Engineer in the country urges immediate action; and it seems to us that the best course will be to follow his advice. The cost will be heavy; but if the outlay is necessary for the welfare of the town, there should be no hesitation in incurring it. The Corporation have got possession of the water-works; and they must do the best they can with them.

The Water Committee of the Coventry Corporation have lately been considering the subject of the prevention of waste; and, with the view of obtaining statistics and other particulars to help them in their investigation, a deputation visited Birkenhead, Bolton, and Blackburn, where they



had opportunities of seeing the Deacon meter in operation. In the first-named town it was introduced in 1882, with the result that the consumption has been brought down from 24 to 17·84 gallons per head. The capital outlay was £4600, against which there was a saving of £1000 a year. Only eight day and four night inspectors are employed. The Committee came to the conclusion that if the consumption in Coventry could be reduced to the Birkenhead level, the saving would be 416,500 gallons per day, or equivalent to an annual economy of £500. The water saved (6½ gallons per head) would supply an additional population of 14,800, and would, according to Mr. Hawksley's estimate of the increase, carry the city on for twenty years or more with the present area of supply, or for ten years with an added area. The Corporation at once decided to make a trial of the meter. The introduction of the waste-water meter at Coventry has not entailed a very large outlay; and, as inspection is a part of the new system, it will be interesting to watch the results. If the saving turns out to be what is promised, it will have been a highly beneficial step to have taken.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1411.)

AGAIN last week the course of business on the Stock Exchange was irregular; the markets being swayed from time to time by varying, if not conflicting, influences, which produced fluctuations. Taken generally, the markets were a little busier; but the fortnightly settlement was not without its effect. In the earlier portion of the week, the tendency was good, and all in favour of rising prices. But then a check set in, and there was a marked disposition to realize profits; so that thenceforward things were weaker and somewhat irregular. Outside the American Market prices in general closed easier; and the Funds and the gilt-edged division as a whole had their full share of depression. The Money Market was pretty stiff until after the settlement and the close of the month, when rates slackened off perceptibly. In the Gas Market, business was decidedly quieter, and no marked feature was prominently conspicuous. Upon the whole, the general tendency may be written as fairly firm, although movements were not uniformly in the upward direction. Still, the one or two retrogressions which checker the list were not of chiefest importance. In Gaslight issues, very moderate business was done in the ordinary, which changed hands daily at prices between 97½ and 98½, without any sign of a tendency to stray outside. But there was some little demand for the debenture stock; and the quotation advanced a point. South Metropolitan continued on the rise, and gained another point, marking top price. The few transactions recorded in Commercials pointed to a continuance of its long standing firmness. The Suburban and Provincial group were almost as devoid of business as ever, and nearly without movement. British, however, recovered a point. The Continental division was remarkably quiet, but fairly steady, if it had not been for a drop in European. Among the remoter gas undertakings, Monte Video relapsed, but Oriental advanced on the *ex div.* quotation. The Water Companies had their usual quiet time; the most noticeable feature being an inquiry for their debenture stock. Some further advances were made by two or three issues, while Southwark went the other way.

The daily operations were: Gas stocks were quiet on Monday, and remained firm at opening prices; quotations undergoing no variation. Tuesday's transactions were just as limited; but British rose 1, and the debenture stocks of Gaslight and South Metropolitan did the same. In Water, West Middlesex rose 2½; but Southwark fell 1. No greater activity was developed on Wednesday; but all were steady, while South Metropolitan gained 1. Thursday was a shade more lively; but Monte Video receded ½. Friday fell quieter; and European part paid was ½ lower. In Water, New River rose 2, and East London debenture 1; but Southwark fell 2. Saturday was quiet, and unchanged.

### ELECTRIC LIGHTING MEMORANDA.

The Shoreditch Vestry and their "Duplex Toy"—The Electrical Promoter again in Evidence—Fire and Life Risks of Electric Fittings.

THE notorious Shoreditch Vestry electricity supply *cum* dust destructor plant has again engaged the attention of the analytical accountant of the "Electrician," and also of the "Engineer," on the occasion of the publication of the third year's accounts. A year ago, the Vestry Committee gave an undertaking that for the future the accounts relating to electricity generation and dust destruction should be combined, in order that the ratepayers might be able to understand better how the splendid enterprise of their Vestry was working out. It was not pretended that the accounts were intelligible on the old basis.

Now the alteration has been effected, it will be a source of intense gratification to the amateurs of this kind of municipal trading to learn that neither the "Electrician" nor the "Engineer" is able to make head or tail of the statement, regarded as a guide to the actual condition of affairs. The former critic is driven to employ such words as "presumably," and "it does not appear," in his endeavour to ascertain the financial relations of the dustcart and the dynamo; but he is early obliged to confess that "to define fairly the reciprocal relations of the electricity and destructor departments is difficult, if not impossible." So that municipal book-keeping has triumphed once more in the noble effort to conceal results. All that the accountancy of the "Electrician" amounts to in this regard is the disclosure that an apparent working profit of 7·47 per cent. for 1899 has fallen to 4·33 per cent. for 1900. The critic of the "Engineer" is disappointed "at the paucity of the information that is available for consideration on the present occasion." He finds, chiefly, that the Vestry have spent £170,383 on their duplex toy; and, further, that the accounts are remarkably reticent as to the extent to which the refuse destructor helped the coal-store. "In fact, the absence of any details concerning the actual financial position of the destructor tends to disarm, if not prevent, a proper criticism of the joint undertaking for the past year." Next year, let us hope, the Local Government Board Auditors will be able to wipe off this scandal of "Progressive" book-keeping.

The electrical company promoter is incorrigible. He is always ready to jump, like the Old Man of the Sea, upon the back of any and every kind of electrical trading enterprise that appears to be finding its feet; and he can rarely be dislodged until the whole thing is crushed to earth. We have repeatedly argued here that one of the chief objections to the vague beginnings of electric power generation in bulk, and electric traction, is the opening it affords for company-mongering. Quite suddenly, during the past few days, we have been forcibly reminded of these forebodings by an outbreak of prospectuses of the "British Electric Street Tramways, Limited." It is unnecessary to describe the contents of these prospectuses in detail. They are stuffed, in the usual way, with references to the working of other concerns, and gilded with some names that seem sadly out of place. The "Electrical Review" of the 30th ult. reproduces all the particulars, and then adds the comment: "When such an astounding proposition can be put before the public, how can the electrical industry flourish? We can only hope that not 200,000 pence will be subscribed towards this preposterous demand." Our contemporary's City Editor is contemptuously sarcastic over the issue; saying that "it is difficult to imagine that there can be anybody simple enough to apply for shares in such a Company." After this, it might be considered libellous to repeat the names of the eminent electricians with which the front page of the prospectus is embellished.

There is evidence to the effect that the electricians who are responsible for the working of central supply stations, and those who are naturally interested in the fair fame of household electric light fittings, are becoming seriously uneasy in regard to the frequency of electrical fires and accidents to the person. The other day, a leading electrical journal laboriously attempted to poke some carefully-manufactured fun at those who dread electrically-caused fires. This was in respect of an alarming outbreak of fire at a Regent Street photographic studio, which was explained at the time by reference to the enormous consumption of current necessitated for working a photographer's business by electric light. Our contemporary's laughter was slightly hysterical, probably because of its knowledge that the modern fashion of distributing electricity at the maximum pressure permitted by law is something which may yet be found to cover some unpleasant surprises in the way of shocks and fires. Meanwhile, there is a continual occurrence of very nasty switch-board and live-wire "accidents," which, as an observer of the record very pertinently remarks, are monotonously ascribed to the fault of the individual sufferer. The man who is killed is invariably alone to blame. This is the almost inevitable Coroner's conclusion from the evidence, which is always to the purport that preventives and safeguards were provided, but not used. It is marvellous to the practical man how easily Courts of Law, from the lowest to the highest, are persuaded to give a rigid interpretation to the consideration of this matter of guards and protectors. If an employer cannot prove that every bit of moving machinery was securely fenced, he is held liable for every accident that may occur in connection with that machinery. The circumstance of the workman having perhaps knocked away the fencing for his own convenience, or having neglected to complain of the dangerous state of the machinery, is never regarded as absolving the proprietor. Similarly, it is usually sufficient to prove that a workman in an electric lighting station had india-rubber gloves to wear about his work, if he had chosen to use them, for a jury to find that it was his own fault if he met his death from electric shock. Another famous precaution in such cases is an india-rubber mat to lie in front of the switch-board. Even the Board of Trade appear to believe in the virtue of the mat. All these things, however, are likely to prove snares. Mr. Ferranti years ago propounded the only perfectly safe rule for the avoidance of shocks—that it should not be physically possible for any human body of ordinary dimensions to bridge over the distance between two naked conductors at dangerous differences of potential; but this rule has been treated as a counsel of perfection.



## BENZOLIZED WATER GAS AT ERFURT.

It will be fresh in the memory of readers of the "JOURNAL," that Professor Vivian B. Lewes, in the course of his lecture to the Institution of Gas Engineers last May, on "Water Gas and its Recent Continental Developments,"\* dwelt on the great merit of the system of using water gas for admixture with coal gas which had been introduced at the Erfurt Gas-Works. Thanks to the courtesy of Herr G. Martin, the Manager of the works, we are able to give to-day two photographic views of the water-gas plant—one (fig. 1) showing the generator with doors for clinkering and connections; and the other (fig. 2), the working stage with the operator at work, and the analyst making tests of the gas with Bunte burettes. Herr Martin has also kindly favoured us with a plan and elevations of the plant from which the illustrations on pp. 1396-97 have been prepared. The system of working adopted at Erfurt will be readily followed by reference to these figures.

Water gas is produced by the Dellwik-Fleischer process, which has been several times described in our columns. This system differs essentially from the common process in that the fuel in the generator is raised to incandescence by the combustion of a part of it by means of an excess of air, which is introduced at very high pressure; and the product of the combustion of the carbon of the fuel is, under these conditions, carbonic acid, in place of carbonic oxide, which is the chief product of the "blows" in the common water-gas process, in which the carbon of the fuel is generally maintained in excess of the air. The heat produced in the generator for a given consumption of fuel is consequently about three times as great in the Dellwik-Fleischer as in the common process; and therefore the fuel is raised to the proper temperature for decomposing steam in order to produce good water gas, with "blows" of about one-third the duration of the "blows" to which we are accustomed in working the common system. So far as the production of simple ["blue," or "straight"] water gas is concerned, the economy of fuel and time which these figures indicate is realized as net gain; but when there is employment for the large volume of producer gas which is formed during the "blows" in the common process, the latter may, for the particular purpose, be every whit as economical as the Dellwik-Fleischer system.

In the latter, the fuel used up in the "blows" is completely consumed in the generator, and only the sensible heat of the hot spent gases escapes from that vessel. The gases given off during the "blows" are truly "spent," or incapable of yielding more heat by a more complete combustion. The generator has had the benefit of the whole of the heat of the fuel consumed in the "blows." In the common water-gas process, however, the generator fuel which is consumed in the "blows" is not completely burnt *in situ*; the carbon of the fuel is carried away in the gases produced, in the form of carbonic oxide, and these gases constitute what is ordinarily known as producer gas. The carbon of the fuel contained in them in an incompletely burnt state—i.e., as carbonic oxide—can be conveyed to a neighbouring vessel or kiln, and its combustion completed by means of a further supply of air. In other words, if heat is required for any purpose in a vessel or kiln near the generator, it may be economically obtained from the producer gas which is formed during the "blows" in the common water-gas process. The whole system of generator and kiln is then capable of utilizing the fuel supplied to the common type of water-gas generator quite as effectively and economically as the Dellwik-Fleischer generator utilizes the fuel supplied to it merely in the production of simple water gas. In the common water-gas process, only a part of the heating value of the fuel is utilized in the generator; but the balance is available for utilization in any adjacent plant where heat is required, while in the Dellwik-Fleischer system the whole of the heating value of the fuel is utilized in the generator, and none is available for external work. In this argument, it is necessarily assumed that the water gas produced in the generator is not available for immediate consumption in the adjacent plant in which the producer gas can be utilized.

This somewhat tedious explanation indicates the reason why the Dellwik-Fleischer water-gas plant—which is admittedly superior to earlier apparatus for the production of simple or "blue" water gas—has not superseded the Lowe type of carburetted water-gas plant, as exploited in this country by Messrs. Humphreys and Glasgow, the Economical Gas Apparatus Construction Company, and Messrs. S. Cutler and Sons. Under ordinary conditions of working, and especially when the proportion of oil gas added to the coke consumed in the generator is not too low, this type of carburetted water-gas plant utilizes the heating value of the coke used as economically as does the Dellwik-Fleischer plant, though in a different direction. Heat is required for the gasification of the oil used; and it is obtained conveniently and economically from the producer gas which is formed during the "blows." Hence, wherever water gas has to be "carburetted" by the cracking of oil, the Dellwik-Fleischer system is not superior to the improved Lowe process. But in Germany and other countries where suitable oil for cracking is not obtainable at a reasonable price, by reason of heavy import duties on petroleum, or from other causes, there has lately been



FIG. 1.

adopted a system of carburetting, by means of the vapour of readily volatile hydrocarbons, which admits of full advantage being taken of the special economy of the Dellwik-Fleischer method of producing water gas. This system of carburetting water gas, made by that method, by means of benzol vapour, is in use at Königsberg, Erfurt, and elsewhere, as Professor Lewes pointed out on the occasion already referred to. He also emphasized the fact—which was clearly made out in a series of articles on the "Enrichment of Coal Gas" in the "JOURNAL" in September and October, 1897—that benzol was superior to fatty hydrocarbons for such a purpose, as it possesses nearly four times as high an enriching value as carburene.

Now it has been often shown that simple water gas is, by itself, a bad basis for an illuminating gas. Practically, a quantity of benzol vapour or other illuminating hydrocarbon must be added to it before it begins to afford a flame having an appreciable luminosity. In other words, it does not respond at once to the addition of a carburetting agent. In carburetted water gas made by the Lowe process, the gaseous constituents derived from the oil neutralize this lack of efficiency of simple water gas as a foundation of illuminating gas; and there is not a great initial expenditure of illuminating hydrocarbons before the gas responds normally to their carburetting action. There is, however, some measure of loss in this direction, for carburetted water gas always contains a higher proportion of illuminating hydrocarbons than does coal gas of the same candle power; and as the hydrocarbons are very similar in nature and relative proportions in the two gases when both are made at the high temperatures now in vogue, the difference must in reality be due to the different nature of the diluent or non-illuminating constituents of the two gases. It is unnecessary, on this occasion, to enter on a discussion of the reasons for this different effect of the diluent gases of carburetted water gas and coal gas. They are now apprehended tolerably exactly, and were touched upon by Professor Lewes in the lecture already mentioned. But in any consideration of the enrichment of coal gas, the broad facts alluded to above must not be ignored; otherwise we shall commit the fallacy of supposing that a mixture of (say) equal volumes of 16-candle power coal gas and 16-candle power Lowe carburetted water gas has not a higher illuminating power than 16 candles. Anyone who is dubious of the value of Lowe carburetted water gas as an enriching agent, or of coal gas as a basis, should make observations of the illuminating powers of the two gases of as nearly as possible equal candle power, and of a mixture of the two.

Hence, it seems that simple water gas is not to be commended as the basis of an illuminating gas if coal gas can be made at about the same cost. It requires too great an expenditure of carburetting material, in order to convert it into an illuminating gas. But it may usefully be either slightly carburetted with benzol and then added to a greater volume of coal gas, or it may be added to coal gas and the mixture carburetted with benzol. The first plan is practised at Königsberg; and as Professor Lewes has pointed out, an addition of less than 20 per cent. of 9-candle power benzolized water gas to 16-candle coal gas, gives a mixture of over 17-candle power. Such a result, having regard to the cheapness of benzol, and the fact that only about 0.14 gallon is required per 1000 cubic feet of the mixture, may seem so satisfactory that it would be futile to seek means

\* See "JOURNAL," Vol. LXXV., p. 1194.



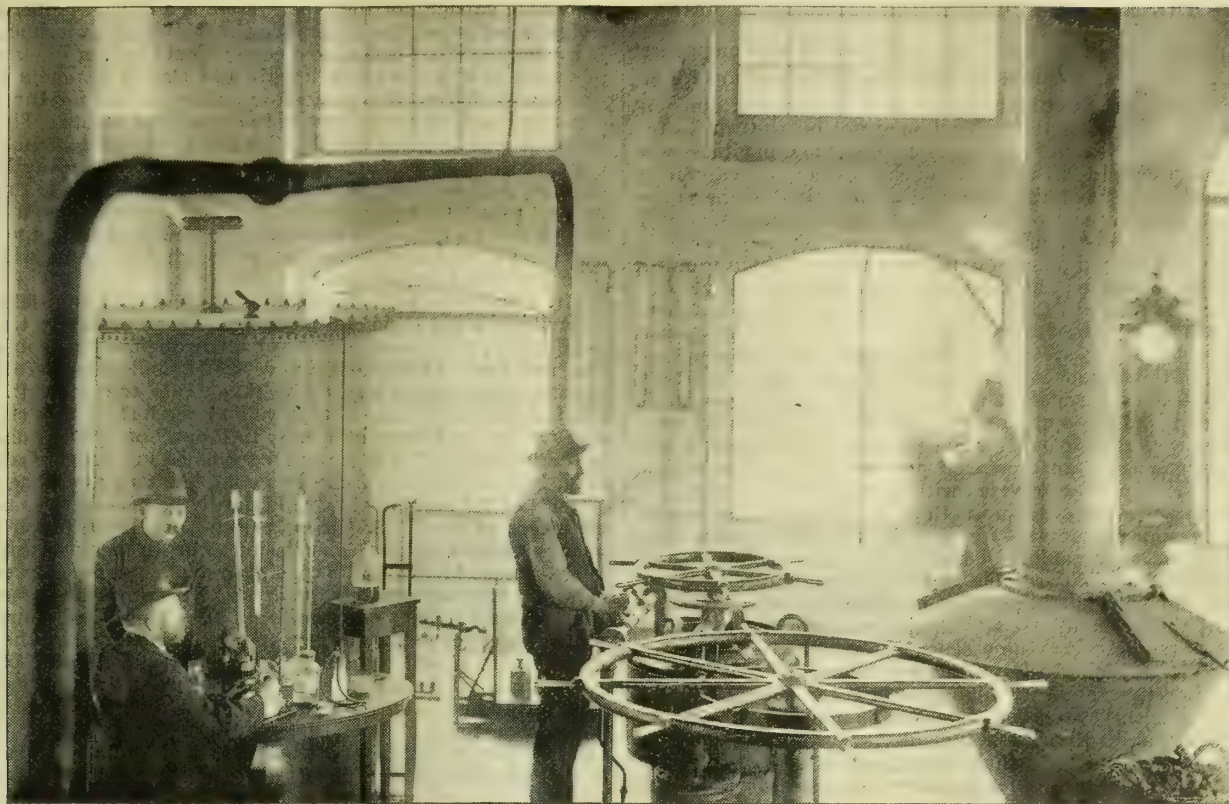


FIG. 2.

whereby it could be improved upon. But if, instead of adding benzolized water gas to coal gas, simple water gas is added under certain conditions to coal gas and the mixture is benzolized, a greatly improved result is actually attained, as the Erfurt trials have shown.

The water gas is made at Erfurt in the Dellwik-Fleischer generator, of about 9000 cubic feet productive capacity per hour, shown in the illustrations. The plan and elevations show clearly the general arrangements of the plant. A boiler working at a pressure of 60 lbs. per square inch supplies steam to the generator through a 2-inch steam-pipe, and also drives the fan by which the blast of air for the "blows" is obtained. The air-inlet pipe is 12 inches in diameter. The generator is provided with reversing valves, to admit of the runs being made either from bottom to top or top to bottom, and with a closed charging hopper, which will appear an innovation to those familiar only with the English or American forms of generator. The top of the generator-shaft is provided also with a spark-catcher, which is, of course, more necessary than with the Lowe carburetted water-gas plant, owing to the facts that the blast is under higher pressure and that the shaft issues directly from the generator, and consequently the spent exit gases do not traverse checker-work chambers in which sparks would be deposited. The water gas passes from the generator to a scrubber, and thence by a 12-inch main to the relief gasholder, which has a capacity of 21,200 cubic feet. From the gasholder, the water gas flows through an 8-inch main to the station-meter, and thence by 8-inch connections to the foul main of the retort-house. It there mixes with the crude coal gas, and the mixture passes through the usual plant to the station-meters. An exhaustor, driven by a 2-horse power gas-engine, is provided in case it may at any time prove desirable to force the water gas direct from the relief gasholder to the coal-gas main at the inlet to the purifiers, instead of passing it through the foul main of the retort-house. Up to the present, however, this method of working has not been applied; and the exhaustor has therefore not been used. Connected with the 24-inch main which conveys the gas from the meters to the holders, is a carburettor of the Leybold pattern, by means of which the mixed gas is carburetted with benzol to the customary illuminating power of about 16½ English candles. The arrangement of the mains and valves will be readily understood from the illustrations given.

The results of the working of this scheme at Erfurt cannot yet be given with any certainty, as the plant has not been long at work, and will be used continuously and under normal conditions for the first time this winter. These particulars will be awaited with the greatest interest. In the meantime, we may glance at the results of preliminary work as given by Professor Lewes. Putting aside the problematical figures as to the cost of production of coal gas, water gas, &c., and looking only at the quantities of benzol used at Erfurt and elsewhere for a given degree of enrichment, we shall be able to see what is the extent of the economy which is claimed for the Erfurt system.

At Erfurt, according to Professor Lewes, 1 gallon of benzol brings the illuminating power of a mixture of 7500 cubic feet of 16-candle power coal gas and 2500 cubic feet of simple water

gas to over 16 candles. Thus 2500 cubic feet of non-illuminating water gas is given an illuminating power of over 16 candles. At Königsberg, also, according to Professor Lewes's figures, 7200 cubic feet of mixed gas, consisting of 16-candle coal gas to which 17 to 20 per cent. of benzolized water gas has been added, has an illuminating power of over 17 candles, and 1 gallon of benzol has been used in benzolizing the water gas. Now the volume of benzol vapour will be relatively quite small, and the mean proportion of simple water gas in the mixture may be taken at 18 per cent. Hence the 7200 cubic feet of gas carburetted by means of 1 gallon of benzol will consist of about 5900 cubic feet of coal gas and 1300 cubic feet of water gas. But since the illuminating power of this mixture is over 17 candles, about one-fifth of the gallon of benzol will have been required merely to bring the gas from 16 to 17 candle power. Hence four-fifths of a gallon of benzol impart to 1300 cubic feet of non-illuminating water gas an illuminating power of over 16 candles. At Erfurt, 1 gallon of benzol gives an illuminating power of over 16 candles to 2500 cubic feet of water gas; at Königsberg, to only about 1600 cubic feet. Therefore the Erfurt system appears to give a net gain represented by 900 cubic feet of non-illuminating water gas being converted to 16-candle power gas, for every gallon of benzol used or every 10,000 cubic feet of mixed gas made. This is on the assumption that Professor Lewes's figures are correct for both cases, though it should be added that they display some inconsistencies and are, for Erfurt at least, based only on preliminary trials. The 900 cubic feet, or thereabouts, of water gas must evidently have had illuminating quality imparted to it by vapours which otherwise would have been condensed and deposited in the coal tar. Now something over half-a-gallon of benzol would appear, from the Königsberg figures, to be required to give an illuminating power of over 16 candles to this 900 cubic feet of water gas, which is associated, in the mixed gas, with 7500 cubic feet of coal gas and other 1600 cubic feet of water gas. Hence the tar obtained in the manufacture of 7500 cubic feet of coal gas must yield to the 900 cubic feet of water gas over half-a-gallon of benzol, or the equivalent thereof in illuminating duty. But the 8 gallons or so of tar which would be obtained in the manufacture of 7500 cubic feet of coal gas would yield, in the hands of the tar distiller, more nearly half-a-pint than half-a-gallon of benzol. Probably there is a considerable loss of benzol from the tar before it reaches the tar distiller; but the difference is too great to be wholly accounted for in this manner. Actually, it seems that the Erfurt practice of introducing water gas into the foul main, and benzolizing the mixed gas to the required degree, results in an economy of enriching material (benzol) which is greater than can be accounted for by the retention in the gas of all the benzol and similar vapours which ordinarily would be condensed and deposited in the tar. We shall await with the greatest interest the report of actual working results at Erfurt and other places where benzolizing processes are in operation, in the hope that some explanation may be afforded by them of this apparent anomaly.

In the meantime, we must congratulate Herr Martin on having introduced a scheme which is undoubtedly a success, whatever its underlying principles may prove to be.



## WHAT IS THE MAXIMUM DELIVERING CAPACITY OF MAINS?

AT the present juncture, when the attention of gas engineers is being powerfully attracted towards the technical novelty of town's gas distribution at high pressures, a few observations on the physical science of the subject may not be thrown away. Indeed, unless students of the elements of gas manufacture, and practical men unread in the theory of the subject, are careful to distinguish the truths of the matter, it is possible that they may conceive quite erroneous ideas respecting the purposes and possibilities of high-pressure gas distribution. To begin with, it is necessary to bear in mind the different objects which the distribution of town's gas at pressures considerably above the normal may be required to subserve. These are two in number. High pressures may be desired for the service of a high-power incandescent lighting system, in which case the minimum requirement of the system in this respect fixes the datum to which the distributing engineer must work. This is a purely mechanical question; and its solution is not affected by economical considerations. That is to say, for the purpose of actuating these high-power gas-lights an increased pressure of gas is essential, and must therefore be provided without regard to its cost. If the high-pressure gas costs more than the low-pressure supply—within reason, of course—this is not the consideration that determines the acceptability of the whole thing. Of course, if the excess of cost, or the trouble and risk, of a high-pressure gas supply for intensified lighting were extreme, the whole system would fail to commend itself to the judgment of the technical and general public. It is the essence of the claim to permanent success made on behalf of the modern intensified gas lighting systems, that the necessary high-pressure gas supply can be safely and efficiently provided, at a reasonable, though still an extra expense, and without real difficulty.

The second object for which high-pressure gas distribution may be proposed is of a different nature altogether. It is that of saving expense, as compared with the usual and customary transmission of gas through pipes at low pressures, by making pipes of the same size carry more gas. One of the strong partisans of this way of transmitting and distributing gas is Mr. Frederick H. Shelton, of Philadelphia, whose important memorandum on the subject, contributed to the International Gas Congress in Paris, was published in the "JOURNAL" for Sept. 25 last. Mr. Shelton is the pioneer in this particular development, which is described by himself as consisting in the supply of a town with gas directly from a high-pressure main through regulators, from a point nearly 5 miles away, without the use of a holder or any storage receptacle.

Older examples of relatively high-pressure gas transmission—distinguishing this operation from distribution—exist in the trunk mains from Beckton, which feed the district gasholders of the Gaslight and Coke Company. Originally designed to work at ordinary low pressure, the exigencies of the undertaking have led to the driving pressure being continually increased, until we understand that it occasionally attains 48 inches of water, which is about 1.75 lbs. per square inch. The usual driving pressure is about half this figure. In a paper read before the Institution of Gas Engineers, in 1898, and given in the "JOURNAL" for June 21 of that year (p. 1446), Mr. Fletcher W. Stevenson described a similar arrangement in use in Sheffield; and in the course of the discussion on the paper, Mr. George Livesey and Mr. C. C. Carpenter described what had been done by the South Metropolitan Company in the way of increasing the delivery of gas from a district feed main by "boosting" the gas into it under increased pressure at the originating end. A small, but, as we shall show, significant, contribution was made to this debate by Mr. F. D. Marshall, who stated that Mr. Irminger, of Copenhagen, had adopted the equivalent expedient of sucking the gas through the transmission mains, instead of driving it under high pressure.

Mr. Shelton would probably say, justly, that all these other examples differ radically from his application of the same principle, in being cases of very much less exaltation of pressure, and also of difference of use. But we venture to remark that Mr. Shelton's experiment has not been quite accurately described in his paper. What he does is to create a store of compressed gas, in the form of a cylinder 3 inches in diameter and 5 miles long, from which the consumers draw, as and where they please, as much gas as they want. It is, in short, a gasholder. There is nothing in the paper to show that the arrangement could not be tapped equally satisfactorily at either end. In other words, the paper does not offer any data to prove that this Royersford example is a case of increasing the *delivering* capacity of the gas-main by reason of the high pressure. The pressure appears to be as high at the far end as at the beginning, less 2 lbs. or 3 lbs. for friction. Now it is obvious that the delivering capacity of a gas-main depends upon the *difference* of the pressure at the two ends—that is to say, upon the fall. If you start at 20 lbs. pressure and end at 17 lbs., you do not pass any more gas than if you began at 3 lbs. and ended at zero pressure.

If Mr. Shelton drives from one end of his Phoenixville-Royersford main at 20 lbs., and finds at the other that his reducing regulators are not much needed, then he is transmitting gas at the pressure named. He may be doing this; but we have no evidence of the fact. If he is doing it, he should be able to supply some interesting and valuable data as to the extent to which the increase of driving pressure actually increases the

delivering capacity of the pipe. Here is a crucial point, which, so far as we know, has never been investigated experimentally. It is, simply, What is the most economical head, or difference of pressure, at which a given length and size of gas-main can be worked, to deliver the greatest quantity of gas for the power expended and the prime cost of the main and plant? The textbooks do not help one to solve this problem. Mr. Shelton says, truly, that, other conditions being the same, "quadrupling the pressure doubles the flow." He should have said also that this general rule only applies to small differences of pressure, such as give flows well within the carrying power of the pipe. We are wholly without information as to what happens when the pipe is really doing its best.

Mr. Shelton adopts the optimistic view that the delivering capacity of a gas-main can be increased ten or twelve times by quadrupling the pressure, or head, all through. This contention has not been experimentally verified; and there are many countervailing influences to be taken into the account. The chief of these is friction. It is well to read Dr. Pole's classical essay "On the Motion of Fluids in Pipes," originally published in the "JOURNAL" in 1852, and reproduced in "King's Treatise" (Vol. II., chap. iv.), to arrive at a complete understanding of the physics of the matter. It should hardly be necessary to remind engineers of Mr. F. S. Cripps's useful graphic solution of the usual problems of gas transmission; but we mention this work here because Mr. Cripps is careful to explain that the pressures given by his diagram are "the *difference* between the pressure at the inlet and outlet ends of the pipe." This is, of course, the motive power of the discharge; and it is independent of the internal pressure at which the fluid may be contained in the pipe.

Dr. Pole states that the effect of friction in a pipe is independent of the hydrostatic pressure to which the fluid is subjected. This is true; and it shows that there is at least no advantage in this respect in putting the contained fluid under high pressure. When we come to consider the case of the moving fluid, we are immediately reminded by Dr. Pole that the skin-friction of a fluid moving along a pipe varies with the velocity. He did not know the exact relation; but he made a "shot" at it, and put the rate of increase of friction as equal to the square of the velocity. This is a very serious matter. The particles of fluid in a pipe move faster at the centre than at the circumference. This effect is due to skin-friction between the fluid and the pipe-surface, and also to the viscosity of the fluid itself. What the proper arithmetical or algebraic expression of the effect may be, has not been determined. Besides, at high velocities of motion a third kind of brake-action comes into play—eddying. Evidently, therefore, there is in the case of gas-mains a maximum economical *velocity* beyond which their delivering capacity cannot be driven. This quantity has no relation with the hydrostatic pressure. It matters nothing whether the main carries gas at a mean hydrostatic pressure of 20 lbs. to the square inch, or of 1 inch of water. There is a point beyond which the discharging rate of the cross-section of the end of the main cannot be economically urged; and it is of supreme importance to determine this point in every case.

Obviously, therefore, the force of Mr. Irminger's proceeding remains unaffected; and it matters nothing, on physical grounds, whether the difference of pressure which induces the flow of gas through the pipe is caused by pressure at one end or sucking at the other. Up to a point, and under certain easily-defined conditions, sucking would be more effective than driving; but usually, other considerations determine the choice in favour of driving.

Let us not, in conclusion, run away with the notion that extremely high pressures in gas-mains—that is, pressures beyond anything that can be directly utilized for lifting gasholders, or actuating intensified gas lighting systems—can effect anything to the advantage of the general undertaking, beyond making greater use of the mains as storage. This, of course, may be a good thing to do; but it is at least desirable that we should clearly understand that it is being done. There may be a preferable alternative. On the other hand, as regards speeding-up the delivery, we lack information as to the ultimate possibilities of "boosting" by exhausters or fans. Pole, Barlow, and Cripps all fail us here—not through their own fault, but simply because the question refers to higher differences of pressure than anything they worked upon. We venture now to bring the practical question to a point, by declaring that the general rule about doubling the flow by quadrupling the pressure (meaning the *head*, of course) fails for coal gas after the head surpasses 18 inches, with large pipes of any reasonable length. Beyond this maximum economical velocity, the increased flow is insignificant as compared with the expenditure of power necessary to produce it. Anyone who will either refute or confirm this hypothesis, shall receive the hospitality of our columns for the purpose. We can offer no fairer terms; and the gage is down for all comers.

The Bucharest correspondent of the "Daily Express" repeats an announcement contained in several journals to the effect that the Standard Oil Company have obtained from the Roumanian Government immense privileges for petroleum mining on all tracts owned by the Government, as also the right of exploration and shaft-sinking wherever traces of oil are found. Besides this, the Company have the right to construct pipe-lines wherever necessary. The price of this concession, which gives the Company almost the entire monopoly of mineral oil "welling" in Roumania, is stated to be only £400,000.



## LOCAL ADMINISTRATION AND TAXATION.

IN the notice of the water section of the recently issued annual report of the Local Government Board which appeared in the "JOURNAL" for Nov. 6, we remarked that these volumes increase in bulk year by year. This is shown by the fact that whereas what may be called the report proper—that is to say, the portion which is signed by the President (the Right Hon. Henry Chaplin)—last year occupied 185 pages, the one lately published extends to 206 pages; the appendices, of which there are seventeen, occupying 744 pages, as compared with 684 pages before. The various subjects dealt with are arranged in five groups, embracing respectively: The work of county councils under the Local Government Act, 1888; proceedings under the Local Government Act, 1894; the relief of the poor; the public health and local administration; and, lastly, local taxation and valuation. These are all subjects of general interest; but it is with the fourth group that readers of the "JOURNAL" are specially concerned. We purpose, therefore, giving, as concisely as possible, an indication of the work done in connection with matters relating to public health and local government, so far as it is considered worthy of being recorded by the Board.

As no projects, whether sanitary or administrative, can be carried out without funds, it will be well to take note of the extent to which sanitary authorities incurred indebtedness in the period covered by the report, and for what purpose they required the money. We find the Board sanctioned the raising of £10,026,336 last year by urban and rural authorities; the former requiring £443,482 for water supply and £1,461,228 for sewerage and sewage disposal, and the latter £125,104 and £406,238 respectively. Joint boards asked for £74,888 for carrying out works coming under the second head. In addition to these sums, £14,260,981 was authorized by Parliament. Many applications were made to the Board for power to raise money for the execution of works of sewage disposal involving the adoption of one of the bacterial processes. Where they were acceded to, the Board required an undertaking from the local authority that, in the event of the method adopted not turning out satisfactory, some other approved method would be substituted. Under section 243 of the Public Health, 1875, the Board recommended the Public Works Loan Commissioners to make advances amounting to £73,070 to local authorities. Of this sum £45,857 was required by town and urban district councils, and £27,213 by rural councils. Under the Public Works Loans Act, 1898, the Board's recommendation is no longer necessary, in the case of loans under the Public Health Acts, unless the period allowed for repayment exceeds thirty years. Since the constitution of the Board in 1871, they have sanctioned the raising of £102,161,317 by urban and rural authorities for the carrying out of various sanitary improvements, electric lighting works, public baths and wash-houses, &c.

Among the Provisional Orders issued by the Board last year, 79 were under the Public Health Act, 1875, and 3 under the Gas and Water Works Facilities Acts, 1870 and 1873. Additional powers were conferred on local authorities in regard to their gas and water works, including the extension of limits of supply and the purchase of works. The largest amount sanctioned was £500,000 to the Manchester Corporation in respect of their gas undertaking; Rotherham was allowed to raise "such sums as may be necessary;" Ramsgate had £30,000; Wallasey, £12,500; and Southport, £5000. With regard to water-works, Reading had £50,000; Southampton, £25,000; Ramsgate, £20,000; and Bath, £6700. The three Orders issued under the Gas and Water Works Facilities Acts related to Ashburton, Wallingford, and Wokingham. The 82 Provisional Orders above referred to were included in Confirmation Bills, and all but two were confirmed by Parliament.

Under section 62 of the Public Health Act, 1875, any district council may apply to the Board to determine the reasonable cost at which water may be required to be furnished to houses without a proper supply; and the Board are empowered, by section 8 of the Public Health (Water) Act, 1878, to fix a general scale of charges for the whole or any part of the district in question. Eight such scales were fixed last year for the urban councils of Ashby-de-la-Zouch, Leigh-on-Sea, and Walton-le-Dale, and the rural councils of Eastry, Ludlow, Penrith, Stratford-on-Avon, and Wigan. The Board also issued an Order, pursuant to an application made to them under the section first named, determining the reasonable cost of providing a supply of water in the case of a particular house in the urban district of Sunbury-on-Thames. Under section 3 of the Act of 1878, the Board issued Orders determining the reasonable cost at which water might be furnished to certain houses specified; while in virtue of section 11, they invested several district councils with enlarged powers under the Act. The question of the pollution of rivers and streams occupied the attention of the Board during the past year; and ten Orders were issued, under the West Riding of Yorkshire Rivers Act, 1894, sanctioning the taking of proceedings by the West Riding Rivers Board against manufacturers, for the pollution of rivers and streams. In some cases, however, the Rivers Board preferred to put in force the alternative power they possess of proceeding under the Rivers Pollution Prevention Act; and accordingly the Superior Board issued two Orders consenting to that course. But in six cases they decided to withhold their consent to the institution of proceedings.

Apart from the local inquiries conducted by the Engineering

Inspectors of the Board with regard to applications made to them under the Local Government Acts of 1888 and 1894 and the Municipal Corporations Act of 1882, others, to the number of 1167, were directed. The majority of them had reference to the raising of money for carrying out works of a permanent character under the provisions of the Public Health, Electric Lighting, and other Acts. There were 68 inquiries in regard to petitions for the issue of Provisional Orders under the Public Health Act, 1875, the Gas and Water Works Facilities Act, 1870, and the Housing of the Working Classes Act, 1890; and eleven related to objections to the construction by local authorities of works of sewerage or water supply beyond the limits of their districts, and to the making of reservoirs to hold more than 100,000 gallons of water. Among the subjects of the other inquiries may be mentioned complaints, under section 299 of the Public Health Act, 1875, of the default of district councils in the performance of their duty in the matter of sewerage and water supply, applications for consent to the taking of proceedings against manufacturers on account of the pollution of rivers, and for fixing a scale of charges at which water may be required to be furnished to houses without a proper supply. In an appendix to the report is given a list of the Acts obtained last year by local authorities and by gas and water companies in England and Wales (exclusive of the Metropolis). The approval of the Board, as far as matters within their jurisdiction were concerned, was duly given, under section 4 of the Borough Funds Act, 1872, to the resolutions of 52 urban councils to promote 59 Bills, and to those of 71 councils to oppose 54 of them. During the year, the Board made reports to Parliament on 146 Private Bills, of which 69 were promoted by local authorities and 77 by companies. In 17 cases it was found necessary to make supplementary reports, in consequence of alterations made in the Bills during their passage through Parliament. The portion of the report bearing upon the Metropolitan Water Supply has already been dealt with.

The District Auditors of the Board had before them the accounts of 803 urban district councils, 663 rural district councils, 43 port sanitary authorities, 66 joint boards for sanitary purposes, 20 isolation hospital committees, and 234 joint committees appointed wholly or in part by district councils. They made a considerable number of disallowances and surcharges; 624 being in the accounts of urban district councils and their officers and 14 in those of gas, water, and sewerage boards. Among the appeals made to the Board against disallowances, &c., they decided 335. Particulars of the appeals, and of the Board's decisions thereon, are tabulated in one of the appendices. The next portion of the report is devoted to a review of the labours of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter) and his assistants, which were fully dealt with in our columns when the separate Blue-book in which they are recorded was published.

The remaining subject to be noticed is that of local taxation and valuation. The Board prepared and presented to Parliament in the past twelve months returns showing, for the financial year 1897-8, the receipts, expenditure, and outstanding loans of the various local authorities in England and Wales. They include summaries of the accounts of no less than 30,132 of these bodies. A summary of the statistics is given in one of the appendices. It shows that the aggregate receipts amounted to £69,144,543, which included £5,091,467 from gas-works, £3,292,098 from water-works, and £427,310 from electric lighting. The expenditure, so far as it was not defrayed out of loans, came to £67,823,716, including £3,956,793 for gas-works, £1,284,478 for water-works, £1,283,254 for public lighting, £218,200 for electric lighting (other than for public purposes), and £1,562,667 for sewerage and sewage disposal. Included in the total expenditure is a sum of £14,218,949, "principal of loans repaid and interest on loans." It is explained that this sum cannot be apportioned exactly between the various works and purposes for which loans were raised; but £970,000 is put down for gas-works, £2,230,000 for water-works, and £190,000 for electric lighting. The outstanding loans of the local authorities in England and Wales at the end of the year amounted to £262,017,152, of which £18,292,119 was for gas-works, £47,867,413 for water-works, £3,674,641 for electric lighting, and £27,190,006 for sewerage and sewage disposal works. The relative proportions which the above grand total bore to the National Debt at the end of the financial years 1874-5 and 1897-8 respectively are strikingly shown by the following figures: 1874-5.—Debt, £768,945,757; outstanding loans, £92,820,100, or 12.07 per cent. 1897-8.—Debt, £634,435,704; outstanding loans, £262,017,152, or 41.30 per cent. According to these figures, the decrease of upwards of £134,000,000 which took place in the period named in the amount of the National Debt was accompanied by an increase of more than £169,000,000 in the total outstanding loans. Compared with the population of 1891—29,002,525—the loans were equal to £9 os. 8d. per head; and taking the rateable value at Lady-day, 1897, as £168,664,993, they were equivalent to £1 11s. 1d. in the pound. An interesting table shows how the amounts received from the public rates by the several classes of local authorities have risen since 1873. In that year the total was £18,906,137; in 1897-8, it was £38,882,162—an increase of no less than £19,976,025. It is explained that much of this is attributable to "the needs of an increased population," and it has to a certain extent been accompanied by a rise in rateable value—the figures given being 32.7 and 50.1 per cent. respectively. Moreover, some was due to legislation which took effect immediately before or during the period specified. The increase in the amount of rates raised to meet the expenditure of School



Boards (established under the Elementary Education Act, 1870) is cited by the Board as worthy of special notice—the amount raised in 1873-4 being £251,906, and in 1897-8, £4,909,696. This is a great increase; and some ratepayers may be inclined to ask whether, after all this outlay, the product has not been a set of sciolists and Hooligans.

#### MR. L. F. VERNON-HARCOURT ON THE PROFESSION OF CIVIL ENGINEERING.

THE November issue of the "National Review" contained an interesting article by Mr. L. F. Vernon-Harcourt on "Civil Engineering as a Profession," tracing its modern history from the days of Smeaton (of Eddystone Lighthouse fame) down to the present time, and also outlining the steps in the career of a civil engineer of to-day from his pupilage to the top of the professional tree. It is to the latter part of the article that we should especially draw attention. In the historical introductory pages, Mr. Harcourt points to the ever-widening field of activity open to the engineer (clearly foreseen in 1828 by the founders of the Institution of Civil Engineers, who, when applying for its charter, remarked that the scope and utility of the profession was "limited only by the progress of science, and would be increased with every discovery in philosophy, and its resources with every invention in mechanical or chemical art"); to the increasing demand for special knowledge in each sub-division of the profession; and to the inevitable consequences—namely, the ever-growing tendency towards specialization on the part of the individual, and the greater need of careful scientific training for those desirous of making their mark in the engineering world.

In the first half of the century, when the consequences of the discovery of the power of steam were beginning to make themselves felt in the development of our railway systems, and the demand for engineers exceeded the supply, "a mechanical turn, however slight, and a preference for an outdoor life were considered ample evidence by parents that their sons were fitted to become civil engineers;" and for a long time practical training was all that the student received. Nowadays, however, the need of a preliminary training in theory and science is required, and rightly required, of most engineering pupils. We say of "most" engineering pupils advisedly, because there is reason to fear that the need of some preliminary qualification and proof of fitness for his profession being required of every would-be engineering pupil, is not recognized as fully as it should be in every quarter of the gas world. The sons of officials in some companies are accepted as pupils by the works managers without any, or with little, regard to their ability or to their antecedent education. In the course of time, they are given positions of responsibility in the concern, after by no means too careful an examination into the results of their under-studying of a man who was perhaps chosen in the same way—namely, on account of his seniority. By the aid of a constant shoring-up by competent foremen, such "engineers" may, and do, run works without disaster. If the sole qualification necessary to entitle a gas engineer to claim credit for his lifework were the fact that he had never come to obvious grief, the system of selection outlined might be defensible; but if it be desirable that gas-works should be in the hands of men of scientific training, proved ability, enterprise, and initiative, men capable of taking a broad view of the problems of management as well as of manufacture; if the ideal of gas engineering be the most economical production of marketable gas—then the sooner some managements reconsider their methods of admitting pupils and selecting engineers, the better.

The subjects enumerated by Mr. Harcourt as of most importance to student engineers are "mathematics (especially trigonometry), statics, dynamics and hydrostatics, elementary physics, hydraulics, the principles and practice of surveying, mechanical drawing, and graphic statics. Some knowledge of geology, chemistry (particularly in gas engineers), and meteorology is desirable; while acquaintance with two or three of the principal foreign languages—such as French, German, and Italian—is very serviceable for reading foreign engineering publications, visiting public works abroad, and discussing engineering problems with foreign engineers." A pretty long list; but through how many can the man who wishes to be a "thorough-bred" gas engineer safely put his pen?

Before leaving the subject of pupil engineers we may notice one other point, and that is the need that students on a works should be allowed to learn every branch of the duties of the engineer, and not be kept merely to that section in which they are found to be most useful. It is not a very acceptable principle to the engineer-in-chief, and is only too rarely acted upon, that the pupil is best employed on work of which he is most ignorant. But how else is he to become generally efficient? To take a premium for teaching a pupil, and then to only use him as an assistant on the work he knows best, is something very close to obtaining money under false pretences.

Having passed from a pupil to an assistant engineer, and having acquired some experience and reputation in that sphere, it becomes necessary for a young man to decide as to the best course for him to pursue—to endeavour to become a works manager or engineer to some undertaking, or to set up in practice on his own account. The latter is, in the absence of local influence or of

an inherited practice, a very hazardous experiment for any but the most reputed engineers. Mr. Harcourt points out that one of the surest ways to attain the position of consulting engineer is to be the son of one; and he protests "in the interests of the public, and of the reputation and progress of the profession," against the too-common custom of a father who has achieved eminence in the engineering world by his own merits, taking his sons or chief assistants into partnership, and thereby enabling them to trade upon his name while frequently not possessing his qualifications.

Another feature of modern times not tending to the advancement of civil engineering in the estimation of the public, is the tendency for engineers of high reputation to accept more work than they can possibly superintend efficiently, with the result that much of it is delegated to subordinates. "Schemes, reports, and designs are prepared, and works are carried out, in a kind of routine manner, by numerous assistants, with little of the guiding hand of the engineer (except in very important cases), though the work has been obtained in consequence of his personal repute. Much, in such cases, depends on the capacities of the assistants, though the responsibility and credit rest with the engineer; and the work would often be more satisfactorily done by a specially competent rising engineer, who could attend personally to the matter, and give it more thorough consideration." This is a difficulty that is encountered in other professions as well. The name of a firm of well-known accountants at the foot of a balance-sheet often means nothing but that a clerk employed by the firm has more or less efficiently audited the accounts; but the public do not understand this. And how often does the leading Q.C. take his retaining fee, while the Junior Counsel is the only one to be seen in Court?

"Civil engineering," adds Mr. Harcourt, "being a scientific profession, should not be suffered to degenerate into a business." We confess we do not quite appreciate the point in this remark. It is certainly not so satisfactory for the public that work especially given to and undertaken by a certain engineer should be executed by another employed by the first; but why the second engineer should be said to be doing something which "does not require very special qualifications for its successful prosecution"—Mr. Harcourt's definition of a business—when if the same work were carried out by his superior it would be a professional service ("requiring very special qualifications," &c.), is somewhat difficult to understand.

As to what qualities are most valuable in an engineer, Mr. Harcourt specifies "a very retentive memory; a power of rapidly assimilating the main features of a problem, and of separating the essential from the unimportant facts; a capacity for observing carefully the chief parts of a site inspected, and carrying away a sort of photographic picture of them in his mind which can be called up when required; and the capability of weighing opinions and evidence, of noting the scientific bearings of the question, of investigating any possible objections, and of arriving at a sound decision." He should be able, also, to write a clear and forcible report, or technical essay or book; should be able to take part in discussions on professional topics; and be capable of thinking rapidly and expressing himself clearly in the witness-box or before a Parliamentary Committee. One is tempted to remark, "*machinator nascitur, non fit*;" and so, indeed, is it true of the very first rank in the engineering—as in every other—profession. You cannot manufacture Stephensons, Brunels, or Liveseys, any more than you can Huxleys, or Gladstones, or Shakespeares. But that is, of course, no reason why we should not try to get as much inspiration and guidance from them as possible.

In regard to the giving of expert evidence, we would thoroughly endorse what Mr. Harcourt has to say. After remarking that a consulting engineer naturally accepts most of the work offered him, and thereby gains varied experience, he adds: "The giving of expert evidence, however, should form an exception to the general rule of accepting work; for though an engineer is obliged to support his own schemes before Parliamentary Committees

... he should regard it as derogatory to his profession, and to his standing as a man of science, to become a sort of advocate in place of an impartial witness, by consenting to give evidence in support of, or in opposition to, schemes, without being thoroughly convinced of the soundness of the views which, from an engineering standpoint, he is asked to endorse."

Every budding engineer, and the "full blossoms" too, should read Mr. Harcourt's very able article upon the profession which, as he says, in dealing with the practical applications of science, has fresh problems to consider at every turn, and is ever full of interest and possibility.

**Cheaper Coal.**—The optimistic views recently expressed by Mr. George Livesey on the question of an early drop in the price of coal have been strikingly justified by recent events. We learn that the South Metropolitan Gas Company have just bought 800 tons to make up a cargo of coal f.o.b. the Tyne at 11s. 3d. per ton. The Company's contract with the colliery concerned is at 15s. 6d. a ton; but as the latter were in advance with their deliveries, and wanted an extra boat to keep their pit going, they accepted 11s. 3d. An announcement made in last Friday's papers has an important bearing upon this question. It was reported that, owing to severe depression in the coal trade of the Forest of Dean, the house-coal owners had resolved to reduce the quotation 2s. per ton as from the 1st inst.



## THE CONVICTION OF THE AUDITORS OF DUMBELL'S BANK.

THE evidence given at the recent trial of a Director, a Manager, and the three Auditors of Dumbell's Banking Company, has brought forcibly before the public once more the question of the value of an audit. Moreover, and most fortunately, the result of the trial must call the attention of the profession of accountant auditors very urgently to the subject of what are the duties of an auditor, how those duties are usually fulfilled, and what may be the consequences to an auditor of a default in the performance of his duty. The prisoners were charged (and convicted) with making, circulating, and publishing, and concurring in making, circulating, and publishing, balance-sheets which they knew to be false in material particulars, with intent to deceive and defraud the members, shareholders, and creditors of the Bank. Rogers, the local (Isle of Man) Auditor, was sentenced to eighteen months' imprisonment; and the two Manchester Auditors, William and Harold Aldred, to twelve and six months' imprisonment respectively—all the sentences being "with hard labour." Such sentences upon auditors, against the last two named of whom no charge of benefiting by their default of duty was brought, may well be described as exemplary, and must undoubtedly prove a rude shock to the tranquil self-satisfaction with which the majority of auditors appear to regard the manner in which they "fulfil" the obligations of their office.

It is always a sad thing to witness the sentencing to hard labour of an old man 76 years of age (as is the senior Aldred), who, during a long business career, has enjoyed a reputation for uprightness, and the confidence of his fellow-citizens. Apart from this natural sentiment (which can, or ought, never to influence the course of justice), we feel nothing but satisfaction at the result of this trial; and the heads of the profession, its institutions, and its journals, will best serve its interests and reputation if, instead of moaning over the fancied injustice of the sentence, they can bring themselves to realize that their attitude of defence of the conventional and futile methods still adopted by not a few of its members is in no small degree answerable for the ruin that has overwhelmed Aldred and his son. We have time and again urged the profession to take a long-sighted view of the necessities of the case, and to do all in their power to restore the confidence of the public in auditors' certificates by taking every opportunity of reprobating and excommunicating those of their members who may be proved to have fallen short of the highest standards of auditing principles. If this had only been done—in conspicuous instances it has not been done—is it likely that the Aldreds would have put to the balance-sheets of Dumbell's Bank those signatures which have been the cause of their downfall?

The case is so important—not only as far as it concerns auditors, but also as regards directors and their duties—that attention must be called to one or two points of principal interest in the evidence. In the first place, the reputation of the Manchester Auditors is to be noted. It has been said before now that "first-class" firms of auditors do not pursue futile methods of examination. We have asked for, but failed to obtain, a definition of the means by which the public may know which are the "first-class" among the auditors belonging to the Institutes of the profession. Well, in this case, the senior Aldred was able to call two ex-Mayors of Manchester, the Chairman of the Salford Quarter Sessions, and other prominent citizens, to prove that he bore a very high character, was greatly esteemed and trusted, and was of "unequalled" reputation for honesty and integrity. It was, moreover, stated that he was Auditor of the accounts of the Manchester Corporation, and of several business concerns with which Sir Bosdin Leach (a past Mayor) is connected. Would not the public be justified in assuming his firm to be among the "first class"?

Yet how did this firm conduct the audit of Dumbell's Bank? We will endeavour briefly to indicate. The Articles of the Company provided that no advance should be made to any director or officer of the Bank without the consent in writing of the Board of Directors; and, also, that the explicit duty of the Auditors was to distinguish in their reports between good, bad, and doubtful debts. Nevertheless, at the time the Bank collapsed, one of the Directors named Nelson (whose assets were valued at £10,000) had overdrawn his account to the extent of no less than £71,985, unknown to the Board, and without the knowledge of the Auditors, until they "accidentally" discovered the fact during the last year of the Bank's existence! The overdraft was not previously noticed by the Auditors, because it was made at a branch office, and "the branch accounts were not examined by the Auditors; the practice being for the branch managers to send to the head office certified returns and abstracts of balances." When, moreover, the advances to Nelson were thus accidentally discovered, the Auditors, instead of immediately calling the attention of the Board thereto, were content with an official's assurance that Nelson was a very rich man—it not, apparently, occurring to them that it was a curious thing that "a very rich man" should need to overdraw his account by tens of thousands, year in, year out. The culpable futility of such "auditing" hardly needs other demonstration; but it will be useful to further examine the evidence.

As already remarked, the duty was explicitly laid upon the Auditors to distinguish in their reports between good, doubtful, and bad debts. But the Liquidator, on investigating the accounts of the Bank, found that, in June, 1899, about £470,000 of

debts which were included as good were doubtful; and that, of these, debts to the amount of £200,000 were absolutely irrecoverable—one, for instance, being due from a customer who died insolvent in 1882. Moreover, interest was being still charged upon these outstanding worthless balances; the annual total of the charges being equal to the dividends paid! It may be added that the paid-up capital of the Bank was only £50,000.

This does not, however, reach the limits of the failures in duty, and in sense of duty, of these Auditors. Neglect to properly examine accounts when, as a matter of fact, one has every confidence in their genuineness and accuracy, is bad enough, and cannot be too frequently declared to be dishonest as well as dangerous; but what condemnation is too strong for men who, having serious doubts as to the legitimacy of most material items in accounts, yet neglect to thoroughly investigate every detail of those items, and actually sign the accounts year after year? This, however, is what the Aldreds did. It was shown that, so far back as 1885, they called the attention, not of the Board nor of the shareholders, but of the officials, to certain accounts which they considered irregular; while in July, 1899, they wrote to one of the officials of the Bank (now sentenced to penal servitude) to say that "each half year we sign the account with more hesitation, owing to what we consider the excessive overdrafts." This letter also proved that at their previous attendance the Auditors had expressed their uneasiness in respect of the large overdrafts. Yet they signed the balance-sheets for December, 1898, and June, 1899, without reserve. In December last, they wrote: "It becomes increasingly difficult for us to sign accounts including so many increasing balances in respect of which we believe your security to be altogether inadequate." The senior Aldred stated in evidence that he "was always assured at the end of every audit that the contingent fund would provide for every doubtful debt." These Auditors, therefore, stood convicted out of their own mouths of having signed an unqualified certificate to accounts which they believed to be misleading, upon the assurance of the officials whose honesty they were appointed to check. No word did they write to the Directors as to their doubts; no reservation did they make in their certificate. Aldred said "he believed that the letters they wrote as Auditors to the Manager were laid before the Board of Directors"—this belief being founded upon the Manager's statement. "He never thought the Bank was insolvent." Is it not really difficult to read such words with patience? "They thought;" "they believed;" "they were assured;" but never did they examine, investigate, determine—the very vital essence of an auditor's duty.

The organ of the profession, "The Accountant," in discussing the evidence, suggests, as a point in favour of the Aldreds which was not sufficiently emphasized by the defence, that "it takes some time for suspicion to fructify into action sufficient to pull up a Bank." Now on this there are one or two observations to make. The bad debts of Dumbell's Bank had been growing for practically the whole period of its existence. The extreme case mentioned by the Liquidator was that quoted above, of a balance due from a man who died in 1882 insolvent. For a period, therefore, of over fifteen years, there were on the books of the Bank items among the assets which a thorough investigation would have shown to have been absolutely indefensible. Had the Auditors done their duty, the Bank would have been pulled up at the beginning of the period, not at the end, when all harm was done. A debt due from the insolvent estate of a deceased customer could by no manner of reasoning be considered a good debt. It is no case of sufficient or insufficient security, but one of absolute worthlessness; and the item would be immediately disallowed by any competent auditor, and a strong representation made personally to the directors, while any continuance of the system of allowing bad or doubtful debts to remain among the assets should have been met at once by a statement of the fact to the shareholders, in accordance with the explicit terms of the Articles. The plea that suspicions in regard to the genuineness of assets which grew steadily and rapidly in amount—suspicions which would have been more than confirmed by an audit such as should have been, but was not, made—require any considerable time, leave alone fifteen years, to ripen into action, is simply inadmissible.\* An auditor who can write that "each half year he signs the account with more hesitation," writes his own condemnation; and the letters quoted constitute, in our opinion, full justification of the sentences meted out to the authors.

Counsel for the Aldreds pleaded, in mitigation of their offence, that "his clients, whatever they had done or not done, had been actuated throughout by good faith, and had acted in ignorance of the actual facts, as now known," and begged "a fool's pardon" for them. Now if at the trial of an engine-driver, who had seen but had taken no notice of a warning signal, and had remarked to the stoker that he passed each signal set at "danger" with more hesitation, and had occasioned, by his failure of duty, a serious accident to his train, Counsel for the defence pleaded that, whatever the engine-driver had done or not done, he had been actuated by good faith and had acted in ignorance of the actual fact that there was another train in front of his, and finally begged "a fool's pardon" for him, what would the Judge be likely to say? And it must not be forgotten that few railway accidents could be

\* We are glad to see that, in a second article dealing with the trial, the "Accountant" fully endorses the verdict of the jury, and expresses doubt as to whether "anything short of a plea of insanity could have been seriously entertained as any excuse."



attended by more widespread suffering that has been occasioned in the Isle of Man by the failure of Dumbell's Banking Company. If the trial and conviction of the Auditors of that concern should lead to every auditor writing large upon his walls: "Beware of Negligence," some good may arise out of evil.

Finally, attention may well be called to the evidence given by the Chairman and largest shareholder of the Bank. It was not lengthy, but sufficient. He said that, "although he frequently asked questions as to overdrafts, he had never asked for the books of the Bank, as they would have been unintelligible to him." Commenting on this, "The Times" calls it "perhaps the most extraordinary bit of evidence in the whole trial," and adds: "Conceive a man acting as chairman of a board of directors, and yet confessing that he could not understand so simple a thing as a bank account!" We can conceive—we have indeed heard—of directors possessing such a minimum amount of business capacity, and such a thorough ignorance of the affairs of the concern they are supposed to "direct." True 'tis a pity, but pity is 'tis true. We commend a careful consideration of the evidence in this sensational trial to all directors as well as to all auditors.

### PROFESSOR LUNGE ON COAL TAR AND AMMONIA.\*

[SECOND ARTICLE.]

THE present edition of Professor Lunge's work contains 248 pages, with 84 illustrations, dealing with ammonia, against 194 pages, with 53 illustrations, in the 1887 edition. This substantial increase in bulk is fairly uniformly distributed over the various chapters, which now number four, as compared with three in the earlier edition, owing to two chapters being now devoted to the working up of liquor, in place of one.

The sources from which ammonia is obtained are discussed at greater length than formerly; and there is a slight re-arrangement of the sections of the chapter which deals with them. From a practical point of view, it would have been better to speak of many of the sources referred to as potential rather than as actual sources. They are classed under ten groups, of which several are practically unimportant. The first refers to the natural occurrence of ammonia—e.g., in the air in minute traces, in guano deposits as bicarbonate, in the Tuscan *suffioni* and lagoons, in the neighbourhood of volcanoes, and in a few minerals. Considerable quantities of sulphate of ammonia are said to come from Tuscany as a bye-product in the manufacture of boric acid. The second group comprises ammonia formed from atmospheric nitrogen. The pages of Professor Lunge's work which refer thereto read like a catalogue of inventions which have failed; for the conversion of atmospheric nitrogen into ammonia has always proved a most fascinating exercise for inventors, although few schemes have even passed beyond the laboratory stage. Nor, so long as we have a store of nitrogenous bodies, derived from the atmospheres of bygone ages, in our deposits of coal and peat, does it seem likely that a process for artificially producing ammonia from atmospheric nitrogen will prove a commercial success.

The third group covers the ammonia formed in inorganic chemical manufactures; and Professor Lunge concludes that none of the processes classed in it are likely to be remunerative under present circumstances. Then he deals with ammonia from animal excreta, &c., which form a perfectly practicable source in cases where they can be collected without dilution. It seems that in Paris, Amsterdam, and some other Continental towns schemes for collecting and treating excreta for the production of ammonia, have been adopted; but apparently the amount of ammonia recovered from such sources is not known precisely. The fifth source is guano. This, apart from any ammonium bicarbonate present which was included in the first group, may be treated for the production of ammonia salts, which, however, would have a lower manurial value than the guano itself. Hence this source is practically useless. The next group comprises ammonia from bones, horn, and other animal substances, which are generally used for the manufacture, primarily, of bone charcoal or prussiate, and ammonia is recovered only in some cases as a bye-product. Professor Lunge does not estimate the amount obtained from this source. The next group relates only to ammonia as a bye-product in beetroot sugar factories. The amount so obtained appears at present to be small. Professor Lunge computes that if all the beetroot sugar works in Germany recovered the total ammonia given off, it would yield 15,000 tons of sulphate. Most of it is now lost. During the last few years, however, the endeavour has been rather to produce cyanides from the molasse liquors in place of ammonia.

The last three groups really cover the sources from which the bulk of ammonia products are obtained, or are likely to be obtained in the immediate future. The first of these three comprises peat; but it does not appear that much ammonia is at present obtained from this source. The second comprises shales; and the amount of sulphate actually obtained from the Scotch shale distilleries has been from 37,000 to 38,000 tons for each year from 1895 to 1899. From this, the second largest source of

ammonia products, Professor Lunge passes on to the last group, which includes ammonia obtained from coal, (1) in the manufacture of gas, (2) by treatment with steam, (3) from coke-ovens, (4) from blast-furnaces, (5) from producer gas, or (6) from ordinary coal smoke. Gas manufacture, of course, continues to be the chief source of ammonia products in this country. We confess that we are somewhat at a loss to understand what grounds Professor Lunge has for writing as follows:—

Since the great bulk of the ammonia compounds is obtained as a bye-product in the manufacture of gas, and the latter is unlikely to be more extensively employed than it is at present, the question must necessarily arise—what will be the state of things if the demand for ammonia should exceed the supply?

Why does he believe that the use of gas will not continue to extend? He does not tell us; and it is certain that everything points to a steady and by no means insignificant increase in the employment of gas. Surely Professor Lunge had not studied the statistics of the gas industry for the last few years when he wrote thus of its future.

A good many new data on the distribution of the nitrogen of coal on carbonization have been introduced since the last edition; but most of them will be familiar to readers of the "JOURNAL." Professor Lunge does not appear to have taken the trouble to ascertain the extent to which Cooper's coal-liming process is now used; for he says, as he said in the 1887 edition—

Only a few gas-works introduced Cooper's process; and, according to information received by the author from highly trustworthy sources in 1886, there was but little prospect of its more general adoption, as the extra yield of ammonia is counterbalanced by several drawbacks.

We believe he could have satisfied himself without much difficulty that the drawbacks have led to the process being discarded at nearly all the works at which it was tried. In fact, so far as we are aware, it is now used in this country only at Folkestone. We are sorry to see that spent oxide is still regarded as a practicable source of ammonia, as it is evident that it cannot be so if efficient scrubbing of the gas is practised.

Coke-ovens constitute an important source of ammonia, especially in Germany, where 42 per cent. of the coke produced is obtained from ovens provided with ammonia-recovery plant. The yield of sulphate from the German coke-ovens is now estimated at 84,000 tons per annum. In Great Britain, however, though it is estimated that 35 million tons of coal are carbonized in coke-ovens, ammonia is recovered from only 1,100,000 tons; and the yield of sulphate is therefore only about 11,000 tons. Perhaps it is well for the gas industry that it is so; but there can be no doubt that the more economical German practices in the coking of coal are now being adopted here to an increasing extent. Fortunately, however, the demand for sulphate for manurial purposes is likely, according to Professor Lunge, to increase at as great a rate as its production. Much more of such nitrogenous fertilizers can be applied as the conditions of rational agriculture are better understood. The prospect does not therefore seem disheartening to gas managers, even though the gas-works production of sulphate be eventually surpassed in this country—as it has been in Germany—by that of the coke-ovens and blast-furnaces. The recovery of ammonia from ordinary coal smoke is, of course, at present out of the question, though Professor Lunge gives, for what it is worth, a statement by Professor W. Foster that he found 11·55 per cent. of ammonium sulphate in the soot from a coal-fire!

The chapter on the "Composition and Analysis of Ammoniacal Liquor" has been adequately revised for the present edition; but naturally it did not require the extensive changes which were needed in other parts of the book.

In the next chapter, on "The Working-Up of Ammoniacal Liquor," a great deal of new matter has been introduced on the manufacture of "concentrated gas liquor," of pure liquor ammonia, and of anhydrous liquid ammonia. Concentrated gas liquor is largely produced at German gas-works, and contains 15 to 20 per cent. total ammonia. It is consumed in large quantities in the manufacture of ammonia-soda. With regard to pure liquor ammonia, Professor Lunge says that its manufacture is "the most difficult, but the most remunerative, way of dealing with gas liquor, and is practised on a very large scale; the demand for this article for cold-producing machines being very great." The processes and apparatus for the manufacture of both concentrated gas liquor and liquor ammonia are fully described; and gas managers who have to work up liquor might profitably consult this portion of Professor Lunge's work before they decide to continue to make sulphate only. But it is doubtful if it is fair to expect any gas manager to master more than one process of dealing with gas liquor, and especially such an operation as that of the manufacture of pure liquor ammonia. Such processes always require close supervision of a manager killed in them; and the gas engineer will find, as a rule, mores profitable employment in his more legitimate avocations. If he is asked to undertake the manufacture of liquor ammonia in place of sulphate, we would recommend him to secure a skilled subordinate, to whom he could depute the task of supervising the working of the new process. With regard to the manufacture of sulphate, the information contained in the second edition is now somewhat amplified. We are inclined to think that Professor Lunge credits, to a far greater extent than is actually the case, English sulphate works with continuing to use apparatus which has become obsolete. His observations on the avoidance of

\* "Coal Tar and Ammonia." Third and Enlarged Edition. By George Lunge, Ph.D., Professor of Technical Chemistry in the Federal Polytechnicum, Zurich. London: Gurney and Jackson; 1900.



nuisance from sulphate works are well worth reading by anyone in charge of such works, notwithstanding the beneficent supervision exercised in this country by the Alkali Inspectors.

The last chapter in the book is a short one on "Other Technically Important Ammonium Salts." It also deals with the estimation of ammonia. There is nothing here that calls for special comment. Then follow an appendix, giving some useful tables, and the inevitable *addenda*, which are fewer in this than in the second edition. The index brings up the present volume to 929 pages.

The work, of course, is a *sine qua non* to all engaged in tar distilling or in the working up of gas liquor; and every gas manager will find it a useful reference volume. We are disposed to think, however, that the great bulk (and high price) of the present edition indicates that it would have been better to have issued it in two parts—one on Coal Tar and one on Ammonia—so that those interested in one of the products only need not necessarily have been burdened with a lengthy treatise on the other.

#### NICHOLS ON THE ACETYLENE FLAME.

AN instructive memorandum on "The Acetylene Flame" has been written by Mr. Edward L. Nichols, and appears in the last issue of the "Journal of the Franklin Institute." The author has experimented for a considerable time with the acetylene flame, with the object of determining its usefulness in the physical laboratory. He has not completed his experiments, because the subject is a surprisingly broad one, and new questions are continually presenting themselves in the course of the investigation. Although he disclaims the industrial point of view in regard to these observations, it is impossible to dissociate industrial considerations altogether from the statements he makes respecting the results of his experiments. Speaking in the first place as a physicist, Mr. Nichols remarks that the peculiar attraction of the acetylene flame for workers in physical science lies in the fact of the fuel being of definite chemical composition, which burns under suitable conditions with a flame of great brightness, stability, and actinic power. Thus it appears calculated to lend itself readily to the attainment of greater precision in photometric and spectroscopic research, and other desirable purposes. Such is the reasonable expectation of those who become acquainted with this new addition to the resources of the physical laboratory; but experience of the acetylene flame soon shows that its complete control is no simple matter.

The first important discovery in this connection is that the illuminating power of acetylene depends to a surprising degree upon its age, and also upon the method by which it has been produced. The gas loses much of its illuminating power when stored for a long time over water; and Mr. Nichols is not sure but the same is true of any and every store of acetylene, however preserved. He cites an example of a sample of acetylene put into a water-sealed gasholder in the spring of 1899, and left untouched for five months, when its flame was compared with that of some newly-made gas. The old gas had an illuminating power of only 6 per cent. of the new, although the colour of its flame, examined by means of the spectro-photometer, showed a scarcely appreciable change. A preliminary chemical analysis showed that the stored gas was 25 per cent. acetylene. It is obvious, from this example, that acetylene must be consumed while it is new, to avoid loss by the breaking down of the compound; but precisely how long the gas will keep in its pristine state and value, Mr. Nichols cannot yet say. He is still investigating the point.

The illuminating value of the acetylene also depends largely upon the character of the process by which it is generated. There are two distinct methods of treating carbide of calcium for generating acetylene—the so-called dry and the wet. In the former, water in small quantities is added to large quantities of the carbide; in the latter, small quantities of the material are thrown into large quantities of water. Mr. Nichols tried gas made in both ways, one after another, and found that the illuminating power of the dry-process gas averaged about 80 per cent. of that of the other sample. Examined by the spectro-photometer, the colour of the dry-process light appeared inferior to that of the wet-process acetylene light. Experiments were also made with mixtures of acetylene and hydrogen. It is admittedly one of the disadvantages of acetylene that, unless mixed with air, or with some other gas less rich in carbon, it burns with a smoky flame. The former expedient is followed in the design of burners for ordinary purposes; but the addition of air in unknown proportions upsets all the certainty attaching to the use of a standard fuel, under standard conditions. Mixing common coal gas with acetylene enables the air-hole burner to be dispensed with; but there is little to be said in favour of it. The use of hydrogen as a diluent has been suggested; and Dr. C. H. Sharp has carried on some investigations on these lines under the auspices of the American Institute of Electrical Engineers, with the object of obtaining an improved standard of light. He burnt acetylene and hydrogen, half-and-half, in oxygen. Hartman has tried various proportions of the same mixture, burnt in air. The colour of the mixed flame is whiter than that of pure acetylene. These mixtures burn cleanly, with the same lava burner-tip, up to 60 per cent. of acetylene. The practice of using a given mixture of acetylene and hydrogen for

photometric purposes would have much to recommend it, but for the fact that acetylene is so rapidly absorbed by water that it is impossible to be sure at any moment as to the percentage composition of the mixture in use. And although the colour of the flame would not be seriously affected by small changes in the proportions of the two gases, the illuminating power would vary widely from the same cause.

These preliminary investigations do not offer a very encouraging prospect to those who think of acetylene as a possible source of an improved photometric standard. Yet the flame possesses certain characteristics which, Mr. Nichols says, merit further consideration. It is, for one thing, of remarkable stability. He has observed the union-jet acetylene flame by projecting its image on the screen; and in this way he has made several discoveries as to the peculiarities of this kind of flame. Thus at low pressures, up to 2 centimetres, the two jets of gas issuing from the orifices in the lava tip of the burner are seen to impinge upon and deflect one another, without producing actual commingling of the columns of heated gas. The gas-flame is, in fact, two flames rising side by side, with a dark dividing line between them. At higher pressures, there is complete union of the jets of gas at the point of contact. The united flame thus formed is found to consist of a layer of heated gas surrounded by a sheath or mantle of highly luminous material, which, at some risk of confusing the ideas of his readers, Mr. Nichols also calls a "mantle." The thickness of the entire flame, measured from outside the luminous sheath on each side, is 6.5 mm. The thickness of the actually luminous sheath itself is only 0.5 mm. (An illustration of the difficulty of reading "American" is supplied by the circumstance that, within a few lines, this writer uses the terms "sheath," "mantle," and "layer" to designate one and the same thing.)

Respecting the great stability of the acetylene flame—a quality naturally most attractive to any photometrist who has worked with the Hefner or the 1-candle pentane standard—Mr. Nichols mentions, as a proof of its existence, the certainty with which different regions of the flame can be explored with a thermo-couple. From the luminous sheath of the ordinary acetylene union-jet flame outward, there is a very steep gradient of temperature, falling within a distance of 4 or 5 mm. from something higher than the melting-point of platinum to 1000° C. lower. If the loop of a thermo-couple is flattened out for a short distance, so as to make it into the form of a truncated V, the shape is a convenient one for introducing into and measuring the temperature of any vertical plane lying within or near the flame. By fixing it into a horizontal holder capable of being moved by a micrometer screw, the flattened part of the couple can be adjusted to lie in any part of the flame; and so steady is the latter, that the temperature once indicated will scarcely vary with the most sensitive measurements.

Another desirable characteristic of the acetylene flame, from the photometrist's point of view, is its great intrinsic brightness. Mr. Nichols determined this by measuring the photographed areas of one side of an acetylene and a coal-gas flame of equal illuminating power. These areas were approximately as 1 to 12. This means either that the density of the one flame must be, in luminous particles, twelve times that of the other, or that its temperature must be higher, or that both causes are acting in combination to produce the greater radiant effect. The last is the probable reason in this case, although the higher incandescence of the carbon in the acetylene flame as compared with the carbon of coal gas is the major influence.

As regards its colour, the acetylene flame is somewhat whiter than the ordinary lime-light—lying between it and the electric arc. Acetylene burnt in oxygen is distinctly whiter than the ordinary flame in air; being almost exactly of the same tint as the light of commercial electric arc lamps. In temperature, the acetylene flame is stated by Nichols to attain the maximum of 1900° C., as compared with maxima of 1780° C. for a luminous coal-gas flame, and 1675° C. for a candle-flame. These measurements are corrected for the abstraction of heat by the connecting wires of the thermo-couple. Determinations of the radiant efficiency, or luminous duty, of the acetylene flame have been made by Messrs. Hoxie and Stewart, by the classical method of interposing heat-absorbing cells between the flame and a bolometer, and comparing the result with the indications of the naked flame. In this way, the radiant light efficiency was found to be 10.5 per cent. The same method applied to an "ordinary (gas?) flame," gave a radiant light efficiency of 2.9 per cent. This result is fairly consistent with older determinations—such as that of Julius Thomsen, 2 per cent. for a petroleum flame; and Langley, 2.4 per cent. for an argand gas-burner.

Notwithstanding its weaknesses, the acetylene flame can be used as a standard of colour of artificial light in spectrophotometry. With the air blowpipe, acetylene furnishes a non-luminous high-temperature flame of great usefulness and convenience in the laboratory, capable of fusing quartz or the metals of the platinum group. Mr. Nichols holds out some hopes of the success of a Methven-pattern photometric standard with the acetylene flame, when the necessary precautions are ascertained and followed.

At the meeting of the Institution of Mechanical Engineers on Friday, the 14th inst., Mr. Herbert A. Humphrey, of Northwich, will read a paper on "Power Gas and Large Gas-Engines for Central Stations."



### THE PRIZES OF THE SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

WE have received from the Secretary of the above-named Society a list of the premiums to be awarded next year. At the top stands the prize of 10,000 frs. (£400), previously offered by the Society, to be given, wholly or in part, to the inventor of a new incandescent gas-burner showing marked superiority over those now in existence. This burner should be in the hands of the Committee before the 1st of February next. A like amount will be awarded, wholly or in part, to persons who, in the opinion of the Committee, have effected some distinct improvement in the appliances used in the manufacture and use of gas; and a sum of 5000 frs. (£200) to those who have made any noteworthy progress in connection with apparatus employed for the utilization of coke. Three models of each appliance submitted must be placed before Feb. 1 next at the disposal of the Committee, who will indicate the works at which they will have to be delivered. Another sum of 5000 frs. will be distributed for the best chandeliers, brackets, and fittings, combining tasteful design with adaptability for use with incandescent gas lighting; account being taken of the increased illuminating power obtained by this system, and of the smaller sizes of service-pipes which will suffice in the future to obtain a specified luminosity. This is the prize which was decided upon at the International Gas Congress held in Paris in September. It is open to all comers; and those who intend to compete for it should apply to the Society, and send to them, before the 1st of March, a photograph of the appliance, accompanied by a description. The Committee will subsequently indicate the manner in which the appliance itself may be examined. Another prize of like value will be awarded, wholly or in part, to inventors who have effected improvements in the automatic lighting of gas-burners, notably those used with the incandescent system. This prize also will be open to all; and it will be awarded for systems which have been found to give the greatest satisfaction in practical working. As in the previous case, drawings and descriptions of the appliances submitted must be in the hands of the Committee before the 1st of March, accompanied by the names of the towns in which they have been adopted, and particulars as to the length of time they have been in use. Finally, a sum of 8000 frs. will be devoted by the Society to various prizes to the authors of the best papers on any subject of interest in connection with the gas industry; the respective amounts to be determined by the Committee in accordance with the value of the papers. These prizes are open to non-members of the Society, of whatever nationality; but the papers will have to be written in French. They must not bear the author's name, but merely a motto, as is customary; the name being sent in a sealed envelope endorsed with the selected motto. The author will have to make a declaration that his paper has not appeared in print, and give a guarantee that he will not publish anything on the same subject for a year. The manuscripts, with the sealed envelopes, must be addressed to the Society, No. 65, Rue de Provence, Paris, before the 1st of March; and they will remain in their possession.

### PERSONAL.

Mr. W. D. CHILD, Engineer and Manager of the Romford Gas-Works, has been elected Worshipful Master of the Evening Star Lodge, No. 1719, for the coming year.

Mr. R. L. ANDREWS has resigned the position of General Manager of the Gas-Meter Company, Limited; and an annuity has been granted to him by the Directors. Mr. Andrews was appointed General Manager of the Company in 1881.

Mr. H. W. COWLING, Assistant to Mr. C. E. Ball, Engineer and Secretary of the Ilfracombe Gas Company, has been appointed Manager and Secretary of the Sherborne Gas Company, in succession to the late Mr. T. W. R. White. Mr. Cowling was with his father, at the Wallingford Gas-Works, for about nine years; leaving him to take the position at Ilfracombe, where he stayed six years. On relinquishing it to go to Sherborne, Mr. Ball presented him with a tea set, and the men with a tea service.

Mr. H. J. IBBOTSON, Assistant to Mr. Charles Meiklejohn, of Rugby, has been appointed Manager of the Newport (Isle of Wight) Gas-Works, in succession to Mr. F. G. Cockey, who, as already announced in the "JOURNAL," will shortly take charge of the New Swindon Gas-Works. Mr. Ibbotson, who is only 23 years of age, was Mr. Meiklejohn's first pupil, and on the completion of his articles remained with him for three years as Assistant; and the fact that he is deemed competent to take the more responsible position to which he has been appointed bears testimony alike to the efficiency of his training and to his own capacity.

According to the twelfth annual report on "Strikes and Lock-Outs," just issued by the Chief Labour Correspondent of the Board of Trade (Mr. John Burnett), there was no trade dispute last year of such magnitude as to unduly swell the statistics. The number of separate disputes was 719, as compared with 711 in 1898. In all other respects, the figures for 1899 are the lowest of any of the six years for which statistics are available for comparison.

### NOTES.

#### The Gas-Igniting Power of Flames.

A curious remark on the gas-igniting power of luminous and other flames occurs incidentally in the Home Office report on the fire-damp explosion which occurred at Cwm Pit, Merthyr Tydfil, on May 14 last. It appears that the explosion in question injured four men, and raised the question (with which we are not particularly concerned) of the suitability of the explosive used on this occasion. It was a variety of gunpowder; and in the course of a series of experiments carried out by the Investigating Committee, attention was drawn to the appearance exhibited by this and other explosives when fired into the air out of a "stemmed" gun. In these circumstances, common gunpowder gives a somewhat large and luminous flare. The so-called high explosives, fired by a detonator, give a much less visible flame; some of them being almost flameless. This has given colour to the supposition that the latter are safer than the former. But it is remarked that, while to the eye the flame of a blown-out shot of powder is more luminous than that of a high explosive, quite different results are obtained by photographing the flames. Indeed, it cannot be said that the luminosity of a flame is any safe guide to its power of igniting gas. "A familiar example of this fact is to be seen in a common fish-tail gas-burner, which, though far brighter to the eye than the flame of a bunsen burner, is far less hot, and less likely to set fire to gases or other substances." No experimental confirmation of this remarkable new dictum is offered.

#### The Specific Heat of Gases at High Temperatures.

At a recent meeting of the Manchester Literary and Philosophical Society, Mr. Harold B. Dixon, F.R.S., Professor of Chemistry and Metallurgy in Owen College, communicated a summary of the results of experiments conducted in conjunction with Mr. F. W. Rixon, B.Sc., on the above subject. As part of a larger investigation, the authors have determined directly the specific heat of carbonic acid, up to 400° C., at constant volume. The gas is screwed up in a mild steel cylinder, which is heated in a gas-oven running on rails. The oven and cylinder can thus be brought quickly over the calorimeter, into which the cylinder falls through trap-doors forming the bottom of the oven. The transference is thus effected with a minimum loss of heat. The difficulties arising from splashing and from the escape of steam are overcome by dropping the cylinder into a glass tube dipping some distance below the water. The glass tube breaks at a crack made in the neck, and thus ensures complete immersion of the hot cylinder at a good depth in the water, which closes over the cylinder in a cataract. A similar experiment being performed with the empty cylinder, the difference gives the heating effect of the gas. The results stated below for carbon dioxide show that the method, which it is hoped may still be improved, is a workable one:—

Initial Temperature of Gas.	Final Temperature.	Mean.	Specific Heat.
115 ..	16 ..	65'5 ..	0'200
192 ..	16 ..	104'0 ..	0'211
298 ..	21 ..	159'5 ..	0'288
398 ..	21 ..	209'5 ..	0'356

The authors are now measuring the specific heat of nitrogen in the same way.

#### Side-lights on Russian Civilization.

A striking set of statistics relating to the methods of artificial lighting in use in literally "Darkest Russia," has been collected at the instance of the Naphtha Producers' Association. They illustrate the extreme thinness of the skin of civilization that has yet been spread over the profound barbarism of the country people of this vast geographical empire. The returns were obtained from local authorities and school teachers, who were circularized with a set of questions framed to elucidate the common practice of the people in regard to lighting their dwellings, and to ascertain the conditions of the local trade in kerosene. A summary of the information received has been published in the "Petroleum Review," from which it appears that Russian burning oil is very little used by home consumers. The annual consumption of burning oil for all purposes, taken over the entire population of Russia, is under 13 lbs. per head. In country districts, the people do without it. Where forests exist, the primitive method of lighting interiors, by means of strips of pine wood stuck in the wall, is almost entirely practised. All the vast districts in the north, north-east, and north-west, as well as those in the western parts of Central Russia, and in the Caucasus, use wood for lighting. In South Russia tallow-dip candles are the favourite means of lighting. In the very centre of the oil-fields, the people burn the crude oil by means of primitive chimneyless lamps. At least a quarter of the whole Russian population are still in the stage of torch-light. The wood slips (of pine and birch) used for this purpose, are dried by being kept overnight in the oven. This use of the wood torch is made a subject of folk-songs. Obviously, this prevalence of material darkness accounts for the existence of a low state of culture among the people. Eye diseases are also rife. High internal excise duties are chargeable with the small consumption of kerosene for lighting in Russia. In the towns, the retail price ranges from 1s. to 1s. 3d. per gallon. The former is the price in Baku itself, whence the oil is sent to England to be sold for less than one-half the money.



TECHNICAL RECORD.

MR. DIBDIN ON THE EFFECT OF QUALITY ON THE CONSUMPTION OF COAL GAS,

WITH SOME REMARKS AS TO THE RESULTS OF ADDING WATER GAS TO COAL GAS.

At an hour last evening too late for a complete report to be given this week, Mr. W. J. Dibdin, F.I.C., F.C.S., &c., read a paper, entitled "Coal Gas: Effect of Quality on Consumption," before the Society of Chemical Industry, at their meeting held at Burlington House.

The author started with the truism as to a clear comprehension of the effect of variations in the quality of coal gas upon the quantity of light obtainable therefrom being of no little moment. The use of coal gas, he proceeded to remark, purely as a heating agent raised another point entirely apart from that of the illuminating effect when the gas was consumed in the burners commonly employed. The question was also complicated by the recent introduction of incandescent burners or mantles, which very materially affected the question so far as the number employed bore any ratio to the total number of burners of all kinds in general use. If none but incandescent burners were employed, then it might be granted at once that the old idea of the "illuminating power" of coal gas must be very largely and seriously modified, so much so that the expression "heating power" might safely be used in its place. As long, however, as the great proportion of the gas was consumed in ordinary luminous flame burners, it must be admitted that there was no excuse for neglecting the effect of variations in quality upon the quantity of gas necessary to give normal or unit illumination. If the quantity of gas required to be burnt to afford any desired degree of illumination was a variable factor, and the gas so employed was charged for at a uniform rate for each cubic foot used, the actual cost of that degree of illumination must vary with the quantity. Thus, a gas of higher price, but of higher quality, might be far cheaper to the consumer than a gas of lower price but lower quality. These two factors must be taken together; and, to obtain a proper estimate of their ratios, the conditions under which the gas was to be consumed must first be determined, as these conditions would materially affect the problem. Taking the extremes, for instance, the value might depend upon quantity only if the basis were that of the incandescent burner. But even then the heating value of the gas should be taken into account. On the other hand, if the basis were that of a flat-flame burner, then the value must depend upon illuminative effect, as well as on the quantity required to be consumed.

Having thus prefaced the main part of his paper, the author said to assist in clearly establishing the effect of consuming gases of different qualities in the burners commonly employed, as well as in the standard argand and incandescent burners, he had conducted a number of tests, with various burners and different qualities of gas, in regard to the quantity required to yield the maximum amount or normal light from any given burner when consuming 16-candle gas under the most suitable conditions. Following upon a preliminary series of experiments of a limited character, six series of photometrical tests were arranged. The first with coal gas at Widnes; the second, with the Gaslight and Coke Company's gas; the third, with the South Metropolitan Gas Company's gas; and the next three with various proportions of coal and water gas. For the first series, Mr. Isaac Carr, of Widnes, stored different qualities of gas from time to time in an experimental 100-foot holder, which was connected to the author's photometer. The procedure was to first carefully test the illuminating quality of the gas when burnt at the rate of 5 cubic feet per hour in a No. 1 "London" argand burner, and then to burn it in various gas-burners in succession—making photometrical determinations of the light, and estimations of the consumption of gas.

Gas of an illuminating power of 16½ candles when consumed at the rate of 5 cubic feet per hour in the standard argand burner was used in the first series of tests. The value named was ascertained by independent tests by different observers using the closed Evans photometer on the works, employing candles as a standard, and the author's portable bar photometer, with Dibdin's 10-candle pentane argand standard, as was recommended by the Board of Trade Committee. The standard argand on the portable photometer was then removed, and a Sugg's table-top No. 4 burner was placed in position, and the gas adjusted until a fair and even burning flame was obtained, which was found to be equal to 14½ candles. The consumption of gas, as indicated by the experimental meter, was at the rate of 5½ cubic feet an hour. In like manner 28 burners were tested in succession with the same gas, with the results recorded in a large table exhibited by the author. The tests were repeated, in a precisely similar manner, with gas of another quality. In this way, it was ascertained that the flat-flame burner first tested—Sugg's No. 4 table-top—which gave 14½ candles with 5½ cubic feet per hour of 16½-candle gas, required, to produce the same illumination, 6½ cubic feet per hour when the illuminating power of the gas was reduced to 15½ candles, 6¼ feet with 14½-candle gas, 7½ feet with 13½-candle gas, 9½ feet with 12½-candle gas, and 11½ feet with 11½-candle gas; while, when the quality of the gas was raised

to 17½ candles, the consumption required to yield the same unit or normal lighting power of 14½ candles was reduced to 4½ feet, and with 19½-candle gas the consumption was only 3½ feet.

Having referred to other tabular comparisons, the author said that with low-grade gas, the burners could not, in certain instances, properly consume sufficient gas to give the amount of light afforded when the 16-candle gas was employed, and corrections had therefore to be applied. Thus, in the case of Sugg's No. 7 table-top burner, 24½ candles were obtained with gases down to 12½ candles; but when 11½-candle gas was used, only 20½ candles could be realized. As the consumption was 10½ cubic feet per hour, 13½ feet would have been necessary to yield the 24½ candles. These corrections more particularly applied to burners adapted for very rich gases when employed with low-grade gases. On the basis of a sufficient number of burners being employed to consume the total quantity of gas of a given quality to yield the volume of light required, this method of approximation would probably give slightly too low a result.

Reference was next made to a diagram showing the effect of any alteration in the quality upon the actual cost of the gas required to produce unit light with certain representative burners. On the left-hand side of the diagram, the volume of gas was indicated in terms of percentage for the various abscissæ, and on the right-hand side, the corresponding increase or decrease in the cost was shown, on the basis that 16-candle gas cost 2s. 6d. per 1000 cubic feet. Ordinates indicated the candle power of the gas supplied; and curves represented the unit or normal intensity of the light yielded by the respective burners when burning 16-candle gas with a consumption most suited to them. The bottom curve on the left-hand side of the diagram cut the ordinates for 19½-candle gas on the abscissa, representing 60 per cent. of the quantity of gas required when 16½-candle gas was employed. This curve then proceeded upwards until it crossed the ordinate representing 17½-candle gas, which cut the abscissa for 83 per cent. of normal value. The curve then crossed the ordinate for 16½-candle gas on the abscissa for 100 or normal volume. The curve then proceeded until it cut the ordinate for 15½-candle gas on the abscissa for 134 per cent.; and in like manner the ordinate for 14½-candle gas at 180 per cent., 13½-candle gas at 220 per cent., 12½-candle gas at 305 per cent., and the ordinate of 11½-candle gas at about 380 per cent. Then, interpreting the variations in consumption of gas into relative cost as indicated on the right-hand side of the diagram, it would, the author said, be seen that, to obtain equal degrees of illumination with varying qualities of gas in the case of a No. 4 Bray's burner, the actual cost of the gas to the consumer on the basis of light for money would be as follows:—

Illuminating Power of Gas.	Quantity required to give Light equal to 1000 Cubic Feet of 16-Candle Gas.	Actual Cost of Gas at 2s. 6d. per 1000 Cubic Feet.
Candles.	Cubic Feet.	s. d.
19	600	1 6
18	700	1 9
17	820	2 1
16	1000	2 6
15	1340	3 4
14	1800	4 0
13	2400	6 1
12	3040	7 9
11	3750	9 6

With a No. 5 Bray burner, the cost of equal light intensity for different qualities of gas was—

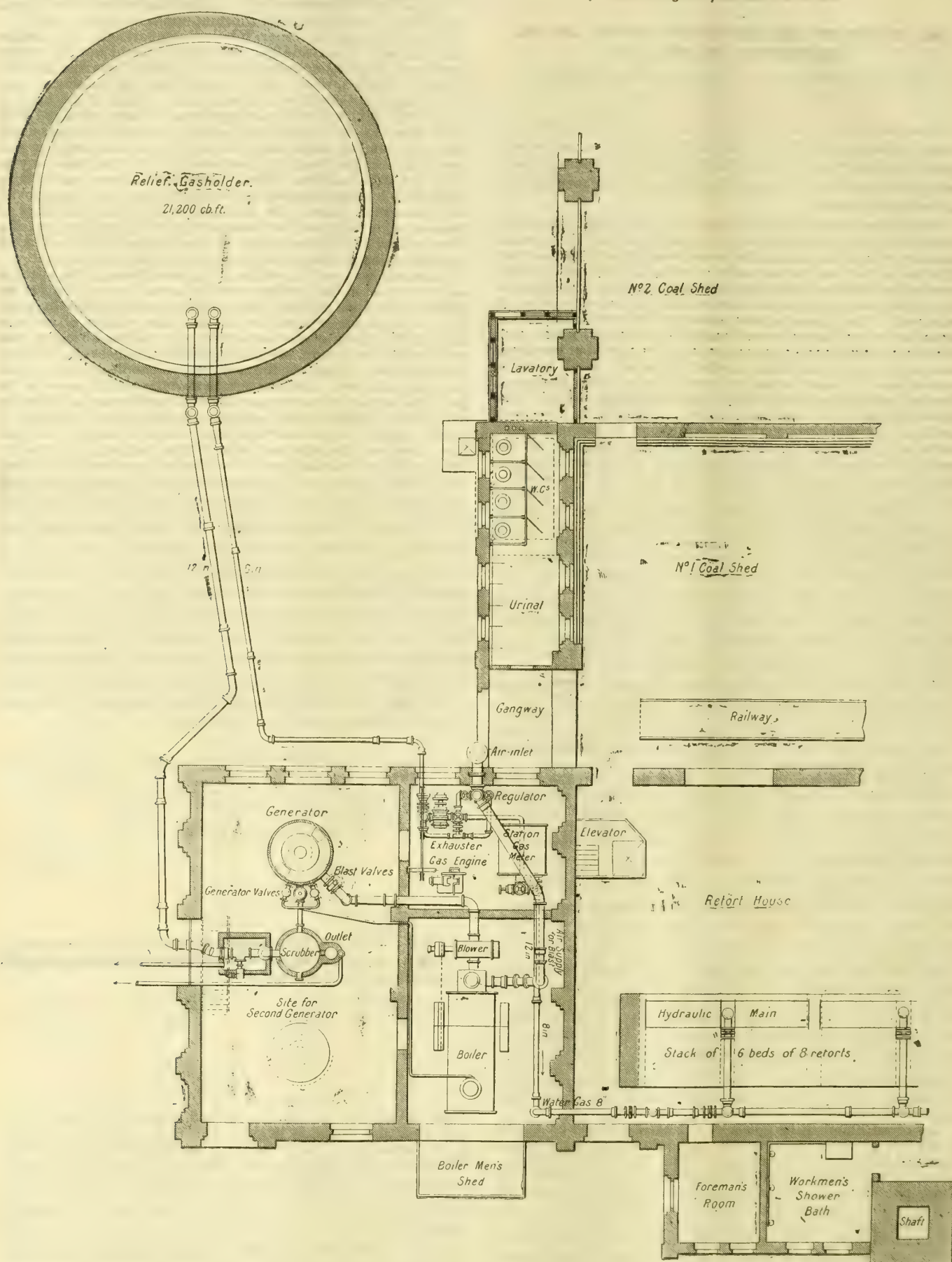
Illuminating Power of Gas—Candles.	Cost of Gas per 1000 Cubic Feet. s. d.	Illuminating Power of Gas—Candles.	Cost of Gas per 1000 Cubic Feet. s. d.
19	1 7	14	3 7
18	1 10	13	1 3
17	2 1	12	5 1
16	2 6	11	7 1
15	3 0		

Remarking on this, Mr. Dibdin said that, on this basis, it was seen that any variation in price per 1000 cubic feet for each candle alteration in the illuminating power of the gas should be greater than had hitherto been supposed. On the other hand, these facts explained the common complaint as to the otherwise apparently inexplicable rise in the amount of the gas bills—a fall of 2 candles in quality causing a rise, in the case of Bray No. 5 burners, of 44 per cent. in the gas bill; while when the gas was down to 12½ candles, the amount of the gas bill was doubled. Therefore any discussion of the cost of gas per 1000 cubic feet was valueless in the absence of an equal recognition of its quality. With Welsbach and the best argand burners (which, however, were used to only a very limited extent as compared with flat-flame burners), the results were, the author pointed out, less disproportionate, and a moderate reduction in price for each candle power would not be unreasonable. Unfortunately, however, to obtain a problematical advantage to the users of gas for heating purposes, the vast majority of those consuming gas for illuminating purposes in burners commonly employed, would be mulcted to a most unjust and injurious extent.

The foregoing results having been obtained with specially prepared gas, the author deemed it advisable to repeat the experiments with gas actually supplied to consumers. Consequently a second series of tests was made with gas supplied by the Gaslight and Coke Company. To obtain gas of very low



## ERFURT GAS-WORKS.—FOR DESCRIPTION, SEE PP. 1386-87.



GENERAL PLAN OF WATER-GAS PLANT AND CONNECTIONS.

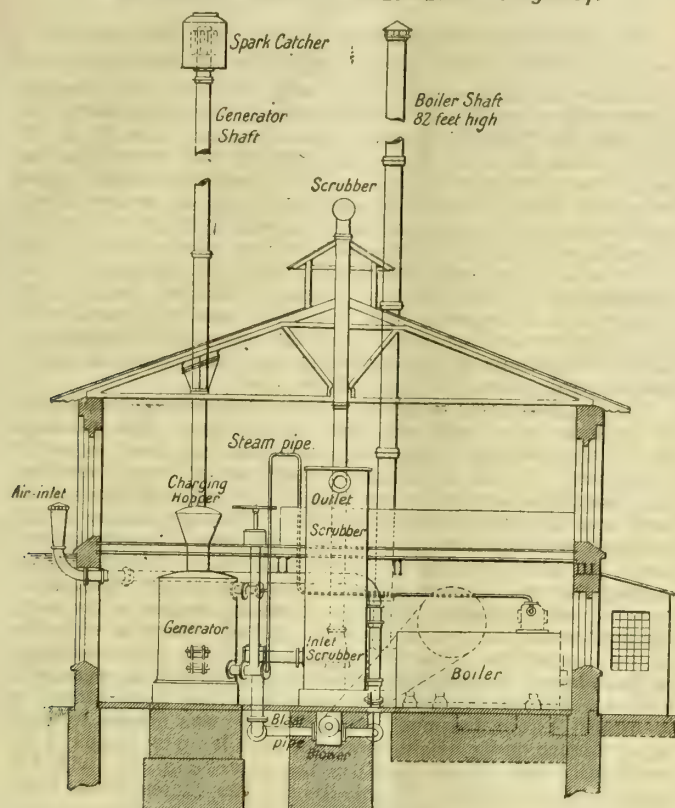
illuminating power, the ordinary supply was stripped by passing it through a coke scrubber; the coke being moistened with linseed oil. Richer gases were obtained by the addition of petroleum to the ordinary supply, and allowing the mixture of petroleum vapour and coal gas to stand for some hours in a holder before making the tests. A third series was made, in similar manner, with gas supplied by the South Metropolitan Company. The results (which were set out in tables on view) confirmed those previously made.

To ascertain the effect of the use of water gas, the author conducted a similar series of tests—first, with a mixture of lower

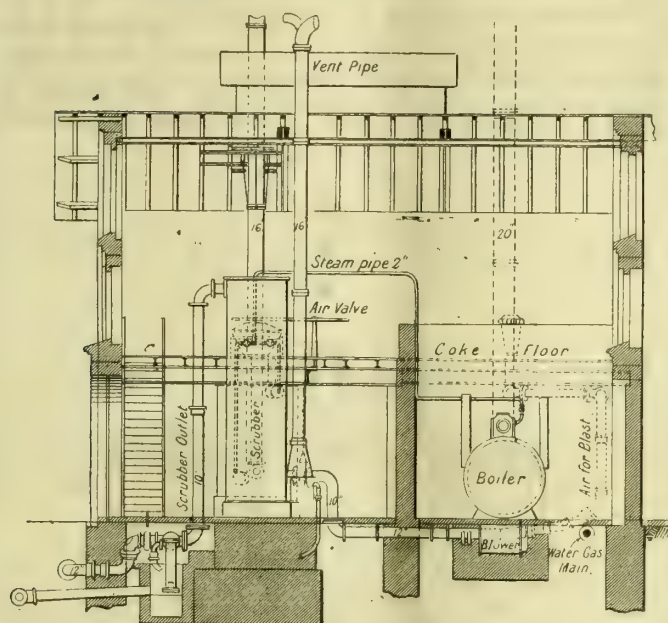
power coal gas and water gas in varying ratios; and, secondly, with mixtures of high-power coal gas and water gas. The figures showed that, with increased percentages of water gas, the quantity of gas required to give unit light with a No. 4 Bray burner rose to as much as 160 per cent.; while with the standard argand burner, the increase was only 6 per cent., and with the Welsbach mantle it was *nil*. In the tests with high-power coal and water gas, with a No. 4 Bray fishtail burner, the increase in consumption was 250 per cent. with 75 per cent. of water gas; but with the standard argand there was no increase, while with the Welsbach mantle there was an actual decrease in the consumption of 7 per



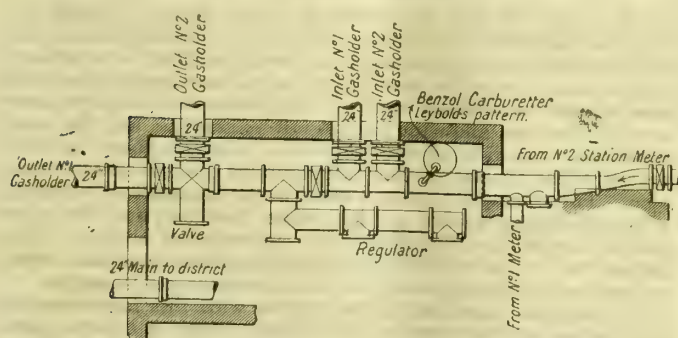
## ERFURT GAS-WORKS.—SEE PP. 1386-87.



WATER-GAS HOUSE—END SECTIONAL ELEVATION.



WATER-GAS HOUSE—SIDE SECTIONAL ELEVATION.



MAINS FROM STATION METERS TO GASHOLDERS—SHOWING POSITION OF CARBURETTER.

cent. Shortly, the results of the water-gas series were that dilution of coal gas with equal power water gas had the same effect in many burners as that produced by a reduction in the illuminating power of the gas—i.e., a larger quantity of gas had to be consumed to obtain the same illumination; while the use of excessive quantities of high-power water gas as an enriching agent was without the commensurate advantages that might have been anticipated—viz., such as were obtained from the use of benzol, cannel, &c.

## THE VALUATION OF GAS LIQUOR.

A Meeting of the Nottingham Section of the Society of Chemical Industry was held last Wednesday at the Municipal Technical College, Derby—Dr. F. STANLEY KIPPING, F.R.S., in the chair—and in the course of the evening, Mr. E. J. R. CARULLA, F.C.S., read a paper of special interest to our readers, on "The Valuation of Gas Liquor."

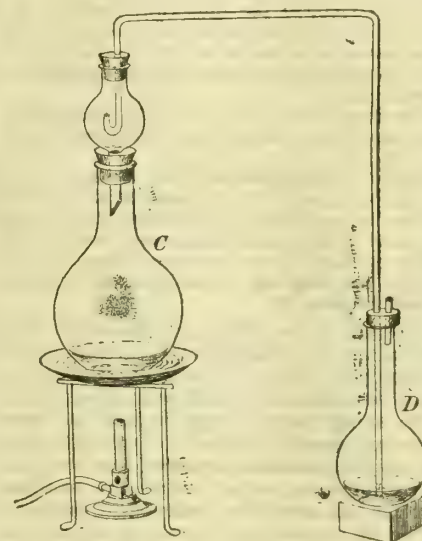
Mr. Carulla pointed out that, although containing other components sometimes of use, the ammonia is the only one generally valued in gas liquor, the large bulk of which is still produced by coal-gas works. Chemical manufacturers at one time almost exclusively worked up this liquor; but gradually the business was becoming more and more one for the gas manager. Some reasons for this change were clear enough. Liquor with an average of 2 per cent. of ammonia would not stand heavy carriage charges; and large gas-works away from chemical works must, therefore, deal with it themselves. Other reasons did not lie so much on the surface. Those depending on the fluctuations of the sulphate of ammonia market, the author made an attempt to remove. Gas liquor was, he pointed out, often sold for long periods at a fixed price; and as the chemical manufacturer could not insure himself by selling sulphate for a sufficiently long time ahead, he was frequently compelled to offer what might not be thought a fair price for the liquor. Hence a sliding-scale of prices suggested itself as a solution of the difficulty. Naturally the methods for taking the strength of the liquor were matters of importance. The author said he found that, up to 4° Twaddell, it was quite safe to use the hydrometer. Above 4°, the true strength was generally a little higher than the Twaddell strength. But a fair allowance could always be made in the price paid for the liquor, so as not to lose the convenience of so simple a method of testing. Where the hydrometer was inapplicable—as in ammoniacal liquor from tar-stills, &c.—the distillation test must be resorted to; and Mr. Carulla said he was glad to be able, by the kindness of Mr. John Phillips, the Secretary of the Bristol Gas Company, to give particulars of the modification they adopt. It was an instructive description, and was besides of special interest—being issued to would-be contractors for the purchase of their gas liquor with the forms of tender to be filled in with prices on a sliding-scale based on the market value of sulphate of ammonia. The description was as follows:—

*Method of Testing Ammoniacal Liquor.*

The facts upon which this method is based are as follows: When a mixture composed of solutions of ammoniacal salts and a sufficient quantity of some caustic alkali for which the acids of the salts have a stronger affinity than for ammonia is boiled for some time, the whole of the ammonia is driven off in a gaseous state, and may be secured as sulphate by bubbling into a solution of sulphuric acid.

The apparatus employed consists of a sand-bath, heated by means of a bunsen burner; a flask C furnished with an india-rubber stopper, fitted with funnel having a glass stopcock, and also an eduction tube, having the end which fits into the flask C ground off to an angle of about 60°; a second flask D; two properly graduated burettes of such capacity as to contain 60 c.c. of liquid each, and divided into 0.1 c.c.

The solutions employed are: (1) A strong solution of caustic soda, made by dissolving 10 grammes of pure caustic soda in 100 c.c. of distilled water; (2) a normal solution of sulphuric acid, in which 1000 c.c. contain 49 grammes of



sulphuric acid ( $H_2SO_4$ ); (3) a normal solution of caustic soda, in which 1000 c.c. contain 40 grammes of caustic soda ( $NaHO$ ).

These normal solutions are prepared as described hereafter, and equal measures taken of each shall, when mixed together, exactly neutralize each other, and shall neither show acid nor alkaline reaction to a colouring imparted to the solution by the addition of a drop or two of methyl-orange solution, which is the indicator of acidity, alkalinity, or neutrality of a solution, and is made by dissolving 1 gramme of methyl orange in 1000 c.c. of water.

*Normal Test Acid Solution.*—To prepare. Place 30 c.c. of pure concentrated sulphuric acid (sp. gr. 1.842) into 1 litre of pure distilled water, mix carefully, and allow it to cool. The solution will contain rather more than 49 grammes of  $H_2SO_4$  per litre. To determine its exact strength, weigh out about 2 grammes of recently heated pure carbonate of soda made by heating pure bicarbonate of soda for ten minutes at a dull red heat in a platinum dish. Add distilled water, boil, allow to cool, and add a drop or two of methyl-orange solution. Then titrate with the acid solution, until the colour imparted by the methyl orange changes to a pale straw colour. 100 c.c. of standard sulphuric acid solution should exactly neutralize 5.3 grammes of pure carbonate of soda.

*Calculation.*—As 5.3 grammes of carbonate of soda exactly neutralize



100 c.c. of standard sulphuric acid solution, then as  $5.3 : 100 :: 2 : x$ ;  $x = 37.74$ —i.e., the number of "c.c." of standard sulphuric acid solution required to exactly neutralize 2 grammes of carbonate of soda. Say, for example, that 36 c.c. of the standard acid solution was found necessary to be used, instead of 37.74, then it is too strong, and by deducting 36 c.c. from 37.74 c.c., 1.74 c.c. remain. Therefore, it is apparent that 1.74 c.c. of distilled water must be added to each 36 c.c. of the acid solution in order to make it a standard normal acid. Consequently, the number of "c.c." of distilled water required to be added to each litre will be as 36 c.c. : 1.74 c.c. :: 1000 c.c. : y;  $y = 48.3$  c.c.

**Normal Test Caustic Soda Solution.**—To prepare. Put 44 grammes of pure caustic soda into 1 litre of distilled water, and when dissolved allow it to cool. This solution will be a little too strong. To standardize it, use the normal solution of sulphuric acid, 1 c.c. of which must exactly neutralize 1 c.c. of the caustic soda solution.

**Calculation.**—Say that 19 c.c. of the above mixed caustic soda solution neutralizes 20 c.c. of normal sulphuric acid solution. Then the caustic soda solution is too strong. To each 19 c.c. of it, must be added 20 c.c. — 19 c.c. = 1 c.c. of distilled water, or to each litre 52.6 c.c. of distilled water. Then equal measures of this and the normal acid mixed together will exactly neutralize each other.

Assuming that all the vessels are perfectly clean, that the flask C has been placed in the sand-bath, and that the junctions are all perfectly tight, the operations are commenced by charging the flask D with 50 c.c. of the normal test acid. The flask is then placed in position so that the end of the education tube is within  $\frac{1}{2}$  inch from the bottom of the flask. 200 c.c. of water is next poured into the flask C, and 20 c.c. of gas liquor added, and the india-rubber stopper placed in the flask C. 20 c.c. of the strong soda solution must now be poured into the funnel, the cock opened, and closed immediately after the fluid has run down into the flask. The bunsen burner, on being lighted below the sand-bath on which the flask C rests, raises the contents to boiling-point, at which temperature it must be kept until two-thirds of the contained liquor is evaporated, by which time the whole of the ammonia will have passed over into, and will have been absorbed by, the normal test acid contained in the flask D.

The crackling noise which sometimes occurs at the commencement of boiling—caused by the rapid absorption of the ammonia by the acid in the small flask—need cause no alarm.

When the ammonia has ceased to come over, the flask D is removed and allowed to cool, and its contents then coloured by the addition of a few drops of the methyl orange solution.

The burette having been charged with 60 c.c. of normal test solution of soda, and the flask D placed upon a white paper or glazed white tile in a good light, the solution in the burette is dropped into the flask until the red liquid therein changes to a pale straw colour.

The strength of the gas liquor subjected to test is indicated by the number of "c.c." of normal soda solution used in titration, subtracted from the number of "c.c." of normal acid used to absorb the distilled ammonia. Thus, if 30 c.c. of soda solution be drawn from the burette, then, as 50 c.c. of test acid were taken,  $50 \text{ c.c.} - 30 \text{ c.c.} = 20 \text{ c.c.}$ , being the number of "c.c." of the test acid neutralized by the ammonia in the gas liquor.

Each "c.c." of these two normal solutions corresponds and is equal to 0.017 gramme of ammonia ( $\text{NH}_3$ ); 20 c.c. are therefore equal to 0.34 gramme of ammonia. But as 20 c.c. of gas liquor were taken,  $20 \text{ c.c.} : 0.34 \text{ gramme} :: 100 \text{ c.c.} : z$ ;  $z = 1.7$  per cent. of ammonia.

**The "Ounce" or "Acid" Strength of the Liquor.**—To change the percentage into "ounce" or "acid" strength, multiply by 4.61;  $1.7 \times 4.61 = 7.83$ , which represents the number of ounces of sulphuric acid ( $\text{H}_2\text{SO}_4$ ) it would take to neutralize the whole of the ammonia contained in a gallon of the liquor subjected to test.

All the operations are of the simplest character, except the preparation of the test solutions. These, however, can be purchased; but they should always be checked.

One important matter remains to be mentioned—viz., the correctness of the measures and burettes employed. These must be in absolute agreement one with the other in measurement, otherwise grave errors will arise. Unfortunately, many of the glass measures and burettes sold are very inaccurate, and differ greatly in capacity among themselves, to the extent of 5 or 6 per cent. But they can be easily tested by filling them with distilled water, and weighing it.

The author went minutely into some other considerations that should govern the preparation of a sliding-scale—including the fixed and varying manufacturing charges—evolving a formula of easy application, by which an illustrative table was constructed. Mr. Carulla concluded by saying that, although figures had been used for the sake of clearness, he only wished to draw attention to a principle—viz., that of differentiating between the fixed and the varying manufacturing charges, which could be modified according to circumstances, but which he believed, if properly applied, would be capable of introducing harmony among the contending interests of the gas and the chemical industries.

The CHAIRMAN said he was surprised to hear that anyone used the hydrometer as a test for gas liquor. He understood that the liquor was bought and sold by the "ounce strength."

Mr. CARULLA remarked that the ounce strength obtained by saturation of the liquor with sulphuric acid also failed to give a true indication in many instances.

The CHAIRMAN said: Precisely; the ascertainment of the ounce strength by the distillation test is what I refer to.

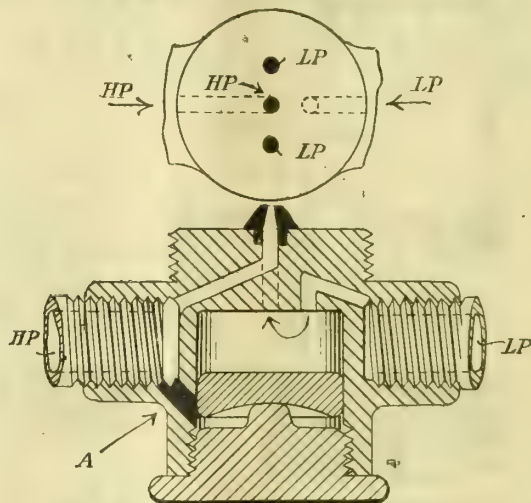
Mr. CARULLA: I have experience of more than a dozen gas companies by whom the hydrometer is found a convenient and reliable instrument. Of course, when buying liquor from tar distillers a distillation test is indispensable, as in that case the hydrometer gives no indication of the strength.

The memorial to the late Mr. G. J. Symons, the distinguished meteorologist, for which public subscriptions were invited a short time since, is to take the form of a gold medal, to be awarded from time to time by the Royal Meteorological Society for distinguished work in connection with meteorological science.

## THE SCOTT-SNELL SELF-INTENSIFYING LAMP.

The Scott-Snell Self-Intensifying Gas-Lamp Company are to be complimented on the several subsidiary improvements which they have introduced into their lamp since we first had an opportunity of making its acquaintance. It was the desire of the inventor, Mr. Scott-Snell, and of his active associate, Mr. C. W. Phillips, that the lamp should not go forth until everything had been done to bring it to a high pitch of perfection; and, having been kept closely informed of what was going on, we are able to say that the first-named gentleman has been untiring in his efforts to produce the highest refinement and best performance. The course which has been pursued is a wise one, as even a little imperfection at the outset in hurriedly finished lamps might have retarded progress; and, as it is, it now only remains for the completion of the provision of the necessary machinery to turn out the lamps at a rapid rate, to meet the already abundant influx of orders from all parts of the globe.

The improvements which have been made will be found to be of intrinsic value, and not mere superfluities. The principal one is the addition to the design of what has been termed a "reverter." This is an accessory which, though simple in action, plays an important part in maintaining the self-sufficiency of the lamp as a complete intensifying plant. The appellation of this new part is an apt one; and in some measure it is self-explanatory. At all events, the description will show that it removes entirely the one objection which has been advanced—that, in the event of any mishap to the pressure-raising section of the lamp, the light would be completely extinguished. Such an objection is now groundless. From the first, one of the commendations of these lamps was the independence of each unit as regards its fellows. Decentralization, it seemed, had then been carried to its utmost extent, inasmuch as each lamp was unable to exert any influence on its neighbours; but each lamp by means of the reverter is now, if one may use the expression, subdivided to minimize local trouble. Simply the reverter accomplishes this: The lamp starts its work with the gas at ordinary pressure; the heat from the incandescent mantle brings into operation the gas-pressure-raising device in the head of the lamp; the high-pressure gas closes the low-pressure supply to the burner in the way to be presently described; and in the event of any untoward occurrence in the head of the lamp, there is at once an automatic reversion to the low-pressure supply. The reverter is situated underneath the burner; and its action is simplicity



itself, as will be seen by reference to the sketch. Within the chamber depicted, is a float; and this float is retained, by the high-pressure gas acting under it, at the utmost limit of its upward range—thus closing the communicating passage leading from the low-pressure or ordinary service. Any cessation of high pressure would, of course, allow the float to fall by gravity; and the lamp would then revert to an ordinary 60 to 80 candle power light by reason of the special gas-feed opened from the low-pressure service. The passage A (shown dark) in the illustration is that by which the high-pressure gas gets under the float, and lifts it to cut off the low-pressure feed when intensifying obtains. The letters "L P" and "H P," it is almost needless to explain, refer respectively to low-pressure and high-pressure gas passages.

The nipples provided in conjunction with this improvement contain two separate sets of gas-delivery holes—a central aperture confined exclusively to high-pressure work, and a set of two or more holes arranged around it which come into play only when the intensifier is out of action, and the connection with the low-pressure pipe opens up by the fall of the float in the reverter. The importance of this type of nipple will be recognized, when it is remembered that, before the lamp intensifies, the bottom of the gas chamber must be heated. By the reverter coming into play, the lamp starts as a 60 candle to 80 candle power lamp, the heat of which quickly tells on the vessel carrying the displacer, and expanding the gas therein, puts the lamp into action. (Of course, it is assumed that the reader is acquainted through our previous article—see *ante*, p. 409—with the operation of the intensifying part of the lamp.) The failure of a lamp to intensify



would simply mean that, while all its neighbours were giving the full volume of 300-candle power or more, the defective one would merely descend to the level of the ordinary incandescent street light. The disaster to the whole circuit which would result from motor failure in a machine-sustained high-pressure service is not only absent, but extinction even in a single lamp is thus rendered practically impossible. We have had an opportunity of testing how smoothly and immediately the reverter answers the cessation of the high-pressure supply.

Other items which make for reliability in construction and ease of examination may be found in the lamps. The reservoir or drum, which constitutes an anti-pulsator, instead of forming part and parcel of the main body of the lamp is now arranged as a separate body, and is so buried inside the water-head that it is quite unnoticeable. It can, however, be easily detached and examined or tested. In spite of intermittent delivery, which naturally obtains in an apparatus involving alternate suction and expulsion of the gas, the light is maintained quite steady by the addition of this small drum, which is only 8 inches in diameter and 6 inches deep. Such simple and direct methods of overcoming difficulties are characteristic of the design of the lamp, and exhibit great ingenuity and skill on the part of the inventor.

The component parts of the lamp are also now materially reduced in number by the clever way in which sheet metal is formed up under pressure, so that in a single piece of metal are combined those parts which would in general practice require multiplicity of pieces with riveted or screwed attachment. Joints—always a trouble, particularly in such a structure as this lamp, in which tightness is an essential to the maintenance of high pressure—are reduced to a minimum, and hand labour is much economized. Castings, with the accompanying labour of machinery and fitting, have been almost eliminated from the design; so that lightness, rapidity of formation, quickness of erection, and interchangeability have received full consideration.

As we have already indicated, and as is not astonishing, the invention has drawn to itself attention from the uttermost parts of the earth. Not only have numerous municipalities, gas companies, and other large industrial concerns in the United Kingdom sent in pressing orders for lamps, but demands have been made from such far-away places as Japan, India, Australia, North and South America, and, nearer home, from a number of European cities. The preparations for the manufacture have, however, absorbed considerable time and close application; and it will probably be the end of the year before regular supplies of the lamps will be obtainable. At the Company's new London works (where, by the way, lamps may be seen in operation, and arrangements have been made for photometrical testing), the dies for stamping out the parts and other tools, which are excellent examples of such work, have been produced under the personal supervision of Mr. Maurice Lachman, the Managing-Director of Messrs. J. F. Pease and Co., Limited. But the manufacture of the lamps in bulk will be carried on in Darlington, where plant is at the present time being laid down equal to a large output.

For want of a more convenient place, it may be mentioned in conclusion that the pressure of 36 inches can now be attained in these lamps, although not required; but it shows that the lamp possesses a considerable reserve margin. It is the intention of the Company not to confine themselves to lamps containing single burners, but clusters of lights in a single lantern will also be produced.

**Private Bill Legislation for Next Session.**—Next year promises to be a busy one in regard to Private Bill legislation, no fewer than 362 notices having been given for Bills or Provisional Orders. There will be 47 measures relating to the supply of gas, 40 to that of water, and 103 to the supply of electricity for light and power. A novel feature this year has been the deposit of 22 notices and plans under the Private Legislation Procedure (Scotland) Act of last year.

**The Chairmanship of the Commercial Gas Company.**—Mr. William Graham Bradshaw has been appointed Chairman of the Commercial Gas Company in the place of the late Mr. John Blacket Gill; and Mr. Walter Hunter, M.Inst.C.E., succeeds Mr. Bradshaw as Deputy-Chairman. The family of Mr. Bradshaw have a long and distinguished connection with the Company. His grandfather, Mr. Charles Salisbury Butler, M.P., was the first Chairman, from its incorporation in 1847 until his death in November, 1870; and his father, Mr. Richard Bradshaw, was Chairman from September, 1875, until his death in January, 1889. To each of these gentlemen the Company is indebted for services of no common order. In its earlier and stormier period, the sagacious counsels and material support of Mr. Butler preserved it from what might otherwise have shipwrecked the young undertaking; while in 1875, Mr. Richard Bradshaw was at the helm, and piloted his Company successfully through the critical parliamentary passage which resulted in the establishment of the sliding-scale. Mr. Walter Hunter, the new Deputy-Chairman, is the Engineering Director of the Grand Junction Water-Works Company, and is Joint Engineer with Mr. Reginald E. Middleton, M.Inst.C.E., of the Staines reservoirs scheme, the inception of which is due to him. Mr. Hunter, in association with the late Mr. Fraser, submitted the scheme to Lord Balfour's Commission of 1892-3, and it was highly approved by them. The first portion is now fast approaching completion.

## REGISTER OF PATENTS.

**Measuring the Rate of Flow of Liquids or Gases through Tubes, and Mixing or Delivering them in Given Proportions.**—Rabe, H., of St. Petersburg. No. 21,772; Oct. 31, 1899.

According to a well-known physical law (the patentee remarks), the volume of a gas or a liquid passing through any opening depends upon the relative pressures on either side. In some known forms of measuring apparatus constructed upon this principle, a fixed contraction in the tube through which the liquid or gas passes is employed; and the varying velocity of the fluid in the tube is measured by the reduction of pressure caused thereby. The total cross-section of the contraction corresponds, in such forms of apparatus, to the mean velocity from which to calculate; while very low and very high velocities—that is to say, the extreme velocities—cannot be calculated with sufficient accuracy, and frequently not at all, for the reduction of pressure varies as the square of the velocity, and the results are therefore too small for low velocities and too great for high ones. These deficiencies have led the inventor of the present method of measurement to construct a resistance consisting of a throttling device, which can be adjusted to the varying velocities of the fluid without interrupting its flow, and which will also show visibly the size of the throttled passage—in other words, the degree of throttling—for any position in which it may be set.

To this end, there is employed any mechanism which can be opened or closed for the attainment of a predetermined difference of pressure—the method being practically similar to a weighting operation, in which the load is approximately counterpoised with weights, and the remaining difference measured upon the scale-beam; whereas in the method employed when using the known apparatus before referred to, the subsidiary scale alone is employed. The velocities of gaseous and liquid fluids are in this way enabled to be estimated within a very wide range, by means of a single piece of apparatus and under any difference of pressure. Furthermore, the apparatus permits of the throttling action being suspended (without interrupting the flow of the fluids) whenever desired, allowing the whole cross sectional area of the tube to be filled—an operation which is frequently necessary when dealing with liquids, to remove stoppages in the pipes, or to control the cross sectional area of the throttling device.

**Pressure-Gauge.**—Guest, J. J., of Birmingham. No. 22,373; Nov. 9, 1899.

The claim of the inventor is for "a pressure-gauge constructed of a tube, the cross section of which is elliptical (or other than circular), twisted about its axis so that the corresponding points of the various cross sections lie upon helices around the axis of the tube, which axis may be either straight or curved—the distortion which is observed to determine the pressure being that due to the integration of the effect of the twist of the elements of the length of the gauge-tube."

**Gas-Ignition Pills.**—Martini, A., of Berlin. No. 24,392; Dec. 7, 1899.

In the course of his specification, the patentee points out that, since the discovery of the catalytic properties of the metals of the platinum class, numerous attempts have been made to manufacture "effective and durable gas-ignition pills;" the substances most generally employed being platinum in a state of very fine distribution and meerschaum. Care has, however, to be taken, not only to distribute the platinum metals as thoroughly as possible in the pores of the pill-body, and to separate the single particles by heterogeneous substances, but also to avoid a melting of the pill-body, which would form a hindrance to the entrance of the gases; and, finally, the strong hygroscopic tendencies of the pill substance have to be taken into account. He claims that all this may be effected, in a thorough and effective manner, by adopting the method described—using meerschaum, platinum metals, and rare earths (combinations of thorium and platinum), as referred to in his English patent No. 22,901 of 1898.

The principal improvement now suggested consists in the manner of treating the materials to form the ignition pill. At the present time, pieces of meerschaum are impregnated with platinum chloride, and the latter reduced; and generally after this operation the soluble parts of the meerschaum are removed. This process is said to be by no means perfect; and it has been found far more effective to proceed as follows: First of all, the soluble parts are removed from the meerschaum substance ("for it is to these that the hygroscopicity of the latter is due"), which has to be effected without lessening the coherence of the remaining parts. To this end, pieces of meerschaum are treated with acids (especially hydrochloric acid) and water. In this way, a non-hygroscopic skeleton is produced which cannot properly be styled meerschaum any longer, but which possesses nearly all the qualities required for the body of a gas-ignition pill. This skeleton is kept in a wet state (not to expose it to any heat), and subsequently impregnated with a solution of nitrate of thorium or some other rare earth. When the pores are thoroughly filled with the salt, the latter is reduced into the oxide very slowly, without exposing the pill to any high temperature; and then the pills are lixiviated with hot water. The body of the pill thus prepared is next impregnated with a solution of platinum chloride, and the latter reduced into metal by heat or gases.

This manner of using a skeleton of meerschaum, together with platinum and thorium, for ignition pills, can only be made use of when the thorium salt is absolutely pure. If there is any impurity in it (and generally thorium nitrate, as sold by the trade, is not absolutely pure), then the pill will be spoilt. The patentee therefore suggests another method in which to make use of the combination skeleton of meerschaum, platinum salt, and thorium salt. According to this plan, the thorium is not retained in the interior of the pill, but only serves to fill the pores of the skeleton, so as to keep them in such a state that they cannot trickle during the process of manufacture, and to ensure that the platinum shall find inside the pores of the meerschaum skeleton the thorium with which it mixes. Thus, when the thorium salts are subsequently removed (which takes place as soon as the whole process of reduction is finished), platinum mohr remains inside the pores of the skeleton in a finer state than can be reached in the ordinary way of producing platinum mohr. The skeleton has to be manufactured in the same way as before, by removing

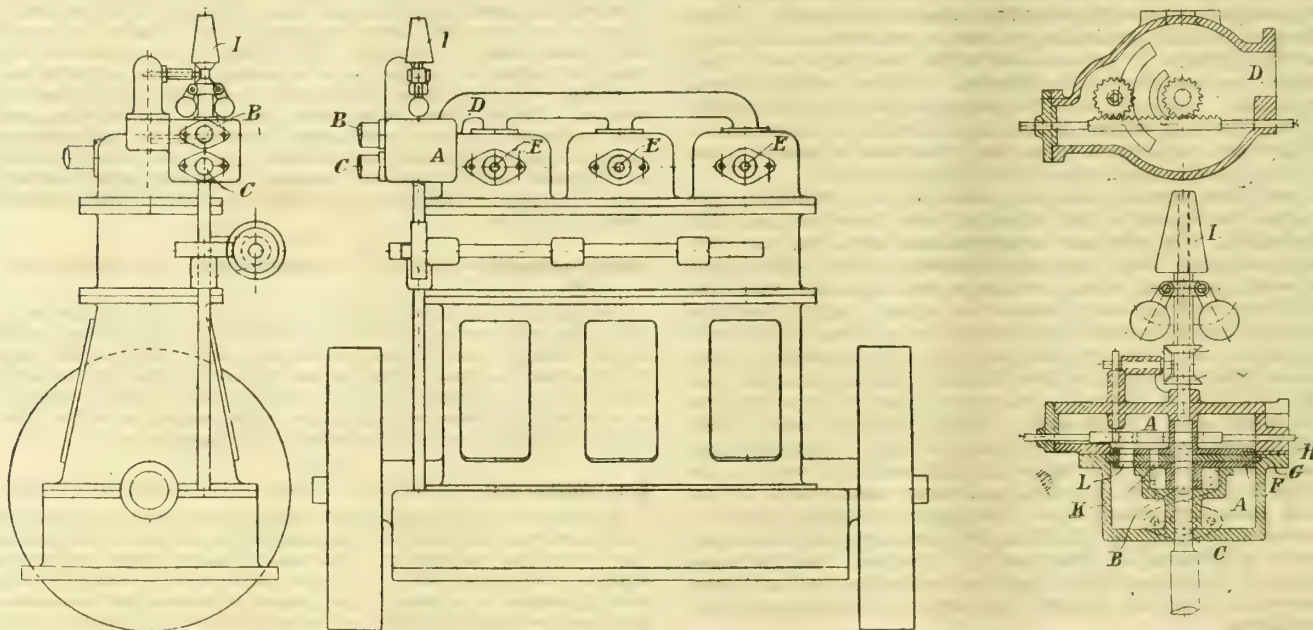


the soluble parts of the meerscham by means of acid and water; and the wet pills are then saturated with nitrate of thorium and dried very slowly. The incorporated thorium salt will thus serve, "firstly, for the purpose of mixing with the salts of platinum, for producing the finest division of the platinum mohr inside the pill; and, secondly, as a stronghold for the finest parts of the skeleton during the whole process of manufacture, preventing them from melting, and also preventing the closure of the finest pores." As soon as the thorium has served these purposes, it is removed, before the pill is used. The dried skeleton, filled with salt of thorium, is then saturated with a solution of platinum salt; and after being slowly dried, the platinum salts inside are reduced to platinum mohr.

**Internal Combustion Gas-Motors.**—Crossley, W. J., of Manchester. No. 23,266; Nov. 22, 1899.

This invention is for the purpose of obtaining more regular turning with internal combustion motors, by varying the power given by successive impulses to the amount required to drive the load for the time being—thus giving constant regulated impulses, in place of full-power impulses with some of them entirely cut out, as is usually the case with motors of this description."

Applied to an internal combustion motor having three cylinders working on the "Otto" or four-stroke cycle, with three equidistant crank-pins (thus giving three regulated impulses for every two revolutions), the arrangement is as shown in the engraving. Fig. 1 is an end view in elevation of the motor; fig. 2 is a longitudinal elevation; and fig. 3 is a horizontal and vertical section through the governing arrangement.



in the fixed plate G, the suction continues throughout the whole of a suction stroke of one of the pistons. If, however, the governor-plate is moved round a little against the direction of motion of the cut-off plate, the latter will have its ports closed before the termination of the suction stroke; and so the piston will not be able to draw in a cylinder full of mixture, but a reduced charge only—such charge, on compression and ignition, giving a reduced impulse. The extent to which the successive impulses are reduced is dependent upon the position of the governor-plate; and this position is decided by the governor I.

**Mantles for Incandescent Gas-Lights.**—Place, J., of Beckenham. No. 3995; March 1, 1900.

This construction of mantle for incandescent gas-lamps consists of a number of rods or filaments of the material to be rendered incandescent, to replace the woven mantle hitherto generally in use, by which means the patentee claims to be "enabled to replace damaged portions of the mantle at small cost without, as has hitherto been necessary, being obliged to replace the whole mantle."

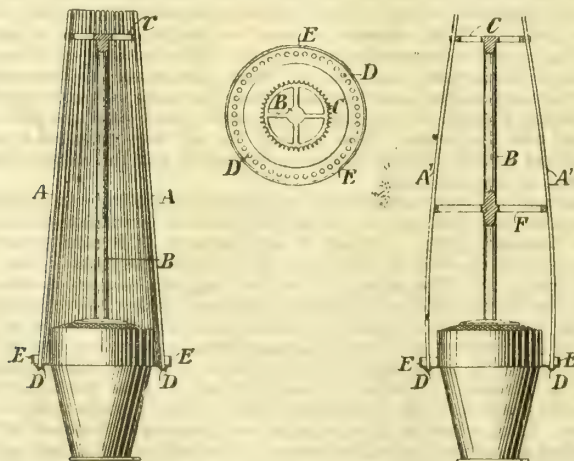


Fig. 1 represents (in part sectional elevation) the top of an incandescent burner with such a construction of mantle in position. Fig. 2 is a plan

As applied to a three-cylinder motor, a cut-off shaft is driven by gearing so as to revolve three times for each two revolutions of the crank-shaft, which passes through an enclosed chamber A (the cut-off chamber). This chamber is provided with a gas-inlet B, an air-inlet C, and a mixture-outlet D—the latter being connected to a pipe which leads to an admission-valve E on each cylinder. The gas-inlet is in communication with the gas-port K in the cut-off plate F; and the air-inlet C is in communication with the air-port L. The cut-off plate is a thin disc having through ports K and L, placed one outside the other, and extending over some 120° of its surface, with the exception of sufficient laps or covers at the outer and inner edges, and to divide the two ports. As the cut-off plate revolves, its ports uncover two corresponding ports in a fixed plate G; one being connected intermittently to the air-inlet and the other to the gas-inlet of the cut-off chamber through the plate F. These ports also extend circumferentially some 120°; and consequently, as the cut-off plate revolves, its ports open to the gas and air ports in the fixed plate G for some 240° of the revolutions of the cut-off shaft. (This 240° of the cut-off shaft corresponds to 180° of the crank-shaft, and is made to coincide with a suction stroke of one of the pistons.) As the cut-off shaft revolves three times to two revolutions of the crank-shaft, the port-openings will thus coincide with the three suction strokes of the three pistons.

In addition to these cut-off and fixed plates, there is a governor-plate H (having similar ports through it), which may be turned round the cut-off shaft as a centre through an arc of some 120°. Its position is defined and decided by a governor I, by (say) a toothed rack and two small pinions. If the ports in this governor-plate H are opposite to the ports

of same. Fig. 3 is a view (partly in section) of a slightly different form of mantle supported by a modified arrangement of stem.

A A<sup>1</sup> are rods or filaments composed of incandescent material—in the former case straight, in the latter case curved—of which the mantle is built up. B is the upright stem inserted in the centre of the burner, and carrying a wheel-like expansion C, provided round its circumference either with a number of holes or a number of more or less semicircular recesses. Around the top of the burner is arranged a ring or channel E, in which are depressions D corresponding in number to the holes or recesses in the crown, and which number again depends upon the number of filaments it is desired to employ. Where curved filaments are used, a notched or perforated ring or expansion F is secured horizontally near the middle of the rod B, so as to afford an internal and intermediate support.

To construct the mantle, a number of rods are placed nearly vertically, either by dropping them through the holes or arranging them in the recesses of the expansion C so that their lower ends each repose in the corresponding depression D in the ring or channel E. As an alternative, so as to get the shape of the mantle accommodated to the natural shape and dimensions of the flame, the filaments may be of curvilinear shape instead of straight.

**Lighters for Gases or Vapours.**—Thompson, W. P.; a communication from Dr. A. Simonini, of Brooklyn, U.S.A. No. 11,874; June 30, 1900.

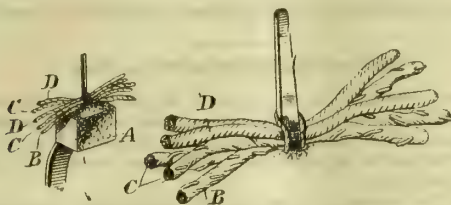
This invention relates to a lighter for gases, constructed as shown by the perspective view of the complete arrangement, and a similar view showing the threads or strands of which it is composed.

The invention comprises a preliminary heater of suitable form, and a secondary heater and igniter, consisting of threads or webbing or other fibrous bodies impregnated with a solution of rare earths, together with platinum chloride, or any metal of the platinum group. The percentage of the component parts varies with its use. The secondary heater has a high percentage of platinum chloride—from 10 to 25 per cent.; whereas in the case of the igniter, the percentage does not exceed 1½ per cent., and may be lower.

In carrying out the invention, a preliminary heater is made use of—such as a pill or pellet A (p. 1401)—composed of platinum black. A secondary or intermediate heater is then built up in the following manner: A thread B, having woven in it a platinum wire, is treated with a solution of thorium nitrate and platinum chloride, in proportions varying from 75 to 90 per cent. of thorium nitrate, and from 25 to 10 per cent. of platinum chloride. In connection with the thread so treated, are two or more threads C, having platinum wire embodied in them, and which are impregnated with a solution of platinum chloride alone. The igniter proper is composed of two or more threads D, treated with a solution comprising (approximately) thorium nitrate 98½ per cent., cerium nitrate 1 per cent.,



and platinum chloride  $\frac{1}{2}$  per cent. The threads thus treated are secured to the preliminary heater A; the whole being supported by any suitable device which will hold them in the path of the issuing gas.



The operation of the lighter is as follows: The preliminary heater A glows, and transfers the glow to the thread B, which, owing to the high percentage of platinum chloride added to the rare earth, glows from end to end at a relatively low temperature—transmitting the glow in turn to the threads C, consisting of platinum wire and very porous metallic platinum. The threads C glow at a somewhat higher temperature than do the threads B. The glow from the threads C, is transmitted to, and taken up by, the threads D, which become highly incandescent and ignite the gas; and it is owing to the relatively low percentage of finely-divided platinum present in the threads that they become so highly heated. From this it will be seen, says the patentee, that there is a gradual building up or accretion of temperature from the preliminary heater through the component parts of the intermediate heater to the igniter. It is also a fact to be noted that, where a large percentage of platinum is employed, the glow travels quickly from end to end of the thread, with a low resultant temperature; while in the case of the igniter where a very small percentage of platinum is present, the temperature is high, but the glow does not travel so fast.

**Washing Illuminating or like Gas.**—Hadden, R.; a communication from the Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft, of Berlin. No. 14,569; Aug. 14, 1900.

This invention has reference to the treatment of illuminating gas (whether obtained from coal, wood, turf, coke, or other similar material) with certain washing ingredients, so as to extract the vapoury substances, such as bisulphide of carbon, carbonic oxysulphide, oil of mustard, mercaptan, thiophene, phenol, phenates, and the like.

In order to condense the vapoury substances, and render them more easily soluble in the washing mixture, the gas is cooled down considerably, and washed with an amine preferably dissolved in alcohol—as, for instance, with an alcoholic solution of aniline. The effect of this solution is said to be to entirely desulphurize the gas. To make the aniline solution more effective, the gas is preferably dried before its entry into the solution by being led over burnt lime. The hydric sulphide separated on the combination of the carbon bisulphide with the aniline must be removed by suitable absorbents for hydric sulphide—either subsequent to the washing process, or simultaneously. In the latter case, it is effected by adding to the aniline mineral salts (preferably such as are soluble in alcohol or oil). In case the calorific and illuminating power of the treated gas should be more or less reduced, the gas, after having been washed, can be carburetted.

Experiments have shown, says the patentee, that traces of sulphur and rhodanide of ammonium in many cases still remain in the gas after it has been treated in accordance with the process described. In order to free the gas completely of these traces, pure sulphur in any suitable solvent is added to the amine dissolved in alcohol, oil, and the like for washing the gas; and the solution is then heated. The hydric sulphide generated by passing the gas through the solution is absorbed; and the gas is then passed through a solution of a nitrate—for instance, nitrate of potassium or of sodium—in order to free it from all traces of salts of ammonium.

**Bunsen Gas-Burners.**—Brooks, F. M., of New York. No. 15,682; Sept. 4, 1900.

In the introduction to his specification, the patentee says: "Investigations and experiments made by others as well as myself, since the introduction of the so-called 'mantle' of refractory material, have developed the fact that the brilliancy of the light produced by the mantle is largely dependent upon the completeness of the combustion of the fuel (combined air and gas), and that when the mixing of these two elements is complete—so that combustion is perfect, or as nearly so as possible—then, if proper devices be provided to control or direct the combined gases at the point of combustion, it is possible to produce a flame having what is now known as a hyperincandescent zone. This is a zone or part of the flame immediately above the surface of the burner, where the combustion is so complete that the heat is intense and the incandescence of the mantle more completely secured, whereby greater brilliancy and intensity in the light result than is otherwise possible, because of the presence of the intense heat which secures the great incandescence of the mantle, and partly because, owing to the complete combustion of the fuel, there is little if any residual product of combustion, which if present darkens the mantle, at its upper part first, and later the obscuration extends downwardly until its illuminating power is seriously impaired."

The present invention, therefore, relates to the parts of a burner which pertain to the above-stated features—that is to say, (1) the means for securing a proper pressure of the gas and air, and their proper mixing before they reach the point of combustion; and (2) improvements in the burner and its various parts whereby "practically perfect combustion is obtained," resulting in the hyperincandescent zone already referred to.

A in the illustrations represents the ordinary bunsen tube; B, the ordinary gas-inlet nipple; C, the air-inlets in the tube A; and D, the ordinary gate or valve which controls the admission of air. It is provided with the usual openings E, which register with the openings C in the tube. F is the enlarged upper portion of the burner tube; and G is the mantle. H is a cap. (The form shown in fig. 1 is the same as figs. 2 and 3; while figs. 4 and 5 show a slight modification.) It is composed of a hollow, cup-shaped part H; the sides I being deep enough to constitute a collar which fits with considerable snugness upon the exterior of the part F of the tube, so as to prevent any escape of gas. Around the

edge of the cap (which may be arched if preferred) are formed a series of openings J made by punching holes through the metal, in such manner, however, that the severed portions K are not entirely punched out, but only about three-quarters of the way, leaving one-quarter of the metal uncut. This acts as a hinge or support for the severed portion, which is bent upwards above the plane of the surface of the cap. Thus each little part K constitutes a deflector superposed over each hole; and the tool which effects the cutting of the metal is so shaped upon its face, in conjunction with the die with which it co-operates, as to slightly twist these superposed deflectors in such manner that the gaseous mixture, as it passes upwards through the cap, will be projected in a series of jets (very slightly separated from each other) at an upward angle, and also a little

Fig. 1.

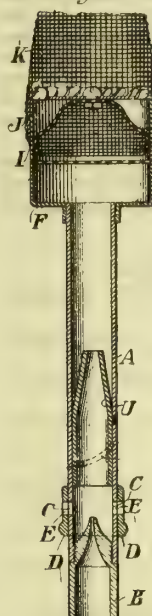


Fig. 2.



Fig. 3.



Fig. 4.

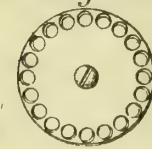
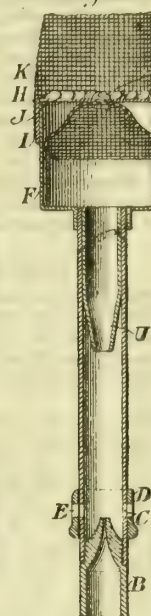


Fig. 5.



Fig. 6.

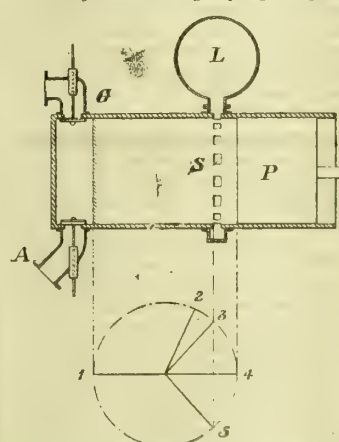


tangential to the circle of the cap at the place where they issue, so that if their line of projection were extended, the entire circle of jets would describe a figure resembling an inverted truncated cone. Because of this construction, the jets of flame, it is claimed, are controlled in volume; and each jet is practically identical in size with the neighbouring jets. Owing also to their tangential projection, they are thrown directly against the inner surface of the mantle very slightly above the surface of the burner; whereby "the most intense flame and the most perfect incandescence of the mantle" are secured "since the hyperincandescent zone which is produced by these intensely hot jets of perfectly consumed fuel, impinges directly against the inner surface of the mantle, and produces a complete circumferential illumination of it."

U is the device employed to aid in effecting the more complete mixture of the air and gas. It may be made in various forms. In fig. 1, the lower part is shown as a tube parallel to the burner-tube A, and adapted to slide within it; while above the tubular part, the side walls are drawn inwards, terminating in a contracted mouth or opening. The apparatus will, however, work well if this part be inverted, as shown in fig. 6, in which event it must be placed near the upper part of the tube A—its contracted orifice or opening being in about the same location—that is to say, within substantially the central third (vertically) of the tube A, as in the other case. When this is the arrangement, the gas and air being retarded somewhat in their upward movement by having to pass through the contracted mouth of the device U, move about and intermingle in the lower portion of the tube A; and being under pressure there, when they pass into the gradually enlarging chamber above the contracted mouth, they expand and cause "freer combustion and greater heat at the burner."

**Working Two-Stroke Internal Combustion Engines with Scavenger Air Supply.**—Abel, C. D.; a communication from the Gasmotoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 15,797; Sept. 5, 1900.

This invention (relating to improved means and appliances for working two-stroke internal combustion engines in which the combustion gases are cleared out of the cylinder by means of scavenger air charges) is shown by the accompanying longitudinal section of the motor cylinder,



attached to which is a diagram showing the action of the piston.

The motor cylinder is provided at its closed end or cylinder head with an inlet-valve G for the combustible charges—forced in under pressure; the valve being actuated for the purpose by cam or other mechanism, and the combustion gases being expelled through the valve A. The engine-piston P, during its out-stroke, uncovers the ports S that communicate with an air-reservoir L, which, before the ports are uncovered, is charged with air at a certain pressure above that of the atmosphere, and which does not receive any further supply of air while the ports are open. The degree of air pressure and the size of the reservoir are so proportioned that, for a fraction of the time during which the ports are open (say, half the time), the pressure in



the reservoir will be able to expand down to that of the atmosphere in escaping into the cylinder through the ports.

The mode of working is as follows: At the end of the piston's instroke, a combustible charge previously forced into the cylinder is ignited, and the piston is made to perform its outstroke in doing work (see Part 1 to 2 of the piston's travel). At Point 2, the discharge-valve A is opened, so that during the Part 2 to 3 of the outstroke the combustion gases under pressure escape through the valve, and when the piston arrives at Point 3 it uncovers the ports S, so that the scavenger air charge now entering from the reservoir L will drive out the remainder of the combustion gases through the valve A. At about the end of the outstroke (Point 4), the air pressure in L will have expanded fully; so that the air pressures in the cylinder and reservoir will be about that of the atmosphere. At this moment the discharge-valve is closed, and the admission-valve for the next combustible charge is opened, so that during the Part 4 to 5 of the piston's instroke, the combustible charge will be forced in under pressure, thereby driving a portion of the air through the ports S back into the reservoir L. At Point 5, the ports will be closed again; and at about the same time, or a little later, the admission-valve is also closed. The piston, on its travel from Points 5 to 1 will now compress the combustible charge admitted, and this is ignited at the Point 1. After the ports S have been closed, the reservoir will contain air under a pressure slightly higher than that of the atmosphere, owing to the amount of air forced back into it, as stated; and this pressure is then raised to the required higher degree by an air-pump.

#### APPLICATIONS FOR LETTERS PATENT.

- 20,849.—SCHROEDER, F. W., PETERS, J., and MORAN, P. W., "Incandescent lights." Nov. 19.  
 20,854.—POTTER, W. G., "Apparatus for producing oil gas; being a combined generator and incandescent burner." Nov. 19.  
 20,893.—HOLM, H., "Carbonization of peat, and apparatus therefor." Nov. 19.  
 20,947.—GUSTAFSSON, K. G., "Generating acetylene gas." Nov. 20.  
 20,983.—MOORE, F., "Coin-fired meters." Nov. 20.  
 21,015.—POTTER, W. G., "Gas-fires." Nov. 21.  
 21,016.—POTTER, W. G., "Portable coal or oil gas generators." Nov. 21.  
 21,054.—WILES, S. F., "Internal combustion engines." Nov. 21.  
 21,074.—KNOFF, W., "Incandescent gas-lamps." Nov. 21.  
 21,132.—MURRAY, T. R., "Endless conveyors." Nov. 22.  
 21,156.—HADDAN, H. J., "Incandescent burners." A communication from C. Paris. Nov. 22.  
 21,165.—CROWTHER, A., "Anti-vibrators for incandescent gas-lamps." Nov. 23.  
 21,182.—HAWKES, M. F., "Gas-pendants and the like." Nov. 23.  
 21,214.—VULITCH, D. DE, and D'ORLOWSKY, J., "Production of calcium carbide." Nov. 23.  
 21,238.—ASTON, W. H., "Conveyors or elevators." Nov. 23.  
 21,274.—TIMINGS, S., "Atmospheric gas-burners." Nov. 24.  
 21,284.—WHITELOW, E. T., and EHMANN, C. P., "Gas-fires." Nov. 24.  
 21,295.—HARVEY, E. C., "Gas heating and lighting appliances." Nov. 24.

**Launceston Town Council and the Gas Company.**—The differences which arose between the Launceston Corporation and the Gas Company respecting the lighting of the town have been amicably adjusted. At the last meeting of the Town Council, the contract about which there had been so much discussion was at length sealed. In answer to a question, the Surveyor said he had made inquiries with reference to incandescent oil lighting, which had been suggested as a substitute for gas lighting. He found that lighting on this principle was very expensive, and that in the town where it was adopted it was confined to a small area, and was not used in the out-districts. Mr. Trood hoped that early attention would be given to the lighting; for unless something was done, they would find the same questions cropping up again next year. He understood that a company had offered to prepare a report on the lighting of the town. The Mayor (Dr. Andrew) said the Lighting Committee would not lose sight of the subject, and they would be glad to receive suggestions from outsiders.

**Fatal Gas Suffocation Case at Hull.**—Gas poisoning was the immediate cause of the death of John Brough, of Egginton Street, Hull, last Saturday week; but heavy drinking appears to have been at the bottom of the act which had this lamentable result. The deceased had a private income, and lived in a house of his own. A friend (Thomas Carr) visited the dwelling on the night of the day mentioned, and found the door barred. Knowing that Brough had been drinking liberally lately, he feared something was wrong; and with a police sergeant, he forced an entrance into the house, which was found full of gas. On being cleared, Brough was found dead near his bed, and the lead piping attached to the gas-meter was discovered torn away. In the middle of the day, a police sergeant had seen deceased moving about the house suffering apparently from the effects of drink. At the inquest, the medical testimony was that gas poisoning was the cause of death; and the Jury returned a verdict of "Death from suffocation, without any evidence to show how such suffocation came about."

**The Wolverhampton Gas Company's Stokers and Inclined Retorts.**—A meeting of the members of the Wolverhampton branch of the Gas Workers' Union was held a few days ago, in order to hear the report of a deputation which had waited upon the Directors of the Gas Company in reference to a rise of wages and alteration of work on the inclined retorts at their Stafford Road station. The matter had previously been discussed by the men (see *ante*, p. 1043). The result was stated to be that the Directors would grant a rise of 3d. a day to all retort-house men on the old and the new work, but they could not see their way to making any alteration in the work. Purifiers' wages were raised 4d. a day, and coal unloaders and coke loaders 2d. per day; horse drivers and general labourers to remain as they are. The Directors pointed out that in future the number of retorts in the inclined plant would be eight, instead of nine as at present; thus making the work more favourable. The men were disappointed that they could not get any change in the work; but as the Company are making the alteration in the number of retorts in each bed, the labour will be lighter. Under these conditions, the men decided to accept the offer made to them.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Oil and Carburetted Water Gas.

SIR,—Those whom I know, engaged in manufacturing carburetted water gas in this country, hold views so diametrically opposed to the opinions expressed in your editorial of the 20th ult., that I am induced to offer an alternative presentment of the case, leaving the issue to the side of fact and logic.

You have the virtue of generosity in associating yourself with the "deluded" manufacturers of carburetted water gas; for surely not one of these gentlemen could ascribe his adoption of the process to the warmth of its advocacy in your columns. You speak now of having "welcomed the advent of carburetted water-gas manufacture into the United Kingdom;" but your past efforts have seemed to many of us more in the way of speeding the parting than of welcoming the coming guest.

"Perhaps it was right to dissemble your love,  
 But—why did you kick me down stairs?"

And is there not something (I had almost said) indecent in your present eagerness to proclaim the obituary, and superintend the obsequies of the industry? If it be mine to express the knowledge and faith that is in me, I hope to show that the prospect of carburetted water gas in the United Kingdom was never more auspicious than now.

You cite Mr. Trewby's fine address of 1891 as if his early experience of carburetted water gas were more rosy than subsequent events justified; but the Beekton results given in the 1892 paper of Messrs. Goulden and Paddon leave no room for such inference. With an oil costing 3½d. in the service-tanks, they were then obtaining 900 candle-feet per gallon. The improved character of the oils and plant now supplied in this market have increased this yield by an average of over 60 per cent.—thus preserving the early economic condition, although oil were at a present price of 5½d. per gallon, and the process had formerly to compete with abnormally cheap gas coal. Later, when my firm was engaged in the construction of various plants throughout the country, you propounded your "poser" for "English dabblers in water gas" with "fluid hydrocarbon costing anything from 3½d. to 5d. per gallon." No one was then misled by delusive oil prices; but, since the very conditions which gave birth to the process were condemned by you as prohibitive, are you now the authority to fix the date of its decease?

The price of oil being the main point at issue, I will briefly recall (from memory) the past market of that commodity. A gradual decline in the price of gas oil (then exclusively Russian) was deranged in 1895 by a fierce commercial contest for the refined oil trade of the United Kingdom, suspending all arrangements for the independent storage and transport of gas oil, and substituting refined kerosene (still Russian) for gas-making purposes, at a price 30 per cent. below that previously attained by gas oil. No one "fell into the delusion that this effect was traceable to the ordinary operations of the economic law of supply and demand," and no one hesitated to profit by the artificial prices from disinclination to support unnatural causes. After eighteen months of this "oil-war," matters were patched up, and Russian gas oil was gradually restored to the market at about 3½d. per gallon.

The next movement was in the spring of 1897, when the Standard Oil Company (upon the representations of my firm) offered their surplus stocks in this market. The sudden advent of this new factor at once broke the market; and a large quantity of oil was sold at 2d. per gallon. The depletion of this American surplus was unhappily coincident with the beginning of a phenomenal condition of world-wide industry and militant activity, which, following a period of equally phenomenal depression, rapidly enhanced and exhausted market commodities. Atlantic tank transport reached 32s. 6d. per ton, having been previously as low as 9s. 6d. The difference between these extremes represents over 1d. per gallon of oil, whereas 0·6d. per gallon is reckoned a fair normal charge for transatlantic carriage. But the difficulty in the oil situation was due mainly to the fact that the startling increase in the demand for oil overtook the quick resources of the Standard Oil Company, and created a panic in the management. They temporarily forsook their character of "territorial octopus," and discouraged the sale of petroleum and its products throughout their system.

Now, however, that West Virginia has been opened with an abundance which is said to rival the Pennsylvania fields, the recent high prices may prove a disguised blessing, inasmuch as they have given a tremendous incentive to oil exploitation throughout the world, and have induced the Americans to eliminate the uncertain question of Atlantic transport by constructing ocean tankage sufficient to carry their gas-oil trade, and give them complete control of their freights. This will not be in commission for another twelve months.

I estimate that the average price of gas oil, *ex tank-steamer*, from the introduction of carburetted water-gas manufacture to the present day, is 3d. per gallon; and, within the limits of human foresight, there is no reason to suppose it will exceed this price in the future. Personally, I am satisfied that the future price will be substantially less than that figure. At the present moment, future supplies of the best quality of gas oil can be booked at less than 3½d. per gallon; but I do not advise purchase. The conditions now prevailing in America are not yet sufficiently reflected in this market, nor is this the season for purchasing. The market quotation for crude Pennsylvania oil is now \$1·07 per barrel, and still declining; whereas, during the four months of last winter, the price per barrel averaged \$1·67. One dollar per barrel may be taken as the fair normal value in the past.

A reduction of 36 per cent. in the price of crude oil, and a greater assured reduction in the future cost of transportation, are the conditions which usher in the New Year. When this is connected with the fact that the extensions of the process undertaken during 1900 aggregate a capacity of over 40 million cubic feet daily, being 50 per cent. greater than the extensions of 1899 (the next largest year, both being years of maximum oil prices), is carburetted water gas moribund in the United Kingdom? or is it revolutionizing the state of the gas industry? And I may add that in Continental countries, where the gas distributed is not only of low candle-power, but where customs duties are levied on petroleum, the



auxiliary advantages of carburetted water gas are meeting increasing recognition.

I now come to a view of this question before which the points I have made shrink to secondary significance. It concerns capital charges. I need not detain you long in this connection, because what I would say is embodied in a paper, entitled "Carburetted Water Gas as a Coal Gas Auxiliary," which I read last year before the American Gaslight Association.\* I enclose a copy. You will see that I have resolved the output of a large English town into two portions. One comprises two-thirds of the maximum and 83·7 per cent. of the annual output, and is taken as a fixed coal gas portion. The other, comprising one-third of the maximum and 16·3 per cent. of the annual output, is called the "debatable" portion, and its cost per thousand is reckoned for both carburetted water gas and coal gas, including capital charges, maintenance, and depreciation. For the cost of money is as real an element in the price of gas as coal, oil, or any other "raw material," and should be as accurately weighed and compared. Under the conditions described in the paper, it was found that the ultimate costs were equivalent for this debatable portion, when the manufacturing cost (*i.e.*, the ultimate cost, less capital charges, maintenance, and depreciation) of carburetted water gas was 2½ times that of coal gas alone!

Your remaining point is that you can still find a works in the United Kingdom, conducted with the wisdom which characterizes the management of the South Metropolitan Gas Company, which is not engaged in the auxiliary manufacture of carburetted water gas. I may, therefore, point out that, although the South Metropolitan Company does not make carburetted water gas, it shares, equally with those who produce this gas, some of the important collateral benefits of the process—namely: There will be used this year in the United Kingdom over 150,000 tons of gas oil, displacing 1,600,000 tons of coal and 1,000,000 tons of coke. This is largely confined to the winter season, and represents one-half of the total annual consumption of coal and cannel by the three Metropolitan Companies. I will not attempt to picture what would result if the present coal and coke markets were burdened with these additional requirements and supplies, nor will I more than name the fact that the labour market is proportionately affected.

A. G. GLASGOW.

Westminster Chambers, 9, Victoria Street,  
London, S.W., Dec. 3, 1900.

P.S.—Absence from England prevented my replying in your previous issue.

#### The Minimizing of Sunday Labour on Gas-Works.

SIR,—There is one point in Mr. Shadbolt's excellent paper on the above subject at the meeting of the Manchester District Institution to which I should like, with your permission, to draw attention—viz., the question of the stokers' wages for the Sunday or seventh day. From the paper, I gather that at Grantham the stokers are not paid for the Sunday they are off. If they are, then Mr. Shadbolt ought to have added the cost in Column 3 of Statement A. In the discussion arising out of the reading of the paper, the only person who referred to this matter was Mr. Tim Duxbury, who, in speaking of the regularity of the workmen, said "they had lost one shift in the week, and took good care not to lose another." From this I infer that at Middleton the men lose their Sunday's pay. If my inferences are not correct, then the cost per ton of coal carbonized greatly exceeds 3·45d., as stated by Mr. Shadbolt.

Something over twelve months ago, the Directors of the Company I serve resolved to give the stokers their Sundays off; and when I was appointed, they told me their desire was that, as far as possible, Sunday labour was to be stopped. I had no difficulty in falling in with their views, as I am strongly in favour of Sunday closing. But in making comparison with the carbonizing wages formerly paid and those of the present day, I was impressed with the cost of Sunday closing, as we pay the men for their Sunday off. It works out as follows:—

No. of Shifts.	Coals Carbonized per Shift.	Total Coals Carbonized.	Wages per Week.	Cost per Ton Carbonized.
7 ..	2½ ..	15¾ ..	35s. ..	2s. 2·66d.
6 ..	2½ ..	13¾ ..	35s. ..	2s. 7·11d.

These figures show an increase of 4·45d. for wages alone; and this added to 3·45d. as per Mr. Shadbolt's statement, makes 7·9d. per ton, which is quite another figure altogether, and is slightly under what it costs in Guildford.

Nov. 28, 1900.

GEO. R. LOVE.

#### The Sale of Stock to Gas Consumers.

SIR,—Recent sales of gas stocks by auction or tender have generally been, to a considerable extent, failures. Stocks, paying at the present price of gas as much as 5 per cent., or even more, to the investor, have, both in London and elsewhere, failed to find purchasers in sufficient numbers—a large proportion of the stock offered being in almost all cases unsold. I have not heard whether the unsold portions have been taken by the existing shareholders, to whom by law these have to be offered at the reserve price. I expect such to be the case, because, being offered at a fixed price, the ordinary investor knows exactly what he or she is buying; but when tendering many do not understand, and this slight difficulty is sufficient to cause such persons to let the opportunity slip.

Why gas directors do not endeavour to place all new issues of stock with their consumers is an enigma. But possibly the present difficulty of selling by auction or tender may lead them to entertain this useful alternative. Quite lately the South Metropolitan and the Crystal Palace District Gas Companies successfully issued £120,000 and £20,000 of new stock respectively. Both Companies are under the auction clauses, which require all new stock to be offered to the public by auction or tender. These Companies chose the latter alternative, and advertised according to law, and only according to the letter of the law, for tenders.

\* This paper was given in full in the "JOURNAL" for Nov. 28, 1899 (p. 1311).—Ed.J.G.L.

No tenders were wanted, and none were received. The Directors were then free to offer the whole of these issues of stock to their shareholders, their consumers, and their employees. Seeing that all such issues are at the market price, as near as may be, they are of no advantage to the shareholders; but it is a great advantage to a gas company to have as many consumers as possible among its shareholders. Consequently, after reserving sufficient to supply the wants of the employees (who under the profit-sharing system require a considerable amount), the balance was offered to the consumers at the reserve price.

In the case of the South Metropolitan Company the reserve price gave £4 2s. per cent., and that of the Crystal Palace District Gas Company £4 9s. 3d. per cent., on the investment. In both cases, circulars were sent to every consumer, giving the price at which £5, £10, £20, £50, and £100 of stock could be purchased; and it was stated that the applications for small amounts would have preferential consideration. The whole was much more than applied for in both cases; and the smaller Company had to make the maximum allotment £100 of stock, while with the larger Company it was £500.

The £18,000 (odd) of the Crystal Palace District Company was distributed among 300 applicants, or about £60 apiece on the average. Some 800 consumers of the South Metropolitan Company took the balance of about £100,000 of the stock, or an average of about £120 per applicant. It is clear that the stock would have been all taken at higher prices than those at which it was issued; but in both cases it was fixed higher than was advised by experts. The money was badly needed; and the Directors fixed the prices lower than they otherwise would have done for that reason.

Gas companies intending to apply to Parliament next session are now preparing their Bills. Would it not, therefore, be advisable to insert provisions for the direct issue of new stock to consumers at the market price of the day, without first offering it to the public by tender. In 1895, the South Metropolitan Company failed in such an attempt; but within the past twelve months both the Government in their War Loan and the London County Council have seen the wisdom, and proved the advantage, of issuing their loans at a fixed price. With such precedents, gas companies should have a good chance of success.

The only difficulty is the method of determining what is the market price. Of course, a slight margin must be permitted; but this could be limited in the Act at (say) not exceeding so much per cent. below the average market price of the last month. For the last ten years we have placed practically all our new stock with the consumers after supplying the employees. We did so before we obtained parliamentary authority; and I can say that the system has great and obvious advantages, and no disadvantages whatever.

South Metropolitan Gas Company, Dec. 1, 1900.

GEORGE LIVESEY.

#### Gas-Fires in Living-Rooms.

SIR,—It may be useful to have the actual figures as to heating rooms so as to know exactly what is possible in practice.

A flueless stove, such as a condenser, burning 15 cubic feet of gas per hour, night and day, in a room 14 feet by 14 feet by 10 feet, with limited but sufficient ventilation for ordinary use, would maintain a rise of 30° over the outside temperature, but would take several hours at first to approach this, as the walls would have to be raised to the temperature before the heat could be maintained. And here is one of the practical difficulties—the necessity for heating the room some hours before it is wanted—which can only be overcome by a fire or stove largely in excess of the ordinary power required. If a warm-air stove is used with a flue, and controlled ventilation, a rise of 22° to 24° may be obtained; but if the fire is used in the day only, this will not be reached until late in the day.

As a matter of practice, a room 14 feet square and 10 feet high does not require an average of more than about 60 cubic feet per day of twelve hours, or 5 cubic feet per hour, for the six months of winter, if the fire is attended to, only lighted when required, and no waste or over-heating allowed. This was my own average in my town house, calculating for the different sizes of the rooms, for eight or nine years; and yet there were times when a 30 cubic feet consumption in a room 16 feet square was barely enough. It is difficult to decide between two points, whether to have a small fire with limited consumption, which will certainly be unsatisfactory in very severe weather, or to have a larger one, and turn it down to what is required. The latter is the most comfortable, and it costs no more if attended to; but there is possibility of waste in any case, and gas-fires should be under the control and supervision of the person who has to pay the bill.

There is one point in the figures obtained in practice worthy of notice. They do not work out to the theoretical requirements—being much lower; and this difference is caused by the heat evolved by gas used for lighting, and also that from the persons in the room. A room in constant use is always warmer than one which is not—a fact very well known, although the reason has usually been overlooked.

There is no doubt that the temperature of a room has comparatively little to do with its feeling of warmth or the reverse. A moist atmosphere always feels much colder than a dry one; and for this reason a warm-air stove, which removes the surplus moisture in damp weather, makes a room feel warmer than would be expected from the temperature registered by a thermometer.

For this reason an incandescent fire with an arrangement for warming the air, is by far the cheapest method of heating; and with proper ventilation and an absence of down-draught in the flue, a room can be kept comfortable—as fresh and sweet as with an open coal-fire—with little greater cost than coal.

The oppressive feeling sometimes complained about when gas-fires are used, is caused entirely by down-draught in the chimney, or by an escape of the products of combustion into the room; and for this reason flueless stoves, even when designed specially for use without a flue, must never be fixed in living rooms, or in any place where the ceilings are low.

The most expensive room I have had to deal with as regards gas heating, was one with three outside walls, 21 feet square, and 17 ft. 6 in. high, and with very large windows. Using an incandescent fire with a large warm-air arrangement, the average annual gas consumption was 50,000 cubic feet, which, at 4s. per 1000, cost £10 yearly.

Warrington, Dec. 1, 1900.

THOS. FLETCHER.



## PARLIAMENTARY INTELLIGENCE.

### NOTICES GIVEN FOR BILLS (SESSION 1901) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

The following notices have been given in addition to those which appeared last week:—

- Arlesey Gas.**—Authority will be sought for the incorporation of a Company to supply gas to Arlesey, Stotfold, Henlow, and Clifton, in Bedfordshire, and also to sell gas in bulk. The usual powers will be sought; and in the Bill to be promoted, provision will be made for obtaining sanction to produce and supply electricity. Power to raise the necessary capital will be required.
- Barrow Corporation.**—The Barrow Corporation will apply for power to construct additional works, comprising two reservoirs, a weir, a settling-pond, and a conduit or pipe-line, and to take water from the River Duddon and other streams. In the Bill to be promoted, provision will be made for securing the purity of the water at the source of supply, altering the existing rents, rates, and charges, laying down gas and water mains, and lighting private streets and courts; also for determining purchase-money and compensation. More capital will be required.
- Blackburn Corporation.**—In a General Bill to be promoted by the Corporation, power will be sought to extend the boundaries of the borough, and to supply electricity within the gas and water limits. Authority to raise more money will be applied for.
- Broadstairs Water.**—The Urban District Council of Broadstairs and St. Peter's will apply for authority to acquire the undertaking of the Broadstairs Water Company, maintain and improve the existing works, and construct new ones. Provision will be made for the supply of water in the ordinary way and in bulk, and regulations framed for the prevention of waste. Borrowing powers will be required.
- Burgess Hill Water.**—The Burgess Hill Water Company will apply for power to construct new works, consisting of an adit and service reservoir in the parish of Ditchling. Special provisions will be made in regard to the supply of water and fittings, injury to pipes, meters, and fittings, &c. Additional capital will be needed.
- Bury Corporation.**—Notice has been given by the Corporation of their intention to apply for authority to purchase certain lands, among them being an area of 2 roods 5 poles 8½ yards, in the parish of Bury, for the extension of their gas-works. Borrowing powers will be sought.
- Cromer Water.**—The Cromer Water Company will apply to be dissolved and re-incorporated with additional powers, and an extension of limits so as to include a number of adjacent parishes. Provision will be made for the sale of water in bulk and the prevention of waste. New works are contemplated, comprising a pumping-station, a service reservoir, and two pipe-lines.
- Derby Corporation.**—In a General Bill to be promoted by the Corporation, power will be sought to supply electric energy and construct additional water-works, consisting of four filter tunnels. Provision will be made for protecting the water from becoming contaminated. More money will necessarily be required.
- Dorking Urban District Council Water.**—Application will be made by the Council for authority to purchase the undertaking of the Dorking Water Company, and maintain and improve the existing works; also to enter into an agreement with the Dorking Rural District Council for the transfer to them of a portion of the concern lying within their district, and to appoint a Joint Committee of the two bodies. Money powers will be sought.
- Dover Corporation.**—Application will be made by the Dover Corporation for authority to purchase the undertakings of the Dover Gas and Electricity Supply Companies, and maintain, improve, and extend all or some of the existing works; also to supply gas and electricity for light and power, as well as meters and fittings. Permission will be sought to levy rents, rates, and charges, and to raise money for carrying out the scheme.
- Harpenden Gas.**—The Harpenden Gas Company will seek dissolution and re-incorporation, with power to maintain and continue the existing works and construct new ones. The limits of supply are to be defined. Authority will be sought to levy rates and charges, sell gas in bulk, inspect meters and supervise fittings, &c.; and also to apply for a Licence or Provisional Order under the Electric Lighting Acts.
- Harrogate Water.**—The Corporation of Harrogate will apply for authority to carry out certain works, consisting of a reservoir to be situated on a tributary of the River Burn, four aqueducts, and filter-beds, and to appropriate waters. Borrowing powers will be sought.
- Heckmondwike Gas.**—A proposal will be submitted to Parliament for the constitution of a Joint Gas Board, consisting of representatives of the Urban District Councils of Heckmondwike and Liversedge, for the purpose of acquiring the undertaking of the Heckmondwike Gas Company. The present works are to be maintained, improved, and extended. Provision will be made for the borrowing of money, the application of revenue and profits, the making good of any deficiency, and the raising of contributions by the constituent Authorities. The District Councils will ask to be invested with all the necessary powers for the manufacture, production, storage, and supply of gas of any description, for all domestic, trading, public, and other purposes.
- Honley Urban District Council (Gas Transfer).**—Application will be made by the Honley Urban District Council for authority to purchase the undertaking of the Honley Gas Company, Limited, by agreement, and carry it on with the usual powers granted to suppliers of gas. Permission will be sought to raise more money.
- Horley District Gas.**—The Horley District Gas Company will apply to be dissolved and re-incorporated with power to maintain the existing works, construct new ones, and supply gas within the limits defined by their Order of 1886. The present capital powers are to be regulated, and more money will be required.
- Ilkeston and Heanor Water Board.**—Application will be made by the Ilkeston Corporation and the Heanor Urban District Council for sanction to the constitution of a Joint Water Board to acquire the undertaking of the Meerbrook Sough Company, construct water-works, and supply

water in Ilkeston, Heanor, and elsewhere. The usual powers conferred upon owners of water-works will be sought.

**Kettering Urban District Council Water.**—The Urban District Council of Kettering intend applying for power to construct a number of new works, comprising a reservoir in the parishes of Rothwell and Orton, another in the parishes of Rothwell, Orton, and Thorpe Malsor, six conduits or pipe-lines, and two outlet tunnels. It is proposed to take the waters of the Slade stream and its tributaries, and the stream flowing between Loddington and Orton and its tributaries. Provision will be made for the protection of land, mine, and mill owners, for preserving intended gathering-grounds and sources from pollution, for protecting the works, and for the supply of water to other Authorities, bodies, and persons. Money powers will be sought.

**Kingston-upon-Hull Corporation.**—In a General Bill to be promoted by the Corporation, power will be sought to acquire land for the protection of waters and water-works, and make provision for the supply of water and the prevention of its pollution. Some more money will be required.

**Leatherhead Gas.**—Application will be made by the Leatherhead Gas Company to be dissolved and re-incorporated with power to maintain the existing works and supply gas, stoves, fittings, residual products, &c., in Leatherhead and adjacent parishes. In the Bill to be promoted, provision will be made in regard to regulating the price of gas by a sliding-scale or otherwise, and also as to the quality and pressure and the inspection of fittings, &c.

**Llandrindod Wells Water.**—The Urban District Council of Llandrindod Wells will seek power to acquire the undertaking of the Llandrindod Wells Water Company, maintain the present works, and construct others, consisting of two reservoirs and pipe-lines, and supply water in their district and the parishes of Cefnlllys Rural and Llandrindod Rural, in Radnor. Further provisions and regulations will be made in regard to the supply of water, the levying of rates and charges, and the borrowing of money.

**Long Eaton Gas.**—The Long Eaton Gas Company will apply for dissolution and re-incorporation with additional powers of supply in the town and neighbourhood. The present works are to be maintained and enlarged. In the Bill to be promoted, the usual provisions will be made in regard to the price and quality of gas, the supply of meters, fittings, &c., and the supervision of the latter.

**Mansfield Corporation.**—The Corporation notify their intention of applying for power to purchase the undertaking of the Mansfield Woodhouse Gas Company. It is proposed to acquire lands for the manufacture of gas, and make general provisions as to its sale in the ordinary way and in bulk, and the supply and inspection of meters and fittings. Additional powers will be sought in respect of the water-works. Certain parts of the Mansfield Water Act, 1870, and of the Mansfield Commissioners' Gas Act, 1878, are to be repealed. The Corporation will also seek authority to construct an electricity generating station, in conjunction with a refuse destructor, supply electric energy in their district, and make agreements with local authorities and companies in relation thereto. Permission will be asked to exclude the water and electrical loans from the operation of the Public Health Act, 1875. Further borrowing powers will be sought.

**Margate Corporation.**—Application will be made by the Margate Corporation for power to construct a series of works, comprising a pumping-station at Wingham, and the necessary adits and conduits or pipe-lines. Provision will be made for the acquisition of lands, waters, and easements, as well as for securing the purity of the water. It is proposed to ask for the partial repeal of certain powers of supply within the area of the Corporation now possessed by the Canterbury, East Kent, and Mid-Kent Water Companies. More money will be needed.

**Mond Gas.**—This is one of the most important projects to be brought before Parliament next year; and it will be found fully dealt with under the heading of "Miscellaneous News," (p. 1409.)

**Oakham Water.**—Application will be made for the incorporation of a Company for the construction of works and the supply of water in Oakham and other parishes in the county of Rutland. The works will comprise a well, adits, an aqueduct, and a pumping-station in Braunston, a reservoir in the parish of Oakham, and aqueducts leading to the town. The usual powers granted to suppliers of water will be sought.

**Omagh Gas.**—The Omagh Gas Company will apply to be dissolved and re-incorporated with power to supply gas within so much of the township and urban district of Omagh, and the parishes of Drumragh and Cappagh, in the county of Tyrone, as is situate within a distance of 2½ miles from the centre of the existing works. Additional land will be required. Provision will be made for a sliding-scale of price and dividend. The Company will also seek power to supply electricity, or to apply for it under the Electric Lighting Acts.

**Oswaldtwistle Improvement.**—In a General Bill to be promoted by the Oswaldtwistle District Council, provisions will be included for the maintenance and improvement of the existing water-works, the acquisition of lands, and the prevention of the pollution of water. Borrowing powers will be sought.

**Prestatyn Water.**—The Urban District Council of Prestatyn will apply for authority to acquire the undertaking of the Dyserth, Meliden, and Prestatyn Water Company, continue the existing works, and construct others, comprising a storage reservoir in the parish of Cwm, two aqueducts, and a balancing-tank in the parish of Dyserth. Power to sell water beyond the limits of supply, and also in bulk, will be sought. Provision will be made for the protection of the works and the prevention of pollution, as well as for the borrowing of money.

**Rhyl Improvement.**—Application will be made by the Rhyl District Council for power to construct water-works, consisting of a reservoir on the Dolwen and an aqueduct connecting it with the existing Plasuchaf reservoir. Authority will be sought to appropriate waters and prevent their pollution; also to supply sea water. Power to raise money and levy rates and charges will be applied for.

**Ripon Corporation.**—Application will be made by the Ripon Corporation for power to construct new works, consisting of six pipe-lines, divert and appropriate additional water, and make provision for the preservation of the sources from pollution. Authority will be sought for the sale of water in bulk, and for raising more money.

**Rugby Water and Improvement.**—Application will be made by the Rugby District Council for authority to construct new water-works,



comprising a reservoir and two pipe-lines, with an incidental alteration of a main road. The Bill to be promoted will contain provisions with regard to the acquisition of land, the interference with streams, and the prevention of contamination of the water. Section 25 of the Rugby Water-Works Act, 1863, is to be repealed, and existing agreements with millowners are to be varied. Powers are also required to supply electricity to adjoining districts, and also electric fittings, as well as to make bye-laws in relation thereto.

**Shipley Gas.**—The Shipley District Council will ask for power to purchase the undertaking of the Shipley Gas Company by agreement, maintain and improve the existing works, and supply gas within and beyond the present limits. Further provision will be made with regard to the water undertaking of the Council (particularly as to the prevention of pollution of the water), and also in respect of electric lighting. Authority to borrow money will be required.

**Smethwick Corporation.**—Among the general provisions of a Bill to be promoted by the Smethwick Corporation will be some relating to the supply of electricity outside the borough, and also electrical fittings, and to the laying of gas-mains, &c., in undedicated streets.

**Stratton and Bude Gas.**—Application will be made for the incorporation of a Company to construct works and supply gas in the parishes of Stratton, Poughill, and Marhamchurch, in Cornwall. The usual powers granted to owners of gas undertakings will be sought.

**Swanage Gas and Water.**—Powers of incorporation will be sought for a Company to supply gas in the parishes of Swanage, Langton Matravers, and Studland, and water in the two first-named places, all in Dorsetshire. The existing gas and water works are to be maintained and new ones constructed. The undertakings authorized by the Swanage Gas and Water Order, 1883, and the Swanage Water Act, 1884, are to be transferred to the new Company.

**Wells Corporation Water.**—Application will be made by the Wells Corporation for power to purchase the undertaking of the Wells Water Company, maintain the existing works, and construct others, consisting of a storage reservoir, an aqueduct, and two pipe-lines. It is proposed to extend the limits of supply so as to include the parish of Wookey. Borrowing powers will be required.

**Wells Water.**—The Wells Water Company will apply to be dissolved and re-incorporated with power to maintain and enlarge their present works by the construction of three reservoirs and a like number of aqueducts. Authority will be sought for the supply of water in bulk and by meter; and provision will be made for the prevention of pollution and waste. The capital of the new Company will be defined.

#### NOTICES OF APPLICATIONS TO THE SECRETARY FOR SCOTLAND FOR PROVISIONAL ORDERS UNDER THE PRIVATE LEGISLATION PROCEDURE (SCOTLAND) ACT, 1899.

The following additional notices of applications under the above-name Act have been published:—

**Ardrossan Gas and Water.**—The Corporation of Ardrossan intend to apply for power to construct new gas-works, and to supply gas therefrom to the burgh and adjacent places and parishes. It is proposed to sell the existing works. The limits of supply are to be extended and defined. Authority will be sought to construct water-works, comprising a reservoir near Burbie Muir, a catchwater in the parish of West Kilbride, conduits, and other works. Provision will be made for diverting and appropriating water and preventing fouling and waste. Borrowing powers will be sought.

**Glasgow Corporation.**—In a Tramways and General Order to be applied for by the Corporation of Glasgow, provision will be made for the establishment of friendly societies and superannuation and other funds in connection with the gas undertaking, and the reduction of the illuminating power of the gas. To carry out the latter object, the Corporation will ask for the repeal of section 55 of the Glasgow Corporation Gas Act, 1869, and section 4 of the Act of 1882.

**Grangemouth Water.**—The Corporation of Grangemouth will seek authority to construct additional water-works, comprising three conduits or pipe-lines, and make provisions for the prevention of waste. Further borrowing powers will be required.

**Hamilton Burgh.**—Application will be made by the Corporation of Hamilton for the amendment of the Hamilton Water-Works Act, 1854, and for new powers in regard to the rating and valuation of certain classes of property.

**Stirling Corporation.**—The Stirling Corporation intend to apply for certain incidental powers in connection with electric lighting, and also for the equalization of rates within the borough and the repeal of the differential water-rate. Authority will be sought for the revival of the powers of the Water Commissioners for the acquisition of lands and the construction of a conduit, as well as for the extension of the water limits. More money will be required.

#### NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1901).

##### Under the Gas and Water Works Facilities Act, 1870.

**Bearsted Water.**—Application will be made to authorize certain parties or a company formed for the purpose, to make, maintain, and enlarge water-works, comprising a pumping-station in the parish of Bearsted, two service reservoirs in the same parish, and the necessary conduits or pipe-lines. The area of supply is to include the parishes of Bearsted, Hollingbourn, Thurnham, and Leeds, in Kent; and the usual powers granted to owners of water undertakings will be applied for.

**Bexhill Water and Gas.**—The Bexhill Water and Gas Company will seek authority to raise more capital, and acquire by agreement additional lands, water rights, and easements.

**Caterham and District Gas.**—The Caterham and District Gas Company will apply for power to acquire land and construct additional works.

**Dearne Valley Water.**—The Dearne Valley Water Company will apply for power to raise more capital.

**Frimley and Farnborough District Water.**—Application will be made by the Frimley and Farnborough District Water Company for authority to raise more capital, and to purchase and hold for the purposes of their undertaking certain lands in addition to those which they have now power to acquire. The Company's Act of 1893 and the Wey Valley, Frimley, and Farnham Water Act of 1898 are to be amended so far as may be necessary.

**Henley-on-Thames Water.**—The Henley-on-Thames Water Company will apply for an extension of their limits of supply so as to include the whole of the existing borough of Henley, the parish of Badgemore, and so much of the parish of Rotherfield Greys as lies within certain specified boundaries. Additional capital will be required.

**High Wycombe Gas.**—The High Wycombe Gas Company will apply for an extension of their limits so as to include the parish of Hughenden, in Buckinghamshire, and for power to raise more capital.

**Hungerford Water.**—Application will be made by certain parties resident in Hungerford and elsewhere for authority to supply water in that parish and several other places, construct works, and generally carry on the business of a water undertaking. Capital and borrowing powers will be sought.

**Mid-Kent Water.**—The Mid-Kent Water Company intend to apply for power to extend their limits of supply so as to include the parishes of Ash, Longfield, Hartley, Ridley, Kingsdown, and Fawkham, in Kent, and levy rates and charges in the enlarged area.

**Nuneaton Gas.**—The Nuneaton Gas Company will apply for power to acquire more land and construct additional works for the manufacture and storage of gas and residual products. Further capital will be required.

**Perranporth Water.**—The Perranporth Water Company will apply for authority to construct works, consisting of a storage and a service reservoir and two aqueducts, in the parishes of St. Agnes and Perranzabuloe, and supply water in the last-named parish, forming the township or place of Perranporth, and the villages, hamlets, farms, factories, houses and buildings along, or adjacent to, the line of pipes or mains. Money powers will be required.

**Pinner Gas.**—Application will be made by the Pinner Gas Company for power to construct and maintain additional works for the manufacture and storage of gas and residual products on land belonging to the Company adjoining the existing works, substitute a sliding-scale for a fixed maximum price of gas, increase the share and loan capital, and provide for the consolidation or conversion of that now existing.

**Portsea Gas.**—The Portsea Island Gas Company intend to apply for authority to acquire by agreement certain lands in the parish of Cosham, and erect thereon buildings and plant for the manufacture and storage of gas and residual products, and dwellings for the workmen and other persons employed by the Company. Additional capital will be required.

**Slough Gas.**—Application will be made by the Slough Gas Company for authority to raise additional capital.

**Slough Water.**—The Slough Water Company will apply for power to raise more capital, and extend their limits of supply so as to include the parish of Wexham, in Buckinghamshire.

**South Staffordshire Water.**—Application will be made by the South Staffordshire Water Company for power to raise more capital.

**Swaffham Gas.**—Application will be made by certain parties carrying on business at Swaffham under the style of the Swaffham Gaslight and Coke Company for power to maintain, alter, and extend the existing gas-works, and supply gas, meters, fittings, stoves, &c., within and beyond the limits. Additional capital and borrowing powers will be required.

**Tilehurst, Pangbourne, and District Water.**—The Water Company supplying the above-named places will apply for authority to extend their limits so as to include the parish of Whitechurch, in Oxfordshire, and exercise therein the usual powers granted to suppliers of water. Additional capital will be required.

**Woking District Gas.**—Application will be made by the Woking District Gas Company for authority to raise additional capital.

**Wokingham Water.**—Additional capital powers will be applied for by the Wokingham Water Company.

##### Under the Electric Lighting Acts, 1882 to 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Aberavon, Aberdare, Abertillery, Alfreton, Alnwick, Annfield Plain, Ashton-in-Makerfield, Aspull, Atherton, Barry, Benfield-side, Benwell and Fenham, Beverley, Birstall, Blackrock, Briton Ferry, Bromsgrove, Burgess Hill, Cannock, Carnarvon, Chesham, Cheshunt, Clayton-le-Moors, Clydebank, Consett, Crieff, Crompton, Dalkeith, Deptford, Dollar, Dorchester, Dorking, Dungannon, East Cowes, Ebbw Vale, Falkirk, Faversham, Felling, Foots Cray, Friern Barnet, Frome, Galashiels, Goole, Gourock, Great Harwood, Ham, Hampton, Hampton Wick, Handsworth, Heston and Isleworth, Hindley, Hoddesdon, Honley, Ilkley, Ince-in-Makerfield, Isle of Thanet, Jedburgh, Kildare, Llandaff and Dinas Powis, Lewisham and Penge, Lichfield, Llangollen, Lyndhurst, Macclesfield, Marylebone, Melrose, Midland district, Mitcham, Mountain Ash, Neath, Newbury, New Hunstanton, Northfleet, Northwood and Ruislip, Norton, Notting Hill, New Hunstanton, Oban, Pickering, Pontypridd, Pokesdown, Pudsey, Rickmansworth, Rhondda, Rishton, Ross, Roundhay and district, Royton, St. Austell, Shildon, Sittingbourne, Skipton, Stoke Newington, Stratford-on-Avon, Teddington, Thornhill, Todmorden, Tredegar, Trowbridge, Ware, Warwick, Waterford, Wellingborough, Wellington (Salop), Whitley and Monkseaton, Widnes, Workington, Worsley. [Applications with respect to other electricity supply projects will be made in Private Bills.]

#### NOTICE OF AN APPLICATION TO THE LOCAL GOVERNMENT BOARD (SESSION 1901) FOR A PROVISIONAL ORDER

Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

**Shoeburyness Urban District Council Gas.**—Power will be sought by the Urban District Council of Shoeburyness to maintain and continue



the undertaking of the Shoeburyness Gas Company, Limited; manufacture, supply, and deal in gas, residual products, stoves, engines &c.; construct, enlarge, and remove buildings and apparatus for the manufacture and storage of gas and residual products; levy rates, rents, and charges; and purchase land required for the above-named purposes. Authority will be required to apply the funds of the Council and raise more money.

## LEGAL INTELLIGENCE.

### KENDAL COUNTY COURT.—Tuesday, Nov. 27.

(Before His Honour Judge STEAVENSON.)

#### Claim for Compensation against the Kendal Corporation.

This was a case in which Margaret Whitwell, widow of Thomas Whitwell, late in the service of the Kendal Corporation, who was alleged to have died from injuries sustained by him through having been poisoned by an escape of gas while connecting a pipe with a gas-main on the 20th of August last, brought a claim against the Corporation for £200 compensation, under the Employers' Liability Act, 1880.

Mr. SHARPE appeared for the plaintiff; Mr. GREER represented the defendants.

Mr. SHARPE stated that the deceased, who was a gasman, was employed on the 20th of August last, with three other men, none of them being what might be called skilled workmen, in making a connection between a 3-inch main and a 2-inch branch pipe. He would suggest, as a reason for saying that they were not skilled, that the deceased was in receipt of 22s. a week. The men were employed at the corner of Sandes Avenue, in Kendal, where there was a trench dug about 4 feet wide and 17 yards in length; the depth of the main from the surface of the ground being 2 ft. 10 in. On reaching the main, the men proceeded to use a brace-bit for the purpose of boring it; the hole which it was necessary to make being a little more than 2 inches, and in making a connection with so large a pipe, his Honour would think that some means would be provided by the Corporation for the purpose of cutting off an escape of gas. But there were no stopcocks of any sort or kind on either side of the place where they were making the breach; and the men were not supplied with any means of stopping the flow of gas. Therefore at this point he said that there was a defect, in there being no means to prevent danger to the lives of the workmen. Secondly, there was no foreman present. The Gas Manager (Mr. T. N. Ritson) was away from home; and neither of his foremen was there. What happened was that the deceased went to the place using a rude tool—a brace-bit which was not round, but V-shaped—for boring the hole; and it was the practice, when this had been used, for the men in turn to take a chisel and chip round the edge of the hole, notwithstanding that all the time the gas was escaping in volumes. The only thing there was to stop it was a piece of tow, or something of the sort; and this being so, he submitted that there was gross inefficiency of plant. Mr. Sharpe spoke of what he said was the usual method of making connections of this kind, and describing what happened in the present case, after which he proceeded to call witnesses.

Mrs. Margaret Whitwell said she was the widow of the deceased, and was his executrix. Her husband was a gasman in the employ of the Kendal Corporation, and met with his death while at work on Aug. 20 last. His wages were 22s. a week during the past few years. Previous to this he had 20s. a week while in the employ of the Corporation.

Cross-examined: He had been employed for 22 years at the gas-works—formerly under the Gas and Water Company, and latterly under the Corporation—and during all this time he was working among gas, first at one job and then at another. He had been six weeks absent from work previous to the week before the accident; but, so far as she knew, he was sound and healthy when he went out, and had been so for a week. She did not know anything about his having heart disease. Some weeks he did not earn 22s.

Mr. GREER remarked that three years' wages amounted to £159.

Mr. SHARPE contended that the sum they were entitled to claim was £171 12s.

Witness, in re-examination, said that during the six weeks her husband was suffering from a bad hand caused by lead poisoning.

Thomas Coleman, examined by Mr. SHARPE, said he was in the employ of the Corporation on Aug. 20, when he was working at the corner of Sandes Avenue and Beezon Lane. Thomas Whitwell, James King, and Richard Wilson were with him on the job, making the connection spoken of. Before beginning to drill the main, they did not take any precaution to cut off the flow of gas. Neither of the foremen was there. They were provided with a drill of the ordinary shape, round which they put some cotton waste; and it was worked with a brace. He began the drilling, and was at work upon it when the point of the drill first broke through. There had been a 3-inch hole to start with, in which was a plug, which they had to take out, and drill to make the hole larger. They prevented the escape of gas with the cotton waste. He could not say that there was no escape; but very little came out. Whitwell began to drill an hour after he and another man had been so engaged. He was not near them when they were at it, but was making pipes ready for the connection, some 10 feet away. He did not do any chipping. Witness worked for an hour, and then came out of the trench; being rather hot, but nothing more than that. Whitwell and King then went on drilling; the former for not more than five minutes. The hole they were in was 4 ft. by 3 ft.; and then there was a trench from it, 17 or 18 feet long. After Whitwell had been drilling for five minutes, witness told him to come out, and he would take the brace off and see if the tap would enter. Whitwell then came out, and went to the far end of the trench and sat down on the edge, with his feet in the cutting. Any smell of gas there was would be very slight then; there was nothing to affect anyone. Ten minutes or so after Whitwell got out of the hole, he complained about a pain at the back of his head. He said: "A pain has struck me at the back of the head, Tom. Gas never did this before." If there was any gas, it was very slight; so slight that he durst have struck a match while in the hole.

Witness went on chipping, and said to Whitwell: "You will be all right perhaps in a few minutes." He looked at him, and saw that he was trembling; and he and Wilson got hold of his arms and assisted him out of the hole where he was sitting, and walked him up and down. He seemed to be pretty good on his legs, but did not appear to get better. Before this, witness had asked him if he would have a drop of whisky; but he said: "No; I shall perhaps be all right presently." Witness then sent for a doctor; but the one he sent for did not come. Dr. Brumwell came about two minutes after Dr. Watson; and they ordered Whitwell to be taken to the hospital. At this time he did not notice the gas at all; the cotton waste and the tallow upon it stopped the escape. There was a slight pressure on the main. He once before saw Whitwell gassed, and had come across two cases in six years; but not in joints similar to this. He had not seen Whitwell gassed several times.

Mr. SHARPE here remarked upon the evidence given by the witness before the Coroner, which, he said, was different on this point from the statement he now made. He did not know whether his Honour would see grounds for his applying to the Court.

His Honour would not say that he did not; but he was loth to interfere.

Mr. GREER remarked that witness might be unwilling. He was his (Mr. Greer's) witness; but his friend had called him, and must take the consequences. He had not shown himself a hostile witness.

Mr. SHARPE said that if his Honour would look at the report of the Coroner's inquest, he thought he would see that witness then said he had seen the deceased gassed several times. So he was instructed; but now the witness said he had seen him gassed only once.

Witness, in reply to his Honour, repeated that he had not seen deceased in that condition several times. He had only seen him so once; but from what he had heard, he had been gassed several times. He saw no signs of vomit in the trench.

Cross-examined: He had been employed at the gas-works for six years next January; and all this time Whitwell had been there also. Whitwell had had a great deal of experience in making connections. He was over witness, and was trusted to act without supervision by the foreman. When they first knocked the plug out of the hole on this occasion, the gas would escape more freely than when they were driving the bit. He and King knocked out the plug, and Whitwell was not taking part in the operation. Neither witness nor King was affected in the slightest degree by the gas. The brace and bit produced were those they used. As they worked, their heads would not be above the level of the ground. At the place where this happened, four road ends met, so that it was open every way. The block of wood affixed to the bit was produced; witness explaining how it fitted the hole that was being bored. In addition to this, there was the cotton waste as a further protection against the escape of gas. As the bit was bored in, the wood and the cotton waste filled up the hole. When he told Whitwell to come out of the trench, he was quite "jokey." He did not then complain in the slightest; nor was there any appearance of there being anything wrong with him. He went along the trench, and sat at the end of it. Witness went back and took off the brace, and tried the tap; and for a moment or two the hole would be quite open. But any gas there was had not the slightest effect upon him. He had made many connections of pipes; and the only effect he had ever experienced was a little pain across the head, which was when he was making a connection with a bigger main than this. Witness explained the method of using bladders when making connections; and said if they were proper bladders, the gas would not escape. But it depended how they worked.

His Honour remarked that this was not the issue he had to try. The question was not whether the best method had been adopted; but whether, given the method that had been adopted, there had been negligence. The Corporation were not obliged to employ every new system.

James King deposed to being present on the above occasion. There was a slight escape of gas; but he did not notice it. He did not see any vomit in the trench, but was himself sick "through swallowing a chew of tobacco," and not through gas.

Cross-examined: He had been employed at the gas-works for over three years, and had not seen anybody gassed; nor had he been gassed himself. He had never felt any ill-effects from gas escaping while the bit that was in use on the day in question was being employed. When Whitwell came out of the trench, he saw nothing peculiar about him. He was not gasping or choking, and spoke quite in the ordinary way.

Richard Wilson said he was employed as a gasman by the Corporation and was present on the occasion referred to, though not when the men first began to drill. He was sent for the block-tap to enlarge the hole; and when he returned Whitwell was drilling. He went on for about three minutes, and Coleman took his place. Whitwell did not turn to again. While Whitwell was at work, witness noticed about as much gas escaping as might come from an ordinary gas-burner. The gas would come from the edges of the drill. Whitwell did not make any complaint till after leaving the hole; and he then said the gas had made him bad in the head, after which he was bad in the neck. He then began to roll on his stomach. Witness and Coleman walked him away from the cutting to the other side of the road. Looking at a job of this sort, he should not expect a foreman to be there when they had a man of Whitwell's experience and length of service. He himself, had he been Whitwell, would have taken it as an insult if a foreman had been present. The foreman came afterwards.

Cross-examined: Whitwell could not finish the work because he was in the hospital. He himself had been kneeling down, with his face over the hole; and he was not gassed. There was nothing peculiar in Whitwell's appearance when he came out of the hole; and it would be about five minutes after when he made a complaint.

Mr. Alfred Hall, examined by Mr. SHARPE, said that on the afternoon of Aug. 20 he was near the cutting where the men were working; and he saw the deceased. Witness was smoking a cigarette at the time. In consequence of something that was said to him, he put it out. He noticed an escape of gas, which was not strong at first; but when the pipe was drilled, it was stronger. Coleman chipped the edges of the hole, after which Whitwell did so; and he then went away and complained of a pain at the back of his head, and rolled about on the side of the cutting. Witness could smell the gas, and felt as though he had had a drink or two of beer.

In cross-examination, witness said that, after Whitwell first went away



from the cutting, he came back and leaned over the hole, and said he had never felt so bad before. Then he went away again, and rolled on his stomach.

Mr. John Atkinson spoke to seeing Whitwell kneeling at the end of the trench, watching Coleman and King, who were working the brace. He smelt gas very strongly, and made a remark upon it.

Mr. Frank Todd, a member of the Ambulance Association, said he saw Whitwell sitting on the ground, and looking very ill. There was a smell of gas; and he suggested that they should take Whitwell where he would get more fresh air. This was done. He went for water, and dashed it on his face and neck.

By Mr. GREER: Whitwell looked very ill, and was yellow in colour. He spoke something like a drunken man.

Mr. J. T. Battersby, Manager of the Ambleside Gas and Water Works, said he should not call it a proper thing to drill a 2-inch hole in a 3-inch main, because he should consider that it would weaken the pipe too much. There would certainly be some escape of gas; but with care this could be minimized. In making a connection of this kind, the usual and best way was to drill the main and bladder it, the process being to drill two small holes in the main, about  $\frac{3}{4}$  inch, insert a bladder in each, and blow them up. He would put them not less than 12 feet apart. This would prevent gas escaping between the two bladders; and a new connection was put between them. With a drill such as that produced, gas would escape; but not in so large a volume as if it had not the wood block around it.

In reply to Mr. GREER, witness said he had been at Ambleside for two years as Manager, and eight years as fitter. He did not say that in that time he had never drilled a hole in a pipe without using bladders. He had drilled them with a flat drill, and without the wooden block.

His Honour observed that the block produced was packed with cotton wool and candle grease apparently.

Witness (continuing) said he did not think there would be much difference between a brace with wood round it in a 2-inch hole and an ordinary brace in a 1-inch hole. It was not a proper job to put a 2-inch hole in a 3-inch main, as it would weaken the main. Weakening the pipe, however, would have nothing to do with the escape of gas. He had never seen an account of bladders bursting.

By Mr. SHARPE: They might burst, if used too long or too frequently.

His Honour said this evidence was a long way astray from the issue. What he had to try was the question whether there was a defect in the method by which the work was actually done.

Witness added that he should call 22s. a week labourer's wages. He thought there ought to have been a foreman over the men employed in making this connection.

Dr. Gibson, examined by Mr. SHARPE, said he was asked by Dr. Brumwell to go to the hospital on Aug. 20. It was close upon 5 o'clock when he arrived. He saw deceased, who was then in a state of coma, and died about an hour afterwards without having rallied. Everything possible was done. He formed the opinion that the cause of death was apoplexy. He was afterwards present at the postmortem examination performed by Dr. Leeming; and Dr. Watson was there also. They found the brain normal and healthy, which was inconsistent with death from apoplexy. The lungs and liver were healthy; but the heart was in an advanced state of fatty degeneration. As regards the valves, they were normal. Clots of blood were found; but they were not such as would operate actively in causing the man's death. No doubt the heart had been in its then condition for a considerable time; but in the absence of any other extraordinary cause, he might have lived for a number of years. Any great exertion might have proved fatal. He concluded that gas had been the cause of death; the heart being weak in the first place.

By Mr. GREER: There was nothing to indicate that sufficient gas to injure a healthy man had been taken into the system. So far as positive evidence went, there was nothing to show gas poisoning at all. His ground for assuming that gas killed the deceased was that it was found he had not died of apoplexy. The symptoms of gas poisoning and apoplexy were very much the same. They had heard, before the examination, that deceased had been in the trench mentioned. Witness had never before had a case of gas poisoning under his observation. He did not think that the appearances of gas poisoning were definite and unmistakable. The symptoms would depend upon the amount of gas inhaled. Assuming there had been a sufficient quantity to kill a man, there would be insensibility and coma, stertorous breathing, a flushed face, and contracted pupils, though the symptoms would not necessarily show immediately. The more fresh air a man had after inhaling gas, the better would be his chance of recovery, if he had not inhaled too much. The chances were, however, against him, because gas formed a compound with the blood which it was very difficult to separate from it. There might be an improvement to a slight extent, and then a relapse. So far as he knew, there was only one form of gas poisoning. It might be attended with nausea and vomiting. The best thing to do for a sufferer would be to take him into the open air. He did not think that the results of gas poisoning would be more serious in a man affected with bronchitis than in a healthy man. The results would be more serious in the case of a weak heart. The state of the deceased's heart was such that a strain at any time might cause death, without gas poisoning. There was nothing in the postmortem symptoms to indicate altogether that death was due to a strain acting on a weak heart.

His Honour: I do not see where we are going. The question is, apart from the fact that it is your opinion that he died from poisoning, were any of the symptoms you saw consistent with his having died from a strain?

Witness: It would be possible.

By Mr. GREER: He did not at the postmortem examine the blood with acid, to ascertain whether there were indications of gas poisoning. Sometimes the blood would be a cherry-red colour, and at other times dark. This was neither. A change of colour in the blood did not occur in every case.

Dr. Leeming said he had been medical attendant to deceased for fifteen or sixteen years. After his death he was requested by some of the relatives to make a postmortem examination. Deceased was ill for a time previous to Aug. 20; but he should not say that it was from inherent bodily weakness. He came to the conclusion from what he found by postmortem examination that death was caused by gas poisoning. The man was fairly strong; but there were symptoms of heart troubles which

did not show themselves outwardly. Until he had made the examination, he concurred with others in thinking that death was due to apoplexy.

Mr. SHARPE having addressed his Honour,

Mr. GREER said he had hoped it would be considered that there was no case for him to meet. Having spoken upon the facts, he proceeded to call witnesses for the defence.

Dr. Cockill said he had been consulted with reference to this case, and had heard the evidence given as to the symptoms, both at the time and immediately after the postmortem examination. Coal gas as a poison acted by means of carbonic oxide; and he had had actual experience of four cases of such poisoning. He had also made a special study of the symptoms of gas poisoning at the time the gas was received; and these would vary according to the amount of gas present. It was not necessary to speak of circumstances other than those attending the present instance. Among the symptoms that would be exhibited in a case of gas poisoning from tapping mains would be nausea, sometimes vomiting, depression of spirits, drowsiness, flushed face, flushed vessels, hilarity, passing on to coma, with or without convulsions. Sometimes there was partial paralysis before coma set in; and sometimes it came on immediately after inhalation. The usual method of dealing with such instances was by removal to the open air, and the application of pure oxygen. He had heard the history of this case; and, in his judgment, the man could not have inhaled sufficient gas to cause poisoning as described, because another man who was there the whole time was not affected. From the evidence he had heard, the man had been five minutes in the trench, and could not have inhaled sufficient gas to cause poisoning. Speaking of postmortem symptoms of such poisoning, witness said the tissue of the brain would be engorged, and generally of a pinkish colour; and the tissue of the lungs a bright red. The blood might be of a dark colour; and there would be a smell of gas escaping from the lungs under pressure.

John Harrison, foreman at the gas-works under Mr. Ritson, said he had about forty men to look after, and had been foreman for over seventeen years. Previous to that he was a fitter, and had had large experience in the laying of pipes, fittings, and repairs. On Aug. 20, he gave the deceased instructions to put in the service-pipe referred to. For a good many years he had been trusted to lay such pipes without supervision, and had proved himself a competent man. It was left to him to take such tools as he required. The brace and bit in question had been in use for four or five years; and before that they employed the brace without the wood, which was afterwards put on to decrease the escape of gas by steadying the drill. He had never heard of any gas poisoning from using it. He went to the job in question at about 2.30; but the men were then only opening the ground, not having found the main. Later he heard of Whitwell being taken to the hospital, and went and finished the job off. Coleman had had experience in such work, which he could do by himself. The pipe was quite right; the main not having broken in the least. He took out the tap, to see if it had gone far enough in, and then gave it three or four turns. The gas did not affect him, the pressure being very slight. There had never been any complaint about the tools, which had been spoken well of by the man who came to grief.

Mr. Robert Porter, Manager of the Elland Gas-Works, said he had seen the tool that was used (a brace and bit); and in his judgment it was a proper implement with which to drill a hole as described. The wood attached made it safer than it would otherwise be; but nine-tenths of such operations throughout the country were done with the drill alone. It was the first time he had seen the wood used for the purpose. Throughout the country there would be something like five hundred holes drilled daily; and he had never heard of a death from gas poisoning in consequence of these operations with a naked drill. He approved of the method adopted in making the connection with the main in preference to the T connection, in which there would be more risk. It was desirable to do without bladders as much as possible; for bladders were a source of danger, of which they had painful experience at Manchester last December, when the Chief Engineer there was killed.

Mr. John Swan, Manager of the Ulverston Gas and Water Works, gave corroborative evidence.

Mr. T. N. Ritson said that he had known for a number of years the brace that was used for boring; and he had never heard of a man being gassed while using it. He had never received any complaint of it being dangerous or inefficient. He did not invent it, but was very much pleased with it; and it was going to be copied by many other gas workers. In making connections, it was impossible to turn the gas off altogether. He disapproved of the use of bladders. Whitwell had had constant experience. He was a service layer absolutely, and was competent to do such work alone, and to be in charge without other assistance. If witness or the foreman had been on the spot when the connection in question was made, it would not have been done in any different way. He had never heard of another case of gas poisoning in Kendal.

Mr. GREER stated that he had three other witnesses, who would say very much what had already been said; and therefore he would not call them.

Mr. SHARPE having replied on the whole case,

His Honour said he found that Whitwell was a man of great experience, and was in a position of superintendence on the occasion in question. He was a competent man, and it was not necessary that there should be anyone over him. He found that the drill and the brace were in good order, and in no way defective; neither was any part of the arrangements defective. There was no danger in the operation of drilling. Having found this, judgment must be for the defendants.

#### DENBIGH COUNTY COURT.—Tuesday, Nov. 27.

(Before His Honour Judge Sir HORATIO LLOYD.)

Damage to Gas and Water Pipes by the Use of Steam Road-Rollers.

To-day his Honour gave judgment in an important case bearing upon the above subject. The plaintiffs were the Denbigh Gas and Water Companies, and they sued the Mayor and Corporation of Denbigh for damages caused to their main-pipes, &c., by the use of the Corporation's steam-roller. The case of the Water Company was heard first; and as the facts in that of the Gas Company were somewhat similar, it



was agreed that the judgment in one case should apply to the other. The Water Company claimed £13 2s. 1d., being damage alleged to have been done to their pipes between Dec. 16, 1898, and Nov. 30, 1899; and they also asked for an injunction restraining the Corporation from using the roller in future. The defendants gave notice of a special defence under the Public Authorities' Protection Act, 1893, which they filed on the 11th of July last, but which the Judge at that time said was a day too late, and therefore he did not entertain it.

Mr. E. ROBERTS appeared for the plaintiffs; Mr. RALPH BANKES represented the Corporation.

His Honour, in the course of his judgment, said the pipes were originally laid, under statutory powers, in 1864, and, subject to occasional repairs, were the same pipes. In November, 1898, the defendants purchased a steam-roller; and the breakages in the pipes had all occurred since that time. No negligence had been suggested in the management of the steam-roller by the defendants, who were simply using a lawful and acknowledged instrument; but they were liable for injury resulting from its use, unless the plaintiffs had been guilty of negligence in the laying or condition of their pipes. The question, therefore, was whether the pipes were properly laid in 1864, and were sufficient for the then state of the ordinary traffic of the district. The Water Company could not be expected to alter their system, and relay their pipes deeper, because steam-rollers, which might be of still increasing weight, were from time to time introduced. He concluded, on the evidence, that the pipes, in some places where injury occurred, were properly laid, though not so deep as it would be advisable to place them. But the fact that they had withstood ordinary traffic for so many years without injury was, to his mind, sufficient proof that the pipes had been laid deep enough to stand any traffic but that occasioned by the unforeseen use of heavy steam-rollers. This, in his opinion, made the defendants liable. Those who use highways must do so with due regard to the rights of others lawfully using them; and bringing upon the road an unusual and extraordinary load, however lawful, carried with it liability, if the property of others was injured. Having quoted the case of *The Gaslight and Coke Company v. The Vestry of St. Mary Abbots*,\* and the recent decision of the Court of Appeal in Ireland in the case of *The Alliance and Dublin Consumers' Gas Company v. The County Council of Dublin*,† his Honour said he adopted the ruling in these cases; and as he was satisfied, on the evidence, that injury had been done by the steam-roller, and might occur again, he would grant an injunction. As to the damages, he was not satisfied that the plaintiffs were entitled to all they claimed, because he was not clear, owing to the insufficient depth at which the pipes were laid, that the breakages might not have been caused by the ordinary traffic of the district, apart from the steam-roller. He would therefore disallow their claim for damages in respect of some of the breakages, and would give judgment for £6 8s. 4d. An injunction would be granted against using a steam-roller on any road in which the pipes of the plaintiffs had been laid, so as to break or injure any pipes which had been properly laid in such roads; regard being held to what, at the time of the laying of the pipes, was the ordinary traffic, and reasonable means of repairing and maintaining the road.

The judgment will apply to the case of the Gas Company; but as no items of claim were submitted at the hearing of the action, his Honour could not make any order as to the amount of damages; this being left to the parties themselves to agree upon.

It is probable that the Corporation will apply for a new trial, as they understood that the plaintiffs had consented to withdraw their claim for an injunction.

#### The Bankruptcy of Mr. M. J. Wells.

In the Bankruptcy Court, last Tuesday, Mr. Registrar Linklater had before him an application by Mr. Maurice J. Wells, stock and share broker, of No. 10, Union Court, Old Broad Street, for an order of discharge. The proofs actually admitted against the estate amounted to £23,229; and the probable claims not yet admitted were estimated at £8049. The assets had at present realized £15 17s. 6d. only; and it was stated by the Trustee that no dividend could be paid to the creditors. The receiving order was made on the 16th of March last, on a creditor's petition. The bankrupt stated in his public examination that in January, 1891, he commenced business as an outside stock and share broker; and the net profits of the business amounted to about £500 a year down to the beginning of 1899; but last year's trading showed a loss. He attributed his insolvency to loss on the promotion of companies and to his liability on accommodation bills. In 1898, he was interested in the promotion of the Hydro-Incandescent Gaslight Company, Limited, and the Plymouth Wharves, Limited. The Official Receiver reported that the bankrupt's assets were not of a value equal to 10s. in the pound on the amount of his unsecured liabilities; that he had contributed to his bankruptcy by rash and hazardous speculations relating to the promotion of companies and transactions on the Stock Exchange; and that he had been guilty of certain misconduct with regard to his property and affairs. The Registrar described the case as a very bad one, and suspended the discharge for five years.

#### Gas Engineer and Money Lender.

Mr. Thomas Stormonth, jun., gas engineer and money-lender, attended at the Exeter Bankruptcy Court on Thursday for his adjourned public examination. This matter has already been referred to (see *ante*, p. 433). In answer to questions, he said he had practised as a gas engineer. He was at one time Consulting Engineer to the Exmouth Gas Company, and he had other appointments at Tavistock and Launceston, though at the latter place he did not do the work. A number of questions were put to the bankrupt respecting property which it was alleged was not accounted for in his bankruptcy. He denied that he had been responsible for any concealment. The examination was closed.

#### Charge of Stealing Gas.

At the Southwark Police Court on Monday last week, Louis Muncey, aged 30, described as a fitter, of North Street, Charlton, was charged, on remand, with stealing a quantity of gas, value 1s., from No. 294, Lynton

Road, Bermondsey, in April, 1899. Mr. Passmore prosecuted. Mrs. Syers stated that at the time of this affair she was a lodger at the house of the accused. Soon after she went there, she noticed a strong smell of gas, and spoke to the prisoner about it. A little later she remarked to Mrs. Muncey that she had often wondered where that lady cooked her food; and Mrs. Muncey replied: "A good many people would like to know." It transpired that the cooking was done on a gas-ring in an outhouse, and Mrs. Muncey said her husband made his own gas. She showed some white stuff like borax, from which she said he made the gas. The prisoner also admitted to the witness that he made his own gas, and could make her some for 2d. a night. One of the Superintendents of the South Metropolitan Gas Company said he found that a connection had been made with the pipe leading to the meter from the main, so that the gas used would not be registered. When prisoner was told that he would have to go before a Magistrate, he went upstairs, and escaped by jumping out of a window on to the top of an outhouse. Detective-sergeant Lee stated that there had been several previous convictions; the last one being seven years' penal servitude for burglary. The accused was committed for trial.

#### Leaving Work without Notice.

The Kidderminster Borough Bench recently had before them some of the men employed by the Kidderminster Gas Company, who had been charged, under the Conspiracy and Protection of Property Act, with breach of contract by leaving their work without notice. It was stated, on behalf of the prosecution, that one of the men—Samuel Guest—a coke wheeler, suddenly left his work, necessitating the making of other arrangements. After the second night draw of the retorts, the defendants left their work without any communication with the foreman; and no persuasion could induce them to remain. The result was that there was a falling off of at least 100,000 cubic feet of gas that night. The ring-leader in the affair was a man named Harrington; and his case was first heard. The foreman (Evan Davies) described what happened at the works, and showed that, though Guest had gone, the stokers were well supplied with coal. The Bench found Harrington guilty, but reserved judgment until the other cases had been taken. The charge against Guest was then heard. The man admitted leaving, but said he was not in a fit condition to work. Mr. Vachell, who represented the Company, said they did not press the charge against the other three men. The Mayor (Mr. P. Adams) said it was evident that the men did not realize the seriousness of their conduct, and the Bench would, in consequence, deal leniently with them. Each defendant would be fined 10s. and costs, or seven days. If any other case of the same kind came before the Court the defendants would be dealt with more severely.

**New Reservoir for Tamworth.**—The Tamworth Joint Water Committee have decided to construct an additional reservoir at Hopwas, at an estimated cost of £6500. The capacity will be 500,000 gallons.

**Joint Chemical Works for Gas Undertakings in the Aire Valley.**—A proposal has been set on foot in the Keighley district for the establishment of joint chemical works for a number of gas undertakings in the Aire Valley. The idea emanates from Keighley.

**Burgess Hill Water Company.**—At the half-yearly meeting of this Company last Tuesday week, it was reported that there was an available balance of £1118, which enabled the declaration of a dividend of 3 per cent. on the original and new ordinary shares, free of income-tax.

**Grand Junction Water Company.**—At the half-yearly meeting of this Company on the 12th inst., the Directors will report that, after the payment of dividends at the rates of 8, 7½, and 7 per cent. per annum on the several classes of shares, and providing for the Company's proportion of the interest on the debenture stock and expenses of the Staines Reservoirs Joint Committee (£3925), the amount of undivided profit carried forward will be £24,160, as compared with £21,592 at the commencement of the half year.

**The St. Helens Explosion and the Damage to the Gas-Works.**—The action which the St. Helens Corporation agreed to take against the United Alkali Company, Limited, to prove liability and seek compensation for the damage caused by the great explosion which partially wrecked St. Helens, and seriously interfered with the working of the Corporation gas-works in May, 1899, will be heard at the forthcoming Liverpool Assizes by Mr. Justice Bucknill and a Special Jury. The Corporation are claiming £5000 for injury to their gas-works and other property, caused by the explosion of dangerous chemicals and other materials stored by the defendants on their premises, and for injury to their gas-works and other property caused by defendants' negligence. The explosion, it will be remembered, created a great sensation at the time, and probably did damage in the town to the amount of £30,000, besides which five men were killed, and several people injured. At the time the question of compensation was widely discussed; and efforts have been made to expedite what was looked upon as the test of liability by the Corporation.

**The Projected Large Water Scheme for Leeds.**—Our readers will probably have seen, from the abstracts of parliamentary notices which appeared in the "JOURNAL" last week, that the Leeds Corporation are projecting a big scheme for providing additional supplies of water for the inhabitants of the city. As already mentioned, it is intended to impound the head waters of the Rivers Burn, Laver, and Skell, draining the moors above Ripon, and convey them to Leeds, a distance of about 40 miles. In order to effect this object, there will be built altogether six large reservoirs, ranging from 70 acres to 138 acres in area. They will be formed by constructing embankments or dams across the natural valleys formed by the rivers; the embankments varying from 280 to 600 yards in length, and from 52 to 105 feet in height. In addition to this, an aqueduct some 25 miles in length will be constructed to carry the water to the existing works of the Corporation. It is expected that the quantity of water available for Leeds from this gathering-ground will be about 18 million gallons per day; and, in addition to this, provision will be made for storing and discharging daily down the rivers compensation water for the use of the riparian owners below. The preparation of all the necessary parliamentary plans and estimates has been entrusted by the Corporation to Mr. E. J. Silcock, Assoc.M.Inst.C.E., of Leeds.

\* See "JOURNAL," Vol. XLIII., pp. 873, 917; Vol. XLV., pp. 539, 823.

† *Ibid.*, Vol. LXXV., pp. 752, 815; and *ante*, p. 100.



## MISCELLANEOUS NEWS.

### SCHEME FOR THE SUPPLY OF FUEL GAS IN THE MIDLANDS.

Among the abstracts of the notices for Bills for next year which appear in our "Parliamentary Intelligence," one will be found which briefly intimates that a project is on foot for supplying "Mond Gas." The following particulars in regard to the scheme are taken from the notice which has been published:—

It is proposed to apply for parliamentary sanction to the incorporation of a Company to manufacture, sell, and supply, within a defined area, gas, and particularly the product commonly known as "Mond Gas," for motive or other power, heating, or any other purpose to which such gas can be applied, except illumination; and to manufacture, supply, or let on hire, machinery and apparatus of any description for, or in connection with, these objects, or any of them. Power will be sought to take and use, compulsorily or otherwise, and to hold, for the purposes of the intended Act, certain lands, buildings, and property specified, situated in the parishes of Tipton, Bilston, Darlaston, Kingswinford, and Smethwick. Upon all or any of these lands the Company propose to erect, maintain, and work all the necessary producers, machinery, and plant for, or incidental to, the production and storage of Mond or other gas, and for the manufacture and conversion of the residual products arising therefrom; and they will ask for authority to sell and deal in such residuals. Power will be sought to open and otherwise interfere with the streets, roads, and highways within the specified districts, for the purpose of laying mains, pipes, and appliances under or above them; and also to alter or otherwise interfere with gas and water pipes, telegraph and other wires, electric lines, &c.

The area over which the Company will ask to have powers comprises the boroughs of Smethwick, Walsall, Wednesbury, West Bromwich, and Wolverhampton, and the districts of the Urban Councils of Amblecote, Bilston, Brierley Hill, Coseley, Darlaston, Handsworth, Heath Town, Perry Barr, Quarry Bank, Rowley Regis, Sedgley, Short Heath, Tipton, Wednesfield, and Willenhall, and those of the Rural Councils of Kingswinford and Walsall (including Bentley), in the county of Stafford, and the borough of Dudley, and the districts of the Urban Councils of Lye and Wollescote, Oldbury, and Stourbridge, and of the Rural Council of Halesowen, in the county of Worcester.

For the supply of Mond or other gas and residual products, and for the supply and hire of machinery and apparatus in this area, the Company will ask for the usual power to levy and recover rents, rates, and charges. They will also seek to be empowered to enter into agreements with local authorities, companies, and persons; to make, alter, and rescind regulations and bye-laws for, or in relation to, the use, misuse, or waste of Mond or other gas; and to impose and recover penalties for the breach of any such regulations or bye-laws. Authority will be sought for the Company, their officers, servants, and workmen, to enter upon lands, buildings, and premises, and to examine any machines, fittings and apparatus, engines, and machinery supplied by them, and any meters or other instruments used for determining the quantity or amount of gas or motive power supplied or used, and to execute such works as may be necessary for the regulation of such use and the prevention of misuse or waste.

They will also ask for power to impose and recover penalties for the tampering or fraudulently interfering with any such machines, fittings, apparatus, engines, or machinery, or any such meters or other instruments.

The Company wish to be authorized to purchase, acquire, and hold, work, and use patents or patent rights or licences for the production or use of Mond or other gas for any of the purposes specified, and any other products or bye-products of coal, or to enter into agreements for the purchase thereof, or to confirm any agreement which has been or may be entered into for such purchase or acquisition; and to sell or let any patents or other rights which they may acquire under the powers of the intended Act or otherwise, or to grant licences to use the same.

It is proposed to incorporate with the intended Act, and apply to the Company and to the undertaking and works authorized thereby, whether with or without modification or amendment, all or some of the provisions of the Gas-Works Clauses Acts of 1847 and 1871.

### THE RESERVISTS' FUND OF THE SOUTH METROPOLITAN GAS COMPANY AND THEIR EMPLOYEES.

There have been few large industrial undertakings which have not had the ranks of their employees reduced by the calling out of the Reservists for service in South Africa; and, of those so affected, probably every one made some provision for supporting the dependents of those who had responded to the call of duty. The men of the South Metropolitan Gas Company were no exception to the general rule; but, curiously enough, recognition of their work has been conspicuously absent from the numerous lists of subscriptions for the support of the wives and families, and widows and orphans, of the soldiers, which have been published. This being the case, the Chairman of the Company, Mr. George Livesey, asked the Editor of "The Times" to grant him the hospitality of its columns to show that the employees of the Company had not been unmindful of their duty in this matter. The request was granted by the insertion last Thursday of a letter of which the following is the principal portion:—

In October, 1899, some 40 of the Company's workmen were called out as Reservists. At the suggestion of one of the foremen (Harvey), meetings of workmen were held at all the works, and resolutions unanimously passed to provide for the wives and children of their comrades at the seat of war. Every man agreed to give a weekly subscription. They then applied to the Directors, and the Company gave an equal amount; while all connected with the Company joined in the good work. Very soon the number of Reservists (including seven St. John Ambulance Volunteers) increased to 112, in addition to a few Volunteers, and most of them left wives and families. The original weekly subscription not being sufficient, the workmen at once doubled it; and now that the Reservists are returning, the higher subscription is maintained to create a fund for the widows—happily so far only seven—and orphans. The Committee of workmen fixed the allowance at

10s. a week for each wife and 2s. for each child under 15, which, with the Government grant, they considered sufficient. The Company's workmen, in number nearly 4000, have subscribed in 57 weeks £1522, and are still adding £39 per week. The contributions of the Company and other subscriptions bring the total up to £3463. The Committee men, who act as visitors, have distributed £3017. There is a rapidly increasing reserve of £436, and the balance of £10 has gone in expenses, printing, &c. [Mr. Livesey enclosed a copy of the latest weekly printed statement of receipts and expenditure at the time of writing.] The whole business has been managed entirely and most satisfactorily by the Committee of workmen, assisted by a capital Secretary, also a workman. The men generally have taken great interest in this good work for their country and their comrades, whose independence they have maintained. I confess my colleagues and I are proud of them, and at the same time gratified with this proof that their large accumulations of savings under our profit-sharing system have induced, rather than checked, generosity. This partnership, or sharing of the burden, has made the carrying of it a pleasure to which the word "burden" does not apply. The shareholders would, I am sure, have gladly taken the whole responsibility; but that would have had the great disadvantage of depriving the workmen of the opportunity of taking action.

We have received from Mr. Livesey the printed statement of receipts and expenditure for the week ending the 24th ult.—the 58th—showing the total paid out to have been £3068; the balance of the reserve fund at that date being about £465. As a proof that all are taking part in the work, it may be mentioned that the Directors contribute £1 apiece per month. The number of deaths—roughly 7 per cent.—is just about in proportion to the losses sustained by the entire army. It should be added that the employees of the other Company of which Mr. Livesey is the Chairman—the Crystal Palace District Gas Company—whose proportion of Reservists called out was not nearly so large as in the case of the South Metropolitan Company, have acted in a similar manner to those of the more extensive undertaking.

### CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. J. DARELL BLOUNT in the chair.

The SECRETARY (Mr. G. R. Guyatt) read the notice convening the meeting; and the Directors' report and the accounts, from which some particulars were given last week, were taken as read.

The CHAIRMAN, having explained that the holding of the meeting had been delayed through the illness of the Manager (Mr. John Reid) and other employees at Ceará, said the working was set out in the report and accounts with so much detail that very little explanation was requisite on his part. He might observe that the Directors had been obliged to add £1419 to the capital investment in consequence of a new coal-store being required. Their coals deteriorated very considerably when exposed without cover; and so the Directors thought it necessary, to prevent injury, to extend the storage accommodation. The cost of coal had been somewhat less than it was last year, although the quantity used was a trifle greater through the larger consumption of gas. In regard to the manufacturing charges, there was a slight decrease, but an increase in maintenance, as they had added to this item a proportion of the cost of the new retort-benches. This was not considered a proper capital charge, and so it was paid for out of revenue. Salaries were also somewhat less; but their old enemy exchange (which for some years past had been advancing) again showed a little increase. But, of course, this was altogether beyond the control of the management. The net profit available for dividend (after deducting the interim payment) was £2497, against £2369. They were consequently able to declare the usual dividend, and to carry forward a rather larger amount than last year. He concluded by moving the adoption of the report and accounts.

Mr. F. A. WALLROTH seconded the motion, which was unanimously adopted.

On the proposition of the CHAIRMAN, seconded by Mr. F. W. BROTHERS, a dividend of 5 per cent. on the preference shares (less income-tax) and of 4 per cent. on the ordinary shares (tax free) was declared for the past six months.

The CHAIRMAN said he had next to move the re-election of Mr. Wallroth to his seat at the Board, and the confirmation of the appointment of Mr. Thomas Guyatt to the vacancy on the directorate. While doing so, he wished to refer to the great loss the Company had sustained by the death of their Chairman (Mr. Horatio Brothers), who had been connected with the Board for many years, and whose acquaintance with gas matters generally had been of special advantage in carrying on the business. The Directors regretted his loss as a colleague, and also as a personal friend. Concerning Mr. Guyatt, he had, as the shareholders all knew, been connected with the Company since its inception. He had had experience that no other man associated with the Company could possibly have had. Consequently, he (the Chairman) was sure the shareholders would approve of his appointment to fill the vacant directorship.

Mr. BROTHERS seconded the motion, which was also unanimously carried.

Mr. WALLROTH, on behalf of himself and Mr. Guyatt, briefly acknowledged the confidence of the shareholders.

The Auditor (Mr. Magnus Ohren) having been re-appointed, On the motion of Mr. F. E. LINGING, seconded by Mr. G. DANNATT, a hearty vote of thanks was tendered to the Chairman and Directors for their services during the year.

The CHAIRMAN having responded, A similar compliment was paid to the Secretary, Manager, and other officers; and acknowledgment was duly made by Mr. G. R. GUYATT.

The CHAIRMAN said, before the meeting adjourned, he wished to refer to a circular which the shareholders had no doubt all received respecting the issue of debentures. The debentures issued some years ago would mature on Jan. 1, 1901; and the Directors considered this would be a proper occasion for applying to the shareholders for an additional amount for working capital. By examining the accounts, it would be seen that there was a sum of £52,797 invested on capital account; but the paid-up capital only represented £44,700; and the debentures that were now about to be paid off made the total £53,210. It was quite clear this left the Company without working capital. It was true they had a reserve fund, which had been set apart in former years, and which had



been put into the business and used as working capital. It was manifest that it was impossible to properly carry on the concern if they were to be hampered by the want of money. The State Government had paid up their accounts, he must say, with extreme promptitude; but whether they could continue to look forward for the next few months to a continuance of this prompt payment was a little uncertain. The province of Ceará was at present suffering from the effects of a drought, which had very much affected its commercial interests. The consequence of this was the Treasury was short of money; and if the State Government were unable to keep up the payments as exactly as they had hitherto done, the Directors would find themselves greatly hampered if they had no working capital. For this reason, they had applied to the shareholders for an amount of £17,000 of debentures to pay off the existing liability of £8500; and they proposed now issuing for this purpose £13,000. The Directors applied to the holders of the existing debentures to know whether it was their pleasure to renew, or to be paid off. He was happy to say that practically the whole amount had been renewed; and the sums that required to be paid off had been replaced by other applications. The first application for the balance had already come in; and he hoped that, within the specified time (Dec. 14), the entire amount would be applied for by the shareholders. He had thought it well to explain to the shareholders that the money was really required for working capital and to keep the works up to the requirements of the times.

This concluded the proceedings.

### IMPROVEMENT SCHEME FOR THE BANGOR (IRELAND) GAS-WORKS.

A Special Meeting of the Bangor (Ireland) District Council was held on the 26th ult. to consider the present condition of the gas-works. A report, prepared by Mr. S. B. Langlands, of Coleraine, with reference to the improvement of the works, was read. It contained two alternative plans, the second being a little cheaper than the first; but Mr. Langlands recommended plan No. 1. The works at the present time, he stated, were in a bad condition, and gas could be made neither economically nor well, so it was desirable to have an improvement made at once. The coal-store, it was remarked, was ample for their present purposes. The retort-beds were totally inadequate to meet the requirements of the town; and the greatest difficulty was experienced in maintaining the gas supply. The retort-house, too, was faulty in construction, badly lit, and too narrow. The chimney also was only in fair condition. Mr. Langlands suggested that a new octagonal chimney stack should be erected; that the old coal-store should be taken down, and a new retort-house built in its stead, adjacent to the new coal-store. The present condensers were incapable of doing their work; and the exhauster would require to be taken out, and a new steam-driven one fitted. The scrubbers and purifiers would also need replacement. The mains throughout the works would, of necessity, require to be re-placed; and Mr. Langlands advised that new ones of a large size should be laid down. In No. 2 plan, the only variation was that, instead of erecting a new retort-house and chimney, an addition should be made to the existing house. The estimated cost of No. 1 plan (including £700 for retorts, £400 for retort-house, and £200 for chimney) was £2757; while the estimated cost of plan No. 2 was £2367—£210 being allowed for an addition to be made to the existing retort-house. Considerable discussion took place, in the course of which the Gas Manager (Mr. R. Gault) declared his general approval of the report. Mr. Bowman asked if the Council would be justified, in view of the present advances in electric lighting, in spending £3000 on improving the gas plant. Mr. Gault, having previously stated that, by the improvements proposed, it might be possible to produce about 1500 cubic feet more gas per ton of coal than at present, Mr. Thomson declared that the profits accruing from this increase would pay the interest and instalment of the necessary loan. A decision on the question was ultimately postponed.

### NEWTOWN AND THE PURCHASE OF THE GAS-WORKS.

#### The Matter to Go to Arbitration.

A Special Meeting of the Newtown District Council was held yesterday week, at which the Gas Committee reported that they had received notice from the Gas Company mentioning £47,000 as the price they were prepared to accept for their undertaking. This, of course, was a sum which the Council could not entertain; and it would now be necessary to give notice to the Company accordingly, and to appoint their Arbitrator. To give effect to the Council's notice to treat, the Committee had secured the services of Messrs. Cash, Stone, and Co., as the Accountants to examine the books of the Company, and of Mr. Charles Hunt, of the Birmingham Corporation Gas-Works, and Mr. Alfred Colson, of the Leicester Corporation Gas-Works, to estimate the value of the concern. The Committee recommended that the Council appoint Mr. W. A. McIntosh Valon their Arbitrator, and give notice thereof to the Company.

Mr. A. S. Cooke, Chairman of the Gas Committee, moved the adoption of the report. Mr. E. Jones, in opposing, said that the purchase would involve a rate of 5d. to 9d. in the pound annually. Mr. P. W. Jones said he also opposed the scheme. He did not see why they should saddle themselves with the Company's old plant. They had saddled themselves with sufficient rates already, and would have to spend considerably more than their borrowing powers upon the water-works. Mr. Jones failed to see that the town would make any profit out of the gas. There had been a lot of very peculiar work in pushing the matter forward. He would rather sacrifice the £2000 which had been spent than proceed with the purchase. Mr. J. Green supported the adoption of the report. If, he said, the scheme was rejected, there would be £2000 expenses to pay; but if they purchased perhaps there would not be a penny to pay. The Company were paying a dividend of 8 per cent.; and if there was any profit to be made, it ought to go to the rates.

After a long discussion eight voted for the adoption of the report and six against it.

### ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the full loan of £34,565 applied for by the Maidstone Town Council for their electric lighting installation.

The Brighouse Town Council last Wednesday discussed at considerable length the advisability of embarking on a proposed scheme of electric lighting calculated to cost about £25,000. The recommendation was approved.

Last Wednesday, Mr. Sandford Fawcett held a Local Government Board inquiry at Heywood, in reference to an application of the Town Council to borrow £17,000 for the purposes of electric lighting and £5438 for a refuse destructor. There was no opposition.

The recent deputation from the Limerick Corporation seems to have produced the desired result, as the Local Government Board, who had previously postponed indefinitely an application for a loan of £22,000 required for carrying out a municipal scheme for electric lighting, have reconsidered their decision; and the Town Clerk received last Thursday an intimation that the loan had been sanctioned.

On Monday evening last week, there was an alarming incident at the Blackburn Corporation Electricity Works. Owing to a short circuit somewhere in the town, one of the engines at the works became overloaded, and this was followed by a serious accident in the engine-room; but fortunately no one was injured. Tramway traffic throughout the borough was temporarily suspended; and the centre of the town was plunged in almost complete darkness.

"Satisfactory progress" is reported by the Chairman of the Electric Lighting Committee of the Doncaster Town Council. He says they have now 8300 lamps connected; but he complains that some people will persist in labelling under the "fallacy" that electricity is more expensive than gas at the charge of 5d. per unit. It is so easy to call truths by other names. We do not know the exact price of gas at Doncaster at the moment, but it used to be, before the rise in the price of coal, 2s. 6d. per 1000 cubic feet.

Having protested in vain against the indifferent lighting of the town, the Chelmsford Town Council recently astonished the Electric Light Company by refusing to sign a cheque for last quarter's account. Mr. F. Reeves, the Secretary, has again written to excuse the Company. He says there has been some trouble with the arc lamps, in consequence of breakdowns in insulation—matters over which the Company cannot exercise control; but every effort is made to ensure that the insulation is perfect. He also promises that the Company will do their very utmost in the future to light the town properly. But promises of reformation have frequently been made; and, sad to say, have been just as frequently broken.

The Leeds Corporation Electric Lighting Committee have decided to recommend the Council to accept tenders, amounting to £72,943, for extending the existing electricity works at Aire Street on the adjacent Britannia Mills site, which has already been cleared and prepared for such development. The Committee propose the provision of a third 600-kilowatt plant on the two-phase system; also the laying of mains with a view to supplying electricity for power and lighting in the southern and western districts of Leeds. Before very long, therefore, it seems probable that not only the shops and industrial premises of Holbeck, Wortley, and Armley, but far-removed residential quarters of this part of Leeds will be supplied with current.

Readers of the "JOURNAL" are perfectly well aware that the electric lighting arrangements of the Paris Exhibition were incomplete for some time after the opening of that great undertaking. This fact, coupled with the high rents charged to the owners of shows and bars, almost led to a general strike. The proprietors were, however, mollified by the promise that their grievances should be arbitrated upon. The decision of the arbitrators was given on Monday last week. They consider that the delay in the completion of the Exhibition and in the supply of electric light constitutes a title to compensation. One claim was for 292,000 frs.; and in this case 80,000 frs. have been awarded. The remaining awards range from 70,000 frs. down to 5000 frs.; six claims being rejected.

At West Hartlepool, last Thursday, Colonel Durnford, one of the Local Government Board Inspectors, held an inquiry with respect to an application by the Town Council to borrow £24,260, of which £19,625 is required for electric lighting purposes. The Town Clerk (Mr. Higson Simpson) explained that a considerable proportion of the excess expenditure upon the original estimate for the electric light undertaking was due to the rise in the price of materials between the time the estimate was given and the letting of the contract. The buildings cost £3600 more than the estimate, £7112 was required for extension of mains, and £2707 for probable improvements during the next twelve months. The Inspector observed that the increase over the estimates for buildings, &c., was very large, being more than 50 per cent. The remaining expenditure having been explained, the inquiry concluded.

In the "JOURNAL" for the 13th ult., we announced that the Electric Light Committee of the Ryde Corporation brought up a report, at the meeting on the previous Friday, recommending that they should be empowered to instruct Messrs. Kincaid, Waller, and Manville to procure tenders for carrying out the electrical works according to plans already received from them, and approved by the Local Government Board. The recommendation was not adopted, and the report was referred back to the Committee. At the meeting of the Corporation on Monday last week, Mr. Hansford brought up the report again, and gave a retrospect of the electric lighting question; concluding by moving that the resolution previously submitted should not be adopted. After considerable discussion, this was carried by 18 votes to 3. Subsequently, the Committee were authorized to endeavour to obtain the sanction of the Board of Trade to the transfer of the Provisional Order of 1899, and to an extension of the time for carrying it out.

The notion was at one time current (observes the "Lancet") that an electric installation secured the householder from many of the risks attendant upon a gas installation or the use of oil and candles. It is very doubtful if this is so, at any rate under the present methods of laying cables and of "wiring" our houses. Recent events which have come to our knowledge call very seriously for a fresh inquiry as to the methods adopted for supplying electricity to our houses. It is common knowledge now that an otherwise innocent current—that is, one of low voltage—



may, through certain defects, become an exceedingly dangerous current of enormous voltage. We might as well allow a large water-main in communication with a reservoir containing millions of gallons of water at a high level to be erected over our heads without providing proper means of preventing leakage. The Board of Trade should be approached with a view to enforcing by very definite regulations a safer method of installation of domestic electric lighting than appears to be in vogue now.

A special meeting of the Aberdare District Council was held a few days ago to consider the scheme of the Aberdare Electric Lighting Company, Limited, for the lighting of the town. A letter from Mr. S. Lloyd, the Secretary of the Aberdare Labour and Trades Council, asked the Council to withhold their assent to the scheme, and procure lighting powers themselves. The Electric Lighting Company wrote saying that if the Council assented to the scheme and subsequently decided within six months to undertake the lighting of the town themselves, the Company would undertake to hand over their powers to the Council on the payment of out-of-pocket expenses alone. The Surveyor reported that the maximum charge which the Company were enabled to make would be 13s. 4d. for 20 units, and 8d. per unit after; being equal to gas at 3s. 4d. per 1000 cubic feet. Alderman J. W. Evans, the Solicitor to the promoters, said that if the Council really purposed taking the matter up, he was prepared, on behalf of the Company, to hand them the Provisional Order at any time within the next six months—or he might say twelve months—without one penny piece of profit. It was too late for the Council to go in for powers next session; and by obtaining the Company's Order, they would be a year in advance. He wished them to remember that a charge equivalent to 3s. 4d. per 1000 cubic feet of gas was the maximum. The Company might be able to supply electricity at a charge equal to 1s. 8d. per 1000 feet. Mr. John Howell said he, too, was one of the promoters. He had advocated a scheme on municipal lines by the Council; but they had not seen their way to proceed with it. He did not wish to make a penny profit out of the scheme. Let the Council take it up, and he would be quite satisfied. Mr. Lewis N. Williams pointed out that the capital of the Company was only £2000. It seemed as if the promoters only wanted to get their scheme sanctioned, and clear a big profit on it. He moved that the assent of the Council be refused. Mr. T. Lewis seconded the motion; urging the Council to arrange for a scheme of their own. After further discussion, assent was refused. Mr. J. Howell then gave notice to move at the next meeting that the Council undertake an electric lighting scheme.

### Increase of Incandescent Gas Lighting in the City of London.—

At the last meeting of the Corporation of the City of London, it was decided, on the recommendation of the Streets Committee, to further extend the incandescent gas system of street lighting.

**Greenall's "Positive" Meter Syndicate, Limited**, has been registered with a capital of £20,000, in £1 shares, to adopt an agreement with J. Greenall, and to carry on the business of manufacturers and suppliers of meters and other apparatus for measuring gas, water, oil, electricity, and other fluids or forms of energy.

LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

### Proposed Deputation to the Local Government Board.

At the Meeting of the London County Council to-day, the Water Committee will present the following report, and ask for its consideration as a matter of urgency: "At the meeting of the Council on the 13th of November, when our report recommending the introduction of a Bill for the purchase of the undertakings of the Metropolitan Water Companies was under consideration, suggestions were made that it might be desirable for a deputation from the Council to approach the Government with a view to seeking information as to the steps, if any, which they propose to take for giving effect to the recommendations contained in the report of the Royal Commission on Water Supply, which was appointed in 1897. Believing that it would be the desire of the Council that we should direct our attention to this matter, we have given it our careful consideration; and we have come to the conclusion that it will be advantageous for a deputation to wait upon the President of the Local Government Board at the earliest possible moment, and that such deputation should consist of the members of the Water and Parliamentary Committees. We also propose that the deputation should avail themselves of the opportunity to urge upon the President of the Board the desirability of their making a daily, instead of, as at present, a monthly examination of the water supplied to London by the Water Companies; and further that the President should be asked whether he will reconsider the determination of the Board not to supply the Council with copies of Orders issued by the Board under the Metropolis Water Act, 1899, sanctioning schemes and the raising of the necessary capital for effecting intercommunication between the works of the Companies. The Council will remember that we have dealt with both these subjects in previous reports—viz., on Oct. 31, 1899, and Nov. 6 of the present year. We recommend—'That the President of the Local Government Board be asked to receive a deputation at an early date on the subject of the water supply of the County of London, and that the members of the Water and Parliamentary Committees do form such deputation.'"

**BIRMINGHAM CORPORATION WATER SUPPLY.**

### Progress of the Elan Valley Works.

At to-day's Meeting of the Birmingham City Council, the Water Committee will report that a further investment to the extent of £26,836 18s. has been made on account of sinking fund in the purchase of annuities for redemption. Of this, £955 was included in the accounts to March 31, and the remainder, £25,881, has been invested since that date. The quantity of water distributed during the half year to Sept. 30 was less than that for the corresponding period of 1899, having averaged 18·2 million gallons a day against 18·7 million gallons last year. Seeing that the number of houses in supply has increased in the interval, and

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1385.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s.
590,000	10	Oct. 12	104	Alliance & Dublin 10 p.c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	19-14	..	5 7 2	500,000	100	Dec. 1	6	People's Gas & 2nd Mtg. of Chicago Bonds.	102-106	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	851,070	10	Oct. 12	7	River Plate Ord.	10-104	..	6 13
270,000	5	Nov. 14	8	Bombay, Ltd.	6-68	..	4 12 4	250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	100-102	..	3 18 5
40,000	5	"	6	Do. New, £4 paid.	4-44	..	5 6 8	250,000	10	Sept. 28	8	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	135,000	Stk.	Sept. 14	10	Sheffield A. Ltd.	234-239	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	209,700	"	"	10	Do. B.	234-239	..	4 3 8
50,000	"	"	5	Do. 5 p.c. Pref.	137-142	..	3 10 5	447,427	"	"	10	Do. C.	232-237	..	4 1 5
159,375	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	5,641,885	Stk.	Aug. 15	5½	South Metrop. 4 p.c. Ord.	128-131	+1	4 1 5	
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	1,520,000	Stk.	July 12	3	Do. 3 p.c. Deb.	95-98	+1	3 1 3
1,099,530	Stk.	Aug. 29	7	Do. A. Ord. Stk.	145-155	..	4 10 4	380,940	Stk.	Nov. 14	5	Southampton Ord.	107-112	..	4 9 3
420,000	20	Sept. 28	10	Bristol, 5 p.c. max.	117-118	..	4 4 9	70,825	Stk.	July 12	4	Do. 4 p.c. Deb.	117-122	..	3 5 7
50,000	10	Aug. 15	12	British	39-41	+1	4 17 7	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	112-117	..	5 2 7
79,000	10	"	9	Bromley, Ord. 10 p.c.	24-26	..	4 12 4	250,520	"	"	4½	and B. 3½ p.c.	80-85	..	5 5 11
500,000	10	Oct. 12	6	Do. 7 p.c.	19-21	..	4 5 8	61,550	"	June 14	4	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
220,000	Stk.	June 14	4	Buenos Ayres (New) Ltd.	8-8½	..	7 1 2	182,380	10	Jan. 12	5	Tuscan, Ltd.	7-8	..	6 5 0
150,000	20	July 12	8½	Do. 4 p.c. Deb.	98-100	..	4 0 0	149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18
100,000	10	Sept. 28	8	Cagliari, Ltd.	28-25	..	6 12 0								
50,000	50	Nov. 2	6	Cape Town & Dis., Ltd.	134-144	..	5 10 4								
550,000	Stk.	Oct. 12	12½	Do. 6 p.c. 1st Mort.	58-55½	..	5 9 1								
236,425	"	June 14	4½	Commercial Old Stock.	270-275	..	4 12 8								
288,237	Stk.	May 31	9	Do. New do.	200-210	..	4 12 10								
800,000	Stk.	"	7	Do. 4½ p.c. Deb.	133-138	..	3 5 3								
200,000	Stk.	"	14	Continental Union, Ltd.	175-180	..	5 0 0								
51,600	Stk.	"	11	Do. 7 p.c. Pref.	168-173	..	4 0 11	780,404	Stk.	June 28	11	Chelsea, Ord.	307-312	..	3 10 6
178,400	Stk.	Aug. 15	5½	Croydon A 10 p.c.	—	..	—	150,000	"	"	5	Do. 5 p.c. Pref.	157-162	..	3 1 9
555,000	Stk.	July 27	5	Do. B 7 p.c.	—	..	—	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
60,000	"	Aug. 15	5	Crystal Palace Ord. 5 p.c.	117-122	..	4 6 1	175,785	"	Sept. 28	4½	Do. 4½ p.c. Deb.	143-148	..	3 0 10
486,090	10	July 27	11	Do. 5 p.c. Pref.	130-135	..	3 14 1	1,720,560	Stk.	Oct. 12	7	East London, Ord.	193-198	..	8 10 8
854,060	Stk.	Aug. 15	4½	European, Ltd.	19-20	..	5 10 0	654,740	"	June 14	4½	Do. 4½ p.c. Deb.	174-152	..	2 19 3
14,993,075	Stk.	"	3½	Do. £7 10s. paid.	134-144	-½	5 13 9	797,687	"	June 14	8	Do. 8 p.c. Deb.	99-101	+1	2 19 5
2,600,000	"	"	4	Gas 4 p.c. Ord.	97-99	..	4 8 10	700,000	50	June 14	8	Grand 10 p.c. max.	110-113	..	3 10 10
8,799,735	"	"	4	light 3½ p.c. max.	92-94	..	3 14 6	810,000	Stk.	Sept. 28	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
8,993,975	"	June 14	3	and 4 p.c. Con. Pref.	115-118	..	3 7 10	708,000	Stk.	Aug. 30	14	Kent	300-305	..	4 11 10
3,800,000	Stk.	Oct. 26	8	Coke 3 p.c. Con. Deb.	95-97	+1	3 1 10	160,000	"	"	7	Do. New 7 p.c. max.	200-210	..	3 6 8
473,600	Stk.	Nov. 14	3½	Hongkong & China, Ltd.	13-14	..	5 14 4	1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	295-300	..	8 10 0
75,000	5	Oct. 14	6	Imperial Continental	202-207	..	4 16 7	405,200	100	"	8	Do. 7½ p.c. max.	207-212	..	3 15 6
560,000	100	June 1	5	Do. 3½ p.c. Deb. Red.	100-102	..	3 8 8	350,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb.	127-130	..	3 1 7
250,000	100	Oct. 14	4½	Malta & Medn., Ltd.	42-52	..	5 14 3	500,000	100	Aug. 15	14	New River, New Shares	415-420	-2	3 6 8
441,920	20	Nov. 14	3½	Met. of 5 p.c. Deb.	105-108	..	4 12 7	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	128-133	..	3 0 2
667,946	Stk.	Aug. 30	8½	Melbourne 4½ p.c. Deb.	104-106	..	4 11	902,300	Stk.	June 14	7½	South- wark 7½ p.c. max.	200-205	-3	8 18 2
299,955	Stk.	Nov. 29	8	Monte Video, Ltd.	94-103	-½	6 13 4	126,500	100	"	7½	and 5 p.c. Pref.	188-193	..	3 17 9
150,000	5	"	8	Newcastle & Gateshead Con.	210-215	..	4 6 1	489,200	Stk.	"	5	Do. 5 p.c. Pref.	155-160	..	3 2 6
135,000	5	"	8	Do. 3½ p.c. Deb.	104-107	..	3 5 5	1,019,585	Stk.	Oct. 12	4	Vauxhall 4 p.c. A Deb.	138-133	..	3 0 2
15,000	5	"	8	Oriental, Ltd.	7-7½	+½	5 6 8	1,555,066	Stk.	June 14	10	West Middlesex	280-290	+2½	3 9 0
				Do. New, £4 10s. pd.	52-62	+½	5 15 3	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 1
				Do. do. 1879, £1 pd.	12-14	+½	4 11 5		"	Sept. 14	8	Do. 8 p.c. Deb.	97-99	..	3 0 7
				*Ex. div.											*Ex. div.

† Next dividend will be at this rate.



that the consumption for trade purposes was also somewhat greater, the net domestic consumption per head per day is seen to have been considerably reduced. This result is doubtless due to the fact that the weather during the summer has been favourable to the operations of the department, there having been no extended periods of drought as was the case last year. The highest consumption recorded on any day during the summer was 23·5 million gallons, against a maximum of 23·2 million gallons last year—that is, above a quarter-of-a-million gallons excess. Several additional purchases of land in connection with the Welsh water-works will be reported, making the total acquirement by the Corporation to date as follows: Freeholds, 10,323 acres; common and exclusive rights, 24,555 acres; mineral or mining rights, 5879 acres; and manorial rights, 36,903 acres.

In reference to the progress of the Elan Valley works, the Committee will report that the weather during the summer having been favourable for the execution of the works, a good advance has been made at all points. At Caban Coch, the middle portion of the dam has been built up to the level to which the work had been previously brought above the culverts on the river banks; and the dam is now practically completed up to 30 feet above the river right across the valley. At Careg-ddu very little remains to be done except to complete the upper masonry of the bridge and the parapets. At Pen-y-Gareg the wall is built up to 915 Ordnance datum, or 30 feet below crest level; and at Craig-Goch, to 1025 Ordnance datum, or 15 feet below the crest. Driving has been going on night and day at the Dol-y-Mynach tunnel; and about three-tenths of the total length is now driven. The excavation has been commenced for the foundation of the Dol-y-Mynach dam. A portion of the Foel tunnel has been partially lined; and a good deal of the Elan conduit being carried out by administration is now complete.

Regarding the aqueduct works, the Committee report that on Contract No. 3 (Elan to Dolau—Messrs. John Aird and Sons), the work is now practically complete; and the twelve months' term of maintenance commenced on Nov. 1. On Contracts 2, 7, 11, and 12 (Dolau to Hagley—Messrs. Morrison and Mason), the delays on which have given the Committee some anxiety, fair progress is now being made, although in the case of the last two it is not so rapid as could be wished. The progress on Mr. Kellett's contract, No. 13 (Hagley to Frankley), has been fairly satisfactory. At the reservoir and filters at Frankley, a considerable amount of work has been done. Contract No. 16 (pumping machinery—Messrs. Glenfield and Kennedy, Limited) is well in hand. On Contract No. 15 (Messrs. John Aird and Sons), for supplying and laying a large portion of the mains from Frankley to the city, &c., a good deal of the work has been done.

"America is beginning to supply Europe with coal on a large scale," says a telegram from New York to the "Daily Express." It continues: "France has ordered 450,000 tons from a Pittsburg Company, and the order will be shipped to Nantes by way of Baltimore. Other big orders are coming from Italy and Austria. Day and night vessels are being loaded for abroad at the piers in Baltimore."

STOCKPORT CORPORATION WATER SCHEME.

The Decision of the Ratepayers Postponed.

A Special Meeting of the Council of the county borough of Stockport was held last Tuesday to authorize an application to Parliament for a Bill empowering the Corporation to construct reservoirs, conduits, and other works for impounding, using, and distributing within the limits of water supply of the Corporation the waters of the Rivers Sett and Kinder and their tributaries, and other waters to be intercepted or taken by the intended works. Alderman Lees, Chairman of the Water Committee, moved the necessary resolution. He said that, when the Corporation acquired the water undertaking recently, it was calculated that their sources of supply were sufficient for 160,000 persons. Mr. Mansergh, however, estimated that the population in the water area would reach this number in the course of the next eight years; and therefore as no part of the proposed works could be completed so as to supply them with water under eight years, it was quite time they made preparation for increasing the supply to meet the demand that would exist eight years hence. To give this supply the Kinder and the Sett were considered the best sources in the district. The estimated cost was as follows: Cost of works—Kinder, £389,370; Sett, £198,310; Hollingworth, £98,030; total, £685,710. It was not intended to proceed with all these works at once. They would be taken in three sections extending over about 26 years. It was proposed to obtain borrowing powers to purchase the gathering-ground if they should require it; and this, with the extension of the district mains and other matters, would cost £134,000. The Borough Treasurer (Mr. H. Grundy) estimated that there would be a deficiency of £23,270 during the first eleven years, and a 1d. rate-in-aid, in addition to the 1½d. rate already laid, would be sufficient to meet this deficiency in nine years. Whatever money was provided out of the rates to meet this deficiency would have the first claim for repayment when the profit period arrived; so that during the next fifteen years this money would be repaid. When it was decided at the ratepayers' meeting to acquire the water-works, it was estimated there would be a deficiency of £1325 on the first year; but, as a matter of fact, the income had exceeded the expenditure by several hundred pounds, so that it was more than likely they would not be called upon for even the small amount of additional rating estimated. Alderman Turner seconded the motion. In the discussion which followed, Mr. Mansergh was requested to state his opinion. He said the Kinder and the Sett were the proper sources of supply for Stockport. The district about Stockport was going to grow enormously, and the best way of fostering such growth was to give an ample supply of first-class water. Unless provision was made at once for increasing the supply, they would certainly have serious trouble; and seeing they had the estimate of their Accountant that such supply could be obtained at the cost of a penny rate for a few years, he could not conceive why there should be any hesitation. It would be the supremest folly to refrain from going to Parliament for the Bill this year. The discussion was continued, and two amendments were introduced; but subsequently, the original motion was adopted by 37 to 6. The

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Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Chairman.

W. H. PEARSON, Junr., Deputy-Chairman.

J. T. WESTCOTT, M.E., Manager.

L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.,	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHADE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRET福德	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.



Mayor (Mr. Albert Johnson) afterwards presided over a representative meeting of owners and occupiers, and proposed a resolution in favour of the Corporation scheme. After a lively discussion, the Mayor accepted an amendment to adjourn the meeting for a fortnight.

#### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A letter signed "An Elderly Citizen" was published in the "Scotsman" on Tuesday, under the heading of "The Edinburgh Gas Supply." The burden of the communication is the policy of the Gas Commissioners in having reduced the illuminating power of the gas. It says: "The inferiority of the light is conspicuous, and is extremely inconvenient when we use it for reading or writing, or for other work. Alas! we are constantly reminded that we are in the hands, not of an individual or a joint-stock company, whose interests would lead them to satisfy us, but of nominees of the Town Council, who probably imagine that a nominal, though not a real, economy does them some credit. I do not know whether the object is to drive us from the use of gas, and compel us to use electric light. In my house I use both; but I confess that the failure of the Town Council and its nominees in the matter of gas, makes me hesitate to trust them as the providers of electric light. . . . One does not want extravagance; but there is no extravagance in paying a higher price for a better article. As I have already said, we can economize for ourselves." Now, there can be no complaint as regards the tone of this letter. It contains no insinuation that an attempt is being made to deceive the public, but is an expostulation against the deliberate lowering of the illuminating power. The writer takes up the attitude which used to be held by nearly all suppliers of gas—that a higher illuminating power is cheaper in the end—but out of which nearly everyone has now grown. He is thus behind the age. It is not at all to be wondered at that someone outside the ranks of the gas industry, and unacquainted with the evolution which has been going on inside, should, when changes come, preach the doctrines he was brought up in. Nothing more natural. As to the facts upon this subject, there is little to be said. In the cloud-laden atmosphere of the past two months all lights have paled, not even excepting that of the sun. But, descending to the particular, I observe from the latest return of the Commissioners that during the month of October the illuminating power of the gas supplied from the Edinburgh works was of 24.05-candle power, as compared with 25.77 candles in October of last year; while the gas from the Leith works was of 22.91-candle power, as compared with 25.13 candles. The Commissioners aim at supplying gas of from 24 to 26 candle power. It will therefore be seen that they succeed in doing this in Edinburgh, but not in Leith. Their failure in Leith they quite acknowledge, on account of the condition of the works. If then, the writer of this letter should happen to live in the district supplied from the Leith works, the gas he would be getting would not be so good as (it might be) the gas which his neighbour across the street

was obtaining from Edinburgh. The correspondence has not gone farther than the one letter—as, indeed, there is every reason why it should not, because at present Mr. Herring has before him the whole subject of the illuminating power of the gas supplied. When his report is published, it will be an authoritative pronouncement on the subject. Various opinions may be expected then, and I daresay will not be unwelcome. The difference between discussion now and then lies in the fact that then there will be an intelligent lead, whereas now there is not, as is illustrated by this letter.

The Edinburgh and Leith Gas Commissioners held their first meeting on Tuesday, after being reconstructed, when the new members appointed by the Corporation took the declaration of trust which is required by statute. There was little other business before the meeting. Mr. Kinloch Anderson was re-appointed Convener of the Works Committee, with Mr. David Purves as Sub-Convener. The latter is a new appointment, and is made with a view to relieving Mr. Anderson of as much work as possible, on account of the state of his health, upon the improvement in which he was congratulated. Mr. Purves acted as Convener during Mr. Anderson's absence. The convenership of the Finance and Law Committee was filled up by the re-appointment of Bailie Manclark, of Leith. The report of Mr. W. R. Herring, the Engineer, upon the output of gas during October, showed an increase of 1,839,000 cubic feet over the same month of last year. Since May 16, there has been an increase of 19,044,000 cubic feet, which is equal to 3.23 per cent. The increase is not nearly so large as it has been in recent years; but I perceive that there are many more houses unoccupied than formerly, which would very seriously affect the consumption of gas.

The treatment of the subject of electric lighting in Edinburgh is an index to, among other things, the enormous wealth of the country. The total amount authorized to be borrowed for the purposes of the undertaking is now £700,000. The entire population is a little over 300,000. That is to say that more than £2 is raised, or will soon be, for every man, woman, and child in the community. Taking the average household as five, there is a capital outlay of from £10 to £12 in respect of every dwelling-house in the city. The whole of this expenditure has taken place within seven years. No one can say that, had it not been incurred, the people would have been one whit the worse off than they are now. Why, then, the outlay? Simply because there is a mine of wealth which skilful people have tapped. There has been much complaint at the rise in the price of coal and other commodities, which are necessities of life; but here is a large expenditure upon what is not a necessity, and yet it goes altogether unconsidered. Had the community been left to themselves, this outlay would not have been made; for the Corporation only applied for a Provisional Order when they recognized that it was their only course for keeping out speculative companies, and almost allowed the Order to lapse before they exercised their powers under it. Yet clever people have succeeded in getting the community, through their municipal representatives, to speculate to the amount of £700,000, and that not only without grumbling, but the reverse; for do we not hear, repeatedly, of the glorious progress of the electric light undertaking in Edinburgh? A community voluntarily



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imposing an annual charge on themselves of over £30,000—equal to 3d. per pound on the rates—is not the view which is usually presented; but it is nevertheless the true way of looking at it. Sufficient thought, I fear, is not given to the matter in this light. Suppose a time of distress, and a general giving up of electric lighting, on account of its extra cost, who would care to propose an addition to the police rate in order to meet the obligations of the electric light undertaking? Yet the probability of this requiring to be done is not very remote.

The Gas and Water Committee of the Aberdeen Town Council have not been long in replying to the "demand," as it is put, of the employees in the gas-works for new conditions of labour—chiefly increases of pay. It was on Nov. 19 that the Scottish Secretary of the Gas Workers' Union communicated the demand; and on Nov. 28 the Committee considered a report on the subject which had been drawn up in the interval by Mr. A. Smith, the Engineer and Manager. Briefly put, Mr. Smith's report was to the effect that the changes desired would represent an additional expenditure on gas manufacture of £3306 per annum, or equal to 1½d. per 1000 cubic feet of gas sold. The wages paid to gas stokers in Scotland range from 4s. to 5s. 4d. per eight-hour shift; while in Aberdeen they are paid 4s. 6d. No gas-works of any size in Scotland have entirely abolished Sunday labour. Some have been obliged to shut down on Sundays for a few hours, but only because of deficient storage capacity. This was tried in Aberdeen in 1888, but was found to be unsatisfactory, both to the undertaking and to the workmen; and at the request of the workmen themselves, the attempt was abandoned. Sunday labour, however, has been reduced to the lowest possible point. After considering the report, the Committee decided to recommend the Town Council to refuse the demands, in view of the present depressed state of the labour market, and the large number of men going idle. The Committee could do nothing else, if they were to be loyal to the undertaking which they manage. There is a long letter to-day in the Aberdeen newspapers, by one who does not give his name, in which a list is given of the wages paid to the various classes of men in different gas-works in Scotland, with a view to pointing out that in Aberdeen the wages are lower than in other places. Upon face value they may be; but wages in Aberdeen cannot be compared with those in Khartoum, and neither can they with the wages paid in southern towns. As a matter of fact, living in Aberdeen is much cheaper than it is in any of the larger towns; and to give the gas workers there the same wages as in the other places, would be to present them with a premium out of the pockets of their fellow citizens. I am still of the opinion expressed in my "Notes" of the 20th ult.—that the reason why Aberdeen has been selected for exceptional treatment at this time by the Gas Workers' Union, is not on account of any discontent among the workmen with regard to their pay, but because there is a strong socialistic element in the Town Council, from whom they expect support.

At a meeting of the Glasgow Corporation last Monday, a Sub-Committee of the Watching and Lighting Committee recommended that the Great Western Road, from Kelvin Bridge to the car terminus, be lighted by incandescent gas-lamps, and that each lamp be provided with two burners, except at the corners of streets, where three burners be fitted to

each lamp. At a subsequent meeting of the Watching and Lighting Committee, Mr. Steven, seconded by Mr. Richard Browne, moved the approval of the minute. Mr. Shaw Maxwell, seconded by Mr. R. S. Brown, moved as an amendment that the minute be not approved of, but that, in lieu of the incandescent gas lighting recommended, the poles erected by the Tramways Department in the centre of the part of Great Western Road in question be, if retained, lit by electric light. On a division, there voted for the motion six members, and for the amendment seven. The amendment was declared carried; and the Committee agreed to recommend in terms thereof. Bailie Cleland, at the Corporation meeting, asked that the matter be remitted back, with powers to confer generally with the Electricity and the Tramway Committees. Mr. R. M. Mitchell seconded, and this was agreed to.

It is reported that Mr. W. Foulis, the Gas Engineer to the Corporation of Glasgow, and Mr. A. Wilson, the Manager of the Dawsholm works of the Corporation, are making extensive and important experiments in lighting by incandescent gas-burners at Dawsholm. About thirty different lamps, and various makes of mantles, are being employed. It is not improbable that, as the result of the experiments, a large portion of the International Exhibition in Glasgow next year will be lighted by incandescent gas.

To the road-roller is attributed a failure last Saturday of the gas supply in the town of Alyth. It was discovered in the neighbourhood of the gas-works that the main was full of water. A road-roller had been working there a day or two before. The belief is that it had fractured both the gas-main and a water-pipe. The town was in darkness all the evening, except for such improvised lights as could be procured. About 2 o'clock on Sunday morning the fracture in the main was repaired, and the gas supply restored.

On Wednesday Lord Provost Macgregor, of Perth, turned on the water to a new reservoir at Muirhall, which is to serve the higher parts of the city and the Seone district. The reservoir holds 2 million gallons of water; and its elevation is 400 feet above Ordnance datum.

The First Division of the Court of Session, on Tuesday, held that the Edinburgh and District Water Trustees had a statutory right of support for their Crawley water-pipe from the Clippens Oil Company, and interdicted that Company from working their minerals in such a way as to injure the pipe. This is the end, so far as Edinburgh is concerned, of the main action in a protracted and bitterly fought litigation. Their Lordships proceeded on the view that the landowners through whose lands the pipe was laid, under the Water Act of 1819, must be held to have obtained all the compensation they were entitled to; this compensation including the reservation of the minerals which are now forbidden to be worked. The counter action of the Company contains a claim for £137,000 as damage for stoppage of work. It is the expectation that the action will now fall. The other questions in dispute between the two bodies are of much less importance.

The Directors of the Welsbach Incandescent Gas-Light Company announce that no interim dividend will be paid on the preference stock.

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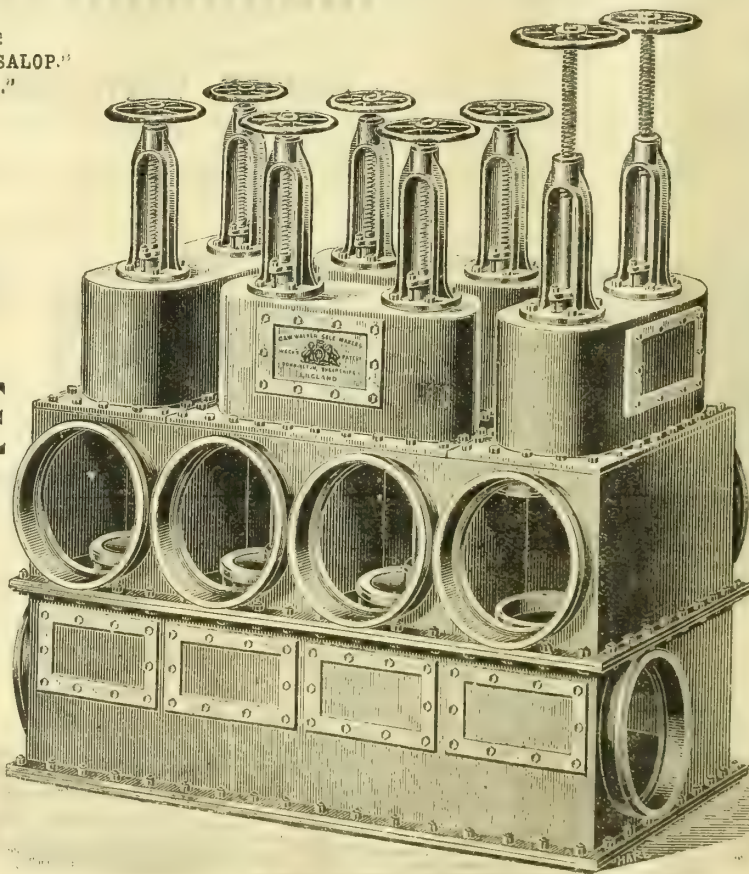
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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 1.

**Sulphate of Ammonia.**—The week opened with a quiet market, and business was done at a slight decline. But later the tone became firmer; and at the close the quotations are £10 13s. 9d. to £10 17s. 6d. per ton f.o.b. at the ports. The bulk of the larger makes is being delivered on contracts; but there have been further "covering" requirements, and, although the smaller makes are approaching their maximum, they have not been too much to meet the later demand. Direct inquiry has been mainly for early spring months; but in this position makers have maintained their firm attitude, and buyers have been driven on to December and January at a premium of 2s. 6d. to 5s. per ton on spot prices. London, Beckton terms, is still quoted at £11 7s. 6d. per ton for January forward, and Leith, ordinary terms, £11 7s. 6d. to £11 10s. per ton for January-March or January-April delivery.

**Nitrate of Soda** is quiet, but steady, at 8s. 3d. to 8s. 6d. per cwt., on spot, for good and refined qualities, respectively.

LONDON, Dec. 1.

**Tar Products.**—A quiet and uneventful market characterizes tar products generally. Carbolic acid is a little more sought after; and better prices are being paid by inland buyers than for exportation. Makers' stocks are low; and there is no reason why this product should languish as it has been doing. Benzols are fairly firm at former rates, although there is considerable difference in value according to the position of the producer, owing to the difficulties and heavy cost of carriage. It is hoped that the better position of aniline will reflect itself on benzol. Toluol is again in better request; but buyers are offering low prices, and, with a fair outlet for solvent naphtha, it is not worth separating at the figures quoted. Creosote is dull; anthracene continues neglected; and pitch is at the moment in an uncertain position, although heavy shipments are being made on former contracts.

Prices are as follows:—Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 85s. Salts, 65s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is not quite so strong; and buyers are holding off in the hope of lower prices. There are, however, interesting inquiries for important business for forward delivery; and with the present improving value of nitrate, sulphate should not realize lower prices. An all-round price of about £10 15s. per ton, less 3½ per cent., at all ports is about to-day's figure.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The month opens with no change in prices for any description of fuel; but, if anything, the tone is perhaps slightly stronger. The better qualities of round coal are beginning to move off

rather more freely for house-fire purposes; and although requirements are still below the average for the time of year, stocks do not increase to any material extent, and are much below what are usually held to meet winter demands. Local collieries, however, are very strong at their full list basis, and less disposed to contract forward at very much below current rates. On the other hand, many of the large users are still holding back from contracting, and are still going on from month to month, buying partly cheap lots in the open market, and taking limited deliveries from Lancashire collieries at the current prices. At the pit month, quoted rates remain at about 16s. 6d. to 17s. 6d. per ton for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, 12s. 6d. to 13s. for steam and forge coal, and 10s. to 10s. 6d. for best Lancashire slack. Shipping remains quiet, with prices easier; 15s. 3d. to 15s. 6d. per ton being full average figures for ordinary steam coal, delivered at the ports on the Mersey. A weakening tendency is the general feature throughout the coke trade. At a meeting of foundry coke manufacturers held last week, a falling off was reported in the weight of new orders coming forward; and the general opinion was that some reduction in prices would be necessary before long. Nominally they remain at about 28s. to 30s. per ton at the ovens for good qualities. For furnace cokes, the minimum quotation is 15s.; but consumers are declining to renew contracts at this figure, and in some instances the blowing out of furnaces is talked of, unless coke can be obtained at a lower price.

**Northern Coal Trade.**—The drop in the price of most classes of coal has continued; while orders are still held back, as is usual on a falling market. Best Northumbrian steam coals are now from 14s. 9d. to 15s. per ton f.o.b., second-class steam coals are 9d. per ton lower, and steam smalls are from 7s. 9d. to 8s. The collieries producing these classes of coal are so far fully employed; but they do not seem to have orders very far ahead. In the gas coal trade, there are now very large deliveries on the long contracts. Production is kept up; and thus the heavy contract quantities are steadily shipped, while there is a little gas coal for occasional sales. For the latter, the prices quoted are lower, and vary a good deal—from 14s. to 15s. per ton f.o.b. being the usual quotation. The coke trade is rather steady; and for best coke for export from 22s. to 24s. per ton f.o.b. is quoted. For coke for blast-furnaces, the rate is from 20s. to 21s. Obviously, these lower prices for coke must affect the gas coke trade; but so far the f.o.b. quotation is maintained at from 24s. per ton, though there are contracts running at much lower rates.

**Scotch Coal Trade.**—The official announcement is that trade is quiet and supplies plentiful; that buyers are holding back, expecting lower prices; but that the feeling now is (among coalowners) that prices have reached the bottom. In face, however, of this inspired announcement, prices still go down. The quotations are: Main 12s. 6d. to 12s. 9d. per ton f.o.b. Glasgow, ell 13s. 6d. to 14s. 6d., and splint 14s. 6d. to 15s. The shipments for the week amounted to 199,284 tons—a decrease of 8304 tons upon the previous week, but an increase of 6405 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,982,761 tons—an increase of 1,958,012 tons upon the same period of last year.

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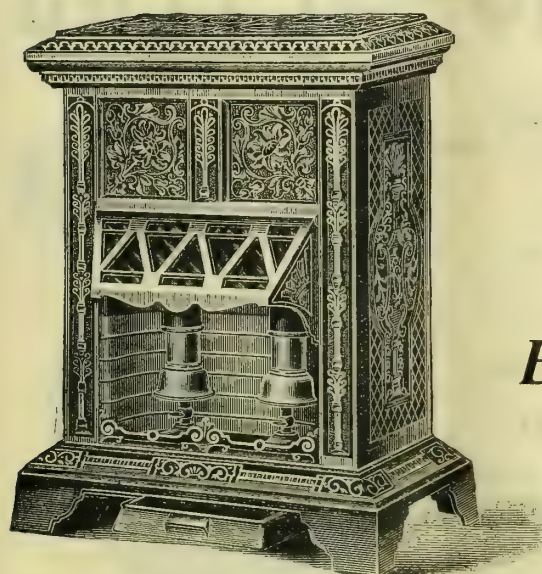
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**The Corporation and the County Council and the Price of Gas in London.**—At the meeting of the Common Council of the City of London last Thursday, the Streets Committee brought up a report relative to the conference with regard to the gas supply which was held at the Guildhall on the 31st of October (*ante*, p. 1154), submitting the resolutions passed at the conference, and recommending that they be approved, and that the London County Council be informed that the Corporation will be prepared to join them in any action which may be mutually agreed to with a view to protect the interests of London gas consumers in the direction indicated by the resolutions. The report also contained the resolutions passed at the conference held on the 17th of October by the County Council (*ante*, p. 1028). The report, presented by the Chairman (Mr. A. B. Hudson), was adopted.

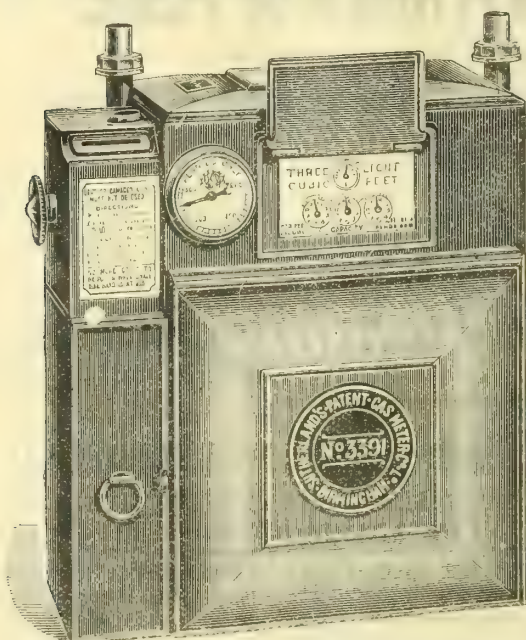
**Rival Water Schemes for North Derbyshire Villages.**—Mr. F. H. Tulloch recently held an inquiry into the merits of a proposed scheme of water supply for a number of villages in North Derbyshire, which has been projected by the Bakewell Rural District Council, and for the carrying out of which they have applied to the Local Government Board for authority to raise £17,000. The application was opposed by the Duke of Devonshire, the principal landowner in the district, who has an alternative scheme, prepared by Messrs. G. H. Hill and Sons. After a long inquiry, the Inspector said he was anxious to know exactly what saving would be effected by the adoption of the Duke's scheme; and to ascertain this, he would like the representatives of the parties to go into each other's estimates together, and, after agreeing on a comparative statement, forward it to him in London, signed by them both. The whole matter hung largely upon the question of relative cost. It was agreed to do this.

**Leaky Water-Pipes as Land Drains.**—In the "JOURNAL" for the 20th ult. we gave a paragraph on the above subject, in which a correspondent of the "Engineer" commented upon the general memorandum lately issued by the Local Government Board "On the Proceedings which are Advisable in Places Attacked or Threatened by Epidemic Disease." The Board, it may be remembered, stated that leaking pipes running full of water with considerable velocity are liable to receive external drainage that may be dangerous, and that the ignorance of this fact has baffled many inquirers as to the cause of the pollution of water. Another correspondent, signing himself "Distribution," expressed the following opinion on the subject: "This is another instance of the ignorance of the Local Government Board, who are engaged in elaborating model rules, hints, and regulations for the guidance of water-works engineers. Many readers of the 'Engineer' will be pleased to know the facts concerning cases of this kind, if any, and what velocity must be attained in practice to make the theory correct. I cannot conceive of an instance in actual practice where this action can take place in the distribution system. The mains are sometimes shut off for repairs; but even then it must be a very large aperture in the pipe to allow of any liquid on the outside of the pipe to be drawn in. When a main is shut down for repairs, it will be remembered that the air from the numerous services fills the pipe, and helps to empty it of water, so there would not be a vacuum formed in the pipe, and the injector-like action could not take place."

**An Ill-Advised Strike of Plumbers.**—The following recently appeared in the "Financial News": "The *reductio ad absurdum* in the matter of labour disputes appears to have been reached by the plumbers of Stockton and Thornaby-on-Tees. They struck nearly three months ago for an advance of 1d. an hour, and they have decided to resume work on a concession by the masters of ½d. an hour now and another ½d. six months hence. On the new basis, it will take the strikers several years to make up for the loss of wages incurred during the strike period. It is a pity that the people who misled the plumbers cannot be made to foot the bill; but the Labour leader always manages to escape, while his dupes are left to pay the penalty."

**Another Water Scare at Chester.**—There has been a little renewed consternation at Chester in regard to the condition of the supply of the Water Company; and at last Wednesday's meeting of the City Council, some references were made to the matter. It was remarked by Alderman Churton that the Public Health Committee had requested the citizens to boil the water before drinking it; and he wished to know whether they had anything else to say to comfort the citizens in the matter. Dr. Hamilton (the Deputy-Chairman of the Public Health Committee) said the condition of the water was only a temporary one, and there was no need for unnecessary alarm. There was no doubt that the report on the bacteriological examination of the water was very unsatisfactory; but they must take into account that the previous reports were most satisfactory. The present state of the water was due to some temporary difficulty in connection with the filtering arrangements at the works. The Committee, as a precautionary measure, had advised that all water for drinking purposes should be boiled while investigations were going on as to the cause of the temporary deterioration. The Committee had taken the advice of Professor Boyce, of Liverpool, one of the most eminent authorities on bacteriological examinations. He had analyzed the water; and as a result he coincided with the opinion which had been expressed by Dr. Frankland that there was a considerable amount of pollution in the water, and that such a state of things, if it continued, would be serious. Dr. Stolterfoth said the examination of the water showed that the number of bacteria was excessive; but this did not imply that the excessive bacteria were harmful. Of course the more bacteria there were in the water, the more probable it was that some would do harm; but the large number might be perfectly harmless. There were other speakers, but they did not advance the foregoing information on the subject. The Water Company have stated to a Press representative that they are strongly of opinion that some unaccountable mistake has been made with regard to the sample of water upon which Dr. Frankland's unfavourable report of the water was based, and in this they say they are confirmed by two subsequent analyses. They are taking steps to obtain further scientific opinion, both as regards the quality of the water and the system of filtration. Although the state of the river in the late autumn is naturally less satisfactory than at other seasons, they consider the treatment to which the water is subjected in filtration should be sufficient to remove all impure matter. They further draw attention to the fact that the medical reports regarding the general health of the city are satisfactory.

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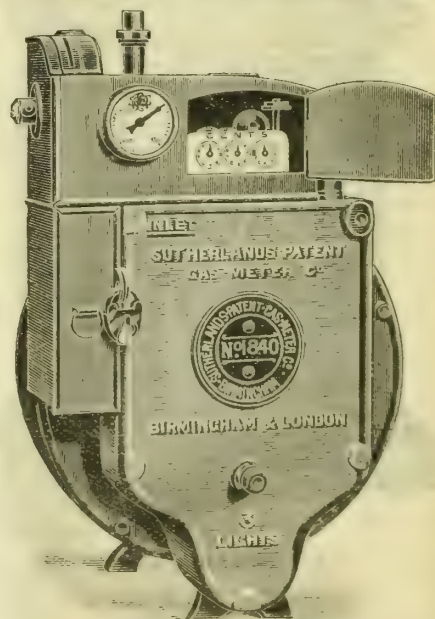
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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

## EDITORIAL NOTES.

## The Question of Next Year's Coal Supply.

THE progress of events in the coal market during the next month or so will be watched with close attention and thoughtful consideration by all users of coal for industrial purposes—not the least by those interested in the gas industry—and with no little anxiety and apprehension by the coalowners. The situation at the present moment is characterized mainly by a general attitude of waiting; the owners holding out as long as possible against demands for a substantial reduction in prices, and buyers refusing to commit themselves to long purchases at present quotations in the sure and certain hope of better terms in the future. From all quarters of the coal market the report is the same—namely, that though this is the season when many contracts for next year would, in the ordinary course of affairs, be settled, practically no forward sales are being made; while it is significant to note that in the few cases where contracts have been concluded, the prices have not been disclosed to the market. We sincerely hope that all buyers will continue to have the courage of their opinions, and decline to play into the hands of the collieries. "Even 'concessions fail to bring out new business,' we read. And no wonder, when the extent of those concessions is considered. The railway companies, for instance, who have this year been paying quite 60 per cent. more for their locomotive fuel than in 1899, have been offered the concession of one-sixth of that increase. "Even" that concession, strange to say, has been declined; and it is to be hoped that new business will not be forthcoming from those companies except at a considerably greater reduction in price than the paltry shilling offered them.

The same "childlike and bland" surprise is displayed at the refusal of the gas industry to play the owners' game. "Consumers of gas coals," writes the Middlesbrough correspondent of the "Iron and Coal Trades Review," "are 'chary about entering into further contracts, even though 'these could be placed at 13s. 6d. f.o.b. in some cases, and '14s. would be generally taken.' When it is borne in mind that the prices named are fully double normal rates and are only about 2s. 6d. below the top prices being paid on current contracts, our readers will readily understand why the offer is not jumped at by gas managers. In view of the fact that the supply of gas coal is now fully equal to, and in many cases greater than, the demand (the London Gas Companies, at any rate, are being inundated with coal in excess of their contract stipulations), that, even allowing for an increased make of gas next year, the coal requirements of the industry during the ensuing twelve months will not be greater, and may even be less, than during the year now ending, and that trade generally is quieting down, there seems no economic reason why gas coal should not be bought next spring at prices 'delivered in London' not higher than those now quoted, and declined, for coal 'free on board' in the North. So far as freights are concerned, they are much easier, in spite of the continued special drain on the tonnage market due to the dragging on of military operations in South Africa.

We have said that trade generally is now quieting down. This is, in fact, a somewhat mild expression to use in describing the situation in the foremost industries—the iron and steel making and engineering trades, especially the former. In spite of reductions in the price of iron that leave the makers little or no profit (so long as fuel and labour costs are at their present level), orders grow scarcer instead of more plentiful. Home consumers are everywhere reducing their purchases to the lowest possible point; while the falling off in the foreign sales is plainly shown by the Board of Trade returns for November. The quantity of iron and steel exported last month was only 262,434 tons, against 345,638 tons in November, 1899; and the total shipments for the eleven months of this year show a falling off of 63,322 tons (excluding pig iron, of 171,028 tons), as compared with the same period of last year. This may be said to represent a reduction in the consumption of coal in the manufacture of iron and steel for export of about three-quarters of a million tons, and by the end of the year the reduction will amount to fully the million. So far as direct exports of fuel are concerned, the returns for November show a further increase of 395,290 tons over the corresponding month last year, but a reduction of 105,532 tons as compared with the October shipments. The fall that has so far been witnessed in coal



prices has, therefore, taken place in spite of the foreign demand, which there are reasons to believe will decrease rather than increase next year.

There will, without doubt, be something of a reaction from the tremendous "slump" in the iron and allied trades, in the natural course of things, when the present abnormal and artificial condition of the coal market passes away; and the trade revival in the States consequent upon the re-election of Mr. McKinley will have some effect on this side of the Atlantic. But the great rush of trade is over; the "boom" in the iron industry is dead; and the coal consumption by the ironmasters next year will be materially lower than in either 1899 or 1900. The part played by the American makers in bringing about the collapse in iron has been frequently noted in these columns. Some idea of the growth of the exports of iron and steel goods from the States may be gathered from the figures for the first nine months of the present and each of the last three years. The value of these exports, in millions of dollars, during these periods was—1897, 46; 1898, 60; 1899, 77; 1900, 97. Some of this great increase is due to higher prices, but the greater part to increased volume; and the presence of this rapidly growing competitor in the world's market must for a long time to come exercise a very considerable influence in the way of a restraint upon upward movements in iron and steel prices. It is scarcely necessary to add that cheap iron cannot be made with dear coal.

So far, we have only been considering the obvious commercial and economic factors in the situation. No prudent man can, however, afford to leave out of calculations as to the course of any business the human factor; and in no case is it more necessary to consider this side of the question than in that of the coal trade. The coalowners are reported to be possessed of a determination not to allow coal prices to return to anything like the level of (say) three or four years ago. The men are similarly eager that wages should be maintained at present figures. Now, the only way in which the owners and the men can attempt to influence the future of the trade is by a material reduction in the output. But whether the owners can combine effectively for this purpose; whether, if they can, they will elect to pursue such a course, fatal as it must be to the industrial prosperity of the nation; and whether the men will throw away the substance in pursuit of the shadow—remains to be seen. We cannot affect to regard the labour aspect of the question with anything but misgivings, which, it is to be noted, are shared and expressed in their current issues by both the principal organs of the coal trade. It must not, however, be forgotten that the coalowners can grant heavy reductions in prices and still make a profit, with wages at their present level.

#### Mr. Dibdin on "How Not to Do It."

MR. W. J. DIBDIN and the team of brother-experts which he captained to their discomfiture before Mr. Oldroyd's Committee of last session have been a long time getting another innings. It is perhaps not uncharitable to suppose that they were, up to a recent date, not without hope that the London County Council would oblige with a second opportunity for performing before a Parliamentary Committee. But counsels of prudence have prevailed, for a wonder, at Spring Gardens; and the County Council are content with promoting only one Bill—that for the purchase of the Water Companies—for glory, and without the slightest hope of passing it. In any case, however, Bill or no Bill, Mr. Dibdin and those who agree with his peculiar ideas of the correct way to compare the lighting value of gases of different normal illuminating powers, would still have enjoyed the advantage of airing their views at the rooms of the London Section of the Society of Chemical Industry. We gave the substance of Mr. Dibdin's communication last week, and complete in another column the report of the paper and the discussion. Readers can now form their own judgment of the intrinsic value of it all. Suffice it to say that the principle upon which Mr. Dibdin elected to base his study in comparisons is the same that failed to impress Mr. Oldroyd's Committee. His idea was to start with something which he called "unit light," which seems to be that yielded by a burner when showing a fair and even flame of gas testing 16·2 candles in the statutory manner. This is his datum; and then he tries to produce an equal illuminating power, by the self-same burner, with gases of other qualities, and he books the difference of the rates of gas consumption. Very curious results are pro-

duced in this way. Mr. Dibdin's ability as a photometrist is unquestioned. The marvel is that any man professing to be an expert in gas, as well as a photometrist, should pretend that such an arbitrary rule of comparison possesses a shred of practical value. He succeeded in giving a good advertisement of incandescent gas lighting; this system being less susceptible of maltreatment in his chosen manner than that "pale, domestic drudge," the flat-flame burner. But beyond this the paper does not convey any lesson. It is hopelessly vitiated by the false and unnatural method of comparison selected.

The discussion did not produce much fresh information. Mr. Dibdin endeavoured to make some capital out of the circumstance that "all those who were concerned in the 'question'—meaning, it may be supposed, the London, and particularly the South Metropolitan Company's Engineers—had declined his invitation to attend and 'fairly argue the 'question out.'" But inasmuch as the proceedings were only a hash-up of the business settled by Mr. Oldroyd's Committee, and never revived in the Upper House, it would have been waste of time for Mr. Dibdin's victorious opponents to have talked it over again, to no purpose. Let him freshen up his matter, and above all drop the pretension of impartiality while patently speaking to a brief, and he will be attended to. Mr. Dibdin knows as well as anybody that, if it is to be a point of obtaining the best light-effect from any make or description of illuminating gas, whether by means of a luminous flame or by an incandescent burner, the only sound, logical, and defensible rule is, "one gas, 'one burner.'" No investigation that ignores this rule can be satisfactory, in whatever direction its apparent indications incline. Mr. Dibdin himself gives his fancy method away when he talks, as the words are given in our abstract last week, about "corrections more particularly applied to 'burners adapted for very rich gases when employed with 'low-grade gases.'" There is no sense, and certainly no science or fairness, in such misusing of gas and gas-burner. When it is known precisely what kind of gas is to be consumed, there is no difficulty whatever in fitting it with the most suitable burner, of any description. This is the sensible and proper course to take; and this is the course which recommended itself to Parliament last session.

No man is likely to find himself in the position of being supplied with 12-candle gas one minute, and 20-candle gas the next, with one and the same burner to use them with. Yet this wholly irrational position is assumed for, and is indeed the only key to, the mysteries of Mr. Dibdin's misplaced investigation. No competent person pretends even that luminous burners, whether argand or flat-flame, made for 16-candle gas, will answer equally well for either 14 or 18 candle gas by merely turning the cock on or off a little, or altering the pressure. Even an incandescent burner, which is not so delicately organized in this regard as the rough-and-ready flat-flame, will be all the better for adjustment of its air and gas supply to the conditions most favourable for the perfect fulfilment of its function. It is, therefore, no use dealing with the subject of the lighting effect of gases and burners, not only without reference to this fundamental rule, but even while systematically violating it, whether of set purpose or by inadvertence. There does not appear to be very much of the latter quality about this parliamentary evidence of Mr. Dibdin's. He knows quite well what he is doing; and he is not alone in the possession of this knowledge.

#### Mr. H. Birchenough on Industrial Problems.

THE Rectorial Address of Lord Rosebery to the students of Glasgow University has already received notice in these columns; but we are led to revert to the subject by an article contributed thereon to the current number of the "Nineteenth Century," by Mr. Henry Birchenough, one of the Directors of the Imperial Continental Gas Association. The subject of Lord Rosebery's address, our readers need scarcely be reminded, was, put briefly, the existence of dangers in our path as a commercial nation, and the unpreparedness of the country to meet and overcome these dangers. Lord Rosebery's main point was that we had no reason to fear for the future if we would only realize its necessities, and prepare ourselves for conflict with our competitors; that we have the material (that is, the men), but that it needs shaping. We must first find out our best men, train them in the best way, and then use them. Many critics found fault with Lord Rosebery's address because, they said, it contained no practical suggestion as



to how the desired ends were to be achieved. These criticisms appeared to be wide of the mark. Lord Rosebery did not make the mistake of imagining that he could prescribe, in the course of a Rectorial Address, a specific for the restoration to rude health of British Commerce when it shall be sick, or a prophylactic to save it from attack. His aim was rather to arouse public attention to the fact that we, as a commercial nation, are now drifting towards danger, and to induce the wise and experienced among us to face the danger, "and by opposing end it."

For Lord Rosebery knows his countrymen too well to think that they need more than to have the difficulties forcibly pointed out to them. He would undoubtedly agree with Mr. Birchenough that business men in this country rightly "have a dogged, unexpressed belief that "the race which built up the great fabric of British trade " . . . is capable of maintaining and extending it. " . . . They are convinced that the past had its "problems as well as the present, and that so far each "generation has met and overcome its difficulties with the "same quiet courage." Lord Rosebery's purpose was to point out the problem, and leave the businessmen to say how best it may be solved; and any words of his have, as Mr. Birchenough says, this peculiar value—that the country listens to them. The fact that his address has been so very promptly discussed in the leading Review, is evidence of that fact. What, then, is the "Nineteenth Century's" contribution to the discussion?

In considering the dangers that lie in the path of British trade, Mr. Birchenough points out, with perfect truth, that those dangers, though they be apparently from without, are really from within. That is to say, it is in commerce, as in war, the case that our difficulties mainly arise from our "want of calculated foresight, of preparation in advance "against all possible contingencies;" and from our "sanguine conviction that it is no use looking too far ahead, "that it will be time enough to deal with difficulties when "they arise." Most serious of all, he adds, "you have in "both the same absence of—may we not say prejudice "against?—systematic professional training." Here Mr. Birchenough puts his finger on one of the two most difficult problems involved in the general question—one to which we have before called attention. How, he asks, are we to breathe into our people "the spirit which has made "the North Germans the best-educated people in Europe, "with the result that they are turning their country into "one of the most prosperous workshops in the world?"

Technical education as we have it in this country is, it is truly said, "an absolutely artificial growth. Apart from "the great towns, such as Leeds or Manchester, or certain admirable institutions in London, it has no real "root. It is offered without conviction by those who have "to administer the funds accidentally set aside by Parliament for the purpose; and it is received with a sort of "sullen acquiescence by those for whom it is intended." There it is—the difficulty that would seem to defy theoretical solution; the absolute antipathy of the average Englishman to education. How many of us, after leaving school and entering business in a subordinate capacity, deliberately undertake the task of fitting ourselves for the most responsible positions in that business? Another question is: How many are encouraged so to do? We do not think that anything short of the bitter pill of adversity will effectually remedy the complaint—that of indifference to systematic and continuous training.

The other of what we have called the two most difficult of the problems involved in the general question is that of the lack of discipline and knowledge among the working classes. The working man, especially the Trade Unionist, wants to be his own master; to say how, when, and where he shall work, and to run the workshop on his own lines. That is his lack of discipline. He is ignorant of the real effects of his interference with the conduct of the business upon its prosperity, and of the prosperity or otherwise of the business upon his welfare. That is his lack of knowledge of the right sort. In combination, these constitute a formidable obstacle for the community to overcome in the race with its competitors. Mr. Birchenough, who speaks very highly of the discipline and education of the German working classes, as exemplified in the stokers employed in the various works of the Imperial Continental Gas Association, quotes the opinion of a prominent and experienced Banker in Berlin, that this country's danger lies in the ignorance of our people; and it is idle to deny that there

is much truth in the opinion. How is this ignorance to be removed? All the School Board education—for the matter of that, all the University education—in the world does not appear to be sufficient to teach men the fact that, for the successful conduct of business, there must be masters as well as men.

#### The Cause of the Business Man in Government.

THE municipally-minded—or if any closer characterization is desired, the parochially-minded—section of the British public has a hot-fit of financial purism in full blast at the present moment. The movement has broken out all over the kingdom, like a rash going through a National School; and on all sides cries are raised for the disinfection of public bodies, from Her Majesty's Cabinet down to Burial Boards, from the taint of illicit financial relations. Ex-Alderman Higginbottom, of Manchester, must experience a bitter satisfaction in feeling his case become that of a type, rather than that of an individual. For the case in question is that of the Business Man in Public Life. His Grace the Duke of Devonshire made haste, on the opening day of the parliamentary session, to proclaim from his place in the House of Lords the glaring truth that he is of the number. A dead-set has been made against the Colonial Secretary for being another. So tender is the conscience of some people on Mr. Joseph Chamberlain's behalf, that they seem prepared to contend that no Public Man ought to have even any distant relation, or connection by marriage, engaged in trade. This is the "Cæsar's wife" standard carried to the 27th degree. It seems to commend itself chiefly to gentlemen who, for their part, are in public life as paid delegates of Labour organizations, or who live by cheap newspapers that are ever trembling on the verge of an infringement of the Gambling Acts.

Is not this new craze a little unworthy of the common sense and practical aptitude in political affairs upon which Englishmen have been accustomed to pride themselves? Let us once more remember the wise counsel, and clear our minds of cant. It is the cry of the age that our national and municipal business should be done in a business-like way. We are told every day that this is absolutely necessary, for the sake of the future of the country. How is it to be done, if not by business men? What hypocrisy it is to pretend that, while a Minister of State or a Lord Mayor ought to be a man of business, he is ineligible for his office if he holds a share in a steamship company which carries Her Majesty's mails, or is the head of a stationery business which sells ink to the Town Clerk. The supreme folly of this canting cry is proved by the history of any established case of undue influence, bribery, or corruption. Those who want to swindle the public can do it easily enough, where the opportunity exists, without advertising themselves as owning shares in, or as being on the Board of, a company. Indeed, the very publicity of such a connection is its redeeming quality. And we venture to say that the law on the subject is consistent with common sense. No man is rendered ineligible for membership of a public body by reason of his owning shares in a joint-stock company doing business with such authority; but he is not to vote on any resolution relating to a contract between the company and the public body. The case of shareholders, of course, includes that of directors, with the difference—entirely a moral one—due to enhanced interest attaching to administering responsibility.

What is desirable in this regard is that every public man should be a competent guardian of his own honour. In so far as the present clamour may help to set up, and firmly establish, a sufficiently high standard of personal integrity for public men, high or low, it will be of general service. Only, let there be no cant about the matter. Do not let us have one law for the shareholder, and another for the Trade Union wire-puller. It would be a poor bargain to drive all the business men out of public life, and fill their places with penniless professional politicians. The man with an itching palm will be the first to impute motives to persons of substance. The large share that trading enterprises now take in all municipal activities renders it very difficult to properly man the corporations and their executive committees; care must be exercised lest it becomes impossible. Similarly, in national affairs, if we are to get rid of the feudal tradition of government by "the ruling "caste," with the familiar result of Lord Tomnoddy at the head, and Taper and Tadpole at the bottom of the Departments of State, it will be necessary to accept for high office the Business Man as he is, and refrain from slandering him



because his second cousin happens, perhaps, to keep shop in a garrison town.

To bring the general question down to the particular application of the financial or trading interests of persons placed in fiduciary positions in gas undertakings, it must be admitted that a keener appreciation of what is befitting might with advantage be cultivated in some quarters. It is not usually a question of law, but of conscience. What is conscience—the judgment that a man pronounces, practically, according to his lights, upon his own actions? That is the common idea of conscience; but it is not the correct one. Conscience, as a wise teacher has well said, is an organ of perception, not a voice. Its true function is to receive the contemporary expression of the eternal verities which are the ultimate sanctions of human conduct, and give them personal interpretation and binding force. This is no more than the ordinary man means when he says that “there are some things that a fellow can’t do.” His conscience will not allow of his outraging the laws of conduct which he perceives to be operative upon his fellows and his contemporaries. But let us leave the matter here. Particular cases are alone worth discussing in such a connection, if the talk is not to be all in the air; and personalities are impossible for these columns.

#### American Coke-Oven Practice.

It is to be hoped that engineers engaged in the work of carbonizing coal on a large scale are keeping themselves posted up in regard to the actual practice of carbonizing by all the known methods. Dr. Bunte mentioned the other day the question of coal carbonizing in bulk for the sake of the saving in labour; and undoubtedly this way of working will appear in a fresh light when the photometer is dethroned. There is no little haziness in the minds of the most accomplished carbonizing experts as to which is absolutely the most economical way to treat bituminous coal. There are so many considerations involved. The solution of the problem depends mainly upon the reply to the query: What is to be the chief product sought—gas, coke, or fluid distillates? The elimination of the photometric test of the gas would appear to unite the two principal products of coal carbonization—gas and coke—in a common cause. The calorific power of coke-oven gas should be about the same as that of coal gas retorted in the ordinary way. Curiously enough, an article on the “Connellsville Coke Region” of America, which appeared in the “Engineering Magazine” for October, supports those sceptics who have not been able to see in the new-fashioned coke retort-oven a technical advance, as a coke maker, upon the old-fashioned beehive oven.

Connellsville coke is the mainstay of the successful American iron industry, of which so much is said to the depreciation of the English iron trade. Last year considerably more than 10 million tons of metallurgical coke were shipped from the region, at an average price of 8s. 4d. per ton. The coal used in the manufacture is a wonderfully suitable material in every way, and is mined from a seam from 8 to 9 feet thick. The coke is nearly 90 per cent. carbon; and with the small exception of a battery of 50 retort ovens, it is all made in the beehive type of coke-oven, with hand drawing, “as machinery has failed so far “to perform that operation either as satisfactorily or as “cheaply as the human coke drawer.” The coal is fed into the ovens from railway trucks; but the levelling of the charge is done by hand. “In fact, there are very few “mechanical appliances in use about the coke yards. The “oven now being built is generally 12 ft. 3 in. in diameter “by 8 feet in height, inside measurement.” It is, in short, the old beehive oven, unaltered, unimproved. This information will be somewhat surprising to those who imagine that an American manufacturing industry must be all carried on by the aid of machinery. It does not speak well for the retort-oven.

#### Chemistry at Fault.

It would only be in agreement with human nature, if at this moment all the noble British army of warrantable subjects of the analytical chemist’s usual and ordinary attentions—the buttermen, the milk dealers, the water companies, and the providers of gas tested under the sulphur clauses—were to be observed shaking hands with themselves, and heard to “chortle in their joy.” Because arsenical poisoning on the largest scale has been going on for years, through the national habit of beer-drinking, and not a chemist of them all detected it! It is not for us to

discriminate between the relative importance, in regard to the interest of public health, of a gas supply containing a little more or less sulphur in other forms than sulphuretted hydrogen, or appearing to possess rather more or less illuminating power than is prescribed by statute, and beer impregnated with arsenic in the degree revealed by the latest newspaper “sensation.” But there it is. An elaborate official organization, costing a lot of money both directly and indirectly, has been employed (with much solace to itself) in watching over the one technicality—as to which nobody ever pretended that any possible *laches* could have the smallest detrimental effect upon the health of the people. Meanwhile, this arsenic volcano has been completely disregarded, until it burst forth into an eruption that not even an official analyst could fail to notice. What a bitter satire this story is when told of a people that pretends to follow the dictates of common sense in all matters of national and local self-government! The last London Gas Referee appointed was an eminent Physiologist. This is not to his discredit, inasmuch as even a Fellow of the Royal Society need not be ashamed of possessing some knowledge likely to prove useful to the community at a pinch. The pity of it is that the “little tin gods” of Whitehall wasted a good physiologist upon the Board of Gas Referees, instead of employing him to supervise constant and thorough Government inquiries into the character of the food and drink of the people. Peripheral neuritis, due to arsenical poisoning, resulting in 250 deaths during the past two years in the Manchester district alone, is one of the most damaging indictments conceivable of the Chemistry that rendered such a state of things possible at one end of the chain of circumstance, and never detected its existence at the other.

#### The Secret of Bethesda Disclosed.

Writing last week of the strike at Bethesda, we remarked upon the curious dilemma into which the “Daily News” had fallen as the immediate result of the endeavours of its special reporter to collect a “stream of facts” detrimental to the employer’s side in the dispute. The tourist from London, although carrying upon his mission the liveliest prejudice in favour of the quarrymen, could make nothing of them. We observed that the rights of the matter were not finding publicity through this channel; but now it is our pleasing duty to notice the fact that the “Daily News” reporter has learnt more of the truths of the affair, and has had the candour to publish his information. On Wednesday last, the quarries were formally thrown open for work; yet nobody came. The misguided men would neither work nor confer with the management on the reasons for their abstention from employment. And what is more, the men who have thus quarrelled with their bread and butter are afraid to meet and talk the matter over among themselves. Not a single meeting of the strikers has been held; and the “Daily News” Commissioner tells the reason why. It is because the whole thing is “being engineered by “three men, not one of whom has had any connection or “relation with the Penrhyn Estate for years.” These mischief-makers profess undying hatred of the quarry management, which they would do anything to discredit; yet they dare not face a mass meeting of their dupes. If one man among the latter had the manliness to declare that the whole trouble was concocted, and that he meant to stick to his job, the great Bethesda revolt would crumble to nothingness. Knowing this, the three wire-pullers shirk the ordeal of a public meeting.

If this story is the truth, it supplies an additional justification for the decision of the quarry management to have no dealings with outsiders. The tale suggests to the Editor of the “Daily News” the sapient reflection that the Conciliation Act was meant to deal with such cases. Most people would incline to the opinion that, if the report is to be trusted, the case is rather one for the policeman. It is impossible to entertain any respect for the men who submit to such tyranny, however much we may pity the lot of those dependent upon them. Is there a Welsh translation of the song about Britons declining to be slaves? Meanwhile, it seems a pity that the arm of the law is not long enough to reach the alleged conspirators against the peace of the Bethesda community.

The Directors of the Commercial Gas Company recently invited Mr. George Livesey to fill the vacancy on the Board caused by the death of Mr. John Blacket Gill; and we understand that he has consented to do so.



## WATER AND SANITARY AFFAIRS.

AT their meeting last Tuesday, the London County Council adopted the suggestion contained in the report of the Water Committee given in the "JOURNAL" last week, and decided to send the members of the Water and Parliamentary Committees as a deputation to the President of the Local Government Board on the subject of the water supply of the County of London. Information on several subjects is desired by the Council; but their primary object is to endeavour to ascertain what steps, if any, the Government propose to take for giving effect to the recommendations in the report of Lord Llandaff's Commission. While they are at Whitehall, they think they may as well urge upon the President the desirability of making a daily instead of, as at present, a monthly examination of the water supplied to London, and of reconsidering the Board's determination not to furnish the Council with copies of Orders sanctioning schemes of intercommunication between the Water Companies' systems, and the raising of the necessary capital to carry them out. It is useless to speculate as to the kind of reception the deputation are likely to meet with. Since they last went to the Local Government Board, there has been a change of Presidents—not because Mr. Henry Chaplin had not "done the State some service" during his tenure of office, but because the Prime Minister considered his retirement from the Government would be essential in order that vacancies might be created for others. As Mr. Chaplin has publicly acknowledged, Lord Salisbury is primarily responsible for the government of the country; and it is for him to judge who are the men best qualified to be at the head of the various Departments. In the selection of Mr. Walter Long for the Local Government Board, he certainly laid himself open to less criticism than he did in some of the other changes with which he surprised the public after the General Election, inasmuch as Mr. Long was for six years its Parliamentary Secretary, and necessarily knows a good deal about its work. What his views upon the Metropolitan Water Question may be, remains to be seen. Possibly they do not quite accord with those of his predecessor, though they may be in harmony with the present opinions of the Government. There seems to be reason for believing that these have undergone some change; and this may have made it "essential" that Mr. Chaplin should be asked to step aside and make way for one of the "others."

An incident which occurred early last week lends support to the belief just referred to. Speaking at the banquet given by Mr. Dickinson, the Chairman of the London County Council, at the Hotel Cecil, on Monday evening, to the new Metropolitan Mayors, in celebration of the recent change in the local government of London, the Home Secretary (Mr. Ritchie) expressed the opinion that "the Government ought not unduly to interfere with the legislative projects of the Council;" and the remark was received with cheers. "If," continued Mr. Ritchie, "the Council desired, as to the water supply and other matters, 'only what was right, some measure might be proposed to Parliament which would be practically unopposed.'" More cheers followed the utterance of these words. Of course, the speaker may only have been giving his individual views on a subject of general Metropolitan interest. But his statement of them in such unequivocal language on such an occasion, taken in connection with the whole tenour of his speech, points, as the "Builder" puts it, to "a more sympathetic policy" on the part of the Government with the Council, and especially in regard to the water question. If there was not some kind of authority for the remarks alluded to, they may only have the effect of buoying up the Council with false hopes of support, and of somewhat embarrassing the speaker's colleague at Whitehall when he has to face the deputation. True, Mr. Ritchie safeguarded himself by the use of a little word in which, as we know on good authority, there is "much virtue." The Council must desire only what is right in regard to the water supply, if they wish their proposals to escape opposition. It is precisely on this question of what is right that difference of opinion exists. The Council think it right that they should control the supply, as is shown clearly by the outline of their Purchase Bill which appears in another column. The last Royal Commission thought otherwise; and many agree with them.

As to the other matters which the deputation will bring before the President, they are merely exemplifications of

the "fussiness" which is characteristic of the Council. As to making daily examinations of the water, surely, with Professor Thorpe working at the Government Laboratory, Dr. Clowes at the County Council, and Sir William Crookes and Professor Dewar for the Water Companies, the existing arrangements are ample for the protection of the public. London water is good enough for all domestic purposes as now supplied. Let the Council see that it is not contaminated by noxious ingredients, and sent out under another name to poison the consumers. This is where vigilance is required, not in chasing a harmless microbe. With regard to the expenditure on intercommunication schemes, the Board must have been satisfied that it was necessary, or they would not have issued the Orders sanctioning it; and if they have hitherto declined to gratify the inquisitiveness of the Spring Gardens authorities by supplying them with copies, it has doubtless been because they have considered the request for them was not justified. But Mr. Long may have other views on the matter. We shall see.

The winter meeting of the British Association of Water-Works Engineers last Saturday must be described by the oft-used term of "satisfactory" in respect of the fulness of the time occupied by the material submitted for discussion—there was no void space, and no hesitancy in pressing through a substantial programme and in sustaining the discussions. But we have to confess to a dash of disappointment in one regard, and that was in the main feature of the proceedings. After long deliberation, the Water Boards Committee appointed by the members to consider the question of the control of water undertakings and sources of water supply, presented their report. The Committee was a strong one; and we believe—and do so most sincerely—that they have given to the work with which they were entrusted very earnest attention. The men themselves—conscientious to a degree, and known to have the best interests of the water supply of the country at heart—were sufficient guarantee that this would be so. But their report seems to indicate that withal, and notwithstanding their eagerness to reach, and knowledge of the desirability of reaching, the goal for which they set out, other influences have operated to stem their progress. We do not intend here to epitomize their report. It will be published *in extenso* next week, and readers may then peruse it in its complete form with the carefulness which it deserves. It sets forth, under six headings, the principal features of the existing system of water supply which could and should be amended, and which should come under more efficient control in order that justice may be done, and the water supply of the country be preserved from danger and abuse. He would be a bold man who would take up a position of antagonism to the Committee on this part of the report. The obvious and only answer to such a one would be that he was callous to the requirement of the country as a whole for a good, pure, and equitable supply of one of the greatest of vital necessities; and therefore his objection could be accounted of little worth.

There is really nothing in the half-a-dozen sections of the report referred to which was not known before; but the Committee have done excellent service in coalescing, in form both plain and strong, the various arguments in the case for reform. But having presented an unanswerable claim for what they ardently desired when setting out on their work, they stop short; and they could not, it seems to us, more plainly have written in the report, "Thus far 'may we go, but no farther.'" Who stands in the way? We do not know; but we may guess, and will presently make a suggestion. "The remedy," say the Committee after their splendid opening, "is entirely beyond the power of an Association such as ours, and requires the intervention of Parliament." True; but no one can seriously prevent, though he may strongly object to, the Association suggesting, and assisting in taking steps to secure, the administration of the remedy. "We would, however, suggest," the Committee continue, "that the members of the Association should be urged to use their influence to bring the points in question into prominence with the view to securing the attention of the various ruling authorities to them at the earliest possible moment." In this there is a trace of weakness. Why delegate to individual members work which could be better done by bringing the compact strength of the Association to bear upon it? The Association could do as a body a great deal that some individual members would not dare do; and therefore, if the propelling forward of this work is to be left



to individual exertion, it is safe to predict that much of the labour of the Committee, devoted as it has been, will be lost. Then the report winds up with the suggestion that the Association should endeavour to organize the systematic collection of data relating to the following subjects: (1) The available water supply obtainable from various sources; (2) general information in regard to existing water-works; (3) information concerning districts not adequately supplied with water. Such information we do not deny would be extremely useful, and may be of immense service later on if more effective action is determined upon. In the meanwhile, the urgency which aforesaid was highly hoisted has been dragged down; redress is delayed; and the conditions which require remedying will be strengthened and enlarged.

We see in this report (we hope time may prove we are wrong) a shelving of the general question so far as the Association are concerned. Members of the Committee in their speeches on Saturday hinted that the Association was too young to have any influence in such a big work. But surely the Association is not so juvenile, nor the positions of the bulk of the members of so little consequence, that the solicitation of the views and adherence to the cause of other learned, professional, and class representative organizations would not have commanded respectful regard; and, united with such societies, a very strong case might have been presented to the ruling authorities. It is not, therefore, in the youth of the Association that we feel satisfied in looking for a reason for the report with a well-developed body lacking a good head; and, casting about outside the Association, one reason occurs to us. But we may be on quite the wrong road. The Committee (who, by the way, were largely assisted by valuable matter furnished by the Secretary, Mr. Percy Griffith, and Mr. C. H. W. Biggs) consisted of six members: Mr. C. H. Priestley (the President), of Cardiff; Mr. H. Ashton Hill, of the South Staffordshire Water-Works Company; Mr. W. Whitaker, the eminent geologist; Mr. W. Matthews, of Southampton; Mr. Frederick Griffith, of Leicester; and Dr. J. C. Thresh, the Medical Officer of Health for Essex. Mr. Ashton Hill dissented from portions of the report; and of the remaining five members, three are Engineers of municipal undertakings. Now, many of the municipalities of the country do not view the question dealt with in the report with the same enlightened minds that their officials do; and the word "control," as well as certain of the other matters mentioned in the report, is as repugnant and irritating to some of them as is a red rag to a bull. They want none of it; but they take good care to keep a watchful eye over the supply when a company are responsible for it. Therefore it is just possible that the municipalities form the reef over which it would be dangerous for many of the members of the Association to sail. We do not know that this is so; but the report itself furnishes justification for making this suggestion in the absence of a well-founded reason for an otherwise well-considered argument ending with no recommendation of an active nature towards striving for an object not long since earnestly desired.

At a recent meeting of the West Riding Section of the Society of Dyers and Colourists, Messrs. A. Dufton and W. M. Gardner read a paper on their arrangement for the production of an artificial light of the same quality as daylight, and illustrated its practical value. The lamp devised for this purpose was shown at the Bradford meeting of the British Association, and was briefly described a short time ago in "Nature."

On the first day of the new century, the Royal Society will commence the colossal undertaking of cataloguing all the scientific literature of the world. The work will be issued in seventeen volumes, each relating to some particular science. The Society have been guaranteed by the Government against loss to the extent of £5000; but it is believed that little, if any, of this sum will be applied for—the subscriptions for the work having been so liberal.

We have received from the Technical Publishing Company, Limited, of Manchester, the "Practical Engineer" Electrical Pocket-Book for 1901. This is the second year of publication, and many useful suggestions called forth by the first issue have been adopted; thereby increasing the bulk of the book by nearly 50 pages, and consequently enhancing its value. The section on "Gearing" has been revised; and many additional tables have been inserted in various parts of the work. The technical matter is followed by a diary on ruled section paper; and the whole forms a convenient pocket-book which will be found useful to all who are in any way connected with electrical undertakings. It may be had without the diary; and in this form it makes a good book of reference.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1468.)

THE general course of business in the Stock Exchange last week was a fair sequel to the line taken by its predecessor, and without any improvement whatever. Things moved quite irregularly and fitfully—the tendency at one period being rather better, and at another rather worse; but at no time with any pronounced feeling. On the whole, the balance at the close was rather on the losing side; and prices left off with more shrinkages than gains. But the difference was nowhere very much. Perhaps the most conspicuous losers were among the gilt-edged division. In the Money Market, there was an abundant supply for short loans. But discount rates were very firm; and with the inevitable demand for the year's end just looming ahead, the chances are that the stringency may be drawn a little tighter. In the Gas Market, business was much about the same as in the preceding week so far as general activity went; there being no real animation on any one day. The tendency, however, was sufficiently marked to show progress in what we believe may fairly be taken as a process of restoration to public favour of sound gas securities. The shock which they received last summer in consequence of the phenomenal rise in the price of coal, and the unavoidably resultant advance in the price of gas, has worked itself out. The next declared dividends will in some cases be lower than the last. But this will be the last rumbling of the storm; and the future will be showing out brighter and clearer. Changes in value during the week were few, but rather substantial, and were all for the better, with one unimportant exception. In Gaslights, business in the ordinary was very moderate; but prices remained steady at the old figures. The secured issues were quiet and very firm. In South Metropolitan, an increase of strength was apparent almost daily; and the quotation advanced three points. Commercial were more than usually active; and their growing advance was marked by a rise in the new stock. There was not much to remark in connection with the Suburban and Provincial Companies, beyond a rise in Tottenham and Edmonton, which has been for a long time figuring at very cheap prices. Business was very limited in the Continental group; and quotations did not move, though Imperial looked like making an advance. None of the rest presented any feature. The Water Companies offered nothing for remark outside their usual routine. Movements were irregular; Kent rising and Southwark falling.

The daily operations were: Business in Gas was quiet on Monday; but prices were good. South Metropolitan rose 1; but Buenos Ayres debenture fell 1. Tuesday was just as quiet; and quotations were unchanged. In Water, Southwark fell 2. Wednesday was similar; and quotations were still unchanged. On Thursday, there was a little more animation. South Metropolitan rose 1. In Water, Southwark fell 3. Friday was rather more brisk; and prices rose. South Metropolitan advanced 1. Commercial new 2½, and Tottenham "B" 3. In Water, Kent rose 3. Saturday was quiet; and quotations closed without any further variation.

### ELECTRIC LIGHTING MEMORANDA.

News of the Nernst Lamp—Improved Forms—Difficulties in the Way—"Nature" on the Electrolysis of Gas and Water Mains.

At last there is news of the Nernst incandescent electric lamp. The current number of the "Electrician" contains a special account of the article as manufactured by the Nernst Electric Light Company—that concern, it will be remembered, which was floated in this country for doing business in all sorts of places except the United Kingdom. People complained then, with reason, that there was no proper publication of the limited and distant scope of the Company's intended operations in their too-universal title. It will therefore be as well if we follow the good example of our electrical contemporary, and state as precisely as may be how the Nernst light interests are constituted. The patent rights in the system for Great Britain, Germany, and the Continent generally, are in the hands of the Allgemeine Elektrizitäts Gesellschaft, at whose stall in the Paris Exhibition the light was shown in action. We believe that, as a matter of fact, the light has not been seen out of the hands of its various dry-nurses. The Westinghouse Company possess the patent rights for the United States and Canada; and Messrs. Ganz and Co. own those for Austro-Hungary and Italy. It thus appears that, so far as England is concerned, the supply of Nernst lamps will come from Germany; while those manufactured here must be exported for Colonial use. Actually, however, it seems that Mr. James Swinburne, the Consulting Engineer to the Nernst Company, and his associates on the Company's staff, have been for two years working out the commercial forms of the lamp. Even now, a price cannot be quoted, nor orders booked for shipment.

It is stated that the Nernst Company have had to adopt for the commercial lamp a lower efficiency than was claimed for the laboratory models. The commercial rating is 1·7 watts per candle power, which is supposed to argue also that it has been found advisable to work the filament at a lower temperature than in the experimental lamps. This drop is believed to account for the longer life of the lamps, which are now reported to last 500 to



1000 hours. It is generally known that the lighting element in the Nernst lamp is a rod of a material which does not conduct electricity at low temperatures, but becomes a conductor when heated. Even then, the temperature coefficient for resistance has still a fairly high negative value. It is, therefore, necessary to add a resistance coil with a positive temperature coefficient in series with the luminous rod, "to prevent instability;" and this regulating coil has a resistance equal to 10 per cent. of the resistance of the lamp. The coil is made of fine platinum wire, wound upon biscuit porcelain. The luminous rod is described as of about the thickness of a pin, carried between platinum wires; the junctions of the two substances being covered by a blob of the rod material. This joint gave a good deal of trouble at first—especially the one at the anode, or positive pole in the continuous-current lamp. It was found that considerable local heating took place here, and that the rod wasted away in the neighbourhood. The mischief is reported to be cured by a fresh arrangement of the platinum binding wire.

Of course, the first bother in the way of making the lamp a commercial article is the necessity of heating the rod. This is effected, in the simplest form of lamp, by applying a spirit-lamp flame to the rod, through a hole left for the purpose in the bottom of the protecting globe. The lamp in its glass globe, therefore, looks very much like an old-fashioned gas-burner in a small-holed ground glass or opal globe. Air is necessary for the burning of the lamp; the reason assigned being that a supply of oxygen is requisite to prevent oxidation of the magnesia which is the basis of the substance of the rod, or perhaps rather to effect the re-oxidization of the magnesium which results from the electrolysis. In the self-lighting form of the lamp, a complicated arrangement exists for heating the rod by means of a resistance coil, which is switched off as soon as current passes through the lamp. It is hinted that there is an "initial cost difficulty" in the way of this Nernst lamp business; which may be easily believed. Again, the necessity of providing for renewal of the perishable portion of the lamp means a good deal. Altogether, and although the "Electrician" is able to testify that the appearance of the Nernst lamps used to light the Company's offices "compares not unfavourably" with carbon filament lamps and fittings, it is possible to gather from our contemporary's guarded expressions of approval of the system, the notion that the long-delayed advent of the commercial Nernst lamp will not immediately revolutionize the electric lighting industry.

A noteworthy little article on "Electric Traction Troubles" appeared in a recent number of "Nature." It dealt with the remarkable slavishness with which English engineers concerned with electric tramway and railway work have copied American methods. "The characteristics of American traction are convenience, comfort, speed, low fares, and a liberal scattering of the electric current over the district generally. Chinese like, we have faithfully adopted them all." The consideration of wandering currents might be put aside, the writer remarks, if the interest, of electric traction were alone to be regarded; but it is otherwise. Shareholders in gas and water companies may well indulge a preference that their own property shall not be interfered with by currents escaping from the "twopenny tube" return conductors. Yet if only one-hundredth part of the current employed on this line were to escape into the gas and water mains, it would mean the loss of a ton of iron yearly from the pipes in the vicinity of the line. The moral urged by the writer is that the return-conductor principle should be insisted upon in all the traction conversion schemes that are likely to be so prominent a feature of English electrical engineering enterprise during the early years of the coming century. The return of current, that is to say, by the metals of the tramway or railway should be absolutely forbidden, for the sake of the gas and water mains.

#### AN AMBITIOUS INVENTOR.

ONE who evidently means to attain a position whence he may dictate to gas and coke works the manner in which their manufacturing processes must hereafter be conducted, is Dr. Paul Naef, of New York City. Such, at least, is the conclusion one is forced to draw from the specifications of three English patents recently granted to him. They are perhaps scarcely of the class known to patent experts as "omnium" patents; but they are certainly very comprehensive. They are numbered 20,658, 20,659, and 20,660, and dated Oct. 14, 1899, though the prior date of March 14, 1899, is claimed under the International Convention. The first specification appears to be an innocent enough one of a patent for a "Method of, and Apparatus for, Producing Coke, Gas, and Bye-Products," and it embraces 8 claims. The second, however—which treats of a "Method of, and Apparatus for, Producing Gas and Bye-Products"—is more formidable, if only from the multitude of its claims, which number 45. The third specification, headed precisely as the second, concludes with only 20 claims. It may be of service to readers of the "JOURNAL" if we endeavour to indicate in a brief article what Dr. Naef embodies in his claims, amounting to 73 in all.

He has several laudable objects in view, among which may be mentioned the following: The use of larger carbonizing chambers than gas-retorts, an increase in the amount of ammonia obtained from the coal, provision for continuous in place of intermittent gas production, the manufacture of water gas from coal,

pre-heating of the fuel used in making water gas, and general increase in the quantity and quality of the gas and bye-products obtained. Truly, a comprehensive programme, which sets one wondering if inventors have hitherto been idle so far as gas manufacture is concerned, since Dr. Naef finds such wide scope therein for his inventive faculties. But we remember our "Register of Patents," which has assumed so great dimensions that we shudder at the mere thought of a search for anticipations of even a few of Dr. Naef's claims. We shall, therefore, speak of what has hitherto been done only from general recollections, which readers will be fully competent to supplement.

It may, however, first be pointed out that Dr. Naef has previously obtained protection for several inventions. Some of these were in connection with the roasting of ores; and gradually he appears to have left the consideration of the metallurgical processes for the more general question of the proper utilization of fuel in furnaces. Thus he was granted three patents dated April 2, 1898, each for a "Process and Apparatus for Making Coke and Saving Bye-Products. And in the same month, one for a "Process and Apparatus for Producing Ammonia, Cyanides, Coke, and Gas." Then, in June the same year, he obtained, in conjunction with R. S. Garton, two patents, each for a "Process and Apparatus for Producing Coke, Gas, and Bye-Products." And even the three specifications which form the subject of this article are being followed in rapid succession by others in the name of this prolific inventor, bearing on kindred topics. Consequently it would seem that Dr. Naef finds coke and gas production a most attractive field for research, and probably hopes that it may shortly prove a remunerative one to him. As we have already indicated, his earlier inventions were in other branches of technology; and in 1883 and 1884, he was collaborating with Professor G. Lunge in investigations "On Chloride of Lime, and the Reactions in Sulphuric Acid Chambers." He clearly has, as his present specifications indicate, a good knowledge of chemistry; and it may be said at once that there is nothing in his 73 claims which can be rejected as absurd merely from theoretical considerations. Were he less prolific of "inventions," and were his claims fewer, it would be necessary to take him quite seriously; whereas actually we stand amused and amazed at the assurance with which he claims protection for nearly every conceivable modification of the common processes of gas and coke manufacture.

The principle underlying the "inventions" which we are now more particularly considering, appears to be the use of pre-heated gas—such as water gas, either alone or in admixture with steam—for the destructive distillation of coal, and when steam is used also for the production of water gas from the coke formed from the coal. Any form of air-heater or stove, as used for heating the air for blast-furnaces, may be employed for heating the water-gas, which is then passed into the coking-chamber, which may take one of several types previously patented by Dr. Naef, or practically may be of any convenient form. The coal in the coking-chamber is carbonized by the stream of heated gas which takes up the volatile constituents liberated from the coal during its carbonization. The depth of coal in the coking chamber is so proportioned to the stream of gas that the effluent gas is at a temperature only slightly above that at which it would deposit its tar. The gas is then passed into washers for the removal of ammonia, and, if required, it is enriched by any ordinary process. The coking-chamber may be of such a type that the coal is charged in at the upper end, and the coke removed at the lower end without interruption of the process; and it may conveniently be an inclined rotating cylinder or cylinders. The coke produced may be partially used in ordinary water-gas generators, from which the gas—which usually contains some undecomposed steam—passes to the heaters, and thence to the coking-chamber. Now the passage of steam over heated coal or coke, as is well known, increases the yield of ammonia therefrom. Dr. Naef claims protection for the production of ammonia by the action of the steam on the red hot coal or coke. After the gas has passed through the washers for the abstraction of ammonia, it may be led back to the heaters and through the coking-chamber to effect the carbonization of more coal; for Dr. Naef does not confine himself to the application of water-gas only for this purpose, but claims the use of any non-nitrogenous gas. The gas heaters may be heated intermittently by means of producer gas, or in any other convenient way. The description of coke produced may be varied by modification of the plant and conditions of operating. For instance, under the pressure of a high column of fuel, hard coke is formed. It is claimed that the temperature in the coking-apparatus is not high enough to decompose ammonia, and that consequently the yield of ammonia is high.

Such, broadly, appear to be the chief aims of Dr. Naef, as indicated by the three specifications now before us. Innumerable modifications of procedure and apparatus are mentioned; but the intention apparently is to introduce, as far as possible, the use of heaters for air, gas, or steam which is afterwards employed for the gasification of coal or coke, and incidentally for the production of ammonia. Where coal is operated upon, coke, of course, may be a chief product, and tar may be recovered. But Dr. Naef proposes under many circumstances to make gas from both the coke and the tar. The tar, if allowed to pass on with the hot gas to the heaters, would, of course, be more or less broken up, and carbon and gaseous bodies formed from it. Unless the temperature of the heaters is lower than we suppose,



a goodly production of naphthalene would ensue, though we do not think Dr. Naef anywhere calls attention to this possibility. There seems no insuperable difficulty in the way of making his methods for the production of water gas, coke, &c., virtually automatic and continuous in operation, as is claimed for them. Also the use of steam at a proper temperature will undoubtedly give a large yield of ammonia; but such use is by no means a novel proposal. There is a greater degree of novelty in a comprehensive scheme for carbonizing coal by means of pre-heated gas; but we imagine the practical difficulties which would crop up as soon as it was tried on a working scale, would be both numerous and formidable. Its economy would depend upon the loss of heat being reduced to a minimum; but the alternate cooling of gas for the abstraction of ammonia and re-heating for carbonizing more coal, seems to be a scheme likely to involve great waste.

In any case, we should have greater confidence in Dr. Naef's plans if there was rather less to be found about them in the Patent Office archives, and more in the Technical Press regarding their practical application. Dr. Naef, however, has furnished us, in the specification of his English Patent No. 20,659 of 1899, with an unsurpassed exercise in modification, permutation, combination, and imagination.

## GAS-ENGINES AND ELECTRIC POWER PLANTS.

### [FIRST ARTICLE.]

DURING the last half year, "Engineering" has published a long series of articles by Mr. Philip Dawson, dealing with the subject of the use of gas-engines in connection with electric power plants. Those who desire to be in possession of all the detailed information collected by Mr. Dawson, and recorded, with ample illustrations, by our contemporary, must procure the numbers of that journal, dating from Aug. 10 to Nov. 23, containing this original matter. We propose now merely to pass the substance of Mr. Dawson's work in review, in order to acquaint our readers with its general character and scope. It does not touch, except quite incidentally, upon the mechanics of the gas-engine, and has nothing to do with the possibilities of improving and enlarging this class of prime movers. It stops short, also, of the latest development of large gas-engines as direct users of the motive power of blast-furnace gases. It is, in fact, confined to the description, with very little criticism, of actual applications of gas-engine power to the generation of electricity; and as such it is a very valuable record of accomplished facts.

Mr. Dawson begins his survey from the economic datum of the introduction of the Dowson gas-producer, which he esteems as having been the key to the wider development of the gas-engine beyond the era of small things that endured so long as town's gas was the only available gaseous fuel. It is unnecessary to follow the writer through all the historical steps by which he traces the gas-engine down to its latest forms. He is a little uncertain in this part of his performance, because he does not appear to have taken his retrospective glance across, so to speak, a good specimen of the modern gas-engine. That is really the only safe way to write history. The writer must thoroughly appreciate the merits, and not be blind to the demerits, of the surviving type; and then he can perceive how the former have been led up to by successive tentatives, while the latter have remained intractable all through. Mr. Dawson does not succeed in making it clear that the Beau de Rochas cycle of operations in the cylinder of the internal combustion motor has survived, or why. Neither does he lay stress upon the ultimate shape given to the important details. This, however, by the way. He ventures upon the following list of advantages positive and comparative, and disadvantages, of gas-driven electric plants, as contrasted with steam power. The former comprise: No smoke and no chimney, saving of space, saving of labour, and avoidance of risk of boiler explosions. His recognized disadvantages are: Complicated mechanism, expensive maintenance, difficult speed regulation, costliness, vibration, and heating of the engine-room atmosphere.

This list, we venture to remark in turn, is both incomplete and partial. Some of the most powerful recommendations of gas-engines are omitted from it; while some of the alleged disadvantages are misrepresented. Mr. Dawson's mistake here proceeds from his too arbitrary assumption—contradicted by some of his own selected examples—that producer gas is the only fuel of the kind worth considering. He should, in fairness, have drawn another horizontal datum-line at (say) the 50-horse power engine for town use, and admitted that up to this size of power unit—at any rate, where the ordinary lighting gas is not very dear—the gas-engine using town's gas is far preferable to a steam-engine. We do not propose to catalogue its advantages; the enormous trade done in the engines proving the case in the best of all possible ways. Of Mr. Dawson's specified disadvantages, however, we can only admit the force of one—the heating of the atmosphere of the engine-room. This is a drawback in hot weather, especially as the gas-engine is usually fixed as near as possible to its work; and a more general employment of ventilating fans is the only palliative for it.

Producer gas is as important a division of the subject, in Mr. Dawson's scheme of treatment, as the engine itself. Accordingly, he explains the process of gasifying carbonaceous fuel in

a regulated blast of air, and states that "Dowson first made a continuous process of it by blowing in steam and air together." This is not historic truth; the credit for the invention being due to several pioneers in this line, who effected nothing of permanent value, because no suitable applications for the semi-water gas thus made existed. It was the gas-engine that made the gas-producer, for power purposes, commercially possible. Dowson made an excellent apparatus for the purpose, the chief drawback of which was the necessity for using anthracite coal—always a dear, and not an everywhere available, form of carbon. Mr. Dawson wastes some space in describing and illustrating various obsolete kinds of gas-producers. Actually, there are only a few surviving types of this apparatus. Most of these are semi-water, gas producers, more or less modified to work with various grades of coal or coke. Thus, on the Continent the necessity of utilizing the very dirtiest and poorest class of "slack" has led to the evolution of the Buire-Lencauchez pattern of gas-producer, with forced draught. The Gasmotoren Fabrik Deutz also make a successful producer for using coke. There are, however, several British and foreign makes of the apparatus capable of doing good work.

Mond producer gas is a different article, consequent upon the circumstance that it is made from bituminous slack, which is first carbonized and the resultant coke gasified by the assistance of an ample supply of superheated steam, in the generator. Mond gas is treated for the recovery of ammonia, and has a reputed calorific power of 150 B.T.U. per cubic foot. It is therefore no richer than Dowson semi-water gas, which bears the same rating, though it is not invariably realized. Mr. Dawson insists on the necessity for thoroughly washing, screening, and purifying from sulphuretted hydrogen the semi-water gas intended for use in engines, though this adds at least 1d. per 1000 cubic feet to the prime cost. The first necessity, after this cleansing, for the successful use of such poor gas in an engine is a high compression of the charge; and the second is reliable ignition. Electrical ignition, by a stream of sparks, is preferred; tube ignition being reserved for engines using lighting gas. Roughly speaking, the consumption of semi-water gas for power generation to an equivalent bulk of common coal gas is as 4 to 1; and this ratio exactly coincides with that of the calorific powers of the same fuels.

## BOARD OF TRADE ANNUAL REPORT ON STRIKES AND LOCK-OUTS.

A PRELIMINARY summary of the statistics of strikes and lock-outs in 1899 was commented upon in the "JOURNAL" for Jan. 30 last; in the fulness of time the Board of Trade report, with detailed tables, have now appeared. We shall here refer chiefly to the particulars not given in the preliminary statement; first, however, mentioning the principal points in the general report.

The most noticeable feature in the statistics for 1899 is the great decrease in the importance of the disputes compared with the two immediately preceding years; the aggregate number of days lost through disagreements between masters and men being only 2,516,416 last year, compared with 15,289,478 in 1898, and 10,345,523 in 1897, although the number of the disputes was 719, 711 and 864 in those three years respectively. That is to say, although there were more disputes last year than in the previous twelve months, they involved fewer men, and lasted on the average a much shorter time. Both 1898 and 1897 were, of course, exceptional years as regards the magnitude and duration of trade disputes, owing to the troubles in the mining and engineering trades; but if the figures for 1899 be compared with the average of the preceding five years, a falling off is still shown to the extent of over 70 per cent. In fact, 1899 is the best year on record, and bids fair to so remain; as, although the current twelve months have been comparatively free from labour troubles of considerable magnitude, the total number of working days lost through disputes is slightly higher for the ten months ended Oct. 31 this year than for the whole of 1899, and the Bethesda squabble will help to considerably swell the total for 1900.

Moreover, it is impossible to entertain the hope that the next following years will witness the same comparative immunity from labour troubles that has been enjoyed by the country during the "sunburst of prosperity" in which the nation as a whole has revelled of late, but which is becoming steadily, if slowly, obscured. Prices and wages are bound to fall; and employment is certain to become less constant and plentiful. Then will the voice of the agitator be heard in the land; and he will receive more heed than is awarded him by men when they are in full work at high wages. The practical cessation of industrial strife during the past two years has been hailed in many quarters as of good omen for the future. Gladly would we believe it; gladly would we welcome the growth of a more reasonable and informed spirit in the ranks of the army of labour. But there seems no evidence to justify such a view. It is possible we are tinged too much with incredulity or cynicism or pessimism—time and the event must show. Be that as it may, we can see in the peace of the past nothing but a suspension of hostilities due to the exceptional circumstances of the time, and no acceptable guarantee against a renewal of trouble in the future.

For that view there is no little justification in the detailed statement of the causes or objects of the various disputes that



did take place in 1899. Out of the 138,058 workpeople directly affected by these disputes, 94,651 ceased work on account of questions concerning their wages, 3857 over questions concerning hours, and 8338 for sundry causes; while no less than 31,212, or 23 per cent. of the total, were engaged in disputes over "working arrangements," "the employment of particular classes or persons," and "Trade Unionism." The first of these three subjects of dispute explains itself—comprising all cases in which the men desired to dictate to their employers as to the management of their works, and including some of the demarcation disputes. The balance of those precious disagreements falls under the second heading, which also includes cases of "skilled" men refusing to have labourers as mates. As to the third class, it is stated that "the majority of disputes under this head were due to the refusals of members of Trade Unions to work with non-Union men, and to men being locked out for being members of a Union. Others were to compel payment of arrears to the Union, and otherwise enforce Trade Union rules and discipline. [A sure sign of the coercion employed to induce the men to become members.] Some were against the use of materials prepared by non-Union houses, and others against employers who refused to support joint trade alliances. It will, of course," adds the compiler of the report, "be understood that Trade Unions were in some way connected with a much larger number of disputes than those assigned to this heading in the table of causes." These numbers are most instructive—especially bearing in mind that they show a considerable increase over those for 1898; but still more so is a consideration of the causes assigned to the individual disputes. The following are a few specimens of the numerous trivial and unreasonable causes that gave rise to disputes in 1899. The first deserves "honourable mention."

Bricklayers demanded apology from employer, in consequence of charge of dilatoriness made against one of their number.

There is a quaint humour about bricklayers striking to avenge the insult of such a charge against one of the fraternity, that must appeal to all who have been privileged to watch the bricklayer lay bricks. The only conceivable parallel would be a libel action by the tortoise against Æsop, for suggesting that his movements were the reverse of rapid. We continue the list of the causes inducing men to strike:—

Because a Leigh employer, having work at Tyldesley, employed Tyldesley men instead of paying walking time to Leigh men.

To obtain payment of London rates by a London contractor employed on a job at Lowestoft.

For reinstatement of colleagues suspended for misconduct and breach of discipline.

Employment of non-Unionists in place of Unionists who had absented themselves without leave.

Against discharge of a foreman, and objection to the successor appointed.

On introduction of machinery to do part of certain work previously done by hand; the men demanding an advance in the piece rate for the remainder.

For promotion of one of their number according to seniority.

Because one of their number had not been promoted. [In one of several such cases, 60 surface workers at a colliery struck work because their employers did not see fit to promote a haulier. Some 1520 colliers were thereby thrown idle.]

Against proposed reduction in number of men to a given number of machines.

Because employers gave inside work to a non-Union man who had previously been working outside.

Objection to minding three machines instead of two.

These are only a few of the many cases detailed in the appendices to the report, which go to prove that the reduction in the aggregate disputes was due, not to the increased reasonableness of the men, but simply to the soothing effect of abnormally high wages, and to the fact that, business being so extraordinarily flourishing, masters preferred giving way in many cases to unfair demands rather than risking the loss of their share of the good things going—demands that at another time they would have rather closed their works than yield. In the engineering trades, the struggle of three years ago has evidently not taught all the men reason; 11,247 days' work (and wages) being thrown away last year over the subtleties of "demarcation." The prolonged dispute in the plastering and general building trade, caused by the unsuccessful attempt of the men to force the foremen to join their Union, was also not calculated to strengthen one's faith in the common-sense of the working man. The employers were decisively victorious—taking advantage of the occasion to insist upon the removal of some irksome restrictions upon their management procedure—while the 4000 men involved lost some £15,000 of wages.

In the settlement of the disputes of last year, arbitration, conciliation, and mediation had but little share; the disagreements so settled affecting only 11,705 workpeople out of a total of 180,217—by far the larger proportion of the 11,705 being involved in the building trade disputes. The plasterers' lock-out was, it will be remembered, helped to a conclusion by the good offices of the Editor of the "Daily News." As to the other 168,512 persons concerned in, or affected by, strikes or lock-outs, 7054 returned to work on the employers' terms without negotiations taking place, 3980 were replaced by other hands, 95 were the cause of the works at which they were employed being closed, while the great bulk (about 157,000) came to terms with their employers by means of direct negotiation. It will, therefore, be seen that, while Conciliation Boards have done much good work in the direction of settling vexed wages questions, and thereby frequently have prevented stoppages of work—it may be remembered that, of the total number of workpeople obtaining

increased wages last year, 32 per cent. received higher rates of pay through the medium of Conciliation Boards and such-like bodies—yet, when once a dispute has reached the point of a cessation of work, conciliators and arbitrators are rarely able to achieve much good. The Conciliation Act was responsible for the settlement of but two disputes—the one concerning 1200 bricklayers at Leicester, the other 464 jute weavers at Aberdeen. Generally speaking, individual arbitrators or mediators of local standing—such as the Mayor or Provost of the town—appear to be most successful in bringing about the termination of quarrels between employers and employed.

So far as the result of the various disputes is concerned, it may be noted that those involving 44 per cent. of the total workpeople affected ended entirely in favour of the employers, those involving 27 per cent. in favour of the employed, while the remainder were compromised. The employers were most successful in the case of disputes classified under the heading "Trade Unionism;" being completely victorious as regards 75 per cent. of those particularly vexatious troubles, as compared with the 3 per cent. in which the men won outright. It can only be hoped that this result will continue to be witnessed in the future.

These are the most interesting features concerning the labour troubles of 1899, as recorded in the Board of Trade Annual Report. In some three weeks' time, the overworked officials of the Labour Department will, we presume, begin the task of compiling the report for 1900, which it should not be impossible for ordinary mortals to produce by the end of January. But then, of course, Civil Servants are not ordinary mortals. They are firm believers in the maxim "*Festina lente*."

### PERSONAL.

Mr. RANKIN, Manager of the Clonmel Water-Works, has been appointed to a similar position at Lymington, in succession to Mr. A. Hughes.

It is announced that Mr. F. P. DAVIS, who for a number of years has been Secretary of the Dawlish Gas Company, will resign the office at Christmas.

Mr. W. JOHNSTONE, who has been for seven years Manager of the Dalbeattie Gas Company, has been appointed Manager of the gas undertaking of the Millport Corporation.

At the first ballot for the present session of the Institution of Civil Engineers, Mr. WILLIAM DOIG GIBB, Engineer of the Newcastle-on-Tyne and Gateshead Gas Company, was elected a member.

Mr. GEORGE HEMINGWAY, Gas Manager to the Driffield Urban District Council, has been appointed Manager of the Chester-le-Street Gas Company's works, in succession to Mr. W. FORSYTH, who has resigned after 27 years' service.

Mr. LAUCHLAN M'INTOSH, who has for the past thirty years been Manager to the Meigle Gas Company, has, on account of advancing years, resigned the appointment, and has been succeeded by Mr. WILLIAM ROLLO, jun. Mr. M'Intosh, although upwards of eighty years of age, enjoys excellent health, and has many friends in and around the district. On the celebration of his golden wedding two years ago, they presented him with a purse of sovereigns.

**Coal in Rhodesia.**—According to a statement published by Reuter's Agency, the report of the experts sent out by the British South Africa Company to inquire into the reported find of coal in Rhodesia practically confirms the original statements made with regard to it. The coalfield is situated some 180 miles north-west of Bulawayo, and is known to extend over at least 400 square miles. The seams vary from 5 to 16 feet in width; and as the coal lies within 40 feet of the surface, it will be worked by means of inclines instead of shafts. It is estimated that at least 1500 million tons will be available, after making an allowance of 20 per cent. for loss. In so large an area the quality naturally varies; but the experts declare that the coal is better than that now in use in the Transvaal, Natal, and Cape Colony, and, in some cases, compares favourably with the best Welsh coal. In view of the confirmation of the value of the discovery, it has been decided to take the Cape to Cairo Railroad through the centre of the coalfields and on to the Victoria Falls.

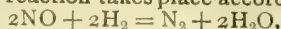
**Price of Incandescent Gas-Burners and Mantles in Spain.**—According to the "Revista Minera," incandescent burners and mantles are more expensive in Spain than anywhere else. The Welsbach burners cost from 8 to 10 pesetas (1 peseta = 9½d.) in Madrid; whereas in Germany the Voelker burners only cost 2½ pesetas. The reason for this is, according to our contemporary, the ignorance and indifference of Spanish consumers and manufacturers. The Kern burner also will be sold in Spain for probably twice or three times as much as anywhere else. It is the same in the case of mantles. When bought of the gas suppliers, they cost 1·75 to 2 pesetas each, and last 800 hours. In Germany, the Voelker mantles are sold for less than 80 c. They, however, are not the most remarkable for cheapness, as German mantles are sold in London at less than 47 c. apiece, after paying carriage and cost. The question therefore arises: Why cannot these mantles be sold in Spain approximately at the same price as in Germany? The present position of affairs is prejudicial alike to suppliers and consumers of gas.



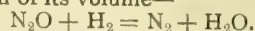
## NOTES.

## Estimation of Nitric Acid in Gas Analysis.

It has been observed that when a mixture of nitric oxide and hydrogen in excess is passed through a capillary glass tube containing platinized asbestos, both nitrogen and ammonia are simultaneously collected, though in variable proportions, besides a certain amount of aqueous vapour. Herren G. von Knorre and K. Arndt have recently been making experiments on this matter, the results of which have been given in the "Berichte," and summarized in the "Chemical News." The authors carried them out in a platinum capillary tube heated to bright redness. Under these conditions, if the current is very slow, no ammonia is formed, and the reaction takes place according to the equation



with the contraction of 1.5 times the volume of NO. In the same manner, nitrous oxide reacts under similar conditions with an equal contraction of its volume—



By this means we are enabled to make analyses of the following mixtures: NO with  $\text{N}_2\text{O}$ , NO with N,  $\text{N}_2\text{O}$  with N,  $\text{N}_2\text{O}$  with O, and so on.

## The Value of Reflection in Lighting.

In the "Student's Column" of the "Builder" for the 10th ult., there is given a calculation of the enhancement of an artificial lighting effect due to reflecting surfaces. The writer explains that the amount of the illumination produced in a room depends greatly on the reflecting powers of the walls of the room. It can be proved that if  $r$  be the average reflecting power of the surfaces of a room, then the illumination produced varies as  $\frac{1}{1-r}$ . For mirrors and clean whitewashed

surfaces,  $r$  is 0.8; but for brown or chocolate-coloured paper  $r$  may be as low as 0.1, and for black cloth it may be only 0.01, or even less. To get approximately the average reflecting power of the walls of a room is not difficult. Suppose, for example, that the reflecting power of the ceiling is 0.8, that of the walls (yellow) 0.4, and of the floor 0.2—then, if the area of the ceiling is equal to the area of the floor, and if the area of the walls is four times the area of the ceiling, we have

$$r = \frac{0.8 + 4 \times 0.4 + 0.2}{6} = 0.43.$$

Hence the initial illumination of such a room may be said to be increased  $\frac{1}{1-0.43} = 1.75$  times, by the reflecting power of

the bounding surfaces. If the whole of the bounding surfaces were covered with the best mirrors ( $r = 0.9$ ), then the apparent illumination would be increased ten times. In order to complete this statement, it would be necessary to give an explanation of the term "luminous flux," as applied to designate the total illuminating effect of a light source.

## The Amount of Air Necessary for Ventilation.

Mr. R. Gordon Mackay writes to the "Engineer" respecting the capabilities and requirements of mechanical ventilation for crowded public buildings. He points out that the air propeller or fan is many times more efficient as a mover of air than the induction set up by a furnace at the bottom of a tube or flue. He has computed the following figures giving the necessary hourly supplies of air to prevent the vitiation of an enclosed atmosphere beyond 8 parts of carbonic acid in 10,000, which would be classified as excellent ventilation.

	Cubic Feet per Hour.
Strong man at rest . . . . .	2000
" " work . . . . .	3200
Average man . . . . .	1640
" woman . . . . .	1500
Young man . . . . .	1500
" woman . . . . .	1140
Boy . . . . .	910
Girl . . . . .	860
One cubic foot of coal gas . . . . .	1400

With ducts and flues well designed, and not too tortuous, the best machine for securing these results in a public building is an air-propeller or a slow-running centrifugal fan. The air can easily be warmed by passing it over a coke-fire or steam-coils, and damped by a steam spray or filtered. Unfortunately, especially in the case of churches, architects generally ignore the necessity for making structural provision for adequate ventilation. Modern experience shows, moreover, in the example of the London Hippodrome, that the occasional removal of the roof bodily is the only perfectly successful way of sweetening the atmosphere of a crowded interior.

## Orde on Liquid Fuel Burners.

A very fair review of existing methods of burning oil fuel was lately given by Mr. E. L. Orde, in a paper read before the North-East Coast Institution of Engineers and Shipbuilders. The economic question is not involved here; the treatment of the subject being purely mechanical. Mr. Orde considered liquid fuel burners as divisible into the three classes of mechanical spray, gaseous spray, and vapour burners. His experiments were carried out with crude Borneo oil, which he describes as in all respects an excellent fuel oil. Its percentage composition is: Carbon 87.9, hydrogen 10.78, oxygen 1.24. The flash-point is 211° Fahr.;

and the calorific value by the bomb calorimeter is 18,831 B.T.U. It is exceedingly clean and mobile. With purely mechanical spray burners, large brick-lined furnaces are needed; and the air required to complete the combustion is very largely in excess of the theoretical quantity. The best evaporative duty recorded for this system is 12.5 lbs. of water from and at 212° Fahr. per pound of oil. The advantages of the system are noiselessness and simplicity. The best steam or air spray processes give a higher evaporative duty. Mr. Orde inclines to the belief that oil-burners of the vaporizing class are the most promising. At the same time, no really satisfactory burner of this kind is yet forthcoming. The chief objection to steam-spray burners is the weight of steam they consume; but this is only of cardinal importance in the case of ocean steamships. The advantage of steam in the spray is that it prevents the cracking-up of the oil, and keeps it as vapour. Air-spray is at several disadvantages as compared with steam. The air compressors take a lot of power; and the difficulty of securing complete combustion and regulating the burners is very great. The impression conveyed by the paper is that the economical and mechanical advantages of oil fuel remain doubtful.

"Practical Gas-Fitting" is the title of a little book just brought out by Messrs. Cassell and Co., Limited, under the editorship of Mr. Paul N. Hasluck, the Editor of "Work" and the "Building World." It is a digest and re-arrangement, in a convenient form, of contributions to the last-named publication, with the addition of chapters on gas manufacture, incandescent gas lighting, and cooking and warming stoves. Out of the 156 pages covered by the contents of the book, only about 40 are devoted to gas-fitting proper—viz., the chapters on laying gas-pipes in the house and gas-fitting in workshops and theatres and for festival illuminations. The text is clearly printed and fully illustrated; and there is an index.

**Hillenbrand's Hydraulic Blower.**—We have received particulars of this apparatus, which is made by Lux's Industriewerke Actien Gesellschaft, of Ludwigshafen-on-Rhine, Leipsic, and Munich, and is intended to provide a high-pressure supply of air or gas for any of the many purposes for which such a supply is required. Among the uses mentioned in connection with the gas industry are blowing air into purifiers for revivifying oxide *in situ*, providing high-pressure supplies for gas-engines and incandescent lighting, and testing gas-meters. The apparatus is said to be readily fixed in position, to remain at rest when the high-pressure supply is not required and to re-start automatically as soon as the demand comes on, and to maintain a uniform pressure, which may, however, be altered at will. The motive power is ordinary service water, which remains clean, and may be subsequently employed for other purposes. The apparatus is made in several sizes to suit different requirements. For instance, one occupying a space of 22 in. by 51 in., and 5 feet high, will give over 300 cubic feet of air or gas a pressure of as much as 12 inches.

**A New Marine Illuminant.**—Last Thursday night, a demonstration took place at Westminster Pier of a new illuminant called the "Marine Torch," which is being brought into notice by the Marine Torch Company, of Baltimore, U.S.A. The torch consists of a plain hollow cylinder of metal, sealed at both ends, and containing in a wire basket a quantity of carbide of calcium. From this acetylene is generated through combination with the water, which, on the torch being thrown overboard, enters by several holes at the base of the cylinder. At the head, a number of small burners are arranged; adjacent to them being a chamber containing a few pieces of calcium phosphide. This, through contact with water, creates phosphuretted hydrogen, and ignites the acetylene gas when it issues from the burners, and having an air-chamber at the upper part, maintains, when in the water, an upright position. Within a few seconds of the cylinder being thrown overboard, the flame bursts out from the burners, so rapid is the chemical action set up. The 6-inch torches used at the demonstration were said to give a light of 2000-candle power. They were charged to burn an hour and a half.

**Precautions in the Use of Acetylene.**—An accident with an acetylene generator for use with a projecting lantern, by which the operator lost his life, has prompted Herr Herzfeld, of Augsburg, to write an explanation to the "Hassfurter Tagblatt," from which we take the following details. The accident was due to the ignition of a mixture of acetylene and air in an apparatus which had just been put to work, and from which the air had not been completely expelled. The door of the generator appears to have been opened, and a lighted match held near. An explosion naturally ensued, by which the operator—Herr Schlenk, of Schweinfurt—was fatally injured. Herr Herzfeld reiterates the necessity for observing the following simple rules in the manipulation of acetylene apparatus, whether large or small: (1) Apply a light at the burner only [the holes in the burner are so small that the explosive wave is arrested even when the service-pipe and holder or generator contain a highly dangerous mixture of acetylene and air]. (2) Search for a leak by applying soapy water, and not with a light. (3) As a precautionary measure, let the mixture of gas and air obtained during the first few minutes after starting the generator pass into the open air unlighted. Herr Herzfeld concludes that, if these reasonable rules are observed, acetylene is no more dangerous than other illuminating gas.



## COMMUNICATED ARTICLE.

## THE FUTURE OF THE GAS PROFESSION.

By ONE OF THE PAST.

The following remarks are the outcome of several years' experience, not only as an engineer and manager of gas-works, but also as a director. They are offered, not with a view of showing up the weak places of the present procedure, but in order to indicate some directions in which to look for improvement. For recent references to this subject, both in the editorial and correspondence columns of the "JOURNAL," seem to indicate that there is something rotten in the State of Denmark, and the existence of considerable dissatisfaction in respect to the gas profession. I take this term to be a general one—covering the engineering or purely structural part, such as designing and superintending the erection of new apparatus; the managing part, such as the control of workmen, and other matters incidental to the daily operations; also buying and selling, negotiating with consumers as individuals or corporations, and other things that pertain to the commercial and financial department.

One complaint is that young men of the first order as regards education and ability are not eager to enter the gas profession. Another is that those who wish to enter have but indifferent opportunities for qualifying themselves; and a third, that those who have qualified are not able to obtain a footing or to satisfy a board of directors on the subject of their ability. These questions, like the poor, are always with us, in a more or less acute degree. They have existed in gas circles for the last forty years at least; and some of the recent utterances are but a re-echo of paragraphs to be found in the early Inaugural Addresses delivered before the British Association of Gas Managers. They are likely, too, to continue, for a time at any rate. The gas profession never was appreciated at its proper value by the best and most prominent engineers and scientists, and by those who are most likely to have a voice in advising young men of the highest order on the choice of a profession. There is no strong central authority to which the beginner can apply for special guidance as to education, or for a certificate of competency when that education is completed; and I fear that the deserving but unsuccessful class will never lack representatives.

The usual understanding in the gas profession, as in most of the similar industries, is that the neophyte should begin at the beginning and take the bottom seat in the class. After having utilized, so far as his ability, his inclination, and his sense of duty permits, the educational facilities that fortune or providence has placed in his way, he is told that he must be content to start at the bottom of the ladder. The best possible education, though essential, is not everything; and a hatful of certificates and medals does not prove that a man is a competent manager or secretary. It only shows that he has acquired the necessary accomplishments or technical knowledge, which is rather another thing. There are physical fitness and many other questions that must be taken into consideration by an employer, in respect to which the certificate is necessarily absolutely silent. Having mastered the technical curriculum, there is commercial and general experience to be obtained, a knowledge of business usages, and other things that cannot be learned outside the gas-works and offices. There is character and judgment to be developed, which can best be done by a course of training in a subordinate position. Some men—the exception and not the rule—have sufficient natural ability to dispense with one or all of these preparatory courses; but this simply means that they have acquired the necessary qualifications by a process of self-education, or that they have sufficient mother-wit to conceal or cover to some extent their deficiencies at the beginning, and trust to experience to make up the rest, like a teacher who keeps just a lesson ahead of his pupils. But characters of this sort are few and far between; and the rank and file require guidance, and cannot get on without it. One frequently hears that a candidate, though technically well qualified, is considered too young to be elected for an important post. The appointing authorities are of opinion that, although satisfactory from an academical point of view, he is wanting in respect to experience of human nature and of ordinary business practice. The stereotyped reply is that the fault is remedying itself every day. But according to the latest ideas, the young man, while unable to claim knowledge of men or of business, or foundation for mature judgment as to the important matters in relation to his subordinates, his superiors, and the customers on the other side of the counter, may pit his youthful freshness of intellectual and physical strength as a set-off against deficiencies of this character.

Apart, however, from the question of youth *versus* middle age, which has really acquired prominence more on account of the fact that the youth is willing to work for a lower salary, than of any inherent superiority of quality in his work, is there any demand in the gas profession for education, ability, and enterprise of the best and highest order? Whatever may be the faults peculiar to directors of gas undertakings, it cannot be said that the exercise of favouritism, by the appointment of relatives, personal friends, or useful business connections to lucrative positions on the staff, without regard to capability, is among them. Whenever it is necessary to discharge the invidious and unthankful task of making a selection of the candidate most suit-

able for an important post, there are sure to be some outsiders, and possibly some insiders also, who, for various reasons, are not prepared to endorse the verdict. It is doubtful, however, if many of them could improve upon it. But the average director is more apt to veer to the other side of the compass, and to regard the presumptive manager or secretary as a well-developed salary-in-the-slot machine, rather than a fellow creature. He looks upon the purchase of technical ability in the same light as the purchase of coal or bricks. "Drop in the salary, and the figure will work." But the discharge of the duties incidental to the office of a responsible managing or superintending appointment, are not of a mechanical turn-the-handle character, that one man can do as well as another; and a failure to appreciate this, is sure to lead to trouble and loss. The omission of any appreciation of the fact—especially in regard to highly-trained or educated candidates—that they are extremely sensitive and nervous, apt to flourish quickly in the sunshine of encouragement, kindness, fair dealing, and liberality, and to wither in the storms of misrepresentation, injustice, and tyranny, having human hopes, ambitions, faculties, and faults, is fatal to the best development of any industry.

The board usually commence by performing an operation of the very unsatisfactory character popularly described as putting the cart before the horse. They first fix on the salary to be offered, or which, in their own opinion, should be paid—a proceeding that is at once fatal to securing the highest order of ability. I would appeal to any manager or engineer of long standing as to whether he has ever seen, on the part of the board of directors, a desire to secure the best available talent in engineering, science, or commerce, and to pay a proper price for the same. A third-class fare will not secure a first-class passage; and the rate of salary as usually fixed is not sufficient to attract the highest order of ability. If they advertised for medical or legal advice at a fixed and very moderate fee, a certain number of replies would be received, but not from the really first-class members of the professions concerned. And first-class experts in any line are not to be secured in this manner. They can command their price, and do not need to compete for office at starvation rates. When directors and members of gas committees rise to a sense of the capabilities of the gas industry when put under the best obtainable technical and commercial control, there will be no lack of candidates to meet the demand. When the directors are willing to lay down a first-class fare, the first-class ticket will be ready to hand.

But all this by the way. Having fixed the price, they take a good deal of trouble to get (also in their own opinion) the best possible value for the money. If the works belong to a corporation, the special committee take the place of the directors, and the tendency to keep strictly to business is strongly accentuated. The average town councillor, like other persons who hold their positions on sufferance, is troubled with a kind of mental *strabismus*, due to being obliged to keep one eye on the business in hand and the other on the chances of retaining his seat. This is not the case with the director, who is fairly safe so long as he does not take advantage of the bankruptcy laws or otherwise lose caste. The councillor knows that a desire to save money is sure to "take on;" while he is not so confident as to the policy of recommending such a liberal scale of pay as is necessary to secure high-class services. The chances are that the gas committee changes more rapidly than the board; and therefore the special experience represented thereon is of a decidedly lower order. The councillor is usually touched a little with political or religious bias. It is all very well to say that all personal feeling is done away with, in these enlightened days. But the best gas engineer in the world, if known to be a Conservative in politics, would not stand at his best before a committee who were Liberal to the backbone; and an equally able man, having strong Radical tendencies, would be at some disadvantage before a committee of Tories. The question of a high order of ability or of special training, comes outside the scope of vision; and the indifference towards it is simply the result of ignorance, or of narrow-minded prejudice.

While all the members of the staff, from the office boy upwards, are required to show evidence of ability, the director or the member of the gas committee is frequently pitchforked into office on other considerations. If a foreman in any department, a time-keeper, or even a junior clerk is wanted, the candidate is required to furnish direct evidence as to character and ability. No managing board would agree to the appointment of a man—say, as carbonizing foreman—because he or his friends had a large holding of capital in the concern, or because he had been successful in business as a butcher or baker, or because he had influence with the local authorities. But a director, who has a voice in the management of affairs, who can *veto* anything and everything in the way of advancement or enterprise, or who can control the principal officers of the company, is more frequently selected from motives of policy—because he has a large holding, or is a wealthy or influential resident of the district—than for any special fitness or knowledge. If the list of shareholders happens to include gentlemen of special ability, the chances are that they may be offered a seat at the board; but usually the appointment is influenced by other considerations. The results of this custom are unfortunate in more ways than one, but especially as regards the trained technical staff, because ignorance and suspicion go together, and it is just the individual who is least capable of guiding the helm who assures



his colleagues that he does not sit in the board-room to be told what to do or to believe all he is told, but to exercise his own judgment. Fools will rush in where angels fear to tread; and the inexperienced director is the most likely to claim that he means to earn his fee, and to seek to control all sorts of things that should properly be left to the special experience and knowledge of the engineer and manager.

The average director, as a rule, has a very slight acquaintance with the purely technical side of the engineer's duties, and cares less. A gentleman who had sat at the board of a medium-sized gas undertaking for many years, was not aware that there was a laboratory and test-room at the works; and on being assured of the fact, wanted to know what it was for, and what benefit was secured by it. Being a retired tradesman, his idea of good management was based upon smart buying and energetic counter practice, and was apparently represented by fourteen hours a day hard work—mostly of a character that could just as well be executed by a young junior. And if a man came along who would put in fifteen hours, he would be considered the better of the two. Another director, also of several years' standing, happened to take a look round the works one day in August. At this season of the year, quite one-half of the plant would be idle. He was so strongly impressed by the quantity of apparatus out of use, that the result was a tremendous charge of extravagance against the manager, who he alleged had erected retorts and gasholders to the extent of 100 per cent. beyond the actual requirements. So the average director is apt to judge the manager and his duties in the light of the portion of them that comes under his direct observation. To him, the manager is the man who engages and pays the men, conducts correspondence, negotiates purchases, arranges extensions of mains, &c. He is a sort of cross-breed between an intelligent artisan and a smart clerk, rather than an expert and experienced technician; and any attempt to claim special knowledge of engineering or chemistry, is simply spread-eagleism, adopted with a view of justifying high emoluments.

What do the directorate or the committee know of the numerous details incidental to the maintenance of an ample supply of pure and good gas throughout the winter, of the arrangements necessary to the securing of a proper coal supply, of the chemical knowledge indispensable to efficient condensation and purification, of the care and watchfulness that must be exercised in regard to the labour question, of tact in dealing with dissatisfied consumers, &c.? And so, as has already been remarked, in some towns the gas manager is accorded his proper position as a professional engineer, in others he is looked upon and treated as a deserving working man. He may really carry the whole of the technical skill and experience of the company under his hat, while an influential board of directors appropriates the credit for the efficient carrying-on of the concern, and the man who really does the work waits outside the board-room, hat in hand, till he is wanted, and is not recognized in the annual vote of thanks to the directors for "their efficient management of the affairs." Some men must perforce put up with a lot of this sort of thing; but the young man of the first order need not, and will not. He is apt to look, not only at the remuneration, but at the position in society; and if he is to be tempted into the gas profession, some better security in this direction than is at present obtainable, must be offered.

One need not be surprised, under these circumstances, if a board of directors fails to take seriously a list of the qualifications which prove that the candidate has spent many years in training for an important post in a gas undertaking; that, under the not altogether safe impression that ability speaks for itself, he has plodded steadily through class-room, lecture-hall, laboratory, drawing office, engineering workshops, and so forth, until he is as perfect as may be in regard to every structural detail and method of procedure; and that he has not been satisfied to see one side of his subject, but has travelled and studied methods in different countries. The experienced technician would be able to assess the long list of qualifications at its proper value; but it appeals to the director's sense of humour, as an attempt to claim some fictitious advantages as compared with other candidates, rather than to his business instincts. And so the puzzled directors go over the list of applicants again and again. It would be too long a task to consider each one of seventy or eighty applications *in extenso*; and they do not know how to sift the wheat from the chaff. After coming down to the short list, their troubles are not at an end, especially if there has been close cutting over the salary to be paid. For one reason or another, the favoured individuals selected for a personal interview do not always improve on closer acquaintance. If really desirable candidates, their present employers will offer some inducement to withdraw their application and stay where they are. I have known as much as 50 per cent. increase of salary to be offered, which is a tacit admission that a fair remuneration was not previously paid. On the other hand, if the present employers appear too willing to allow the candidate to leave, there is an impression that all is not satisfactory. So, in the end, the board are glad to fall back upon somebody whom someone knows something about; and the selection is, to a great extent, a matter of chance or luck, while the candidate who knows he is on the whole better able to discharge the duties than the successful competitor, looks on with helpless amazement. Can we wonder if he propounds the question: "Is it luck or influence?"

(To be Continued.)

## TECHNICAL RECORD.

### MR. DIBDIN ON THE EFFECT OF QUALITY ON THE CONSUMPTION OF GAS.

The substance of a paper read by Mr. W. J. DIBDIN, F.I.C., F.C.S., before the London Section of the Society of Chemical Industry on Monday last week was given in the following day's issue of the "JOURNAL;" but in order to complete the communication, we publish to-day some of the tabulated results of the author's experiments on the effect of quality on the consumption both of coal and water gas, together with most of the incidental remarks which he made thereon, and which were not included in the paper. The tables given here are the only ones exhibited at the meeting.

It is only fair to the author to put on record his emphatic assurance that he had no particular object in placing the facts contained in his paper and the tables before the Society, other than to elucidate, so far as any efforts of his might serve to elucidate, the essential features of the question. He did not wish to prejudice in any way the minds of those present, or the minds of those who might afterwards read the paper, by trying to emphasize any point unduly; and if it seemed to them that any particular point in the paper was emphasized somewhat strongly, he asked them to take it from him at the start that it was merely the outcome of facts as they appeared to him to be facts. For what they were worth, he put them forward for those present and for those who read them, to form their own conclusions, and to criticize as severely as they could, in order that the truth, and nothing but the truth, might result from their deliberations. He said this in order to avoid any misconception that he desired to represent any faction or factions or set or parties in the controversy one way or the other. In this Society—a Society of scientific men devoted to unravelling those intricacies which they met with in daily life—they had but one desire, which was to wholly and solely arrive at the truth, however the result might affect their predilections one way or the other. Further on in the paper, Mr. Dibdin broke off to say that in the experiments he used 28 burners. The work was undertaken not for the purpose of elucidating the peculiarities of any particular burner; but to obtain an all-round average with the various burners commonly employed. He first used a standard London argand burner; then Sugg table-top burners, Nos. 4, 5, 6, and 7; Sugg slit-unions, Nos. 4, 5, 6, and 7; Sugg fishtails, Nos. 6 and 7; Bray fishtails, Nos. 4, 5, 6, and 7; Bray batwing, No. 6; and Bray slit-union, with codac economizer, about which there was a good deal to be said—very excellent results being found from this arrangement. Then followed Mints batwings, Nos. 6 and 7, an iron fishtail, a common butcher's burner, an imitation Bronner burner, Peebles burners, Nos. 4, 5 and 6, Sugg "F" argand, Welsbach "C" incandescent burner, and a Sunlight burner. He thought that in taking such a series as this, he had fairly covered the ground of the burners commonly employed by the public, and of which he had given some of the results—what might be called typical results. From these it would be seen that the conclusions were not based upon a few accidental coincidences. Remarkable that everyone experienced in burners knew that there was a point at which a burner developed the maximum amount of light for the gas consumed, and beyond which they had a straining effect, and the ratio of light to consumption went down, he explained that, in these experiments, they started at the rate at which the burner gave the best effect. Of course, he did not pretend that in such a large number of tests as these—some hundreds in number—there might not be some accidental circumstances which affected the results. But where they had such a series of tests and drew diagrammatic curves, he did not think the general conclusions could be very far wrong. Another explanation was that, when the illuminating power of the gas was reduced below a certain point, it was impossible to burn all the gas required to get the same amount of light from the burner as with a 16-candle gas. What they did then was to burn just as much gas as the burner would properly develop. He also called special attention (here and later on) to the fact that far better results were secured with Welsbach burners when water gas was used than with any other class of burners. Speaking of the Widnes experiments, he mentioned that they were made with gas specially prepared by the admission of air, or by increasing the illuminating power with benzol. He admitted it was open to argument that there might have been exceptional circumstances in these particular experiments to influence the results; but he thought his diagrams and figures and subsequent experiments proved that exceptional circumstances did not exist. Commenting on No. 3 table, he pointed out that, with the standard argand burner, when using 12-candle gas, they had to burn 5·8 cubic feet, instead of 5 feet, to produce the normal intensity of 16-candle gas; and when the gas rose to 19 candles, they only had to burn 3·9 cubic feet. In the same way, if they took the Sugg table-top No. 4 burner, starting at 5·2 cubic feet for 16-candle gas, they had to burn 12·9 cubic feet of the 12-candle gas; while with 19-candle gas, the consumption was reduced to 3·8 cubic feet. The enormous difference between the 3·8 cubic feet and the 12·9 cubic feet would be observed. Then, if they took the Bray No. 4 fishtail, they had 15·1 cubic feet for 12-candle gas, 4·7 cubic



Consumption of Coal Gas of Various Qualities by Different Burners, under the Conditions named in the Paper (ante, p. 1395).

TABLE I.—WIDNES TESTS.

Burners.	Illum. Power.	11'2.	12'2.	13'5.	14'2.	15'2.	16'2.	17'2.	19'2.
Standard Argand . . . . .	Cubic Feet of Gas Consumed	6'2	6'0	5'7	5'4	5'1	4'9	5'0	4'7
Sugg Table-Top No. 4 . . . . .		11'2	9'7	7'7	6'4	6'1	5'3	4'5	3'9
" " No. 5 . . . . .		9'5	7'8	6'2	5'7	5'5	5'3	4'6	4'1
Bray Fishtail No. 4 . . . . .		15'5	13'4	10'5	9'0	5'6	4'3	3'1	2'6
" " No. 5 . . . . .		14'0	10'6	9'8	6'8	5'9	5'0	4'0	3'2
Sugg "F" Argand . . . . .	Cubic Feet of Gas Consumed	7'7	7'4	7'2	6'6	6'4	6'3	6'2	6'1
Welsbach "C" . . . . .		4'9	5'0	4'0	3'7	3'5	3'5	4'2	3'4

TABLE III.—GASLIGHT AND COKE TESTS.

Burners.	Illum. Power.	12'0.	13'5.	14'5.	16'0.	16'5.	19'0.	12'5.	14'5.	16'0.	16'5.	17'2.	18'0.
Standard Argand . . . . .	Cubic Feet of Gas Consumed	5'8	5'4	5'3	5'0	4'8	3'9	5'5	5'3	5'0	4'8	4'4	4'3
Sugg Table-Top No. 4 . . . . .		12'9	9'4	9'0	5'2	5'0	3'8	6'6	5'9	4'5	4'4	4'3	3'5
" " No. 5 . . . . .		10'4	8'0	7'4	4'8	4'7	3'7	6'3	5'3	4'7	4'6	4'4	4'0
Bray Fishtail No. 4 . . . . .		15'1	10'7	10'1	4'7	4'6	3'2	6'9	5'3	5'0	3'4	—	2'8
" " No. 5 . . . . .		14'8	8'8	10'3	5'4	5'2	3'9	6'7	5'9	4'3	4'2	3'8	3'4
Sugg "F" Argand . . . . .	Cubic Feet of Gas Consumed	7'3	7'0	6'8	6'2	6'0	5'4	7'1	6'4	6'0	5'8	5'6	5'3
Welsbach "C" . . . . .		3'3	2'9	3'2	3'4	3'3	2'5	4'0	4'0	3'4	3'3	3'5	2'9

TABLE V.—SOUTH METROPOLITAN TESTS.

Consumption of Coal Gas and Admixtures of Coal and Water Gas by Different Burners.

TABLE VII.

TABLE IX.

TABLE XI.

Burners.	—	Pure Coal Gas.	Water Gas.					Coal Gas.	Water Gas.		Pure Coal Gas.	Water Gas.		
			14-Cand.	20 p. ct.	48 p. ct.	73 p. ct.	100 p. ct.		27 p. ct.	75 p. ct.		16 cand.	17½ cand.	18 cand.
Standard Argand . . . . .	Cubic Feet of Gas Consumed.	5'2	5'3	5'6	5'4	5'4	4'7	4'7	4'7	5'0	4'7	4'6		
Sugg Table-Top, No. 4 . . . . .		4'9	5'4	6'0	7'6	9'3	4'5	5'7	7'3	5'4	5'7	5'0		
" " No. 5 . . . . .		5'8	6'0	7'6	8'8	9'0	4'6	4'9	5'9	5'4	4'9	4'9		
Bray Fishtail, No. 4 . . . . .		5'6	6'8	7'6	9'6	14'5	3'1	6'4	10'0	4'4	6'4	5'4		
" " No. 5 . . . . .		6'9	8'0	8'7	9'4	16'3	4'0	5'0	11'1	5'1	5'0	4'8		
Sugg " F " Argand . . . . .	Cubic Feet of Gas Consumed.	6'5	6'7	6'8	6'8	6'8	6'1	6'2	6'6	6'4	6'2	6'2		
Welsbach " C " . . . . .		3'9	3'6	3'9	4'0	3'9	4'2	3'3	3'9	3'5	5'7	4'0		

feet for 16-candle gas, and only 3'2 cubic feet for 19-candle gas. When they came to the Welsbach burner, they obtained far more uniformity. With 12-candle gas, they had 3'3 cubic feet; with 16-candle gas, 3'4 cubic feet; and with 19-candle gas, 2'5 cubic feet. So that, with variable qualities of gas, the consumption was very much the same with the Welsbach burners; but, when they took ordinary flat-flame burners, the consumption rose enormously as the illuminating power decreased. With the Welsbach burner, it was almost impossible to get exactly the same amount of light on the photometer; the fluctuations were very considerable. In every case, they had to turn up the gas until they could get the maximum effect out of the mantle, and then the actual figure was stated. This was the way they worked the Welsbach; and it was the only practical way, because of the variations in the mantle itself. If they took pure coal gas of about 14-candle power, the Welsbach burner required 3'9 cubic feet to give its maximum intensity. When this was mixed with 20 per cent. of water gas, they had a consumption of 3'6 cubic feet; showing a reduction. But with 48 per cent. of water gas, the consumption was 3'9 cubic feet—the same as with pure coal gas; with 73 per cent. of water gas, the consumption was 4 cubic feet; with 100 per cent. of water gas enriched by petroleum to raise its power to 14 candles, 3'9 cubic feet were required. Therefore whether they used pure 14-candle coal gas or 14-candle water gas, the consumption required to produce unit light by the Welsbach burner was the same. This was satisfactory so far as incandescent burners were concerned. They found the same thing when they had another series of tests of coal and water gas of higher quality (19 candles). With coal gas of that power, the consumption was 4'2 cubic feet; with 27 per cent. of water gas, 3'3 cubic feet; and with 75 per cent. of water gas, 3'9 cubic feet. Here, again, the Welsbach burner showed, if not an advantage in one case, a distinct advantage in another. But the differences, having regard to the peculiarities of the Welsbach burner, were very slight; and, with this system, the water gas in varying ratios showed no disadvantages. It might be argued from this that, "if you can get water gas cheaper than coal gas, then have water gas." The standard argand behaved very much in the same manner as the Welsbach. Going to flat-flame burners, they found the consumption rising from 4'9 cubic feet to 9'3 cubic feet, 5'6 cubic feet to 14'5 cubic feet, 6'9 cubic feet to 16'3 cubic feet. Then the "F" argand showed fairly concordant results—6'5 cubic feet to 6'8 cubic feet. When they came to the richer gas, with a flat-flame burner, they found the consumption rising from 4'5 cubic feet to 7'3 cubic feet. These results made one think that if consumers were going to use a particular quality of gas, they must use a burner most suited to it. This was an old saying; and gas engineers would say he was only telling them an old tale. But he ventured to think this was the first time these facts had been brought out in this manner. At all events, he had now spent some few years in

connection with this question; and he must confess to having been somewhat startled when he arrived at these conclusions. He was really not prepared to find there was such an enormous difference in the consumption required in burners of different values to produce unit light. It was a new departure; and therefore he felt justified in bringing these results before the Society for discussion. The essential facts were fairly before them.

The foregoing are some of the remarks made by the author apart from the paper; and they must be read, and the tables studied, in conjunction with the paper, the material parts of which were given last week.

Discussion.

The CHAIRMAN (Mr. Otto Hehner), in opening the discussion, said the first moral they might draw from Mr. Dibdin's experiments was that no direct relation existed between the nominal illuminating power of gas and the illuminating power of gas as it was generally consumed. The second moral was "Use Welsbach burners," because they gave a fairly equable illuminating power. If Welsbach burners were an established institution for the future—if they had come to stay, as he heartily hoped they had—then they could at once conclude that their present ideas of illuminating power were all nonsense, and the sooner they dropped making coal gas with illuminating power at all the better. The third moral was, that if they did not choose to use Welsbach burners, they must take to argands, and eschew flat flames. Mr. Dibdin had told them a great deal more than that. If consumers got 16-candle gas, and obtained light of equal value, and if this was changed by Act of Parliament to 14 candles, to say that all they had to do was to adjust the proper payment by diminishing it by two-sixteenths, well (as Mr. Dibdin had showed) no greater fallacy than that could be perpetrated. The matter was of the utmost importance not only to the public, but to all consumers of gas.

Dr. PERCY F. FRANKLAND, F.R.S. (Birmingham), was sure all present must have considered it a great privilege to have had the pleasure of hearing Mr. Dibdin give the results of his extensive experiments. As they all knew, probably there was no one living who had had so much experience (practical experience) as Mr. Dibdin in connection with the illuminating power of gas—how it was developed, and upon what principles the burners and so forth must be constructed. These experiments all led to the conclusion—and he thought they might be summarized in this one sentence of Mr. Dibdin's—that "a gas of higher price but of higher quality might be far cheaper to the consumer than a gas of lower price but lower quality." This was a fact which had been long known. He (Dr. Frankland) might say that he had known it almost from his earliest days, because his late father (Sir Edward Frankland) was always very eloquent on this point. In his experimental researches as early as the year 1876, or before that, he distinctly enunciated this fact: For instance, in



London at that time, and before that time even, there were two kinds of gas being circulated in the mains—one coal gas of nominally 16-candle power, and in other mains canal gas of about 27-candle power. Of course, the canal gas was sold at a much higher rate than the coal gas; yet, as the result of his experiments, it was distinctly shown that the canal gas was far the cheaper for the consumer to use than the ordinary coal gas. He could remember that his father was desirous of taking a house in a part of London that was supplied with canal gas, so enthusiastic was he about the use of this high illuminating power gas, compared with gas of lower power. However, just as he was in search of such a house, the canal gas was cut off by the Company; and it was then impossible for the ordinary consumer to get canal gas at all. At present, the whole of the gas supplied to the Metropolis was coal gas, and no canal gas. Now in 1876, the nominal illuminating power of gas was 16 candles; and it was nominally 16 candles at the present day. At an earlier period—in 1851—the gas was, he believed, nominally 14-candle. The general population of London was thus under the impression that between the years 1851 and 1876, a very important increase in the illuminating power had been made by the Gas Companies. But in 1876, his father tested the London gas with the same burner that was used in 1851 for the official testing of the gas; and it was found that the gas of 1876 had no greater value than the gas of 1851 when tested with the same burner. The increase in the nominal illuminating power of the gas was due entirely to the improvement in the testing-burner. The gas was tested in 1876 by the argand burner; and it was this that led to the so-called improvement of the gas supply of London. They had that evening obtained evidence that the standard argand burner developed a large amount of illuminating power out of poor gas which the flat-flame burner which was used in the official testing of gas in 1851 was incapable of doing. This was really the point of the whole matter. The important thing in connection with this question of gas and illuminating power was to use such a burner as would develop the maximum amount of light out of the particular gas which was being supplied. He should like to say here that the material from which Mr. Dibdin's conclusions were drawn was so enormous that it was difficult to grasp the whole situation at once; but with extreme ingenuity, the author had grouped all the results in a single diagram.\* He (Dr. Frankland) was closely associated with the author at the time of his earlier experiments; and he must confess, when Mr. Dibdin made this diagram in which all the experiments were summarized, and the results seen at a glance, it seemed to him to be a masterpiece of lucidity. These experiments had involved an immense amount of trouble. It was very easy to experiment upon a number of different burners at one and the same time on one and the same gas, which happened to be the same gas that was supplied in the experimenter's laboratory. But these experiments had been made with gas of different illuminating powers; and a large number of different burners had been tested with each of these special gases. This had involved the arduous preparation of gases of particular illuminating powers on an extensive scale, in order that this comprehensive series of experiments could be made. Therefore, he thought, they were particularly indebted to Mr. Dibdin for having carried out the experiments which brought before the public in such a forcible way the importance of illuminating power to the individual consumer, and enabled them to see that the intrinsic illuminating power was not always the nominal illuminating power. As the Chairman had said, of course if the incandescent burner were universally used, it would be a matter of little importance what the intrinsic illuminating power of the gas was. Indeed, from the interesting latter experiments of Mr. Dibdin, it appeared that the non-illuminating gas—the gas which was for the most part composed of water gas—was more advantageous by far than the ordinary coal gas for the development of light with the Welsbach burner. He (Dr. Frankland) did not know what the experience of most chemists was, but the result of his own experience in connection with Welsbach burners was that he should like to have as few as possible. They were distinctly troublesome to keep in order; and the mantle used was never giving its full light just when it happened to be most wanted. The burners, however, had one great advantage—that, for a given amount of light, they did not pollute the air so much as ordinary burners. But for this reason, he should not use them at all. As a matter of fact, he used them because, if he had one Welsbach burner alight, the air was tolerable; but if he used two or three ordinary flat-flame burners, it became intolerable. He did not think anyone could contend that Welsbach burners were by any means the universal fashion in the streets of London. They were rarely seen; and the lights were generally flat-flames, and of low quality too. Now, he thought, nothing could be more startling than the extraordinary way in which the volume of gas had to be increased in order to produce a given amount of light with ordinary flat-flame burners when the illuminating power of the gas was diminished. In houses and workshops, if the illuminating power of the gas fell short, more burners were needed to produce the same amount of light; and they saw by Mr. Dibdin's figures what the effect of this was. If the illuminating power of the gas was diminished from 16.2 to 14.2 candles, the consumers

did not have to pay merely a very little more for the gas, but they had to pay enormously more for it. With a small diminution of the intrinsic illuminating power, the gas bill was doubled. While flat-flame burners were in vogue (and he should say in general life they were almost exclusively in vogue), any diminution in illuminating power was a distinctly retrograde movement. It put into mind that they were going back not only to the nominal illuminating power of the gas distributed in 1851 before the 16-candle gas came into vogue, but they were really going back to a gas of inferior power to the gas distributed in 1851, because if that gas had been examined by the standard London argand, it would have been 16-candle gas, just as now. This was what they were actually confronted with at the present day—that they were going back to a quality of gas inferior to that distributed in London in 1851. What was more, it was also of very great importance that the gas should be of constant illuminating power, because, as they had seen, each burner was adapted to gas of a particular power, and it gave different results if there was any diversion from that power. But the order of the day was that gas was to be varied from a certain illuminating power. Regarding the paper generally, he thought the points brought out in connection with water gas were perhaps the most instructive and novel of all.

Mr. T. FAIRLEY (Leeds) hoped that some of their friends who took the view of the gas companies on this question would join in the discussion, and so give more heart to it. Dr. Frankland had so well gone into the points that he (Mr. Fairley) might have discussed, that it left him little to say. The work that he had personally done in gas-testing had been more in relation to the heating power; but before he mentioned the conclusions to be drawn from this work there were one or two points in the remarks of both Mr. Dibdin and Dr. Frankland that might be summarized—(1) that flat-flame burners throughout were best for gas above 16 candles; (2) that argand and Welsbach burners were best for low-quality gas below 16 candles; and (3) that, when they were trying to estimate the value of a gas for lighting, they must think, however difficult it might be, of a definite quantity of light—they wanted so many cubic feet of gas, of a certain power, and of a certain price. These three items must come in; if they only had one or two of them then they misled themselves. In speaking of the heating power of the gas, he had not found the same differences per candle power that Mr. Dibdin had found in using different burners. In fact, the relation of heating power to lighting power for ordinary coal gas might be put in a kind of algebraic formula—that was to say, they had in all gases a certain proportion of non-luminous constituents—non-luminous coal gas, that might give about half its heating power; and the rest (the other part of the heating power) was due to the lighting constituents. This part was a multiple of the candle power. They could find the factor, which, added to the constant number, gave the total thermal units—British or such other units as they chose to use—from the lighting power. Now some persons in speaking of this, had tried to show that the heating power went down in proportion as the lighting power went up. Apparently this was so. Suppose he called  $B.T.U. = M \text{ c.p.} + C$ . If they divided the whole sum by the candle power, it was obvious that the right-hand term  $\frac{C}{\text{c.p.}}$  (C being constant) became less as

c.p. (the candle power) increased; and therefore the apparent number of heat units per candle power went down. But if they put it in an actual concrete form, his experiments, so far as they extended, gave them some number like this—

$$B.T.U. = 23.5 \times \text{c.p.} + 275.$$

The B.T.U. might be computed by the candle power multiplied by the 23.5, while the constant 275 might be regarded as representing the non-illuminating part of the gas. If they divided such a fraction as this by the number of candles, as the candle power rose, the apparent number of units per candle power went down, because the number 275 did not increase with the candle power. No argument was to be drawn from this fact in favour of the lowering of the illuminating power of the gas; but Mr. Dibdin had well proved that, with ordinary flat-flame burners, gas of low illuminating power was the most costly they could have.

Dr. P. DVORKOVITZ said the question the author had raised was of great importance. As probably all present knew, the South Metropolitan Gas Company applied to Parliament last session to be allowed to distribute to the consumers gas of 14-candle power, instead of 16 candles. But steps had been taken (thanks to the previous experiments of Mr. Dibdin) which proved that, though the Company professed to supply 16-candle power gas, the consumers only received 14-candle gas. From this it was argued, "Well, the consumers have had 14-candle gas up to now, they may continue to receive it by Act of Parliament." Mr. Dibdin's experiments had absolutely proved that, with 14-candle power gas, a consumer would have to pay nearly double the amount for the light which he used; and to this the utmost importance should be attached. His experiments had also proved the fact that the higher the illuminating power, the cheaper was the illuminant to the community. It was quite true that there were some burners which were used for testing purposes—viz., the argand, and the same might be said of the Welsbach—which produced good results with either rich or poor gas; but, as Mr. Dibdin had explained, and as they all knew, there were not many consumers in the United Kingdom who used standard argand burners, and a very small percentage

\* We are unable, at all events at present, to publish this diagram; but it was the one exhibited in the Parliamentary Committee Room during the consideration of the South Metropolitan Gas Company's Bill last session.—Ed. J.G.L.



of the consumers were employing Welsbachs. At the same time, the results of the experiments had shown them that, with ordinary flat-flame burners, if given rich gas, the consumers always had value for money. His own connection with the gas industry had been a long one; and he was quite sure the interests of the gas companies themselves lay in the direction of not reducing the illuminating power. Mr. Dibdin had made experiments with water gas enriched with petroleum vapours. He hoped that he would continue his experiments with carburetted water gas as supplied; and then, he (Dr. Dvorkovitz) thought, the result obtained would be different. All his own experiments with water gas enriched by petroleum vapours or enriched by petroleum gas were quite different; and if Mr. Dibdin would make experiments with water gas which was produced now by the various systems introduced into gas-works—water gas of 19, 20, or 22 candle power—he would find it would give a result quite different to that which he obtained by the so-called carburetted water gas which he used. The combustion in burners of the petroleum vapours would give a different result from what would be obtained with water gas enriched by actual petroleum gas. This contained a large quantity of aromatic hydrocarbons which produced a high illuminating power, while petroleum vapours did not contain aromatic hydrocarbons; and, in combustion, they produced different results altogether. The diagram and the figures presented by the author showed distinctly what a consumer would gain if, instead of gas companies trying to reduce the candle power, they would try to increase it. If they took the statements of gas engineers who used carburetted water gas, a positive candle-power only cost  $\frac{1}{2}$ d.; so, if they spent 1½d., they would be able to supply the consumers with 19-candle power gas, which would be, as Mr. Dibdin had conclusively shown, the cheapest illuminant possible.

Mr. R. G. GRIMWOOD (London) said one of the most interesting points Mr. Dibdin had brought out in the paper was the peculiar influence which water gas exerted on the relation between illuminating value and the quantity of gas consumed. This was a most important matter, because every day the proportion of water gas introduced into gas supplies was gradually increasing in England. On looking down the tables, he found from Table VII. that, where coal gas and water gas of equal illuminating power were mixed together in varying proportions, the mere addition of 20 per cent. of water gas involved an increasing consumption to obtain the normal illuminating value from the burners. He had taken the average of the whole lot; and he found that it entailed an increase in consumption of 10 per cent. If they took what was undoubtedly the most common burner in England (the Bray No. 5 fishtail), it involved an increase in consumption of no less than 16 per cent. over what would be required if ordinary coal gas enriched with petroleum was used. He might say at once that this was water gas made on the most modern principle, and was water gas as supplied from the very best plant that could be obtained. It was quite normal water gas, in fact; and there was no suspicion of its being enriched after it had been made. Looking at Table XI., where water gas was employed in the manner in which it was ordinarily used—that was to say, as an enriching agent—he found, where a mixture containing 27 per cent. of water gas was used, which enriched the gas from 16 to 17½ candles, the mean normal illuminating value for this series of burners required 5·6 cubic feet of gas per hour. Now that was for 17½ candle gas, containing 27 per cent. of water gas. On referring to Table I., he found that for 17½-candle gas the mean normal illuminating power only required 4·6 cubic feet—that was to say, the mere addition of 27 per cent. of water gas entailed an increase in consumption of over 20 per cent. This was certainly a most startling statement; and it was not an individual result. Some of these things were so peculiar, that in making the experiments they could scarcely believe them, and the tests were made all over again. Another way of looking at this was that 17½-candle power gas, containing 27 per cent. of water gas, gave no more illuminating value than 15·8-candle coal gas, or coal gas enriched with petroleum. This was certainly a point which required their very careful consideration, since no restriction was placed on the gas companies as to what amount of water gas they should put into their supplies. There was another point, and a most interesting one (but Mr. Dibdin could not do everything), as to what would be the effect of adding (say) 10 per cent. of 40-candle power water gas to an ordinary coal gas (say) of 14-candle power, which would raise it to 16·6 candles. So far as one could see in this work, it did not seem that it was the luminous portion of the water gas which had the effect he had been referring to; it appeared to be more the water gas itself. Of course, 27 per cent. was fairly high; but it was not more than occurred in many of the gas supplies in England. Further evidence was required on another point which Mr. Dibdin had mentioned, and which was brought prominently forward in this matter—as to the uselessness of making any comparison of the price of gas without taking into account the illuminating value. Being interested in this matter, he had been looking up the London County Council report on the illuminating power of the gas supplied to London, as tested at the testing-stations; and he found, taking the mean of the year, that the Gaslight and Coke Company's gas was 15·7 candles, whereas the South Metropolitan Company's gas was 14·6 candles. Now, looking at the author's diagram, he found that this difference of 1·1 candles represented a difference of 5d. in illuminating value;

and before they could make any comparison of price between the South Metropolitan gas and the Gaslight and Coke Company's gas, they had to add 5d. to the price of the former. This paper had opened up many new points, and points which required very careful consideration—in fact, during the year, many new matters in connection with gas supply had come to light. The fact that no restriction whatever was placed on gas companies as to the amount of water gas they should put into their gas supplies required some attention. As an illustration, he might say that the other night 17½-candle gas was found in London with a bare 2-inch flame. This was not got without a large addition of water gas; and there was no restriction. It was acknowledged that a large percentage of water gas was detrimental to health; and Mr. Dibdin had proved that it was certainly most detrimental to consumers' pockets. The whole question demanded that some impartial body—some body like the Board of Trade—should hold an inquiry at once, and make an effort to settle these many points, which were points of dispute and of discussion between scientists and consumers and the gas companies.

Mr. ISAAC CARR (Widnes), who had been invited to attend, sent instead a communication on the subject, which was read by the Secretary. Mr. Carr had assisted Mr. Dibdin in the experimental research work at Widnes mentioned in the paper, and was in accord with the conclusions adduced as to the lighting value of coal gas of varying quality when consumed in the ordinary flat-flame burners common to the consumers of to-day. The difference of 9d. per 1000 cubic feet in the selling price of gas by the two great London Companies was, he remarked, at the present time the subject of dissatisfaction and discussion. While there was no denying in one sense the hardship of the position of the consumers of the Gaslight Company, who were paying 3s. 5d. per 1000 cubic feet as compared with the 2s. 9d. of the South Metropolitan, yet the important fact that the former price was for 16-candle gas and the latter for 14-candle gas did in great measure appear to be lost sight of. The writer had found that the light-giving value of 14-candle gas in the best type of flat-flame burner required 32 per cent. increase in consumption to give the same light as 16-candle gas; and this with gas at 2s. 9d. per 1000 cubic feet, amounted to 10d. per 1000 feet. He had stated that the position of the consumers on the North side of the river was a hardship as compared with that of the consumers on the South; and he did so on the ground that the cost of enrichment to the Company did not bear a proportionate relation to the loss sustained by the consumer in the reduction in quality—i.e., while the Company might keep up the quality from 14 to 16 candles at the additional outside cost of 1d. per candle per 1000 cubic feet, the loss to the consumer by reducing the quality from 16 to 14 candles for ordinary lighting purposes was 5d. per candle per 1000 cubic feet. At the same time, the consumers on the South side paid dearly for his so-called cheap gas when the loss in lighting efficiency was taken into consideration. The economic standard of burner duty with gas of varying quality had an important bearing on this matter from the consumer's point of view. With the best ordinary batswing and fishtail burners and 20-candle gas, the consumer obtained 4 candles per cubic foot, yet a batswing burner of the most suitable kind—Bray's No. 6 special—when consuming the London 16-candle gas yielded only 2·66 candles per cubic foot, or a falling off of 33·5 per cent. in effective duty. The highest economic duty the writer had obtained with 14-candle gas and a Bray No. 6 special batswing burner was 1·9 candles per cubic foot, or a further falling off of 32 per cent. The writer did not, however, agree with the author in describing the use of incandescent lighting as limited. On the contrary, this system of lighting was becoming very general, and with the recent reductions in the price of both burners and mantles, it was, in his opinion, highly probable that the amount of incandescent lighting would in a few years' time exceed that of the flat-flame. Until, however, the flat-flame burner was entirely superseded by incandescent lighting, the serious loss in lighting efficiency inflicted on users of flat-flame burners by low-grade gas must continue. Low-grade gas also affected adversely every type of burner such as incandescent, gas for heating, cooking, and motive power purposes on account of the reduced calorific value, although the proportion of falling off was very much less than in the case of flat-flame burners. For these purposes, the writer found that for each candle the gas was reduced in illuminating power, about 3 per cent. increase in consumption was required.

Mr. D. A. SUTHERLAND (London) spoke of his experience in Glasgow and London, and advocated the use of regulators to enable the consumers to govern the gas at the burners. In connection with Dr. Frankland's remarks, he said that, being of an economical turn of mind, he invariably in London used incandescent lights, because he could not carry on his work in winter without a white light; and he could not afford the electric light. He also found the incandescent light very useful in his house. He changed his incandescent mantles every month. They only cost 6d. each; and the difference they made in the gas bill was very great. Another thing, to ensure good results, the burners should be occasionally blown out. In experiments of the kind undertaken by Mr. Dibdin, a great deal depended on the temperature and pressure; and he would be much interested to know at what temperature these tests were made. A great difference might have arisen through the work being carried out in the summer or the winter. It was impossible to calculate



the variations in carburetted water gas. Though the gas might have been controlled at the beginning, the change in temperature in the same day might have been very great.

Mr. CLAYTON BEADLE (Erith) remarked that one of the great practical objections to the Welsbach light was the rapid rate of destruction of the mantle. But Professor Lewes had described a new mantle made of Lehner silk instead of cotton fabric, which had lasted 3000 hours, as against 600 hours with the ordinary mantle. If the new mantle proved as good as the preliminary trials gave hope for, it would certainly go a long way towards making incandescent lighting a practical success.

Mr. R. WATSON (Hertford) asked for information as to the point at which the air was introduced to produce the lower qualities of gas—the 11·2-candle gas, the 12·2-candle, and so on. Surely this must to an extent oxidize a certain percentage of the gas which would furnish no heat, and would falsify the results so far as the actual consumption of gas was concerned. It seemed to him that the true moral to be drawn from the figures before them was that the consumer should be educated to use the correct burner for the gas supplied, and not take any burner that might happen to please his fancy so far as appearance or popular opinion was concerned. It would seem, judging by the figures, that there was very little variation between 14 and 16 candle gas when an argand or a Welsbach burner was used; and the question of price as between 4·9 cubic feet of 16·2-candle gas and 5·4 cubic feet of 14·2-candle gas was a comparatively small one—not more than 10 per cent. of the actual value.

Mr. DIBDIN, called upon by the President to reply to the discussion, said he did not know what he had to reply to. He assured those present that he considered it a great compliment there should be practically nothing to answer. He had expected that he would have had considerable pulverizing going on there that night; that he would have been shown that his conclusions were utterly fallacious; and that his was an altogether nonsensical inquiry. But from the tone of the discussion, he believed he was not far off the track; and, this being so, he thought it was a very serious track. He had hoped there would have been some justification for the statement that had been made, that it was an economical thing to the consumer to be supplied with low-grade gas, because, if he used a good burner, he could get better illuminating value than with 16-candle gas. Some very funny statements had been made; and he (Mr. Dibdin) was sorry the makers of those statements were not there to justify them. All those who were concerned in the question had had a copy of the paper, and had been invited to attend the meeting to state their views, and fairly argue the question out. If they declined to come and discuss the matter, nothing more could be said; and they could only leave the matter to the judgment of the public at large when they had the whole of the facts before them. He did not say this because he wished to establish any one point. It was well known there had been much controversy on this question. He did not think the controversy was settled; and all honest-minded men would have it settled on the lines of truth, and truth alone. One question that had been asked was as to the character of the water gas used in these experiments. It was water gas enriched in the process of its manufacture—that was to say, the charge of oil was placed in the retorts, and the oils were cracked in the usual way. It was not that a simple water gas was first made, and then enriched with the vapour of petroleum; but the petroleum oils were cracked in the process of manufacture. Mr. Carr had referred to the question of the London gas. Of course, the London gas question was a very important one; but he did not wish to emphasize it again. He did not care about London gas or Manchester, Birmingham, or Liverpool gas, or gas from elsewhere. He had put these facts before them as scientific truths, obtained by much patience and care. Whether they applied to London or to Kamtschatka, he cared not one jot. Mr. Carr thought that incandescent lighting was not limited. Well the question of limitation was, after all, a relative one; and undoubtedly a very large number of incandescent burners were used. He thought himself they would continue to be used; and with improvements in mantles, they would be, if not entirely, almost entirely in the future, the only class of burners which would be employed. Although they could hope that in the future something better might be done, it was not wise to neglect the existing position of the question. If one went through the country, into large towns, small towns, or where one would, the common flat-flame burner would be seen pretty well everywhere. Enormous manufactories would be found lighted with flat-flame burners, and in street after street how many incandescent burners would be seen? A few might be found in the principal thoroughfares. Then in the ordinary rooms of houses, flat-flame burners of various kinds would be found; and there were many places in which the present mantles could not be used with advantage because of vibration and draught. He had had them placed in his own laboratory; but, with all the good will in the world for the advance of the gas industry, he had been compelled to put them on one side, and revert to flat-flame burners. There were places in which mantles could not possibly be used; and he felt justified in saying that at present throughout the country the use of the incandescent mantle was very limited in regard to the total quantity of gas which was consumed for luminous purposes. As to how the gas employed in the experiments was enriched with petroleum vapour or benzol, in order to increase its illuminating power, the method in one case was to mix the benzol while the holder was

filling. Pentane was employed in one instance. This was put into the holder, and allowed sufficient time to diffuse throughout the whole. It was well known that, in an hour or two, even with atmospheric air, they would get petroleum vapour thoroughly diffused, and find the gas of even quality. This was, in fact, how Mr. Vernon Harcourt proposed to produce his standard pentane gas for his standard burner. The same method was employed in these tests. The petroleum vapour instantly diffused; and in the course of an hour or two, the mixture was complete—sufficient time was allowed for the mixture to become thorough. As for the temperature, he thought it would be taken for granted that it was carefully noted in every case; and corrections were made not only with regard to the volume of gas manufactured but used at the time of the test, and corrections made as to the illuminating effect. The experiments at the Southwark gas-testing station were made in a room which was kept constantly, day and night, at 60°, in order that the testing of meters might be made under the most advantageous circumstances; so that there were no exceptionally favourable or unfavourable conditions. All these points were noted at the time; so as to get at the truth as near as possible. The observation as to the possibility of there being a new type of mantle was very interesting. He should be delighted to hear that they had a mantle which was going to last a good many more hours than the one they had at present. If they had a new mantle which would take the place, under every circumstance, of the ordinary flat-flame burners, he should be the first to consider the man a fool who continued to use any other form of burner than the incandescent; but when they had to put on mantle after mantle, then he said the man was not a fool who still employed flat-flame burners. There were many places where it was impossible, where it was not advisable, to use such delicate things as mantles—in fact, they could not be used on account of constant breakage. This being so, one was compelled to use the burner that could be employed; and that was, in a large number of cases, the flat-flame one. As to the method of introducing air into the gas, there was only one case in which that was done; and it was in the Widnes experiments. It was done to tennate the gas. In that instance, a small side cock was opened, and a little air drawn in. For the same purpose, the Gaslight and Coke Company's gas was passed through a coke scrubber moistened with oil; but with the South Metropolitan Company's gas, he had no occasion to do this.

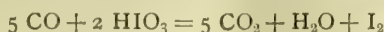
The CHAIRMAN said Mr. Dibdin had put a matter of the highest consequence before them in a very fair manner. If he had erred at all, it had not been on the side of exaggeration. He regretted very much with Mr. Dibdin that the managers of gas companies, especially of the London Companies (one of whom had recently obtained an Act of Parliament in favour of lowering the illuminating power of their gas), had not thought it worth while to appear at the meeting to refute Mr. Dibdin's statements. The Company referred to had managed to get a lowering of their illuminating power without the whole question being made clear to all those who were interested in consuming the gas. It was all very well to use Welsbach burners. They had all tried them, and had come to the conclusion that they were most admirable, and would no doubt become to be more used in a short time. But Mr. Sutherland had stated that he put on a new mantle once a month; and he (the Chairman) dare say he put on a new one even more frequently than that. Thirty days at six hours a day was a long time. Each burner passed 4 cubic feet of gas per hour; so that each mantle would use 720 cubic feet during its existence. Supposing the cost of this quantity of gas was 21d., and they added the cost of the mantle (say, 6d.), this 6d. was a large proportion on the cost of the gas—a much larger proportion than the drop in the price of the gas, which, in turn, hardly corresponded with the drop in illuminating power. As to the Lehner mantle, it certainly could not be weaker than the Welsbach mantle; consequently it must be stronger. (Laughter.) Certainly it gave an excellent illuminating power. He was absolutely convinced that, although the incandescent light which was at present in vogue had caused an immense progress in lighting generally, it was only in an ephemeral or intermediate stage. He felt satisfied that before many years were over, the incandescent mantle would be as different from that of 1900, as the 1900 one was from that of 1885. At the present time, perhaps, the greatest disadvantage under which they were labouring in regard to progress was that the Welsbach Company's patent did not expire until 1907. On the Continent, on the other hand, the patents were no longer in force, prices were lower, and the mantles were much more generally used. While the great bulk of the gas used for illumination was consumed in ordinary burners, it was absurd, and it was disastrous to disregard the proportions which existed between illumination and consumption, as shown so clearly by Mr. Dibdin. Until they reached the ideal time when the heating effect solely would be utilized for producing illuminating power (which was not now the case), they had to reckon circumstances as they were. He should like to echo what Dr. Frankland had eloquently put—viz., the fact that Mr. Dibdin had made so little of the enormous labour involved in his work. When they considered that he had operated on 28 burners with a great number of gases of different illuminating powers and different mixtures, they could calculate how many transmutations and permutations were necessary, and how many thousands of observations had had to be made before he could generalize and show the results in these figures.



## THE DETERMINATION OF CARBONIC OXIDE IN GAS.

The objections raised to the presence of more than a moderately low proportion of carbonic oxide in illuminating gas, have directed attention to systems for its determination; and the following account of a new method, which has been devised by Heeren A. Smits, H. Raken, and P. C. E. Meerum Terwogt, in the laboratory of Amsterdam University, will therefore prove interesting. It has been fully described in recent numbers of "Het Gas" and the "Zeitschrift für angewandte Chemie."

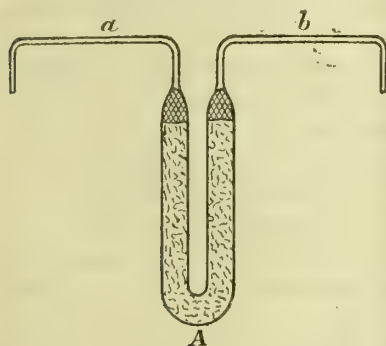
M. Nicloux, in 1898, proposed to determine carbonic oxide in air by passing the air over iodic acid heated to 300° Fahr., whereupon the carbonic oxide becomes oxidized to carbonic acid, and iodine is liberated, according to the equation—



The iodine is carried forward and absorbed by solution of caustic soda, in which it is determined by a colorimetric method. The quantity of iodine liberated is a measure of the amount of carbonic oxide in the air passed over the iodic acid. M. Gautier modified this method, with good results, by passing the air over iodic anhydride (iodine pentoxide) at from 150° to 160° Fahr., and absorbing the iodine and carbonic acid liberated by caustic potash free from carbonate. The iodine is then determined by titration, and the carbonic acid by the volumetric method of Müntz and Aubin. MM. Nicloux and Gautier found that hydrogen and methane did not act on iodic acid or anhydride; but that ethylene and acetylene did slightly. Consequently, ethylene and acetylene, if present, must first of all be removed by means of fuming sulphuric acid.

This very delicate method of estimating traces of carbonic oxide in air is evidently applicable also to its estimation in illuminating gas. But in gas analyses where more than mere traces of carbonic oxide have to be determined, it cannot be used. The authors have therefore endeavoured to devise a method for the volumetric determination of that gas by means of iodic anhydride, with the following results.

The apparatus comprised a pipette (very similar to Hempel's palladium pipette), containing about 8 grammes of iodic anhydride. Thus a U-tube, as shown in the annexed figure, is filled



with iodic anhydride and asbestos; plugs of asbestos being placed where the narrow tubes *a* and *b* are fused on. The tube *a* is connected with the gas burette; the tube *b* with the potash pipette. On leading gas that has been freed from carbonic acid, heavy hydrocarbons, and oxygen through the iodic anhydride pipette (U-tube) after it has been raised to a temperature of 300° to 350° Fahr., the iodine set free sublimes in the tube *b*, and the carbonic acid is absorbed in the potash pipette. Proceeding thus, it was observed that stoppages due to the sublimation of iodine in the tube *b* readily happened; but it was found possible to get over this trouble in the following manner: At the start, the gas was passed rapidly to and fro through the iodic anhydride pipette, and then more slowly, whereupon the iodine sublimed in the two tubes *a* and *b*, and a stoppage was avoided. As the carbonic oxide in this manner becomes completely oxidized to carbonic acid, which is taken up in the potash pipette, the contraction found, after the iodic anhydride pipette is cool, corresponds to the quantity of carbonic oxide present in the gas. The tension of iodine vapour is so inconsiderable that it may be left out of account.

In order to make the pipette ready for a second determination, the sublimed iodine must be removed from the tubes *a* and *b*. This may be easily done by warming each tube while a slow current of air is passed through.

To confirm the observation of MM. Nicloux and Gautier that hydrogen and methane do not react with iodic anhydride at 300° Fahr., some experiments were made on mixtures of carbonic oxide and hydrogen and carbonic oxide and methane. It seemed possible that the nascent iodine might attack the hydrogen or methane; but the following results disproved this supposition:—

	Hydrogen.	Carbonic Oxide.	Methane.	Carbonic Oxide.
Taken	72.6 c.c.	8.8 c.c.	42.8 c.c.	8.0 c.c.
Found	72.7 "	8.7 "	42.7 "	8.1 "

These figures further show that the new method is very exact, and that at 300° neither iodic anhydride nor nascent iodine acts on hydrogen or methane.

With regard to the results actually obtained in working, it will be remembered that when the palladium pipette only is used, merely the quantity of methane found requires a small correction. When working with the iodic anhydride pipette as well, a correction must be applied to the quantity of hydrogen as well as that of methane. For instance, supposing 100 c.c. of coal

gas are taken for an analysis, and that there are successively absorbed—

- a* c.c. by the caustic potash pipette
- b* " " " fuming sulphuric acid pipette
- c* " " " phosphorus pipette
- d* " " " iodic anhydride pipette
- e* " " " palladium pipette

and that in *f* c.c. of residual gas, *g* c.c. of methane is found, then the actual percentages of hydrogen and methane are arrived at in the following way: Let *p* = the free space in the iodic anhydride pipette and *q* = that in the palladium pipette, and *A* = 100 - (*a* + *b* + *c* + *d*). Then, after the absorption of carbonic oxide, the volume of the gas enclosed = *A* + *p* c.c., consisting of *A* c.c. of gas and *p* c.c. of air, because the iodic anhydride pipette, filled with air, was placed in communication with the gas burette, and the quantity of air naturally remained unaffected during the absorption of the carbonic oxide. When, however, the gas burette is put out of communication with the iodic anhydride pipette, and is connected with the palladium pipette in which is *q* c.c. of air, then *A* c.c. of gaseous mixture from the burette is mixed with *q* c.c. of air. If the whole of the residual gas were diluted with air in the same proportion, then the total volume ought, according to the equation—

$$A : A + q = A + p : x$$

$$x = \frac{(A + p)(A + q)}{A}$$

to amount to  $\frac{(A + p)(A + q)}{A}$  c.c.

Let the contraction found in the (*A* + *q*) c.c. of this gas, owing to the palladium absorption, be = *e* c.c. Then the contraction for the total quantity of gas would be

$$\frac{e}{A} (A + p) \text{ according to the equation}$$

$$A + q : e = \frac{(A + p)(A + q)}{A} : x$$

As the iodic anhydride pipette, as well as the palladium pipette, was filled with air, the contraction does not coincide exactly with the proportion of hydrogen, as the oxygen of the air has been consumed in the partial oxidation of the hydrogen by the palladium treatment. The contraction consequently is  $\frac{p + q}{5}$  too

much; and the actual percentage of hydrogen is therefore—

$$\frac{e}{A} (A + p) - \frac{p + q}{5} \quad (1)$$

The actual residual gas before the hydrogen absorption amounted to—

$$\frac{(A + p)(A + q)}{A} \text{ c.c.}$$

The total contraction  $\frac{e}{A} (A + p)$ , and the mixture of gas remaining behind, should therefore have amounted to—

$$\frac{(A + p)(A + q)}{A} - e \frac{A + p}{A} = \frac{A + p}{A} (A + q - e) \text{ c.c.}$$

In *f* c.c. of this gaseous mixture *g* c.c. of methane were found. Consequently the actual percentage of methane is

$$\frac{g}{f} \times \frac{A + p}{A} (A + q - e)$$

With regard to the magnitudes of the corrections for a gas of particular composition, they depend on the values of *p* and *q*. Consequently these values should be as low as possible.

The magnitude of the corrections may now be ascertained for ordinary coal gas. Let the following values be assumed:—

<i>p</i>	<i>q</i>	<i>A</i>	<i>e</i>	<i>f</i>	<i>g</i>
2	2	87	50	10	9 c.c.

then the correction for percentage of hydrogen amounts to—

$$\frac{e}{A} \frac{p + q}{5} = \frac{50}{87} \frac{4}{5} = 0.3 \text{ c.c.}$$

Consequently, the omission of this correction would introduce an error of 0.3 per cent.

The correction for the percentage of methane would amount in this case to—

$$\frac{g}{f} \left\{ \frac{A + p}{A} (A + q - e) - (A - e) \right\} = \frac{9}{10} \times 2.9 = 2.6 \text{ c.c.}$$

The omission of this correction, therefore, would introduce an error of 2.6 per cent.

With regard to the free space in the iodic anhydride pipette, it continues to increase slowly, owing to the reaction which takes place when the pipette is in use. Consequently, the free space should be re-determined from time to time.

A fair idea of the profitable nature of coal mining during the last two years or so can be gathered from the figures given with regard to the increased profits earned by a Northumbrian Company, which has just been converted into a limited liability concern. In 1898 it is said to have profited to the extent of £31,118; in 1899 the profits rose to £55,601; and for the current year they are at the rate of about £95,000.



## AMERICAN GASLIGHT ASSOCIATION.

Annual Meeting at Denver.

The Twenty-eighth Annual Meeting of this Association was held at Denver (Col.) on Oct. 17th, 18th, and 19th. Mr. G. G. RAMSDELL, of Philadelphia, the President for the year, occupied the chair; and there was a good attendance. The list of applications included 36 for active, and 12 for associate membership. M. Th. Vautier, the President of the International Gas Congress at Paris, and Dr. Auer von Welsbach were elected honorary members. The resignations during the year were 13.

The Committee on Research reported (see *ante*, pp. 1338, 1340) that during the past year they had undertaken experiments to determine a useful working standard for the measurement of the illuminating power of gas, and found that, with proper treatment, both the Harcourt 10-candle standard and the Edgerton chimney with the Sugg "D" Argand, were highly satisfactory. Some appendices to this statement were submitted at a later stage of the proceedings. The proper point for mixing coal and water gas was suggested as a suitable subject for investigation; and a hope was expressed that some member would take the matter in hand and report upon it at the next meeting. Some work had also been done on the measurement of high temperatures; but the experiments were not yet complete, though it was hoped they would be ready for the next meeting. Other questions before the Committee were: The removal of tar from water gas, the production and separation of cyanides, and the effect of regenerator furnaces and anti-dips on the yield of ammonia. The Trustees of the Gas Educational Fund submitted a satisfactory report, portions of which have already appeared in our pages (*ante*, p. 1281). The first section of 19 had completed their three years' course. A second section, comprising at present 42 members, and a third section, numbering 53, were in operation. The collection of information and statistics had been continued; and there were at present 94 subscribers to the fund.

The President's Inaugural Address has already been reproduced in these columns—see *ante*, p. 1087.

The reading of the appendix to the report of the Research Committee, dealing with the experiments they had undertaken "to determine a useful working standard for the measurement of the illuminating power of gas" (which was given in full in the "JOURNAL" for the 27th ult., pp. 1338-9), was followed by a brief discussion. Mr. E. C. Jones described a standard burner which he had devised for use in testing incandescent lamps, and which was arranged to consume acetylene. He said that the variation in duty caused by carelessness and want of skill in dealing with the mantles, was much more serious than that due to any degree of change in quality of the gas that would be likely to occur under ordinary circumstances. He also expressed surprise that variations to the extent of  $1\frac{1}{2}$  inches of mercury in the barometer should have no appreciable effect on the illuminating power. Mr. A. C. Humphreys remarked on the change that was taking place in the profession, as regards their attitude towards the photometer, which was instanced by the experiments just reported. There was need, he thought, for further investigations of the same kind. Mr. A. S. Miller regarded the experiments as a remarkable showing for the standard candle, and as especially demonstrating its superiority as a standard. The demand for something better was really an endeavour to substitute perfect machines for imperfect men.

Mr. Barret's paper on "Inclined Retorts" (see *ante*, p. 1278) aroused much interest; and many questions were put to the author at its close. Mr. Egner referred at some length to the history of the question, and said that, while a considerable length of retort had been adopted by some of the English gas engineers, in Germany a shorter retort was favoured. He believed that the coal used should be dry. Mr. Forstall remarked that, whereas the general practice had been to develop water gas in America and coal gas in England, the tables were now turned, as the present meeting was studying inclined retorts, while the English were directing their attention to water gas. The special feature of the inclined system was that the force of gravity was utilized and turned to account; and this force was constant and reliable in action. Mr. Littlehales claimed that the original suggestion for inclined retorts came from Montreal, and said that he was associated with the very first attempt to apply it in practice.

Mr. Barret, in reply, said he was satisfied that since he had adopted inclined retorts the yield of tar was less; but he had not ascertained where the deficiency had gone to, nor did he intend to guess. He was not prepared to give figures. He had not observed any change as regards density of coke; nor had he found any difference in the average frequency of stopped pipes. The wages per man were unaltered; but the men were not pushed so hard as with the horizontal retorts. As to the best length of retort to adopt, this was entirely dependent upon the quality of the coal to be used. A  $\frac{3}{4}$ -inch screen would about represent the best standard to which the coal should be broken before use.

A description of the means adopted for the repair of a crack in a 36-inch outlet-pipe from a gasholder, contributed by Mr. W. N. Tolman, of Philadelphia, was read by the Secretary. The tank of the holder was of masonry, 36 feet deep, with the ground-water standing about 19 feet below the coping. It was

found that all the joints in the horizontal run beneath the tank wall were leaking; and this line of pipe was 22 feet long, and had three joints—one lead joint at the drip-pot, and the other two flange joints without gaskets. This was stopped by caulking with cold lead from inside the pipe; two being successfully completed, and the third nearly so, when a small crack appeared on the top of the pipe about 2 inches away from, and parallel to, the joint, which was the middle one immediately under the walls. The pipe at this point was embedded in solid masonry. The crack was very small, and only about 4 inches long, when first discovered; but it gradually lengthened, until it extended half way round the pipe, meeting the joint at the ends, and being  $\frac{1}{4}$  inch wide at the centre. Large volumes of water leaked into the pipe; and constant pumping was necessary to keep it clear. The crack was first plugged, as far as possible, with soft pine wood; and a wrought-iron sleeve, 8 inches wide and  $3\frac{1}{4}$  inches outside diameter, was placed inside the pipe, and centred so as to give an equal joint all round. Grooves were made, to hold the jointing material in place; and the joint was made up with 4 inches of tarred oakum, having 2 inches of lead on either side. The lead joints were made with single strips of cold metal. The work was completed in May last, and had proved a successful job up to the present time. The crack was caused by settlement of the vertical pipe outside the tank.

An interesting lecture was next delivered by Dr. E. G. Love, on "The Theory of the Incandescent Gas-Light." This was given in full in the "JOURNAL" for the 20th ult., p. 1277.

Mr. W. C. Morris, of Long Island City (N.Y.), contributed a paper on the "Removal of Tar from Water Gas," which was read by Mr. Alten S. Miller. The author confined himself to the consideration of the removal of tar particles that might be present in the gas after passing the relief holder. He remarked that Professor Jacobus had shown that steam condensed only on the surface of solids and liquids, and not in the shape of a fog in an atmosphere free from dust or floating particles. All actual condensation that was carried with the current was in the form of streams on the sides or bottom of the pipe. With regard to unpurified gas, scrubbers were designed to give surfaces for the condensation of the supersaturated vapours. The tar particles might therefore be removed by the use of baffle-plate arrangements, by a suitable absorbing material, or by centrifugal action. Experiments were tried with a box 6 feet long, and 3 in. by 4 in. section, containing 132 thin plates of iron, so arranged as to break up and change the direction of the current of gas as many times as possible. Gas was passed through at several speeds, and with the free edges of the plates vertical or horizontal. In the first case, the tar drained against the gas, and in the second from between the bottom plates. The efficiency of the scrubbing action was determined by passing the gas at the outlet through a glass tube packed with cotton wool. Passing various quantities of gas ranging from 240 up to 600 cubic feet per hour, tar showed at the outlet in a few seconds, but sooner when the plates were in the vertical position. A Pelouze and Audouin No. 2 condenser, tested under varying conditions of pressure, proved ineffective in removing every trace of tar. A scrubber 4 feet in diameter and 16 feet high was packed with wooden strips  $\frac{3}{4}$  inch wide, spaced  $\frac{3}{4}$  inch apart, and arranged so as to break joint, and tested at various velocities ranging from 200 to 800 cubic feet of gas per square foot of sectional area per hour; but in all cases tar passed in a few seconds. A 10-inch pipe 16 feet long was packed with spruce shavings; and gas was passed for 80 days without a trace of tar showing at the outlet—the back-pressure being 8 inches. The shavings were found to be black for a distance of 2 feet from the inlet, brown for 5 feet, and oily for the remaining 8 feet. A scrubber 6 inches in diameter and 5 feet high, containing two 18-inch layers of shavings, was tested with gas passed at the rate of 600 cubic feet per hour (equivalent to 3100 cubic feet per square foot), and passed 30,600 cubic feet of gas before showing a trace of tar at the outlet. The back-pressure at the conclusion of the experiment was  $6\frac{1}{2}$  inches. This gave a duty of 65,000 cubic feet of gas per bushel of shavings. When removed, the lower layer was black for 10 inches, and brown for the remainder; and the upper layer was only oiled. A 21-foot length of 6-inch pipe was packed with 20 feet of shavings, and 89,100 cubic feet of gas passed through it at the rate of 2140 feet per square foot per hour, and until the back-pressure had reached  $14\frac{1}{2}$  inches, without any trace of tar appearing at the outlet. The shavings, when removed, were only tarry for  $2\frac{1}{2}$  feet from the inlet. The loss of illuminating value of the gas, caused by passing through the shavings, was 2 to  $2\frac{1}{2}$  per cent. Assuming a gas velocity of 100 cubic feet per hour, it would be seen that the 5-foot scrubber would run for 24 days, and the 20-foot for 152 days, without changing; and this appeared sufficiently promising to warrant a practical trial. The first purifier of each set was therefore charged with two layers of spruce shavings, 2 feet to 3 feet thick. Some difficulty was found to arise from the gas blowing through in places; and this was prevented by placing boards between the two layers and over the top, so as to cause the gas to travel from one end to the other through the bottom layer, and to return through the top layer—travelling twice the entire length of the purifier before exit. This proved successful in removing all traces of tar; and a duty of 210,000 cubic feet of gas per bushel of shavings was obtained. The pressure necessary for a velocity of about 1700 cubic feet per square foot of area per hour was 13 inches. A special plant was then constructed, consisting of six cylinders



each 10 feet diameter by 30 feet high, and to contain four 6-foot layers of shavings supported on wooden grids. They could be filled from the top by machinery, and emptied when required through the bottom. The back-pressure for a velocity of 920 cubic feet per hour, after several months' use, was 5.2 inches; and the quantity of gas passed up to the last renewal was 570,000 cubic feet per bushel. The author understood that Mr. Knapp, of Omaha, had also used spruce shavings for this purpose in a scrubber 8 feet in diameter, in two layers each about 18 inches thick.

Discussion being invited, Mr. Knapp said that the author had omitted to mention that the shavings should be moistened with water before being used, as otherwise the heat of the gas caused them to swell. Excess of pressure, due to accumulation of tar, could easily be got rid of by turning exhaust steam into the inlet. This could be done several times without injury to the illuminating value of the gas, as he had proved by connecting a photometer in such a way that readings for gas, either from the inlet or outlet, could be obtained. Mr. Norris said that where the purifiers were large, a layer of shavings on the bottom grid was sufficient, and that one supply of shavings would last over several ordinary changes of the purifiers. Mr. Young thought that it was better to use separate boxes for the shavings.

Mr. W. Frucraft, of Denver, read a paper on "Gas Advertising," which he said was first recognized as a factor for the growth and development of the gas business in Denver by the late Mr. G. T. Thompson, under whose direction a plan of campaign was marked out for the year 1899. The Company adopted the plan of selling gas-stoves at cost price, fixing free, and giving 5000 cubic feet of gas gratis with each stove; and these advantages were advertised in each issue of the four daily papers—using a large script print to catch the eye. Rough sketches and short pithy sentences were employed; the copy being changed every fortnight, and different in each paper. An excellent pamphlet, entitled "Denver ladies do some talking," and giving personal experience, illustrations of interiors of kitchens, and other information, was also issued. A demonstration of gas cooking was given at a free pure-food show. The services of the billposter were freely resorted to, large illustrations appearing on every hoarding throughout the city; and space was secured for advertisement on the delivery tickets of two large grocery houses, and on those of other tradesmen. A well-known cookery book was also distributed gratis. Not the least important feature was the establishment of agencies for the payment of bills in drug stores throughout the city. In 1900, newspaper advertising was abandoned, and a systematic house-to-house canvass inaugurated. To meet the needs of those who could not pay for a stove at once, a cheaper line of stove had been introduced, and could be had for monthly payments. The sale of stoves in 1900 was three times as many as in the previous year; but this was partly due to the work of 1899. The results of the advertising were highly satisfactory.

Mr. F. D. Moses opened the discussion by giving various details as to the sale of stoves. He wanted it to be distinctly understood that the object was to increase the sale of gas, and not to build up a stove trade. Mr. H. L. Doherty advocated spirited advertising and canvassing, and said that a common mistake was to be in too much of a hurry for returns. Mr. Littlehales, while admitting the advantage of every possible form of advertising, said that a house-to-house canvass was absolutely necessary, and should never be omitted. Mr. Jenkins was in favour of advertising, followed up by canvassing. The advertisement made the want, and the canvassing supplied the means of satisfying it. Mr. A. C. Humphreys advised that the best advertising talent should be employed; and Mr. Doty remarked that both advertising and cookery demonstrations were valuable means of educating the gas consumer. Captain White said that local conditions must be considered, and that the aid of women was imperative. After some further discussion, the President proposed that the Association should officially assist in the efforts now being made by other Gas Associations for the establishment of a National Advertising Bureau.

A paper on the use of cards for records and accounts, by Mr. W. C. Anderson, of Norristown (Pa.), was read by the Secretary. Cards were already used to some extent; but the author advocated their employment to a fuller degree, and in place of books. The system was economical, because the initial outlay for a filing cabinet was the only real expense connected with it. He first described a form for a record of mains, which could be readily filed in such a manner as to be available at a moment's notice. If a book was used for this purpose, there must either be a great deal of cross-indexing or a waste of space at one part and crowding at another. This also applied to meter records; and by using a special colour for each size of meter, the number of various sizes could be accurately ascertained at any time. For similar reasons, he also recommended eyeletted cards for use in forming a meter-index record or route book. A form exhibited showed monthly entries for two years. The cards could be rearranged from time to time as alterations in the district occurred, in a manner that was not practicable with a book. The card system could be substituted for the rental-ledger; and a form to correspond with the meter-record book was exhibited. An advantage in this connection was that, as soon as an account was paid, the card could be shifted to another compartment, and thus the accounts still owing could be ascertained at any time. One book-keeper could look after a much larger number of

cards than of book accounts. A similar method could be advantageously applied to the sales of products or of fittings. Cards were especially suitable for the canvassers' department, as affording a record of possibilities for future business. To ensure the successful working of the card system, one person must be in charge of it. Or where the number of cards was too large to be properly cared for in this way, they could be divided into separate departments. The cards used for recording accounts should be numbered consecutively; and thus the loss or mislaying of a card could be easily detected. The user of the system would find increasing applications and possibilities for it.

Mr. Glass opened the discussion, and said that his Company had adopted the system very extensively. The chief want was a good subject-index card, suitable for recording matter appearing in the Gas Journals. Mr. Humphreys thought the use of cards was rather getting out of hand, and that legitimate use might lead to abuse. The great feature was the preservation of the individual numbers; and after a time the system might become so unwieldy as to cause more trouble than it saved. He also referred to the use of the card system as connected with auditing or with legal processes. Books must at times be produced in Court, and cards would scarcely be accepted as legal evidence. It would be difficult to prove they had not been tampered with. Mr. Lathrop said that, while cards were suitable for many purposes, they would not do as financial records, or as a substitute for the ledger. Mr. A. S. Miller thought that cards should not be depended upon as the sole record, either for meter-indices or for accounts. If used at all, there should also be a book record. The object of keeping accounts was to avoid the possibility of fraud; and an employee having access to cards, could very easily make a meter record agree with a "short" cash record. On the whole, he agreed with the previous speaker. Mr. W. Forstall believed in the use of cards for certain purposes, and described his system, with the aid of examples. Mr. A. E. Forstall was favourably impressed with the system; but each set of cards should be under the control of one person, who was held responsible for every entry. Mr. Doherty doubted whether the card system could be successfully adapted to the purpose of an index for current literature. Mr. Norris said that, for purposes of reference, the cards were as useful and handy as a book; but to insure accuracy, there must be no divided responsibility. One person only should have charge of them.

"A Blue Glass Pyrometer" was the subject of a short contribution by Mr. E. H. Earnshaw, of Philadelphia. The common use of blue glass to modify the intensity of light had led the author to consider whether it could not be adopted for measuring temperatures, by the principle of obscuration. If one observed the temperature of a furnace through a sight-hole, and held a piece of blue glass in front of his eye, the heat would appear less intense. A second piece of glass would still further reduce it; and by the use of a sufficient number of pieces of blue glass, the light would be entirely shut out. Supposing that each piece of glass was of the same shade and thickness, and it was found that ten thicknesses of glass would completely obscure the light, one had a No. 10 heat or temperature; if twenty pieces were required, a No. 20 temperature. He had designed a light hand apparatus, with an observing tube and discs of blue glass, so arranged that any quantity of pieces up to 26 could be used, and the number easily read off. The instrument, as it stood, was only comparative; but it could be readily standardized. The tint of the glass and number of discs had been specially devised to meet the requirements of water-gas manufacturers; but the same principle could be adapted to other purposes, and to any degree of visible temperature.

Mr. E. C. Jones, speaking on the paper, remarked that in 1893 the author prepared a communication for the New England Association of Gas Managers, on "Everyday Pyrometry," and then exhibited a set of glasses twenty in number that had been standardized to show various temperatures from 315° to 1750° C. At best, the blue glass was only a makeshift; and on account of individual error, each man must standardize his own pyrometer. One cause of error was the failure of the pupil of the eye to adapt itself to varying intensities of light. Coming direct from a brilliant light, one would get a reading that would require modification after the eye had had time to adjust itself. Mr. Norris said that, in ordinary practice, the surrounding light conditions had an effect, even on the same pair of eyes. Two more thicknesses of glass were required at night, with the same temperature, than in daylight. Mr. Strecker thought the reading would tend to vary with the personality of the operator, and there would be difficulties in standardizing the instrument; but it was very useful, notwithstanding these objections.

In the report of the Committee on the President's Address, it was stated that the incandescent gas-burner, the gas-engine, the prepayment meter, the inclined retort, and more energetic and liberal policies of management, were some of the means and assurances of the future prosperity of the industry. The election of Dr. Auer von Welsbach to hon. membership was heartily confirmed. With reference to the departure by some pipe manufacturers from the standard dimensions agreed on by the Association, the Secretary was instructed to write officially to these manufacturers urging adherence to the standard; and members of the Association were advised to insist on having all specials made in accordance therewith.

The last clause led to an animated debate, in the course of which it appeared that some of the members looked upon the



"departures" as improvements, and would therefore support them. A motion to appoint a Committee on "Standard Accounts for Gas Companies" was agreed to.

Mr. A. E. Forstall then read a paper on "Governmental Control of the Price of Gas," which has already appeared in our pages—see *ante*, p. 1211.

The Committee on Final Resolutions suggested votes of thanks to the Committee on "Transportation," in appreciation of their earnest and successful endeavours to secure train accommodation and favourable rates for members attending the meeting, to the Entertainment Committee, the Denver Gas and Electric Company, the officers of the Association, the readers of papers, and the local Press. These were unanimously agreed to.

#### EFFECT OF BENZENE AND OTHER HYDROCARBONS ON THE ILLUMINATING POWER OF INCANDESCENT COAL GAS.

In a recent number of the "Engineer" were given the results of some interesting experiments on the effect produced upon the duty of incandescent coal gas by alterations in the natural illuminating power of the gas itself, which have been published by Dr. Samleben, of Bremen. The gas was consumed in an argand burner and with a Welsbach mantle, and it was examined photo-metrically before and after the addition of varying proportions of benzene vapour, ethylene, acetylene, and gasoline. The argand consumed 5.3 cubic feet per hour at a pressure of 0.4 inch; the incandescent burner consumed 3.5 cubic feet at 1.18 inches. The illuminating power is given in German standard candles in the following tables:—

##### I.—Benzene Vapour.

Per Cent. by Volume.	Candle Power in Argand.	Candle Power with Mantle.
Traces	8.3	80.0
1.18	18.0	82.5
1.36	20.2	85.0
1.78	21.6	89.0
1.95	22.7	91.0
2.38	24.6	97.0

##### II.—Ethylene.

Heavy Hydrocarbons + C <sub>2</sub> H <sub>4</sub> . Per Cent.	Candle Power in Argand.	Candle Power with Mantle.
3.8	18.0	85.0
5.4	18.5	89.5
7.6	19.0	93.0
10.0	19.5	95.0
12.6	20.2	96.0

##### III.—Acetylene.

Heavy Hydrocarbons + C <sub>2</sub> H <sub>2</sub> . Per Cent.	Candle Power in Argand.	Candle Power with Mantle.
4.0	18.0	87
4.4	19.0	89
5.8	22.0	92
7.7	24.5	95
8.8	30.0	102

##### IV.—Gasoline.

Grammes per 1.5 Hectolitres.	Candle Power in Argand.	Candle Power with Mantle.
—	18	87
7.0	21	91
10.5	22	94
15.0	23	96
20.0	24	98

**Manurial Value of Sulphate of Ammonia.**—According to the "Chemical Trade Journal," Professor Stutzer, of the Government Research Station at Königsberg, referring to sulphate of ammonia as an excellent nitrogenous fertilizer, says there is no reason why it should be discredited in the cultivation of tea, as it can be applied to this plant as well as to any other perennial—of course, not by itself, but with other manures supplying phosphoric acid and potash.

**Water Supply in India.**—At a meeting of the East India Association, held last Tuesday at their rooms in Victoria Street, with Lord Reay in the chair, Mr. William Sowerby brought forward a project for supplying water in India during times of drought on the partial or complete failure of the monsoon rains. Considerable quantities of water, he thought, could be obtained in almost every part of India by means of deep but inexpensive artesian tube-wells. The chief points to be considered in boring the wells were the nature of the strata and the likelihood of obtaining water; and the data could be ascertained by the examination of existing wells and by a proper hydro-geological survey of the various formations. Large supplies could also be secured by means of accumulating and compensating reservoirs constructed in the valleys of the great rivers, along which there were many low-lying recesses that, without very much labour and with moderate-sized dams, or bands, could be made to retain considerable quantities of water, to be used only when the monsoon failed. A tank holding 6½ million gallons of water—sufficient to supply 1000 people with 25 gallons a day each for 260 days—he estimated could be constructed for £605. Such tanks, combined with artesian wells, would greatly mitigate the sufferings of the people of India during failure of the monsoon rains, though these supplies would, of course, be insufficient for any extent of irrigation of the crops, which must be supplied by rain or by canals from extensive reservoirs.

#### BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

The Winter Meeting of the Association was held last Saturday, at the Geological Society's Rooms, Burlington House—the PRESIDENT (Mr. C. H. Priestley, Assoc.M.Inst.C.E., of Cardiff) in the chair. Among the members were a number of gentlemen connected with other Societies who were particularly interested in one of the subjects down for discussion.

The SECRETARY (Mr. Percy Griffith) having read the minutes of the meeting held in Cardiff in June last,

Messrs. W. Jones (Pontypridd) and J. W. Lewis (Farnham) were appointed Scrutineers of the ballot-lists for the election of officers, members, and associates.

#### REPORT OF THE WATER BOARDS COMMITTEE ON THE CONTROL OF WATER UNDERTAKINGS AND SOURCES OF SUPPLY.

The report (which will be published in *extenso* next week) dealt with the main question under seven heads; and those heads convey the conclusions of the Committee. They are: (1) The present system of control over undertakings for public water supply is unsatisfactory; (2) the existing powers for enforcing a proper water supply are inadequate; (3) the areas allotted to existing local authorities are altogether independent of the sources of water supply, and the trouble and expense of forming "united districts" and "joint water boards" are unnecessarily great; (4) the law relating to underground water is inequitable and a standing danger to many public water supplies; (5) the law relating to the pollution of water requires revision; (6) the provisions for preventing waste are insufficient; and (7) the collection and publication of official returns relating to existing undertakings is much to be desired. The Committee, however, made no suggestion as to steps being taken towards securing the remedying of these matters, excepting in regard to the last; and as to that they proposed that the Association should endeavour to organize the systematic collection of data relating to the following subjects: (1) The available supply obtainable from various sources; (2) general information concerning existing water-works; and (3) information regarding districts not adequately supplied with water.

The subject of the report (which is commented upon to-day in "Water and Sanitary Affairs") was discussed at great length; but, as will be seen when we publish a summary of the speeches, no one came into conflict with the Committee.

On the motion of the PRESIDENT, seconded by Mr. W. MATTHEWS (Southampton), it was agreed that the report of the Water Boards Committee be adopted, and that it be printed and circulated.

#### NEW OFFICE-BEARERS, MEMBERS, AND ASSOCIATES.

The Scrutineers reported that the following officers had been elected for the ensuing year:—

*President:* Mr. W. A. Richardson, of Birkenhead.

*Vice-Presidents:* Mr. Frederick Griffith, of Leicester; and Mr. R. H. Swindlehurst, of Bolton.

*Ordinary Members of Council:* Mr. F. J. Bancroft, of Hull; Mr. C. Sainty, of Windsor; Mr. E. A. B. Woodward, of Wolverhampton; Mr. W. Millhouse, of Scarborough; Mr. H. W. Pearson, of Bristol; Mr. E. Sandeman, of the Derwent Valley Water-Works; Mr. C. E. Jones, of Leyton; Mr. W. Terrey, of Sheffield; Mr. Hamlet Roberts, of Ipswich; Mr. C. Gilby, of Bath.

The following new members and associates were also elected:

*Members:* Mr. F. C. Cook, of Hinckley; Mr. R. H. Machell, of Dewsbury; Mr. R. E. Middleton, of London; Mr. W. H. Prescott, of Tottenham; Mr. J. Shaw, of Darwen; and Mr. G. M. Taylor, of London.

*Associates:* Mr. J. R. Anderson, of London; Mr. W. W. Coster, of Cape Town; Mr. H. W. B. Cotterill, of Sheffield; and Mr. Lewis Mitchell, of Bury.

#### THE PROTECTION OF UNDERGROUND WATER.

The foregoing business fully occupied the morning sitting; and in the afternoon the members heard an interesting communication by Mr. W. MATTHEWS on the "Protection of Underground Water." It was full of suggestive matter, formed a good supplement to the morning's debate, and supplied a cogent argument in favour of control and new legislation.

An excellent discussion followed, a report of which will appear with the paper in a future issue.

#### VOTES OF THANKS.

The thanks of the members were then tendered to Mr. Matthews for his paper, to the Council of the Geological Society for the use of their rooms, to the Scrutineers, and to the representatives of other Societies who had attended to take part in the discussion on the report of the Water Boards Committee.

#### PLACE OF NEXT MEETING.

On the invitation of the President-Elect, it was decided that the annual meeting should be held at Birkenhead in June next.

#### A VOTE OF SYMPATHY.

Mr. G. GREENSLADE (South Hants Water Company) observed that last month one of their members, Mr. J. C. Amos, passed away. He thought it fitting the Association should send a vote of sympathy to his relatives. He proposed that this be done.

The PRESIDENT seconded the motion; remarking that he believed this was the first death they had had since the Association came into existence. It was a good precedent to record their sympathy with the relatives of their late friend.

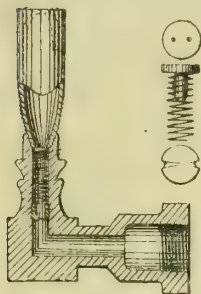


## REGISTER OF PATENTS.

**Producing Coke, Gas, and Bye-Products.**—Naef, P., of New York. Nos. 20,658, 20,659, and 20,660; Oct. 14, 1899. Date claimed under International Convention, March 14, 1899.

These are three of a series of patents taken out by the "inventor," whose proposals are sufficiently indicated in an article appearing elsewhere to-day, entitled "An Ambitious Inventor."

**Regulators for Gas-Burners.**—Wilson, J., of Plaistow, Essex. No. 23,088; Nov. 20, 1899.



The patentee's proposal is to insert in the space between the shoulder in the base of the burner and that formed by the elbow of the fitting, a spiral spring in tension, with a valve-plug upon each end, slotted or perforated so as to "allow exactly the requisite amount of gas to pass to produce the necessary illuminating effect." The shoulders formed by the joint and the base of the burner are the valve-seats, and since the slots or orifices are the only points of admission to the burner, the pressure of gas in the mains always tends to press the plugs against their seats.

**Governors for High and Low Pressure Gas Supply.**—Scott-Snell, C., of Saltash. No. 24,096; Dec. 4, 1899.

In explanation of his proposal, the patentee says that his invention has for its object to provide a burner which shall be effective for either high or low pressure of gas—that is to say, it is peculiarly suitable on gas-circuits in which gas is compressed and burned at a pressure above the normal which obtains in the street-main, or under equivalent conditions. In many installations, the gas is compressed by machines operated by water pressure, hot-air engines, or like sources of power. The failure of the source of power, however, leaves the gas at the normal street pressure, if an automatic bye-pass be allowed to come into action. The light at the burners is then very small, by reason of the necessarily small gas-apertures in the nipples designed to suit the heavier pressure.

In the present invention, a series of holes is provided, collectively large enough to maintain an effective light to the mantle, at normal gas pressure. The central hole is, however, of larger bore than the others; and when closed, it leaves sufficient aperture area in the remaining holes to provide the required illumination, while the machine is running and maintaining the gas pressure. A disc, ball, or diaphragm form of valve is formed, whereby, at a pre-arranged point in the gas pressure, it closes the exit of the low-pressure aperture, leaving the maintenance of the light entirely to the remaining high-pressure apertures. Governors, of course, exist for maintaining more or less steady issuing pressure to the gas; but in this invention the low-pressure aperture (not wire drawn) may be entirely cut off or the gas flow choked. It is evident, moreover, that the definite change in the burner, from its high-pressure function to its adaptability to low-pressure, is quite a feature compared with governing in the sense usually understood; and although the patentee says he prefers to absolutely cut off the low-pressure aperture, it is within the spirit of the invention to make the valve only partially cut off.

One form of the arrangement proposed to effect the object aimed at was described and illustrated in the "JOURNAL" last week, p. 1398.

**Gas-Engines.**—Hautier, C., of Paris. No. 1235; Jan. 19, 1900.

The object of this invention is to provide means for increasing or diminishing the area of the explosion-chamber, and providing a relief outlet therefor, whereby the starting of the motor will be facilitated by increasing the capacity of the explosion-chamber, "thus reducing the force of the explosion and at the same time permit a certain portion of pressure due to the exploding gases to escape into the atmosphere," and, after the motor is in motion, to reduce the capacity of the explosion-chamber, and at the same time confine the entire force of the pressure due to the explosion to the piston—it, of course, being understood that the charge of explosive mixture which is admitted to the explosion-chamber is constant at all times.

The illustration shows a longitudinal section of one end of a gas-engine, with the improved explosion-chamber; also a top plan view of same.

A is the upper end of the cylinder; B, the piston; C, the main explosion-chamber; and D, the auxiliary chamber, which is formed with a valve-seat E, opening into the explosion-chamber, and with a smaller valve-seat F, opening into the atmosphere. The valve-stem has a threaded engagement with the neck of the auxiliary explosion-chamber; and its lower end terminates in a conical faced valve, adapted to close against the seat E, and cut off communication between the main and the auxiliary explosion-chamber. This threaded valve-stem also carries an outwardly opening valve, adapted to close against the seat F; and on the projecting end of the stem is mounted a crank-arm, by means of which the stem and valves are simultaneously operated.

**Liquid-Meters.**—Frost, H. H., of Ardwick, Manchester. No. 15,892; Sept. 7, 1900.

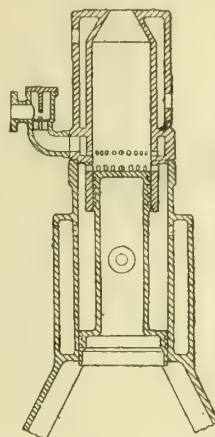
This invention relates to liquid-meters such as are described in Patents No. 2720 of 1883 and No. 2578 of 1887; the chief object of the present improvements being to dispense with the packing and stuffing-box hitherto

employed around the piston-rod, "whereby friction is diminished, and the meter is made more sensitive and reliable, and will measure the liquid accurately even when passed in very small quantities."

The claims made for the proposed new arrangement are: (1) In a liquid-meter having a measuring-chamber and a double-acting piston, dispensing with the ordinary stuffing-box and packing for the piston-rod, and, instead, surrounding it with a casing the only outlet from which is sealed by an extension of the sliding-valve cover. (2) In combination, a measuring-cylinder, double-acting piston, slotted piston-rod, casing surrounding piston-rod, valve-mover, projecting through a slot in the casing into the slot of the piston-rod, and an extension of the sliding-valve cover by which the slot in the casing is sealed. (3) The combination with the sliding-valve cover of an elastic ball bearing for the cover, by which slide-ways for it are dispensed with.

**Internal Combustion Engines.**—Bever, A., of Dewsbury, No. 9624; May 25, 1900.

This invention refers to the class of gas-engines which have two tandem pistons of unequal size—the smaller acting as the power piston, and the larger as an air-pump, and creating a partial vacuum in a reservoir so as to draw the waste gases out of the working cylinder, and draw in a fresh charge.

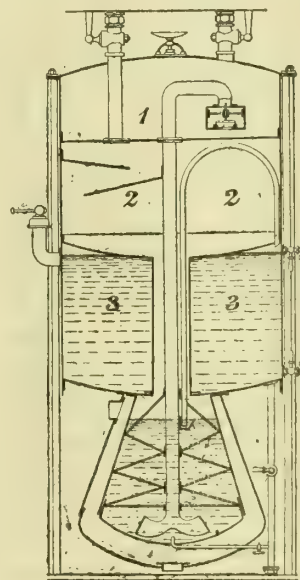


The explosion-cylinder is connected with the air-pump cylinder, by direct port-holes through the body of the cylinder. This connection is always open, and allows the waste gases to pass over, when the piston, in completing its out-stroke, uncovers the exhaust-ports. The cylinders are fitted with a self-acting lifting exhaust, or a check-valve, which allows the waste gases to leave the air-pump cylinder during the return stroke.

The cycle of operations is as follows: If it is assumed that the pistons are at the back-ends of the cylinders, the working piston receives its mixture of gas or vapour and air, and compresses it. It is then fired by an ignition-tube or other device, and drives the piston outwards. In the meantime, it expands almost down to atmospheric pressure. At the end of its stroke, the working piston uncovers the exhaust-port, as shown in the engraving. The air-piston, during the outstroke, has created a partial vacuum; and when the working piston uncovers the exhaust-port, the interior of the working cylinder is put in free communication with the air-pump cylinder through the holes or ports in the cylinder. The partial vacuum then withdraws the waste gases, and also draws in a fresh charge of gas or vapour and air, which are compressed on the return stroke. The larger piston at the same time drives out the waste-gases through the check-valve; and the engine is ready for another explosion and working stroke.

**Production of Carburetted Air by the "Cold Process."**—Lothammer, F. J., of Paris. No. 15,930; Sept. 7, 1900.

Previous mention of the patentee's name in the columns of the "JOURNAL" will cause readers to take some interest in the present "invention," which is said to relate to "an improved apparatus for the cold production of carburetted air, which may be employed either as a luminant or for heating purposes, or as a motive fluid." The carburetted air is formed by passing air through liquid hydrocarbons—such as petroleum, benzine, or other similar liquid—in such a manner that the air, "by its mechanical work and its considerable subdivisions," is caused to be intimately mixed with the vapours of the hydrocarbons, thereby forming "a gaseous combustible fluid of absolutely homogeneous composition." The pressure is controlled from the commencement of the operation, and remains "absolutely uniform whatever the consumption"—that is to say, "production is in exact proportion to the consumption, and there is no possibility of over-production."

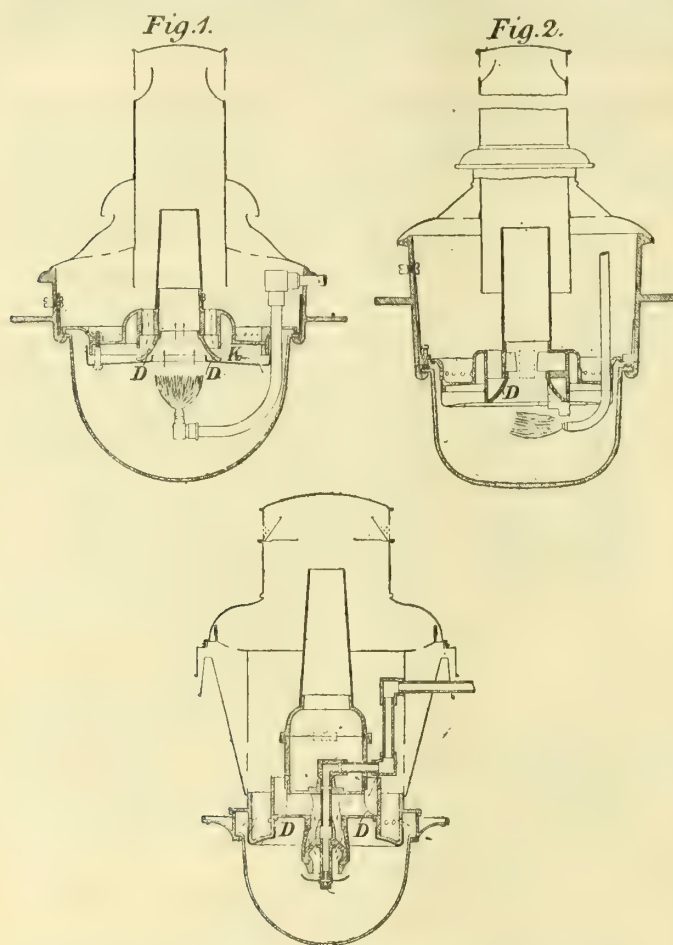


The apparatus comprises a cylinder, supported by legs, beneath which is arranged exteriorly a conical receiver C, which forms the real carburettor. The cylinder above is divided into three chambers, 1, 2, and 3. The chamber 1 is the pure-air chamber, in which the pressure is regulated by a weighted valve; and the air flows from this chamber by means of a central pipe F into the carburettor. The compartment 2 is the carburetted-air chamber, which is in connection with the carburettor by means of a large central pipe, and with the consuming apparatus by the pipe on the left of the compartment 1. The compartment 3 is the hydrocarbon reservoir, whose lower part is in connection with the lower part of the carburettor by means of pipes, and whose upper part is in connection with the upper part of the carburettor by a bent tube, which ensures the level of the liquid in the carburettor remaining constant. The actual carburettor is formed by a conical receiver, in which the level is maintained constant, and the compressed air which has to be treated flows through to the bottom of the receiver (the base area being larger than the area of the top), across metal gauze or perforated plates; and the air afterwards meets in the liquid. Plates of similar construction, inclined in all directions, are in combination with a heated air jacket surrounding the hydrocarbon receiver, so as to compensate for the cold produced by the evaporation of the hydrocarbon.



**Regenerative Gas-Lamp.**—Welch, W. H. I., of Bow. No. 16,626; Sept. 18, 1900.

This invention relates to overhead regenerative gas-lamps of the kind described in patent No. 8318 of 1895; the object being to so arrange the passages for the entering air as to simplify the construction and to reduce the risk of explosions when lighting the lamp. The passages for the entering air and for the issuing products of combustion are formed in a casting provided with a series of tubes arranged around the central chimney above the flame. Through these tubes the entering air passes, and is delivered on to the upper surface of an annular cone, where it is



highly heated; thence it flows through holes arranged to impinge on to the flame, while the products of combustion pass up a central chimney.

When the flame is vertical, as in fig. 1, the casting is supported on lips at the outer casing of the lamp, and is provided with a set of circularly-arranged tubes C directing the air over an annular cone D into a chamber K, the bottom of which is formed as an enamelled reflector provided with openings for the passage of the highly-heated air through the tubes C and over the annular cone. A portion of air, not so heated, is allowed to pass into the globe by small openings arranged around the casting. The chimney being quite open, there is free access for lighting the lamp, as well as for the products of combustion.

When the flame is horizontal, as in fig. 2, the chamber K is dispensed with, and part of the annular cone D immediately above the flame is made with perforations. This perforated part is surrounded by a casing open at the bottom, so as to direct the heated air on to the upper part of the horizontal flame. The rest of the air necessary for the combustion of the gas is supplied to the globe through small openings, as in the former case.

When the flame is circular, as in fig. 3, the tubes C and the annular cone D are connected by channels to a central chamber immediately above the burner; free passage to the chimney being left on each side of the channel. The air for supporting the combustion of the flame passes down the tubes C impinging upon the upper surfaces of the cone D, thence through the passages to the central chamber, and thence in a highly-heated condition through holes to the upper part of the flame from the burner. The air for the underside of the flame is supplied to the globe through small openings, as in the former cases.

#### APPLICATIONS FOR LETTERS PATENT.

- 21,347.—MILLER, H. W., and GRAHAM, M., "Measuring and delivering coal to furnaces." Nov. 26.  
 21,387.—KITSON, A., "Protection of incandescent mantles." Nov. 26.  
 21,390-1-2-3.—SARGENT, C. E., "Internal combustion engines." Nov. 26.  
 21,394.—CRAIG, J. A. I., "Coin-controlled meters." Nov. 26.  
 21,414.—WALKER, J. H., "Gas-cooker." Nov. 27.  
 21,465.—SIMMANCE, J. F., and ABADY, J., "Water-heating apparatus." Nov. 27.  
 21,476.—SKINNER, G. H., "Gas and similar engines." Nov. 27.  
 21,511.—RAUTHMELL, T., "Generating acetylene gas." Nov. 28.  
 21,518-9.—PURVES, W. T., and the NOTKIN SYNDICATE, LTD., "Automatic carbureting apparatus." Nov. 28.  
 21,588.—COX, J. H., "Combining acetylene gas with air." Nov. 29.  
 21,622.—BOULT, A. J., "Supplying air or other combustion supporter to gas or other burners." A communication from the New Process Lighting Company. Nov. 29.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Oil and Carburetted Water Gas.

SIR,—However widely I have been compelled to differ from your opinion on a technical question of which I have intimate knowledge, I most highly esteem your courtesy and skill in dialectics.

To your final remark, that "there are no means of ascertaining the extent of this relief" from 5½d. (?) in the price of oil, I oppose the statement in my previous letter—viz., "At the present moment, future supplies of the best quality of gas-oil can be booked at less than 3½d. per gallon." While not advising immediate purchase, I will undertake that any of my friends now requiring oil shall obtain cargoes on such terms.

9, Victoria Street, S.W., Dec. 7, 1900.

A. G. GLASGOW.

### The Sale of Stock to Gas Consumers.

SIR,—In my letter of last week, on the sale of stock to gas consumers, there is a slip of the pen which makes one of the most important sentences unintelligible. The sentence reads: "But when tendering many do not understand." Omit the word "when," and the point I wished to make becomes clear.

Your contemporary, "Fairplay" of Nov. 29, p. 898, says, on this subject: "The general run of investors do not understand tendering; and if they want the bonds [the proposed new issue of Exchequer Bonds] will have to get them later on from the professional 'middleman,' and give him his profit. . . . The fixed price system would afford the small investor a chance of getting in on the 'ground floor,' and square with the desire that he should have a fair chance, expressed by Sir Michael Hicks Beach when the National War Loan was brought out last year." It may, in fact, be said that the sale of gas stock by auction or tender is not the best method to ensure the placing of the stock at a good price. The clientele of a sale by auction is very limited. There may be fifty in the room; but probably not more than half are buyers, and of these a certain proportion are the middlemen referred to in "Fairplay." Sale by tender is not much better. The issue of stock is not brought to the notice of buyers in a way to attract their attention, or that they can understand; whereas the direct offer to the consumers at a fixed price in quantities to suit all classes—and especially the investor of small savings—appeals to a very large number and never fails.

Dec. 8, 1900.

GEORGE LIVESLEY.

### Piping Gas to London from the Pit's Mouth.

SIR,—The "JOURNAL" for Jan. 19, 1869, contained a letter from me to its then Editor, calling attention to a paragraph which had just appeared in an illustrated periodical, setting forth the advantages of making gas at the pit's mouth, and piping it up to London. The following is practically the whole of the paragraph in question:—

The Metropolitan Board of Works has again had the question of the removal of gas manufactories from the populous districts of the Metropolis brought under its consideration. The proposal for a remedy to the present dangerous and preposterous system of making gas in the most crowded parts of the richest city in the world is limited to removing the factories into the country, and conveying the product by a few miles of piping to the consumer. We really cannot understand why our gas should not be made at the mouths of the coal-pits that supply the material, which by a costly and tedious process is at present brought to London by rail or sea, the freight being not less, probably, than 10s. per ton between the pits and the factories, all of which the consumer pays, besides being injured in health and endangered in person by means of the manufacture taking place in that which is the worst possible spot in the world for the purpose. The cost of laying down gas-mains between London and, say, Newcastle, would not be greater than the maintenance for a short period of the fleet of colliers which bears the crude material to London, where wages, living, and land are more costly than anywhere else. As to the removal of the gas factories out of London, that is, of course, merely a question of time and convenience.

I do not propose to discuss the merits of the project set forth in the preceding paragraph, but merely bring it forward in connection with a similar one described as "novel" in yesterday's "Daily Mail." I give below the entire article:—

To make London a clean and smokeless city is the dream of the ardent smoke abatement reformer. Mr. E. Baynes Badcock, who has devoted some years to the study of the question, has a scheme for the disappearance of London's smoke which is novel, if not convincing. Just as there are enthusiastic persons who conceive that sea water may be brought to London through the medium of iron pipes, so Mr. Badcock believes that gas can be made at the pit's mouth, and conveyed to London through pipes, and that instead of using coal, the thrifty householder would be disposed to have gas and coke fires, thus preventing any smoke. "The nearest coalfields to London," said Mr. Badcock to a "Daily Mail" representative, "are in the neighbourhood of Coventry and Leamington. I should erect a gas plant on that coalfield, and thence I would run a cast-iron main gas-pipe to Brentford, or elsewhere near London where gas-works abound. I would use those gas-works as storage and distributing systems for the gas brought from the coalfields. By that means the capital outlay of the gas companies would be preserved. The main to London could be laid from the coalfields for the greater part of the distance above ground; thus reducing the cost of the undertaking. I should say that 2½ millions would cover the whole cost of laying the pipes. The enormously reduced cost of the gas would repay that expenditure in a short time. People would find that a coke and gas fire was so infinitely less expensive than a coal-fire, that economic laws, in the natural course of events, would enforce that method of heating and cooking. And then good-bye to your smoke nuisance!"

I leave this so-called "novel scheme for making London smokeless" to the consideration of your readers.

London, Dec. 8, 1900.

LUMEN.

### The Valuation of Gas Liquor.

SIR,—Some explanation seems necessary in connection with the description of the method of testing ammoniacal liquor by the Bristol Gas Company, and the illustration accompanying it, on p. 1397 of your last issue.

The funnel with the glass stop-cock having been done away with in



the apparatus, it will be obvious that the 20 c.c. of strong soda solution must be introduced into the flask C with expedition, and the stopper carrying the bulb and eduction tube should be immediately put on, so as to prevent any loss of ammonia. It may also be mentioned that at the end of the process of distillation, to prevent any syphoning back of the test acid from the flask D (which would have been obviated by opening the glass stop-cock), in the apparatus as illustrated will have to be done by taking out the stopper with the bulb from the flask C.

These points are obvious enough to those who are acquainted with the process, but might be puzzling to a beginner trying to follow the instructions so lucidly given in the Bristol Gas Company's statement, which you have reproduced.

Derby, Dec. 5, 1900.

F. J. R. CARULLA.

On the same subject, Mr. JOHN PHILLIPS, Secretary of the Bristol Gas Company, writes: When we first used the apparatus, we had a funnel with a glass stop-cock; but we found that this weakened the stopper, and also gave rise to slight error, owing to the accumulation of ammonia in the tube. As our Chemists are all experienced men, we have now discontinued its use. The cork must, of course, be replaced immediately the soda solution is introduced. The syphoning back is easily prevented by removing the cork from the distilling flask C, or the tube from the acid flask D, before turning out the gas.

## LEGAL INTELLIGENCE.

### COURT OF SESSION—SECOND DIVISION.

Tuesday, Dec. 4.

(Before Lord STORMONT DARLING.)

#### The Perth Corporation and their Gas-Works Contractors.

To-day the record was closed in an action brought by the Lord Provost, Magistrates, and Town Council of Perth against Hugh Symington and Sons, Contractors, of Coatbridge, to recover £1104 13s. 6d. as the amount of over-payments made and expenses paid by the pursuers in connection with the contract by the defenders for the execution of works on the site of the proposed new gas-works at Friarton, near Perth. There was also a claim for £1000 as damages for breach of contract.

The pursuers say that, during the progress of the works, alterations were made upon the written authority of their Engineer, and the defenders were paid certain sums. On May 17, 1898, they sent a schedule of measurements of work alleged to have been done by them, making a total value of £6176, and a statement showing the balance due to them as £1376. The pursuers instructed their Architect to examine and measure the work, and he did so, as far as he could. But a large part of the work had been covered up; and he found it impossible to examine or measure that. He met one of the defenders, and received from him statements, upon which he relied, regarding the extent and quality of the work; and he adjusted the account at £5817 14s. 7d. On the 8th of December pursuers paid the balance alleged to be due. Then it is said that in November, 1899, the pursuers were informed that one of the retaining walls which had been built by the defenders for the erection of the new gas-works was not in accordance with the specifications, and utterly unsuited for the purpose. They say that, on examination, an over-statement of work done was discovered to the extent of £604 13s. They claim this, and also £500 for opening up, repairing, and strengthening walls and buttresses. They say they have suffered serious loss, damage, and inconvenience in consequence of the delay in the erection of the new works, and that they anticipate further loss.

The defence is that the defenders have not received payment for work which, in their knowledge, was unexecuted; that they have not induced the pursuers to make payment of sums not justly due; that the pursuers have not incurred any expense in respect of misrepresentations by the defenders; and that the pursuers and their Engineer accepted the work, and there was a concluded settlement between the parties. The defenders deny that any portion of the work was so covered up that the Architect could not examine and measure it. They deny that one of them gave any particulars, and say the account was adjusted at £5817 without interference on their part, except that, for an amicable settlement, they agreed to abate from the sum claimed £359 4s. 8d., which they considered they were entitled to in respect of certain deviations from the original design ordered by the Engineer, and that they abstained from putting forward claims which they considered justly due for other deviations. They reserve their claim for the £359 4s. 8d., and the cost of other deviations. As to the retaining wall, they say it was built according to a modification, and was perfectly suited for its object. The pursuers, however, have used the wall for other purposes than as a retaining wall, and have erected a building up against it, the roof of which rests upon the wall.

The case was sent to the procedure roll.

### LIVERPOOL ASSIZES—NISI PRIUS COURT.

Friday, Dec. 7.

(Before Mr. Justice BUCKNILL, and a Special Jury.)

#### The Liability for the St. Helens Explosion.

This was an action brought by the St. Helens Corporation to recover £5000 damages from the United Alkali Company, Limited, for injury done to the gas-works of the plaintiffs by the explosion of some chlorate of potash on the defendants' works on the 12th of May, 1899.\* The defendants denied that they, in fact, manufactured and stored potash; but, in the alternative, they said chlorate of potash was not a dangerous substance, and they were not guilty of negligence in the way in which they carried on their business.

Mr. DANCKWERTS, Q.C., Mr. CLARKE HALL, Mr. HUTCHINSON, and Mr. RIGBY SWIFT appeared for the plaintiffs; Mr. JOSEPH WALTON, Q.C., and Mr. HORRIDGE represented the defendants.

\*See "JOURNAL," Vol. LXXIII., pp. 1311, 1365.

Mr. DANCKWERTS, in opening the case, said the action was brought to recover damages for the destruction of part of the plaintiffs' property in consequence of an explosion of chlorate of potash upon the defendants' premises on the 12th of May last year. The Jury would see, from a series of plans which had been prepared, that the defendants' works were located round about Warrington New Road, St. Helens, and that on the other side of the road were situated the gas-works of the Corporation. In those works there were two gasholders and a number of buildings of various kinds. The plans showed the several areas in which total and partial destruction of property occurred; and it would be seen that the explosion which was caused was of an exceedingly violent character, and such as to create wreck and ruin in the neighbourhood. Some unfortunate people also lost their lives. The learned Counsel proceeded to describe by the aid of the plans the position of the portion of the defendants' works in which the explosion took place, and the operations carried on therein. On the day the explosion occurred, 99 wooden casks had been received from Messrs. Bryant and May, in whose business, he understood, chlorate of potash was largely used. They had been sent to the firm filled with chlorate, and were subsequently returned empty. After being examined at the cooperage, they were brought to the chlorate-house. A man was engaged in rolling the casks into the house when, owing to one slipping, a spark was given off which fell on the woodwork of one of the crystallizing tanks, and it at once burst into flame. No possible cause could be assigned for the spark save that the casks had been splashed with the composition used in making matches. The fire extended, and in less than ten minutes the explosion occurred. It was of a most violent character, and its force was expended in the direction of the gas-works. One of the holders, which was about three-quarters full, and had risen to a height of 60 feet, was torn asunder, and a great volume of gas escaped, which, ignited, and a column of flame rose into the air some 500 or 600 feet. The second holder was seriously damaged; and in making the works good the Corporation had been put to an expense of about £4000. The Jury, however, would not be troubled with figures, because he was informed that the Solicitors on either side had come to an understanding upon the point, and the Jury would only have to concern themselves with the question of liability. How the explosion was caused was, of course, more or less a matter of speculation, because no one actually saw it; but he thought the Jury could be easily satisfied upon the point. As to the alleged liability of the defendants, there was a doctrine of the law of England to the effect that people must so use their property as not to injure their neighbours; and it was upon this simple proposition that the plaintiffs relied. There was the further ground alleged that the defendants were negligent in the way in which they dealt with the chlorate. They were also negligent in having wood upon the premises where the material was made and stored; in having wooden surroundings to their vats and coolers; and in not taking precautions that the returned casks were thoroughly cleansed inside and out, so that there should be no trace of match-making composition upon them. Negligence was also alleged in the fact that all these operations were carried on under one roof.

The following witnesses were then called:—

Mr. S. Glover, Gas Engineer to the Corporation, deposed to seeing clouds of smoke emanating from the defendants' works. He went in that direction, and in a few minutes an explosion took place. He described the damage done to the gas-works.

William Bate, a cooper employed at the Kurtz works—the portion of the premises of the United Alkali Company where the explosion occurred—described, by means of models of casks, how he placed one cask on end against two others, and how it slipped. He said he saw the spark, and noticed it strike the cooler, which quickly broke into a flame. He gave an alarm of fire.

Dr. Best, Chemist and Manager for the Hardshaw Brook Chemical Works of the Company, said he went across to the Kurtz works when he saw the smoke. He looked inside the chlorate-house, and saw that the fire had got hold of the coolers, and was running from one to another. He made no attempt to save the building, as he thought the fire had gone too far. He and others ran away, and when they had reached a distance of about 50 yards the explosion occurred. This was about ten minutes after he first saw the smoke. He had never before known an explosion of chlorate of potash, which was not classed as an explosive; and he was prepared to stake his professional reputation upon the statement that, as a pure chemical, it would not explode under any circumstances whatever.

Saturday, Dec. 8.

Further evidence in support of the plaintiffs' case was given to-day.

Mr. L. G. Boor, a London merchant, said he had been connected for 28 years with the manufacture of chlorate of potash, and during that time had received casks from customers, who were principally match manufacturers. His experience had been that such casks when rubbed together had emitted sparks. He had not, however, known of an explosion of chlorate of potash by itself.

Mr. Guttman, Consulting Engineer and Chemist, said he had had large experience in explosives. Chlorate of potash, which was a chemical compound, was not officially classed as an explosive, nor was it one of those with regard to the manufacture of which any special conditions of prohibition had been issued under Order in Council. It was an explosive, however, when mixed with any combustible or carbonaceous substance. The St. Helens was the first known case of an explosion of a chlorate store; and, in his opinion, it was perfectly foolish to have had so much as 150 tons under one roof.

Professor G. Lunge, who was formerly Manager of the Tyne Alkali Works, South Shields, and now Professor of Chemistry at Zurich, said, as the result of many years' experience in the manufacture of chlorate of potash, that until the St. Helens explosion it could not be called an explosive at all. The accident had to some extent opened the eyes of experts. He still thought they might put into a store any quantity of chlorate without danger. Asked if wood used in chlorate of potash coolers was the right material to employ, witness quoted from a book written by himself to show that wood lined with lead was the only thing then known. Questioned as to whether chlorate increased the inflammability of wood, he answered: "Most certainly;" adding that the less inflammable matter there was present, and the farther the processes of manufacture were separated from each other, the less was the danger.



Asked whether chlorate should have been regarded with suspicion on the ground of experience having taught people that many substances of an endothermic kind, believed to be non-explosive by themselves, had with further knowledge been discovered to be explosive, witness replied that some might have had a suspicion that chlorate by itself would explode. Had the tanks been of non-inflammable material when the sparks reached them, he did not think the explosion would have happened.

Mr. T. A. Green said that the result of many years' experience in the manufacture of chlorates led him to declare that all the processes should certainly not be carried on beneath one roof. Under his own management, the store was situated at a distance from the manufacturing processes, as otherwise there would have been danger. They introduced iron tanks from the beginning—never had wooden ones. The temperature in chlorates sometimes rushed up suddenly, causing the liberation of a great volume of gas. As a manufacturer, he regarded chlorate of potash as a substance to be carefully looked after.

The further hearing of the case was adjourned till yesterday morning.

#### Withdrawal of the Injunction in the Denbigh Steam-Roller Case.

Sir Horatio Lloyd, of the North Wales and Chester County Court district, has just intimated to the Registrar of the Denbigh County Court that the injunction which he granted against the use of a steam-roller by the Denbigh Corporation, at the instance of the Denbigh Gas and Water Companies (*ante*, p. 1407), would be withdrawn. His Honour stated that, after fortifying his memory by reading the report of the action (which was heard nearly three months ago), he found that the question of giving up the claim for injunction was undoubtedly mentioned; and he thought enough had been said to justify the defendants in supposing that it was abandoned by the plaintiffs. Under the circumstances, he withdrew that part of his judgment which directed the issue of an injunction. The award of damages in each case would, however, stand. The costs would be still on the B scale, as an injunction was claimed. As a result of the above decision, the Corporation have decided not to proceed with their intention to apply for a new trial, as it is believed that the question of any further damages to pipes by the steam-roller can be amicably settled between the parties on the basis of the Judge's finding on the question, having regard, of course, to the depth of the pipes, their quality, and the manner of laying.

**Proposed Purchase of the Hartlepool Gas and Water Works.**—At the monthly meeting of the West Hartlepool Town Council last Tuesday, resolutions were passed empowering the Corporation, in conjunction with the Corporation of Hartlepool, to promote, in the next session of Parliament, a Bill to authorize the purchase of the undertakings of the Hartlepool Gas and Water Company.

**The London County Council and the Water Question.**—At the meeting of the London County Council last Tuesday, it was unanimously agreed, on the recommendation of the Water Committee (*ante*, p. 1411), to ask the President of the Local Government Board to receive a deputation on the subject of the water supply of the County of London—the Water and Parliamentary Committees to form the deputation.

**Gas Profits and Rates in Manchester.**—Alderman Gibson's motion with regard to the disposal of gas profits, to which reference has already been made, was placed on the *agenda* for the usual monthly meeting of the Manchester City Council last Wednesday; but, as on three previous occasions, discussion on the matter had to be postponed. The question will accordingly be dealt with, unless there should be a further adjournment, at a meeting of the Council to be held next week.

**Automatic Meters, Stoves, &c., in Leeds.**—According to a report lately presented to the Gas Committee of the Leeds Corporation, during the year ending in March last there was an increase of 1391 automatic stoves, 1644 automatic meters, 45 gas engines, and 747 gas-stoves; the income from these sources being £10,708, as compared with £6508 in the preceding year. There was an augmentation to the extent of 4.09 per cent. in the amount of gas made, and of 3.71 per cent. in the quantity sold.

**Tenby Water Supply.**—The Water Committee of the Tenby Corporation have lately had before them the report of Mr. James Mansergh, respecting the water supply of the town. The document deals with the five proposals which have been made: (1) Filtration of the Ritee water, estimated to cost £13,500; but Mr. Mansergh does not regard this source as satisfactory. (2) Springs in St. Florence Valley, estimated to cost £20,500; but the yield is not sufficient for the town's need. (3) Boring for an underground supply, which is almost impossible. (4) The Tavern-spice source, estimated to cost £50,000; but Mr. Mansergh does not approve. (5) Precelly Mountain, estimated to cost £67,000, which he regards as best for the town. To carry it out, he suggests that Tenby should join with neighbouring places. The Committee decided to print and circulate the report.

**Water Supply of Teignmouth.**—Another discussion on the subject of the water supply took place at the meeting of the Teignmouth District Council last week. The Water Committee were of opinion that a local source of supply which had been suggested was unsuitable, as it would necessitate pumping and the construction of a large reservoir. A deputation had had an interview with the Torquay Water Committee as to obtaining a supply from the town, but had not arranged terms. In the course of the discussion, the advantages of a local supply, as opposed to one from Dartmoor, was again urged by some of the members. Mr. Slocome contended that this idea of getting a supply locally had been the great stumbling-block in the way of improving the service. It had always been brought forward to prevent the carrying out of any practical scheme; and the result was that they had spent thousands of pounds on temporary measures, and were still far from a solution of the question. There was not sufficient water in the district to give an abundant supply to the town. They might offer a premium for a gravitation scheme, or take some other practical step so that they might not go drifting on into next summer and have nothing done. Mr. Banbury thought that they required the services of an expert, and that it would be better to engage an engineer than to offer a premium. It was decided to hold a special meeting of the Council to consider the subject; and Mr. Banbury gave notice of his intention to move that Mr. Baldwin Latham be asked to advise the Council.

## MISCELLANEOUS NEWS.

### PRICE OF GAS IN NORTH LONDON.

#### A Protest from Penny-in-the-Slot Consumers in St. Luke's.

Under the auspices of the St. Luke's Peabody Buildings Gas Consumers' Protection League, which has for its patrons Mr. H. C. Richards, Q.C., M.P., and Mr. J. Allen Baker, a crowded meeting was held in the Memorial Hall, Roscoe Street, Bunhill Fields, on Friday, the 30th ult., "to protest against the heavy charges made for the use of gas and fittings by the Gaslight and Coke Company to the residents of Peabody Buildings, St. Luke's." Mr. Alderman POND, a member of the New Finsbury Borough Council, presided.

The CHAIRMAN, in opening the proceedings, gave a brief history of the League, and said they meant business in fighting the Gaslight and Coke Company.

Mr. E. HOWES (Mayor of Finsbury) said that, though they had met to consider the "penny-in-the-slot" grievance, the whole question of the price of gas was bound up with it; and they meant to keep on knocking at the door of the House of Commons until they obtained a remedy. They did not wish to confiscate the property of the Gaslight and Coke Company. If the Company had chosen to waste their money in the past, they could not expect the consumers of this generation to pay. Let the shareholders take the burden. He was pleased to say that the City of London had woke up at last, and only on the previous day the Common Council had agreed to act with the London County Council in this matter; so that when the Company came before Parliament for financial aid, they would take the opportunity of making themselves heard. If it had not been for the united action of the Corporation and the County Council last session, £36,000 would have been lost to the London Local Authorities on the public lighting north of the Thames.

Mr. H. C. RICHARDS said the movement had his greatest sympathy; and, as one of the representatives in Parliament for the district, he would use his best endeavours in helping the residents. What they must do was to get the large consumers to join them in the fight. If the 28 new Borough Councils would fall into line with the Corporation of London, they would be successful in bringing the Gas Company to book. It was only the unanimity of the Vestries that saved the situation last year. With regard to the hardship of paying so high a price for the gas supplied through the automatic meters and fittings, he would confer with his friend Mr. Walter Long (the new President of the Local Government Board), who was one of the Trustees of the Peabody Buildings, and see if he could not get him to influence the Trustees of the estate to purchase the fittings from the Company. If they could get no remedy from the Company, they would have to bring pressure to bear upon the new Borough Councils to obtain Electric Lighting Orders, and thus have the Model Dwellings lighted up by municipal electricity. In the meantime, they must keep on knocking at the door of the House of Commons. If a Committee of both Houses were formed to go into this matter, he should be pleased to give evidence, and would call the tenants of the Model Dwellings to do the same.

The CHAIRMAN then read a letter from Sir Albert Rolit, who was unable to attend the meeting, expressing sympathy with the movement. He next read the resolution of the tenants not to use penny-in-the-slot meters in their rooms until the price of gas was reduced (*see ante*, p. 1154). This resolution, he said, was signed by 400 of the tenants in 24 hours—this being the only time available—and sent to the Gas Company, who, in reply, simply said: "This Company has no power to charge any consumers preferential rates for the supply of gas, and only a uniform rate for fittings." Thus the question was burked. The tenants did not ask for preferential rates, but for a reduction in the price of gas and fittings all round on the line of the South Metropolitan Gas Company. The Gaslight and Coke Company must be reminded of their promise, and the inducement they held out to the tenants of the Model Dwellings to take the automatic meters and fittings. They were told that it would only cost 1d. to cook a Sunday's dinner; whereas actual practice showed that it cost anything between 3d. and 4½d.

Mr. J. ROWLANDS moved the first resolution—"That this meeting of gas consumers emphatically protests against the exorbitant charges by the Gaslight and Coke Company for gas and fittings, and urges upon the Government the necessity of legislation to protect the interests of small gas consumers north of the Thames." He said he thought it would be only waste of time to complain to the Company; but he would like its Chairman to be present to see the magnificent protest that was being made, and then think how it would fit in with his speech at the last half-yearly meeting of the Company, when he said: "I am glad to be able to say that, though we have some 360,000 consumers or thereabouts whom we supply with gas, we have received protests against the rise from a quite insignificant number of those consumers, and the complaints have been confined to some few people who appear to expect the price of the quartern loaf to remain the same whether wheat stands at 28s. or 40s. a quarter." Why, he would ask, did not Colonel Makins get a large number of complaints from consumers as to the high price charged by his Company for gas? Because the only answer they would get would be to this effect: "We acknowledge receipt of your protest, and are very sorry; but please pay up." With regard to the Colonel's remarks about the people who always expected the quartern loaf to be at the same price, he (the speaker) was not one of them; but he did not expect that, with flour at a given price all over London, a baker on the north side of the river would charge nearly 50 per cent. more for a loaf than one on the south side. This was how the question of the price of gas now stood. Colonel Makins was very fond of bringing in his (the speaker's) name at the half-yearly meetings of his Company. One year Colonel Makins sent him a most elaborate set of figures, and then, because he (Mr. Rowlands) did not reply, he told his meeting that he (the speaker) could not answer them. Not being a gas expert, he did not give any attention to the figures; and when he found that the "JOURNAL OF GAS LIGHTING" was criticizing them very strongly, he did not think it necessary to take the matter up. He did, however, know this—that every penny difference in the prices of the two Companies represented on the output of the Gaslight and Coke Company a sum of £80,000, and at the present difference



it was very nearly £800,000 per annum that the north-side consumers had to pay which they would save if the price were the same as that of the South Metropolitan Company. Mr. Livesey said it was "incompetence;" and if that was so, it was time an end was put to it.

Mr. J. A. BAKER seconded the motion. He said he was a large employer of labour, and had a gas bill of about £800 per annum; yet at times he could not get enough gas to work his engines, and had to keep 80 or 100 men idle. As they were engineers who commanded good wages, they had a fair claim to be heard on this question. His gas bill came to about £250 more per annum than if his works were situated on the south side of the Thames.

The motion was carried unanimously.

Mr. J. BENSON then moved—"That a copy of the foregoing resolution be sent to the Prime Minister, the Leader of the House of Commons, the President of the Board of Trade, the Town Clerk of the City of London, the Town Clerk of Finsbury, and to Mr. H. C. Richards, M.P.; and that he be asked to take the necessary action in the House of Commons to secure a reduction in the prices of gas and fittings." He said the Gaslight and Coke Company stood before Parliament as a mismanaged undertaking. The Company stated that the principal reason for the increased price now being charged for gas was the enhanced cost of coal; but they ignored the fact that the high price received by them for residuals nearly balanced the extra amount they were paying for coal. The Company had not carried out their part of their original agreement, which stated that they were to carry on their undertaking with "due care and economy;" and it was a question that affected, not only the dwellers in the Peabody Buildings of the Metropolis, but in the whole of London.

The motion was carried unanimously.

A vote of thanks to the Chairman was proposed by a member of the Executive of the Gas Workers' Union. In doing so, he said they were watching the Gaslight and Coke Company, and had just received a letter from Colonel Makins telling them that he did not see his way clear to granting an increase of pay. However, they were waiting their time. They were 5000 strong, and were united. With regard to the question they had been considering, it had been proved that, instead of costing 1½d. to bake their Sunday's dinner, as promised when they adopted "slot" meters, it was costing them 4½d.; and therefore his advice to them was to take their dinner to the baker, who would cook it for 2d., and save them all trouble.

The motion was carried, and the proceedings closed.

## SINGAPORE MUNICIPALITY AND THE GAS-WORKS.

### Mr. Corbet Woodall's Report.

Our readers are aware that Mr. Corbet Woodall has recently returned from Singapore, where he has been advising the Municipality as to the purchase by them of the undertaking of the Gas Company. Copies of Singapore papers just to hand give the principal portions of the report he has presented on the subject.

Mr. Woodall is of opinion that, both for financial and practical reasons, it will be of advantage to the ratepayers and consumers if the supply of gas is in the hands of the Commissioners. He says the service will be better and cheaper in their hands than if it remained with the Company. The proportion of gas used for public lighting in Singapore is unusually large, and tends to increase. On this point Mr. Woodall says:

I do not think the public lighting will continue in the near future to be so large a percentage of the whole; but it is practically certain that the actual quantity of gas used by the Municipality will steadily increase. There are some situations where, even at a considerably higher cost, electric light will be preferred to gas; and, for the service of the very poor, where the total quantity of light required is small, gas will hardly be able to eject oil. With regard to the public lighting in Singapore, however, there is no room for hesitation. Gas presents the cheapest and most efficient method available, and will no doubt continue to be employed. This being so, there need be no fear of a falling off in the amount of business, but the contrary may be counted on.

Mr. Woodall deprecates the starting of new works in opposition to the Gas Company, as it would be an intolerable nuisance and great extravagance to have two gas-works and a duplicate system of mains. He advises the purchase of the present works (after some difficulty in arriving at a decision as to the proper basis of valuation) for the sum of £41,420. The Commissioners would have to raise £50,000; the annual charge for interest being £2250, or £560 less than the Company paid in dividends last year. Mr. Woodall goes on to say:

My confidence in the growth of the business in the hands of the Commissioners is strengthened because I feel assured they will adopt the prepayment (penny-in-the-slot) meter, which brings gas within the reach of the poorer people; also because there will be a greater disposition among ratepayers to use gas freely when they know that the profit earned from them as consumers will be returned to them in their capacity of ratepayers.

In my opinion, no scheme for the general lighting of Singapore can be complete which leaves electricity out of consideration. A prosperous community in a tropical climate will naturally desire the coolest light obtainable, even though the cost is high. I have said that for the public streets in Singapore electricity cannot compare with gas burned in Auer burners, either for efficiency or cost, and that therefore there can be no doubt as to the wisdom of taking in hand the supply of gas. But I am further and strongly of opinion that the Municipality will be placed in the best position to supply electricity at a reasonable rate for private purposes, because of their ownership of the gas supply.

In Singapore, the population likely to require electric lighting is not concentrated within a small area, but is grouped in places which are at a considerable distance apart. A general supply over the whole area would be very costly—so much so that the town could hardly face the expenditure for years to come. By means of the gas-mains, power is distributed over the whole town and suburbs. This power can be utilized for the generation of electricity in the immediate neighbourhood where a demand arises, and that at a comparatively economical rate both for capital and working.

My suggestion would be that an electric light station, fitted with gas-engines, be established in a position where, within a radius of not more than half-a-mile, it would command the busy portion of the European town, banks, offices, Government buildings, &c. The power might be sufficient to generate in (say) twelve hours, current sufficient for the day and night—the balance being stored. This would avoid the cost of a second shift of

men, and the loss upon the small quantity stored would not be material. If this proved successful, then a similar station might be established in the residential district, in which case the Commissioners might require a guaranteed revenue from a sufficient number of householders to cover the cost of interest and working. Such installations are easily and immediately available; they would displace those already erected for individual consumers, would be efficient, and their capital cost low. At the same time, without interfering detrimentally with the business of the Gas Department, they would furnish an additional source of income and profit to the town.

Commenting on the report, the "Straits Times" says:

Mr. Corbet Woodall's report on the proposed acquisition of the Singapore Gas Company by the Singapore Municipality is so lucid and to the point in every subject touched upon, that we cannot foresee the possibility of any intelligent opposition to the scheme when it is brought before the consideration of the Commissioners. In the very outset of his report, Mr. Woodall lays it down as his professional opinion that it will be to the practical and financial advantage of the gas consumers as well as of the ratepayers of the town if the gas supply is in the hands of the Commissioners. He subsequently quotes his valuation of the plant to be purchased at a trifle over £40,000, and explains that its productive capabilities can be doubled at a further outlay of only £6000. In fine, he concludes that the Commissioners would have to raise a sum of £50,000, and that the interest on this amount, at the reasonable rate of 4½ per cent., amounts to only £2250, which is a sum £560 less than the dividend paid by the existing Company last year. In addition to this saving, he sets forth an economy in administration amounting to another £600; and, in fact, he proves that, without any increase in the revenue from the existing gas plant, the profit the Municipality would make in its first year's operations as a gas manufacturer—over and above all charges—would reach the sum of about £1200, to be used for a sinking fund or in extending the business. This is broadly what Mr. Woodall sets forward as his financial reason for recommending the purchase of the gas-works at the price he specifies; and the reason seems an eminently sound one. It is possible, however, that the Company may refuse to accept his valuation; but this seems a very remote contingency. At their last general meeting, the Company unanimously resolved to offer their undertaking to the Municipality for £45,000—stocks by valuation. But should this offer not be acceptable to the Commissioners, "the Company propose that Mr. Corbet Woodall be entrusted with fixing the price to be paid, with the sum of £45,000 as a maximum—stocks by valuation." The Municipality, if it makes the purchase, will no doubt take the coal, manufactured gas, and any other stock at a valuation; so in this respect there will be no difficulty. Then Mr. Woodall's valuation seems based on such fair and just deductions, that, though it is little more than half the original capital stock of the Company, it is a reasonable price for the goods that the Company now have to offer.

## SHEPTON MALLET DISTRICT COUNCIL AND THE GAS-WORKS.

At the Meeting of the Shepton Mallet District Council last Tuesday, the Lighting Committee presented a report on the position of the Council in regard to the gas supply of the town, about which there has latterly been some complaint. In the course of it, they stated that, as the local Gas Company were not working under either a Provisional Order or a Special Act of Parliament, the Council could not instruct an examiner to test the quality of the gas under the provisions of Section 29 of the Gas-Works Clauses Act, 1871. If the Company were working under statutory powers, they would be compelled to supply gas of a fixed quality; and an examiner could be appointed to ascertain that they were doing so. In that case, however, the Company would be limited to a profit of 10 per cent., and anything extra must be used in reducing the price of gas. The Committee recommended the Council to proceed, under Section 161 of the Public Health Act, 1875, and apply for a Provisional Order to enable them to undertake to supply gas within their district. The Committee were advised that an Order would not be granted except on the terms of purchasing the works of the Company; but they were further advised that the price would not be anything like so much as it would be if the Company were working under a Private Act or an Order. The Committee made various recommendations on the subject submitted to them; and the Council proceeded to consider them. Mr. Norman suggested that the word "gas" be omitted, and "public lighting" substituted, so that the Council should not be confined to gas. Mr. Luff, the Chairman of the Committee, adopted the suggestion, with the view that the Council might be able to go in for electric lighting if they thought it better. Mr. Garton (Chairman of the Council, and Managing-Director of the Anglo-Bavarian Brewery, who have a private electric light installation) approved of the alteration; and the Council unanimously adopted the report as amended. It was afterwards decided to at once take the necessary steps for going into the whole question thoroughly; and the Committee were empowered to enter into negotiations with the Company to ascertain upon what terms they would be willing to dispose of their undertaking to the Council, and also to prepare a detailed report upon the whole subject, with the view of lodging an application for a Provisional Order.

## ANOTHER GAS AND ACETYLENE EXHIBITION AT THE ROYAL AQUARIUM.

The Second Gas and Allied Trades and International Acetylene Exhibition will be held at the Royal Aquarium, Westminster, from Friday, the 21st inst., till Tuesday, the 22nd prox. Again organized by Mr. M. J. G. Ritchie, this promises to be an exhibition of more than usual interest, for a special feature will be the acetylene section, where it is proposed to demonstrate the progress this illuminant has made during the past twelve months. The success attending the first exhibition, opened about this time last year, has induced the Aquarium management to hope that the second one will prove still more so. The building offers peculiar advantages for an exhibition of the kind, as it occupies a fairly central position, and has a grand hall particularly well adapted for showing to the greatest advantage all kinds of illuminants. The exhibition will consist mainly



of apparatus for the manufacture and distribution of gas, and its utilization for cooking, heating, traction, and the production of power, including the latest types of gas-engines, appliances connected with the different systems of gas lighting, including compressors, mantles, burners, and art metal fittings, will be on view, also apparatus for showing the adaptability of acetylene for railway lighting, acetylene burners, fittings, &c. In the Acetylene Section, it is proposed that a Committee shall test the working of the various appliances during the period of exhibition, and award gold, silver, and bronze medals for the most efficient apparatus. The Committee for awarding the medals has already been formed.

### ELECTRIC LIGHTING NOTES.

Colonel C. H. Luard, R.E., on behalf of the Local Government Board, held an inquiry at the Town Hall, Bexhill, on Thursday, for the purpose of hearing evidence with reference to an application from the Urban District Council for sanction to borrow £7772 for the purpose of electric lighting. Formal evidence only was given by the Clerk (Mr. Douglas) and Mr. L. Preece. The Clerk mentioned that £1500 was required for new machinery and £3300 for mains.

At last week's meeting of the Ilkley District Council, the Gas Committee recommended that a deputation should meet Mr. Gibbings and others, who are applying for a Provisional Order to light the district with electricity. Mr. Horn said that Mr. Gibbings turned out to be the Wharfedale Syndicate; and in this statement he was supported by Mr. Lister. Both gentlemen charged the Company with trying to take undue advantage. Mr. Horsman and Mr. Ellis (both members of the Syndicate) contradicted the statement, and disclaimed any interest in the electric lighting project at all. The minutes, after a long discussion, were confirmed.

The electric light works of the Leeds Corporation require enlargement; and, accordingly, at the meeting of the City Council last Wednesday, Alderman Wigram proposed that the Council approve the acceptance by the Lighting Committee of tenders amounting to £72,943 for the erection of buildings on the Britannia Mills site. He explained that the ultimate provision of power therein would enable the Corporation to deal with the supply of the entire city. The Committee had considered whether it would be wise to proceed with the erection of all the buildings at one time, or only a portion of them. It would be necessary, in any event, to put in the foundations and do the excavating work; and, having regard to the ultimate cost, the Committee recommended that the whole of the work should be proceeded with at once. The motion was carried.

At a special meeting of the Dorking District Council last Tuesday, it was decided to transfer their Electric Lighting Provisional Order to the West London and Provincial Electric Supply Company, Limited, on the terms of the Company's written offer, and subject to the Company agreeing to supply, if required, energy for electric lighting at the rate of not more than 2½d. per Board of Trade unit, and subject further to the Council having the right to purchase the undertaking at the end of the first ten years, or at any subsequent period of seven years. It was unanimously resolved to lodge a formal notice of objection to the application to be made by the County of Surrey Electrical Power Distribution Company, Limited, to the Board of Trade in the forthcoming session for a Provisional Order in respect of their district. The proposed transfer is subject to the approval of the Board of Trade; and, if sanctioned, the Council decided to engage Mr. Trentham to advise them upon the proposed scheme.

Some further information was given at a meeting of the Paignton District Council yesterday week with reference to the offer of Mr. Singer, a wealthy local resident, to provide electric lighting works for the town. The Electric Lighting Committee of the Council have met Mr. Singer, and discussed the matter with him. They reported that he would erect and equip the works at his own expense, and the Council would have the option of purchasing the undertaking at the end of a number of years to be agreed upon, without paying anything for goodwill. The charge for current would be 5d. per unit, with ¾d. per unit for wiring; making a total of 5¾d. per unit. In the event of the Local Government Board declining to sanction the raising of a loan for the purchase of the works, Mr. Singer suggested that the Council, when they could afford it, might take over the works, and pay him by instalments spread over a specified number of years. More generous terms can hardly be imagined. As will be seen, Mr. Singer takes all the risk; and if the venture is a success, the ratepayers may, if they choose, take all the profit.

Referring to Mr. Corbet Woodall's report on the proposed acquisition of the gas-works and the supply of electricity by the Municipality of Singapore, some extracts from which are given in another column, the "Straits Times" says: "Mr. Woodall expresses views on the probable future necessity of an electrical supply for private purposes that prove interesting reading. He recognizes the difficulty in the way of supplying electricity to the residential districts, and suggests a system of gas supply, for the generation of electricity in remoter houses, which system at present seems a trifle visionary. His proposal for a central electric light station, fitted with gas-engines, for the supply of electric light to the banks, offices, Government buildings, &c., seems far more practical, and would be commendable did real demand for electric lighting exist in the business portion of the town. As a rule, however, practically no business is done in the central European district after sundown; and we believe that the demand for an electric light supply would be too small there to justify the erection of a plant. The idea of a plant in the residential district, with a guaranteed revenue from a sufficient number of householders to cover the cost of interest and working, sounds less Utopian. Still, in this country and climate, electricity has so many disadvantages that it can scarcely be expected to oust gas as an illuminant, even for private purposes, until the methods of its production and distribution can be materially improved upon. It costs some money to turn coal into gas; it costs still more money to turn gas into electricity. Then, with the electricity ready produced, we have beetles and mice, and all sorts of things, to eat the insulation off the wires; and we have eternal dampness to rot it. This ensures uncertainty of supply; whereas with gas, the supply is a practical certainty if once the pipes are laid properly."

At the stroke of midnight on the 30th ult., the electricity supply works at Colchester passed into the hands of the Corporation. In announcing

this fact at the meeting of the Town Council last Wednesday, the Chairman of the Electric Light and Power Committee (Mr. E. H. Barritt) explained the position of the electric light in the borough. He said that during the first year of the undertaking—from December, 1898, to December, 1899—the work proceeded quietly. Eighty consumers, and 4254 lamps, were connected with the mains; and it was then only necessary to run the plant for a few hours on five evenings in the week. Towards the close of the first year, the increasing demand for current began to make itself felt; and the Council took steps to provide additional steam power and generating plant. These were not installed a day too soon. The year from December, 1899, to December, 1900, had been a very busy one. The consumers had increased from 80 to 148, and the number of equivalent 8-candle lamps had gone up from 4254 to 9421; the difference in units between the year just closed and the previous one being 88,131, against 44,432. They were starting the third year with a double shift of men, and the plant had to be kept running 17 hours out of the 24. The generating plant consisted of four sets, three of which were capable of developing 110-horse power each; while one could develop 360-horse power. The "load curve" for the 30th ult. showed a good early morning load, a continuous day load, and a very heavy night load, the apex of which was reached about 5.30 p.m. The position each Friday night was that the three smaller sets were not sufficient to create the necessary current demanded. The largest set had to be relied upon entirely; and if this became disabled, parts of the town must for a short time be left in darkness. The Committee believed that during the coming year the rate of increase would be more than maintained; and if the Council were able to reduce the price of the current, the increase would be undoubtedly rapid. The Committee were constantly receiving communications from all quarters of the town for a supply of electricity for lighting or heating purposes. To meet future requirements, they had made several important recommendations. First, in order to meet the increasing demand for current, they proposed to add another 250-horse power set, bringing the total up to 940-horse power. This would enable them to deal with 20,000 equivalent 8-candle lamps. The proposed new set would just fill up the remaining space in the engine-house, and the sets could be used for either lighting or traction. It was proposed to add another 400-horse power condenser, and to erect a cooling-tower. The Committee had also to deal with overloaded mains. There were two ways of doing this—one by making the mains bigger, and the other by increasing the pressure; and the Committee suggested the second course as the least expensive. It was proposed to raise the voltage from 105 to 420, and thus give every main four times its present carrying capacity. The Committee required a loan of £12,000. The report was adopted.

**Failure of the Water Supply at Bedworth.**—Bedworth, an important Warwickshire mining centre, is in danger of a water famine owing to the failure of one of the chief sources of supply. Water is now being distributed from carts. Boring operations are in progress with a view to finding a further yield.

**New Joint-Stock Companies.**—The Kimbolton Gas and Coke Company has been registered with a capital of £1500, in £1 shares, to take over the business of the present Gas Company at Kimbolton, in Huntingdonshire, and to manufacture and supply coal gas or other inflammable gas or artificial light. The Continental Incandescent Gas-Light Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with J. Boehm for the acquisition of his business relating to the sale of incandescent lighting accessories in the United Kingdom, and to carry on the business of burner, mantle, and other fittings and appliance manufacturers and merchants, &c.

**Bridlington Gas Supply.**—It is stated in Bridlington that Messrs. Whitaker Bros., the promoters of the New Spa Company, and the owners of the South Burlington Estate, intend at an early date to make application to the Board of Trade for a Provisional Order to enable them to manufacture and supply gas on the estate and sections of Hilderthorpe not covered by the Bridlington Gas Company. It is understood that the recent action of the Gas Company in declining to lay mains for the lighting of certain parts of the district at the request of the Corporation has induced Messrs. Whitaker to consider the advisability of taking the step which may lead to the erection of gas-works on the south side.

**A Gas Stoker Accidentally Suffocated.**—A short time ago, Charles Smith, 28 years of age, a stoker at the Twyford Gas-Works, was found by the Manager (Mr. T. Watson Little) sitting upon a block of wood in the retort-house, about half-past seven one morning, apparently asleep or in a faint. Closer investigation, however, revealed a condition which led to the police being informed and a medical man summoned. On his arrival, he expressed the opinion that Smith had died from suffocation; and had been dead for three or four hours. At the Coroner's inquiry, it was stated that he had been on night duty for rather more than two months, and did his work satisfactorily. The conclusion came to was that deceased had gone to sleep in the retort-house, which, although properly ventilated, was necessarily warm, and had been overpowered; but it was stated that he might have sat in the workshop, and had evidently been lying down there during the night. A verdict was returned that he met with his death through being accidentally suffocated.

**Poisoning by Gas.**—Unfortunately, another death, making the third, has resulted from the gas poisoning at Renton, in Dumbartonshire, as noticed last week (p. 1417). It may be remembered that Mrs. Follan, the wife of the man who was found dead, was removed from the house unconscious; and she never recovered. The family living in the adjoining house were seriously affected, and were for a long time in a dangerous condition. Mrs. Margaret Gillespie, residing at No. 86, Seymour Street, Shawlands, Glasgow, was found by her son last Tuesday morning sitting unconscious in a chair in the kitchen. The apartment was full of gas, and the bracket was turned on and unlighted. A medical man was summoned; but the unfortunate woman died some hours later. At Halifax, last Friday, an inquest was held on the body of Herbert William Sutcliffe, 27, a brass finisher, who was found dead in his bed on the previous day. The gas unlighted was turned on full, and the crevices of the bedroom and the chimney had been blocked up. He had left on the table a letter signed "Herbert William Sutcliffe, the outcast," in which he said he destroyed himself because no one seemed to want him. A verdict of "Suicide during temporary insanity" was returned.



## LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present the following report on the subject of the Bill they have prepared, in pursuance of the Council's instructions, to sanction the purchase, either by agreement or on arbitration terms, of the undertakings of the Metropolitan Water Companies:—

It is not necessary for us to enumerate the many questions which necessarily arise in settling the provisions of a Bill to deal with the long outstanding problem of the water supply of London; but we desire to point out that, when considering the lines upon which the Bill should be drafted, we have had due regard to the policy which has already been laid down by the Council, and also to the recommendations contained in the report of the Royal Commission on the Metropolitan Water Supply, published in January last. The Bill we present provides for the purchase by the Council, either by agreement or on arbitration terms, of the undertakings of the Companies. In the event of no agreement being arrived at, the Bill provides, as did the Bill of last year, for the appointment of an arbitrator or arbitrators, to be named by Parliament in the Bill, to determine as to the amount of the purchase-money to be paid. It appears to us that this procedure will result in the selection of some eminent person or persons, and secure that the arbitration will be carried out in a manner most efficient and satisfactory to all parties concerned.

The provision dealing with the lines upon which the arbitrators shall arrive at such amount differs from the clause in the Bill of last year in some respects. We have inserted words to provide that no allowance shall be made in respect of the compulsory purchase of the undertakings of the Companies; and, in this connection, we may remind the Council that the Royal Commission in their report (paragraph 55) say that "it would be improper for an arbitrator to give any compensation in the nature of a *solatium* of that kind." It appears to us that the clause which we have adopted substantially carries out the views expressed by the Commission with regard to the principles which should guide the arbitrators in determining the amount of the purchase-money.

With regard to the management of the water supply when purchased, the Bill provides that the Council shall appoint a Committee, which may comprise representatives of other bodies and persons not being members of the Council, and may delegate to such Committee any powers with reference to the management and administration of the supply. This is not in accordance with the decisions arrived at by the Royal Commission who recommend (paragraph 147) that a permanent Water Board should be created, constituted as follows: The Chairman and Vice-Chairman appointed by the Local Government Board; ten members appointed by the London County Council; two by the Middlesex County Council; two by the Surrey County Council; two by the Essex County Council; two by the Hertford County Council; two by the Kent County Council; four by the Thames Conservancy Board; two by the Lea Conservancy Board; and two by the West Ham Corporation. We have been unable to adopt this recommendation as affording a just representation of London on the proposed Board; and when we point out that three-fourths of the population supplied by the Companies reside in London, and that of the rateable value upon which water-rate is charged 84 per cent. is within the county, we are convinced that our view will be endorsed by the almost unanimous opinion of the Council.

With regard to the question of the severance of works and sources of supply among authorities outside London, dealt with in the report of the Commission, we have drafted the Bill so as to accord with the decision of the Commission, who report (paragraph 137) that such severance "would be very difficult and highly undesirable." The Bill, however, provides power to enable the Council and extra-Metropolitan County Councils and Local Authorities to enter into agreements whereby the Authorities of districts outside London may purchase from the Council a supply of water in bulk, and also the necessary mains, pipes, and works of distribution.

We have given instructions for copies of the Bill to be circulated to the members of the Council, and we recommend—"That the London Water (Purchase of Companies) Bill be approved; that the seal of the Council be affixed to a petition for leave to bring in the Bill; and that the Bill and petition be deposited pursuant to the Standing Orders of Parliament, with such necessary alterations (if any) in the Bill as the Parliamentary Committee may consider desirable."

The Committee will also present the following report on the Metropolitan Water Companies (Amendment of Acts) Bill:—

We have had under careful consideration the resolution of the Council on May 29 last instructing us to prepare a Bill for introduction in the next session of Parliament to provide that, in the event of a Bill being passed for the purchase of the Water Companies' undertakings before the end of 1908, the clauses in the several Acts of the Companies known as the "sterilization" clauses shall be deemed to be in operation up to that date. The effect of the sections in question is to provide that the purchase price to be paid for the undertaking or undertakings of any Company or Companies shall not be enhanced by any advantages conferred on such Company or Companies by the respective Acts in which the sections are contained, in the event of such purchase being effected within a limited period prescribed in the several Acts. The Acts in which "sterilization" sections are contained are the following: Southwark and Vauxhall Water Acts, 1884 and 1898; Staines Reservoirs Acts, 1896 and 1898; Metropolis Water Act, 1899; Lambeth Water Act, 1900; and East London Water Act, 1900. The period prescribed for the operation of the sections is seven years from the dates of the passing of the several Acts, except in the cases of the Southwark and Vauxhall Act, 1898, which prescribes ten years, and the Staines Reservoirs Act, 1898, to which is extended the section contained in the Staines Reservoirs Act, 1896, providing a period of seven years from that date. It will thus be seen that in the case of the limit of seven years in the Southwark and Vauxhall Act, 1884, the period for the operation of the section has already expired; and by reason of the fact that no purchase of the undertakings has been effected by a public body, all advantage conferred by the section has been lost. The Acts which we have mentioned above are all Private Acts, with the exception of the Metropolis Water Act, 1899, which is a public statute. We are advised that a proposal for

amending both private and public statutes by means of a single Bill would lead to technical difficulties in Parliament, and we have also borne in mind that the Act of 1899 was a measure put forward by Her Majesty's Government. It appears to us, therefore, that the Council's proposal should be limited to an amendment of the Private Acts of the Companies in which the operation of the "sterilization" sections expires before 1906—that is to say, the Staines Reservoirs Acts affecting the New River, West Middlesex, and Grand Junction Companies. By this means the Staines Acts will, so far as the matter in question is concerned, be placed in line with the Government measure of 1899, and the technical difficulty mentioned above will be avoided. We have drafted the Bill on the assumption that the Council will approve of its proposal being limited to an extension to 1906 instead of 1908, which is the year mentioned in our instruction. The limitation will also enable us to avoid any amendment of the Lambeth and East London Acts of 1900, in which the sections operate until 1907. We have given instructions for copies of the Bill to be circulated to the members of the Council, and we recommend—"That the Metropolitan Water Companies (Amendment of Acts) Bill be approved; that the seal of the Council be affixed to a petition for leave to bring in the Bill; and that the Bill and petition be deposited pursuant to the Standing Orders of Parliament, with such necessary alterations (if any) in the Bill as the Parliamentary Committee may consider desirable."

## DORKING WATER-WORKS PURCHASE.

## Action of the Company's Officials Protested Against.

On Thursday, at the Meeting of the Dorking District Council, the Clerk read a letter addressed by the Chairman (Mr. J. W. Palmer) to Mr. W. J. Down, the Secretary of the Dorking Water Company, in which the writer said he felt compelled to call the attention of the Company to the opposition to the Council's Bill, which was now being "fostered and organized." Mr. Down, he wrote, would remember that the Company obtained their 1900 Act only through the intervention of the Council. The Bill was thrown out by the Lords on the petition presented by the Council; and had not the Council then come to the assistance of the Company, the Act would not now be in existence, and the Company would be in such a grave financial position (having to expend revenue moneys for capital purposes) that the end could not have been postponed long. An important point which the Council had in view at the time it was agreed to withdraw opposition to the Bill was the inclusion of the Council's clause, which clause now formed a part of the Act, that the Company should not oppose the application of the Council for a Bill to take over the undertaking. He was led to believe that some of the Directors of the Company were doing all they could with the view of inducing the electorate to vote against the initial proceedings of the Council; and he was led to believe that some of the Company's employees were also engaged in the same work. The action being taken was, in his (the Chairman's) opinion, a distinct breach of the understanding on which the Company obtained their Act, and a mere evasion of the Council's clause in the Act; for it was impossible for the Directors or their officers to dissociate themselves from the position they held in the Company. As Chairman of the District Council, he desired to record his strong protest against such proceedings. He wished, however, to exclude the name of the Chairman of the Directors from any remarks he had made. To this, Mr. Down replied to the effect that, so far as he was aware, no opposition was being, or had been, fostered or organized by the Company or anyone connected therewith. The Chairman observed that he implicitly took Mr. Down's answer to his letter. He did not believe that Mr. Down would quibble over the interpretation of the words "fostered or organized," but he did think that, if Mr. Down took the trouble to make inquiries, he would ascertain that his (the Chairman's) statements had some foundation in fact. He thought it would be admitted that the Council, in the exercise of a public duty, pressed forward a matter which was the most important financial measure which had ever been laid before the town for its consideration. The Council had acted not only from a sense of duty, but also with great moderation and a sense of fair play; and he thought that they were entitled to the same treatment from the Water Company. They would remember that when the Bill was first printed he and another member of the Council waited upon the Directors of the Company, and formulated certain terms for the purchase of the undertaking, which terms were, in their opinion, very fair and reasonable. The Directors, however, refused to accept them. Petitions were thereupon presented against the Bill, which was thrown out. They quite realized the strength of their position when the Bill was thrown out. They realized that the Council were in a position to dictate almost any terms they chose to make to the Company; and the Directors would either have to accept those terms or lose their Bill. In the first place, the Council agreed to take over the water undertaking within three years, whereas they might have fairly stipulated for ten years. In the second place, they agreed to accept one-half of the cost of the petitions; whereas they were fully entitled to ask for the whole of the amount, inasmuch as the Directors refused to entertain a very fair and reasonable offer. They also agreed to pay 10 per cent. over and above the value of the undertaking. These were, he thought, points sufficient to show that they had behaved with every fairness to the Company. One of the points in the clause was that the Company should not oppose the Council's Purchase Bill. Mr. Down, in his letter, did not take exception to the line he (the speaker) had pointed out, that neither the Company nor their officers had a right to oppose the Council's initial proceedings. What, however, were they to think when they found that a Director of the Company led the opposition to the Bill at a public meeting? What were they to think when persons interested held before the electorate the bogey of a 9d. rate? And what were they to think when others interested were scouring the district for the purpose of inducing owners to register their votes against the Bill? He ventured to say that they had every reason to look upon this proceeding as a distinct breach of the engagement entered into between the Council and the Company, and as distinctly illegal. Assuming the Company had an entirely free hand, did they not think it playing the game rather low down to start the bogey of a 9d. rate? There were absolutely no data for such an assertion; but he believed there were good grounds for believing that, instead of the rate being increased by 9d., it would not be increased by more than 1d., after the cost of the undertaking was divided between them and the other Council interested, and would only last a comparatively brief time.



## EXTENSION OF THE LOWESTOFT WATER-WORKS.

## Arbitration Proceedings.

At the Surveyors' Institute, Westminster, last Tuesday and Wednesday, Mr. J. Green (Messrs. Weatherall and Green, Chancery Lane) sat as Umpire to assess the compensation to be paid to Colonel Stewart for lands acquired, under the Lands Clauses Act, by the Lowestoft Water and Gas Company, for the purposes of their water undertaking. Mr. F. Hornor, F.S.I., was Arbitrator, and Mr. J. A. Cripps, Q.C., and Mr. Buckmaster were Counsel for the claimant; Mr. C. W. Stephenson, F.S.I., was Arbitrator for the Company, for whom Mr. Balfour Browne, Q.C., and Mr. Honoratus Lloyd appeared. From the opening statement of Mr. Buckmaster, it appears that the land taken is 20 acres 2 roods 20 perches in extent, belonging to Colonel Stewart, the owner of the Hopton Hall Estate of about 70 acres. The estate is favourably situated 1 mile from the sea, 4 miles from Great Yarmouth, and 5 miles from Lowestoft. It was purchased by the claimant in 1887 for £3000, which was £2000 less than the previous owner had paid for it; and since he came into possession, Colonel Stewart had expended £1800 on the property. The Hall is at present let furnished to a Mrs. Abbott, for £240 a year. The present water-works of the Company are situated at the end of Fritton Broad; and the Company are authorized to take water from the Hopton River for the purposes of their undertaking. The Company have been gradually acquiring land at each side of the brook, to preserve the water from pollution. The portion of the land taken is, in the opinion of Colonel Stewart, an important part of the estate; and the loss of it will interfere much with the view from the Hall. Colonel Stewart having given evidence as to the above facts, Mr. S. M. Mills, Surveyor, of Norwich, gave a valuation amounting to £3901. This was made up of £810 for land, £50 for timber, £615 for cottage and buildings, £150 for loss of access to pastures, £250 for shooting rights, £900 for general damages and severance, and £1000 for loss of water. In cross-examination, Mr. Mills stated that the land was let at 15s. an acre, which was a fair rent for it for agricultural purposes. Mr. J. T. Bottle, Architect and Surveyor, corroborated this valuation; then Mr. E. H. Tewson, Surveyor, of London, valued the land at £2929. In his opinion, the whole estate was well worth £6800; and the value of the land taken was, to a residential owner, at least £40 an acre. Mr. Lloyd contended that the claim was exaggerated, and that the land, which was simply agricultural, was of small value; the whole estate, including the Hall, having been bought for £3000. Mr. J. C. Miles, Auctioneer and Valuer, of Great Yarmouth, fixed the amount of compensation at £1330 4s. 6d.; Mr. T. W. Gaze, of Diss, at £1318; and Mr. W. H. Elwell, Surveyor, of London, at £1337. Mr. Joseph Hawkesley, Engineer and Manager of the Water Company, said they were empowered to take the water from Hopton River. All they proposed to do was to remove the peat from the stream, to avoid contamination. This would involve no interference with Colonel Stewart's wells; and they had no intention of pumping. This concluded the evidence. Mr. Cripps replied; and the Umpire reserved his decision.

On Thursday, Mr. A. Savill presided as Umpire in a claim by Sir Saville Crossley against the same Company. Mr. Bidwell, F.S.I., was Arbitrator for the claimant; and Mr. Stephenson again represented the Company. Mr. Jelf, Q.C., and Mr. Moon appeared for Sir Saville Crossley; Mr. Balfour Browne, Q.C., and Mr. Lloyd for the Company. The claim was for the value of lands—the Decoy Farm and others—amounting to 42 acres, adjacent to the lands in the preceding case, a farm house, buildings, and timber, and for general damage to the estate, sporting rights, and loss of shelter and water. The valuation of Mr. H. Salter, of Attleborough, was £6135; Mr. Garrett Taylor, of Norwich, £5956; Mr. Kerry Rix, the Agent of the claimant, £6460; and Mr. E. Tewson, £6134. Mr. Tewson said he considered £6000 a fair and proper compensation. The estate had valuable sporting rights; and his experience was that, while agricultural rents were going down, sporting rents were increasing. Mr. Balfour Browne urged that the witnesses had greatly exaggerated the value of the land and the sporting rights. On behalf of the Company, Mr. T. W. Gaze estimated the compensation at £3140; Mr. J. C. Miles, at £2960; Mr. Notley, of Lowestoft, at £2871; and Mr. W. H. Elwell, at £3201. This, they considered, full and ample compensation. Mr. Jelf replied; and the Umpire reserved his award.

## HEANOR AND ILKESTON JOINT WATER SCHEME.

At a Special Meeting of the Ilkeston Town Council held last Tuesday, the Mayor (Mr. R. Hunt) read a letter from the Water Engineers, Messrs. Hodson, of Loughborough, pointing out the advantages of the Meerbrook Sough water scheme over other proposed sources. Local supplies were, they said, entirely out of the question. The quantity of water which could be obtained at any one or two spots was insufficient; and it was liable at any moment to abstraction by mining operations. The Meerbrook Sough water was unexceptionable, and afforded the prospect of a safe supply. The flow in the drain was from 14 to 19 million gallons daily; and as the Corporation only proposed to take 2 million gallons at the utmost, which only represented 3-horse power on a 10 feet fall, if compensation was awarded by the Parliamentary Committee it could not be unduly heavy. As for the hardness of the water, it was 22.1 as against 37.2 in the present town supply; being about the same hardness as London water. Mr. Richardson, in accordance with notice, moved—"That the Borough Surveyor be instructed to report upon and prepare an estimate of the cost of laying down throughout the borough a new and separate water service for the supply of water to be used for drinking purposes only." He said he believed it would be possible to deal with their water supply without going to the expense of a scheme of the magnitude of the one proposed, which had been rushed upon them with too much haste. He thought the two sources of supply at Kirk Hallam and Nutbrook would yield sufficient water to last the town a number of years; and the water derived from the Kirk Hallam shaft was admittedly a pure and wholesome one. Mr. Gregory seconded the motion; and Mr. Wood supported it.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1446.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.								GAS COMPANIES.							
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19-20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd.	5-5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	13-14	..	5 7 2					People's Gas & 2nd Mtg. of Chicago Bonds	102-106½	..	5 13 2
800,000	100	July 2	5	Australian 5 p.c. Deb.	101-103	..	4 17 1	500,000	100	Dec. 1	6	River Plate Ord.	10-10½	..	6 13 4
200,000	5	Nov. 14	6	Bombay, Ltd.	6-6½	..	4 12 4	851,070	10	Oct. 12	7	Do. 4 p.c. Deb.	100-102	..	3 18 5
40,000	5	"	8	Do. New, £4 paid.	4-4½	..	5 6 8	250,000	Stk.	June 28	4	San Paulo, Ltd.	11-12	..	6 13 4
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245-255	..	4 14 1	250,000	10	Sept. 28	8	Sheffield A. Ltd.	234-239	..	4 3 8
270,000	"	"	9	Do. New	177-182	..	4 18 11	185,000	Stk.	Sept. 14	10	Do. B.	232-239	..	4 3 8
50,000	"	"	5	Do. 5 p.c. Pref.	137-142	..	3 10 5	209,700	"	"	10	Do. C.	232-237	..	4 4 5
159,375	"	June 14	4	Do. 4 p.c. Deb.	116-120	..	3 6 8	447,427	"	"	10	South Metrop. 4 p.c. Ord.	131-134	+3	3 19 7
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220-230	..	4 6 11	5,641,885	Stk.	Aug. 15	5½	Do. 8 p.c. Deb.	95-98	..	3 1 3
226,320	"	"	7	Do. A. Ord. Stk.	145-155	..	4 10 4	1,520,000	"	July 12	3	Southampton Ord.	107-112	..	4 9 3
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	117-118	..	4 4 9	380,940	Stk.	Nov. 14	5	Do. 4 p.c. Deb.	117-123	..	3 5 7
420,000	20	Sept. 28	10	British	39-41	..	4 17 7	70,825	"	July 12	4	Tottenham A. 5 p.c.	112-117	..	5 2 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24-26	..	4 12 8	120,000	Stk.	Aug. 30	6	and B. 3½ p.c.	83-88	+3	5 2 3
79,000	10	"	9	Do. 7 p.c.	19-21	..	4 5 4	250,520	"	"	4½	Edmonton 4 p.c. Deb.	111-115	..	3 9 7
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8-8½	..	7 1 2	61,550	"	June 14	4	Tuscan, Ltd.	7-8	..	6 5 0
220,000	Stk.	June 14	4	Do. 4 p.c. Deb.	97-99	-1	4 0 10	182,380	10	Jan. 12	5	Do. 5 p.c. Deb. Red.	98-102	..	4 18 0
150,000	20	July 12	8½	Cagliari, Ltd.	23-25	..	6 12 0	149,900	10	July 2	5				
100,000	10	Sept. 28	6	Cape Town & Dis., Ltd.	134-144	..	5 10 4								
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53-55	..	5 9 1								
550,000	Stk.	Oct. 12	12½	Commercial Old Stock.	270-275	..	4 12 8								
296,425	"	"	9½	Do. New do.	205-210	+2½	4 12 10								
2,600,000	"	June 14	4½	Do. 4½ p.c. Deb.	133-138	..	3 5 3								
889,337	Stk.	May 31	9	Continental Union, Ltd.	175-180	..	5 0 0								
600,000	Stk.	"	7	Do. 7 p.c. Pref.	168-173	..	4 0 11								
200,000	"	"	14	Croydon A 10 p.c.	—	..	—	780,404	Stk.	June 28	11	Chelsea, Ord.	307-312	..	3 10 6
61,600	Stk.	"	11	Do. B 7 p.c.	—	..	—	150,000	"	"	5	Do. 5 p.c. Pref.	157-162	..	3 1 9
178,400	"	"	5	Crystal Palace Ord. 5 p.c.	117-122	..	4 6 1	160,000	"	"	4½	Do. 4½ p.c. Pref. 75	143-148	..	3 0 10
655,000	Stk.	Aug. 15	5½	Do. 5 p.c. Pref.	130-135	..	3 14 1	175,785	"	Sept. 28	4	Do. 4½ p.c. Deb.	148-149	..	3 0 10
60,000	"	"	5	European, Ltd.	19-20	..	5 10 0	1,720,560	Stk.	Oct. 12	7	Do. 4½ p.c. Deb.	198-198	..	3 10 8
456,090	10	July 27	11	Do. £7 10s. paid.	134-144	..	5 13 9	654,740	"	June 14	4	Do. 4½ p.c. Deb.	147-152	..	2 12 8
854,060	"	"	11	Gas 4 p.c. Ord.	97-99	..	4 8 10	797,687	"	"	3	Do. 8 p.c. Deb.	99-101	..	2 19 5
14,993,075	Stk.	Aug. 15	4½	light 3½ p.c. max.	92-94	..	3 14 6	700,000	50	June 14	8½	Grand 10 p.c. max.	110-113	..	3 10 10
8,799,735	"	"	3½	and 4 p.c. Con. Pref.	115-118	..	3 7 10	810,000	Stk.	Sept. 28	4	Junction 4 p.c. Deb.	130-135	..	2 19 3
8,998,975	"	June 14	4	Coke 3 p.c. Con. Deb.	95-97	..	3 1 10	708,000	Stk.	Aug. 30	14	Kent	303-308	+3	4 0 11
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13-14	..	5 14 4	160,000	"	"	7	Do. New, 7 p.c. max.	200-210	..	3 6 8
3,800,000	Stk.	Nov. 14	10	Imperial Continental	202-207	..	4 16 7	1,043,890	100	June 28	10½	Lambeth, 10 p.c. max.	295-300	..	3 10 0
478,600	Stk.	Aug. 15	3½	Do. 8½ p.c. Deb. Red.	100-102	..	3 8 8	406,200	100	"	8	Do. 7 p.c. max.	207-212	..	3 15 6
75,000	5	June 14	6	Malta & Medn., Ltd.	43-64	..	5 14 3	850,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb.	127-130	..	3 1 7
550,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	105-108	..	4 12 7	500,000	100	Aug. 15	14	New River, New Shares	415-420	..	3 6 2
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	104-106	..	4 4 11	1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	128-133	..	3 15 1
541,920	20	Nov. 14	3½	Monte Video, Ltd.	94-104	..	6 13 4	902,300	Stk.	June 14	7½	South. Ord.	195-200	-5	3 17 9
667,946	Stk.	Aug. 30	9½	Newcastle & Gateshead Con.	210-215	..	4 6 1	126,500	100	"	7½	wark 7½ p.c. max.	188-193	..	3 2 6
299,855	Stk.	June 28	8½	Do. 8½ p.c. Deb.	104-107	..	3 5 5	489,200	Stk.	"	5	and 5 p.c. Pref.	155-160	..	3 0 2
150,000	5	Nov. 29	8	Oriental, Ltd.	7-7½	..	5 6 8	1,019,585	"	Oct. 12	4	Vauxhall 4 p.c. A Deb.	128-133	..	3 9 0
135,000	"	"	8	Do. New, £4 10s. pd.	53-64	..	5 15 8	1,155,066	Stk.	June 14	10	West Middlesex	280-290	..	3 2 1
15,000	5	"	8	Do. do. 1879, £1 pd.	12-14	..	4 11 6	200,000	"	"	4½	Do. 4½ p.c. Deb.	140-145	..	3 2 7
								200,000	"	Sept. 14	8	Do. 5 p.c. Deb.	97-99	..	3 0 7

1 Next dividend will be at this rate.



although it was not quite in accordance with his own views. He said they had plenty of water at Kirk Hallam and Little Hallam to last twenty or thirty years, without going to the Meerbrook Sough at all, especially as they were uninformed as to the cost of carrying out the scheme. The Mayor said he believed the Council ordered the Water Committee to be appointed for the purpose of going thoroughly into the Meerbrook Sough scheme. They passed a resolution instructing them to consider the question with a view to carrying out that scheme; and he did not see why they should be engaged in the present discussion. After a great deal of debate, the resolution was put to the meeting and lost—only five votes being given in favour of it. At the monthly meeting of the Heanor District Council the next day, it was decided to sanction an agreement between the Council and the Ilkeston Corporation for carrying out a joint scheme for supplying water to the two places; any dispute arising between the parties, when constituted a Joint Board, to be referred to the County Council for settlement.

### THE USE AND WASTE OF WATER.

Our readers will have learned, from what has already appeared in the "JOURNAL" (see *ante*, p. 1036), that the Merchants' Association of New York are taking keen interest in the question of the water supply of the city. The Engineering Committee of that body, the constitution of which has already been recorded, have had presented to them, by Mr. J. R. Croes, an important report on the subject of the use and waste of water, the following extracts from which appeared in a recent number of the "Engineering Record."

The most reasonable and practical basis of computation for the amount of water used appears to be to consider the number of miles of distributing pipe in connection with the number of taps or separate connections supplying buildings. The mileage of main-pipes enters as a factor into the public use of water for street cleaning, fire protection, sewer flushing, and like purposes. Such use is governed almost entirely by the length of pipe laid, and not by the population.

There is much leakage of water underground from bad joints, breaks, and defective stoppage of disused services. There are, on the 850 miles of mains in New York, at least 18,000 old service-taps which have been brought into disuse and more or less imperfectly plugged up. Thousands of them are leaking continuously—some only a mere dribble, but others carrying off into the subsoil and into the sewers thousands of gallons daily each. If the underground channels become obstructed, the water will rise to the surface, and the leak will be reported. Every increase of pressure in the pipes augments the leakage from these old taps, and attention is called to them. The number of leaks which showed themselves, when the pressure on the mains was kept down on account of scarcity of water between 1883 and 1889, was about 700 annually. After the new aqueduct was finished, and the pressure was raised, the number reported was upwards of 1000 annually; and last year, after the full

pressure had been turned on in the lower part of the city, there were 2500 of such leaks which made themselves manifest. In the basements of buildings, and in vacant lots lying below the street, and even on the surface of the street itself, springs may be noticed by an observer every day which are caused solely by leaks in service-pipes and mains.

The mains themselves also leak largely. There are at least 500,000 joints in the main-pipes underground, and from many of them water is escaping. Indeed, instances have occurred in which the excessive amount of water encountered in the excavation of a pit in the street has been traced to a joint in a main water-pipe which had never been leaded at all by the contractor, and from which several hundred thousand gallons a day had been flowing for years into a sandy subsoil, and been carried off by the sewers. Cases of leakage are constantly occurring in which the source is traced to corroded cast-iron mains. For several years the average quantity of old pipe which has had to be taken up and replaced has been about two miles annually; but the deterioration and consequent leakage from the old pipes is progressing more rapidly than the work of replacing them. These sources of consumption of water are manifestly entirely independent of the population of the city; but they bear a definite relation to the length of pipes.

The quantity of water used for public purposes cannot be accurately measured. No effort has ever been put forth in New York to determine the amount; but in a few American and a large number of foreign cities, particularly in Germany, very careful investigations have been made, which show the average quantity of water thus used to be not far from 5 gallons a day per head of the population. As before stated, this basis of computation in the case of such a city as New York does not appear to be reasonable; for the use of water for public purposes depends more upon the length of streets in which the water is used than on the number of people who reside in those streets and in other streets unsupplied with water. From a comparison of the various records obtainable, both in America and abroad, Mr. Croes thinks a fair basis of estimation of water used for public purposes is 15,000 gallons per mile of main.

For nearly twenty years the records of the quantity of water measured by meters were in charge of the Chief Engineer; and in his reports for each year from 1880 to 1891 there was published a very valuable analysis and classification of the character of the occupation of the premises to which meters were applied, and the quantity of water used per day by each of such consumers. The larger consumers were metered first; and, as the number of metered premises increased, the average consumption through each meter decreased until 1887, since which time it has been practically a constant quantity. After 1891, the Chief Engineer was relieved of the duty of making a classification of meter records; and they have not been made, except in 1894. The quantity of water passed by the meters since that date Mr. Croes has computed from the reports of the Water Registrar, which show the number of meters and the revenue derived from them each year. It appears from these records that the daily consumption of water per metered tap since 1888, when there were 17,750 meters in use, up to the present time, when there are 36,068, has averaged 1450 gallons.

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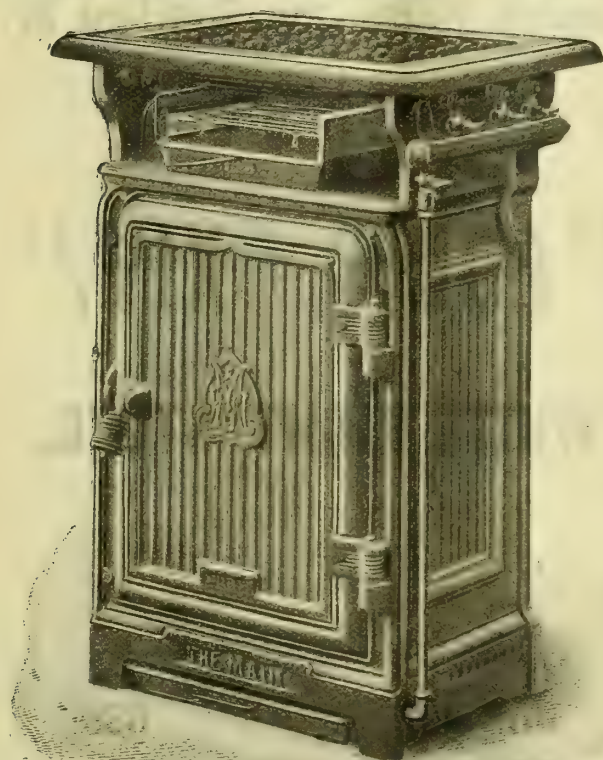
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To check the records of the Water Department as to the consumption of water by private meters, a copy of the records of the monthly readings of 600 meters on buildings of various classes in the city for the past three years was procured from Mr. J. H. Bellis, who has been engaged on the monthly inspection of metered premises by the owners for the purpose of inspecting and checking useless waste of water. A careful analysis of the records furnished by him shows the following result:—

Year.	Number of Meters.	Number of Gallons per Day per Meter.
1897 . . . . .	580 ..	1585
1898 . . . . .	584 ..	1674
1899 . . . . .	574 ..	1491

The quantity of water which passed through single meters of the 574 recorded in 1899 ranged from 64,885 gallons a day in a large manufacturing plant, to 17 gallons a day in a clothing store; but the average of all was 1491 gallons, as against the average derived from the Water Registrar's report of the revenue from 35,755 meters, which gave a consumption of 1417 gallons per meter.

With regard to water used for domestic and general purposes, it may be assumed that none of the metered water is wasted—at all events, it is accounted for, and it produces a revenue. Attempts have been made in New York to determine the proportion of the premises on which water is used in which a constant waste occurs. The difference between a liberal use of water for legitimate purposes and a parsimonious use is really very slight, on the whole. It is the constant loss of water from deliberate wastefulness or unknown defects in plumbing which causes the great difference found to exist in the consumption per house in cities where the majority of buildings are metered and those in which a few or none are furnished with these appliances. When it became evident in New York that the demand for water was increasing at such a rate that the supply would soon be exhausted, an effort to determine the proportion of buildings in which waste occurred, and to take steps to check such waste, was begun by Mr. Allan Campbell, who was then Commissioner of Public Works. In December, 1876, an inspection was made of all the houses in the city; and it was continued with more or less thoroughness for ten years by Mr. Campbell and his successor, Mr. Hubert O. Thompson. The result of the inspections made for nine years was as follows:—

Year.	Premises Inspected.	Premises on which Leaks were Found.
1877 . . . . .	106,577 ..	15,718
1878 . . . . .	55,386 ..	9,572
1879 . . . . .	46,307 ..	8,845
1880 . . . . .	18,347 ..	2,935
1881 . . . . .	19,392 ..	2,122
1882 . . . . .	24,189 ..	3,531
1883 . . . . .	15,308 ..	1,770
1884 . . . . .	19,277 ..	5,944
1885 . . . . .	47,590 ..	5,231
Total . . . . .	352,373	53,668

Leaks were found in only 15 per cent. of the premises inspected.

To determine the amount of water which ran to waste in buildings where leaks were found, inspections of the house drains leading to the sewers were made, from 1882 to 1884, with the following results:—

Year.	Drains Inspected.	Leaks Discovered.
1882 . . . . .	9,268 ..	1411
1883 . . . . .	9,893 ..	1623
1884 . . . . .	9,275 ..	939
Total . . . . .	28,436	3973

In this case, the leaks discovered amounted to 14 per cent. of the total number of drains inspected.

The quantity of water flowing out of the house drains about two o'clock in the morning was estimated in each case where it was found; and the aggregate, from the 3973 cases in which water was found running, was at the rate of 13,232,160 gallons per day, which made the average for each of the 28,436 houses examined a waste of 465 gallons per day. This was not a close gauging, but an estimate from inspection of the water running in the drain-pipes.

In Boston, during the last four years, an inspection of buildings has been carried on, with the following results:—

Year.	Houses Inspected.	Leaks Discovered.
1896 . . . . .	15,288 ..	2,635
1897 . . . . .	47,778 ..	7,652
1898 . . . . .	54,007 ..	11,051
1899 . . . . .	52,425 ..	13,440
Total . . . . .	169,498	34,728

The proportion of premises on which leaks were discovered was 20·5 per cent. In 1899, it was 25 per cent. In this case, no effort seems to have been made to determine the amount of leakage from the several premises.

It would appear from these observations that in 75 to 85 per cent. of the premises on which water is used there is practically no leakage or excessive waste of water when a systematic inspection of buildings is carried on. Continued inspection reduces the proportion of the premises on which leaks exist, but does not check waste entirely, which cannot be accomplished without putting a meter on the service-pipe and requiring the consumer to pay for all the water that passes through it under all possible conditions.

The efforts towards restraining waste of water in domestic use have been confined to reducing the amount which is wilfully wasted, by placing meters on the services of business consumers, and making them pay by measure for their water. The placing of meters on private residences is not permitted by law, or, more properly speaking, the compelling of the private consumer to pay for a meter for the water which passes through it is not authorized by the City Charter.

For several years a considerable reduction of waste from unseen and not readily discovered sources, such as leaking fittings and main-pipes, was effected by reducing the head of water in the pipes. This did not,



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as is generally supposed, diminish the quantity a consumer could use legitimately, but it did lessen the loss by leakage, and so increased the amount available for actual use.

It was by a skilful application of the reduction of head that the supply of necessary water was kept up for the whole city during the years from 1883 to 1890, while the new aqueduct was being built. The gates at the reservoirs and the stopcocks in the mains were partly closed, so that just enough water would pass through them and into the several districts of different elevations to rise not higher than the first or the second storey of the houses. The deterioration of the pipes kept on increasing with little or no effort to stop it, and defective plumbing was not repaired except when it caused inconvenience to the occupant of the house. The increasing loss from invisible leaks was overcome by lowering the pressure on the pipes.

Then in July, 1890, the water from the new aqueduct was turned on, the throttled gates and stopcocks were opened, and the full pressure from the water in the reservoirs was turned on the pipes. The head on the mains increased from 20 to 25 feet; and the result was an immediate enormous increase in the consumption of water. In the first half of 1890, the consumption was about 105 million gallons a day; in 1891, 153 million gallons were used; and by 1895, the quantity had increased to 180 million gallons. Additional leading mains from the reservoir to the lower portions of the city were laid, and the increase during the next year was 20 million gallons a day. In 1897 and 1898, the laying of a line of large mains enabled the head of water in the lower part of the city to be increased still more; and the consumption advanced to 226 million gallons a day in 1898, and 246 millions in 1899. That this was not due to an increase in the actual quantity of water taken by consumers is shown by the fact that the water used by 25 per cent. of them was measured during the entire period from 1889 to 1899, and the rate was not materially, if at all, increased. There were 19,040 consumers taking water through meters in 1889; and the average use of water by them was 1428 gallons per day each. In 1899 there were 35,755 consumers taking water by meter; and they used 1417 gallons a day each. There is no reason to suppose that the average actual use of water by consumers of any class augmented materially during that period of ten years. The number of unmetered consumers rose about 40 per cent.; but the quantity of water furnished to them which disappeared somewhere increased 160 per cent. Dividing the total unmeasured water by the number of unmetered taps, the daily rate increased from 907 gallons a day in 1889 to 2248 gallons in 1899. It is not unreasonable to say that it was impossible that 75 per cent. of the water-takers doubled their use in about seven years, when it was proved that the remaining 25 per cent. taking water under the same conditions, except as to measurement of the supply, did not appreciably increase their use of water. If the higher pressure had increased the legitimate employment of water in the metered buildings, it would have shown in the records of the measured supply. That it did not do so, but merely increased the waste from orifices either undiscovered or left open by design, is clearly established by the fact that where such orifices did not exist the use of water did not increase.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A discussion took place in the Dundee Town Council this week upon the quality of the coal supplied to the gas-works, in which, to my mind, expressions were used which were decidedly strong. It was originated by Mr. High, who said the report of the Analyst showed that in three of their contracts the quality of the coal was about 3-candle power less than that contracted for. They had a loss on each ton of 2s. 8½d.; and the loss for the month on the 6000 tons supplied was about £53. The Gas Commissioners carbonized about 66,000 tons of coal; and this represented a loss of £600 a year. The quality of the coal was not nearly so bad as during the previous month. He suggested that the contractors should implement their bargain; and, failing this, the contract should be at once stopped, and the Commission should buy in the open market against the defaulting contractors. He thought it was very unfair to other offerers to accept coal of 16-candle power when they contracted for coal of 19-candle power. Mr. Quirk asked the Clerk who were the contractors who had not been supplying coal up to the standard. Sir Thomas Thornton said he did not think names should be given in public, lest an action for damages might be raised against the Council. They were not entitled to publish the names of parties unless they were satisfied their statement against them was correct. Bailie Barrie moved that, if the coals were not up to contract in future, no more notice be given to contractors, but that coals be bought against them in the open market. Mr. Henderson seconded, remarking that it was astonishing that for all these years the Gas Commissioners had been allowing themselves to be taken advantage of. Ex-Provost Brownlee suggested that the defaulting contractors be struck off the list. Bailie Barrie's motion was unanimously agreed to, as was ex-Provost Brownlee's recommendation. Bailie Stevenson said it had to be remembered that again and again their Analyst had reported to them that they had got a better quality of coal than had been contracted for. This latter remark is, at best, only an extenuating circumstance. Any deficiency in quality is not necessarily wiped out by the fact that sometimes the quality was over the standard. I think that Mr. High did not go beyond his province in stating his case. But I take exception, as the Town Clerk did, to the proposal to publish the names of the contractors complained of; to Mr. Henderson's assumption that the Council had been allowing themselves to be taken advantage of for years; and to the proposal (which was agreed to) to strike defaulters off the list of contractors.

The Corporation of Aberdeen, on Monday, considered a report by the Gas Committee upon the demands of the gas-works employees, which I gave last week. Mr. Kemp, the Convener, said the Committee had every desire to look at the situation in a reasonable way; but they considered the demand was unreasonable. The men were emphatic in that they must have their whole demands; and as the Committee could not face this, they recommended that they be declined altogether. The increases of wages asked for would amount, in some cases, to 7s. a week. They had in the gas-works 73 men who had been in their employ for periods ranging

# JOSEPH AIRD

## GREAT-BRIDGE.

### STAFFORDSHIRE.

# TUBES

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from 10 to 48 years, and they had winter men who had been coming back to them for from 15 to 35 years; so it did not appear that they had been working the men like slaves. No better proof could be obtained of the men's own opinion of, and satisfaction with, the conditions of labour in the gas-works. Every morning they had a crowd of men at the gas-works gate, asking to be taken on—artisans of all classes, men capable of earning high rates of pay, willing to work as labourers, and pleading to be employed. There was seldom a week in which he was not waited upon by about a dozen men, asking to be taken on at the gas-works. In the face of all this, the Committee felt that the application was most inopportune, and that it would be unfair to the gas consumers to grant the demands of the men. That the matter be referred back to the Committee, with instructions almost that they grant the men's demands, was moved by Mr. Johnston, the former Convener of the Committee, who, as I have pointed out before, seems to be unable to see any good in the work of his successor. Mr. Johnston is a labour leader. Another who rose from the ranks of labour is Treasurer Bisset. He supported the Committee, upon the ground, among others, that if the Council had money to spare upon labour, he would prefer, instead of giving it to the select few inside the gas-works, to give it to those who were outside, and who could get nothing to do. On a vote, only 4 agreed with Mr. Johnston, and 23 supported Mr. Kemp. The recommendation of the Committee was thus adopted. In the course of the discussion, Mr. Boddie (a particular friend of mine) made use of an expression which was interpreted to mean that the application of the men was a "put-up job." This gave rise to much bitter comment by those who favoured the men. How does the matter stand? On the resolution of the Council becoming known, the officials of the Union telegraphed to Glasgow asking Mr. Blackwood, the Secretary of the Scottish Branch of the Union, to come to Aberdeen at once, as the men did not intend to take further steps with regard to the wages dispute till they had directions from headquarters. So it is said; but the other view is open—and, indeed, is the more feasible—that the officials of the Union wanted Mr. Blackwood in order that he might assist them in keeping the "pot boiling." Mr. Blackwood arrived in Aberdeen on Thursday, and addressed a meeting in the evening. No definite course of action was decided on; but it was resolved to hold a meeting the next day, at which, it was said, "the men would arrange what further steps would be taken in the matter." This meeting was held yesterday; and at it a deputation was appointed to wait on the Gas Committee and lay their demands before them. It is not, it is said, the wish of the men to strike; but they desire that some concessions should be granted. I think that this looks very much like a business engineered from the outside, and that it has collapsed.

While this has been going on in Aberdeen, it is stated that, on account of a recent strike at the Phoenix Tube-Works in Glasgow having been authorized by the Scottish Branch of the same Union, Mr. Blackwood has been asked to resign his post; and that he is about to proceed to London to endeavour to vindicate his position before the Executive of the Union. Mr. Blackwood seems to be in a tight place. If it be the case that he has been asked to resign, the incident shows, once more, there are no greater tyrants in the shape of employers than Trades Unionists.

It has taken a long time to reach the point when any except a few could form an opinion as to the best site for the new Corporation gas-works at Falkirk. There are two sites proposed—one at Parkhouse, where the wire-rope guided gasholder is; and the other at Thornhill, to the north of the burgh. There have been muttered objections to the Parkhouse site, on the grounds that it would give bad foundations for buildings, and that it was too small. The latter did not appear to be an insuperable obstacle—particularly when placed against the fact that the Corporation, before the erection of the gasholder some years ago, purchased the ground. It looked unbusinesslike to purchase a second site, unless there were some good cause for doing so. The nature of the site might be a good reason; but its nature was not known to many, until this week. The publication of it should at once put an end to any attempt to have the new gas-works erected at Parkhouse. Where there is, in some places, soft sand and moss going down to a depth of 8 or 9 feet, and below that, as far as a depth of 20 feet, there is only sand and gravel, it is manifest that to build a gas-works there would entail an extra cost which would go far to procure another site. This leaves out of account the continual outlays upon upkeep which would be necessary in such a place, and which, when taken into account, would make the Parkhouse site the more costly of the two. It must have been a misapplied intelligence which advised the purchase of the land at Parkhouse. I can conceive a reason why there should have been hesitation to publish the results of bores of the site, because the knowledge of the nature of the ground will make it difficult for the Corporation to re-sell it, should they so desire. But if this were so, they must be unreasonable men who would not have accepted the information in a private way, and so prevented the exposure of the weakness of the site. The reports as to the nature of the ground at Thornhill were altogether satisfactory. These reports were obtained by the Commissioners in November, 1899, and January, 1900; and the Commissioners have also had before them since November, 1899, a joint report by Mr. J. McGilchrist, of Dumbarton, and Mr. J. Kincaid, the Manager at Falkirk, upon the question, in which they condemned the Parkhouse site, and expressed their approval of the Thornhill or another site, should the bores prove satisfactory. According to them, in addition to the other drawbacks to the Parkhouse site, if the works were planted there it would require a sum of £3000 to satisfactorily couple them up with the town mains. How, with this information accessible, there should have been any desire to see the Parkhouse site adopted, I cannot understand. The publication of the reports of the Engineers and of the borers should soon put an end to all delays, and allow the new works to be gone on with at Thornhill. At a meeting of the Commissioners on Monday, a discussion took place upon the pressure of the gas supplied; and the explanation given was that it was not so much that the works could not produce gas, as that the purifying plant was not sufficient. In such a matter as this, of course, nothing can be done, as there is no rough-and-ready method of extemporizing purifier plant; and the general conclusion which was come to was that the sooner the new gas-works were gone on with the better.

Another attempt to deal with the question of the opening of streets

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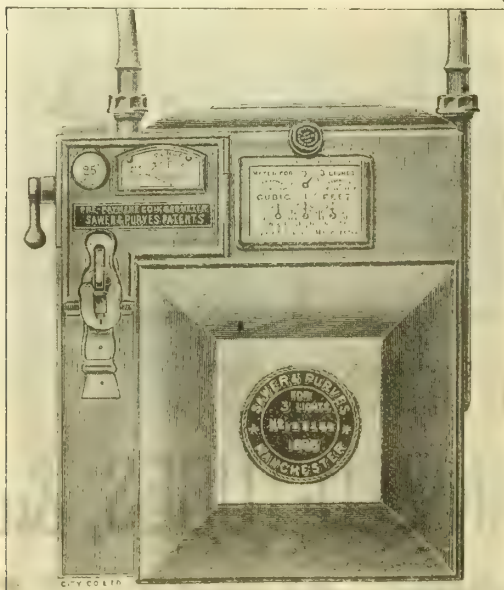
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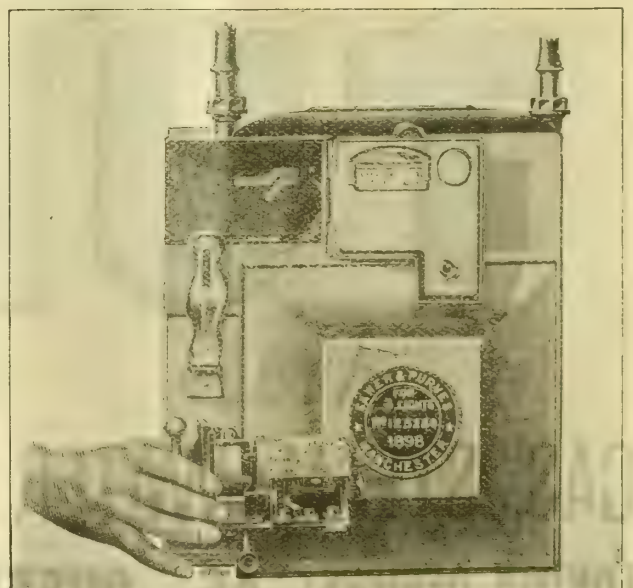
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falls to be recorded. This time it was in Glasgow. The mover was Bailie D. M. Stevenson, whose proposal was that the heads of the Gas, Water, and Electricity Departments, as also the Master of Works, be directed to prepare and submit to the Corporation a return showing the cost of opening and restoring the streets for public purposes within the last ten years—differentiating, as far as possible, between the actual cost of opening and closing, and that of lifting and relaying pipes or other conveniences. This was submitted to the Corporation on Thursday. A discussion followed upon it, in which it was pointed out that such a return would entail enormous labour on the officials, and in the end would be of no value. Bailie Stevenson then accepted a motion to the effect that the subject be remitted to the various Committees for consideration; and this was adopted by a majority of one, as against the previous question. I fear the remit will be the last of the movement. The opening of streets in towns is one of those things which, like muddy roads in the country, although a great inconvenience, must be endured.

A memorandum on the proposal of the Corporation of Glasgow to assess landlords and tenants equally for the lighting of common stairs has been prepared by the Directors of the Glasgow Landlords' Association. In this document, it is pointed out that the proposal amounts to saddling the owners with an annual payment of at least £36,000, as against £3500 at present; and while apparently relieving the tenant of one-half of the £71,000 odd which he presently pays, yet, as the money will almost certainly be spent in other directions, in reality imposing an additional new tax upon him also. It proceeds to argue that, as such lighting ought not to fall upon the landlords, the proposal is to revolutionize the law of taxation. The memorialists intend to oppose the passing of the proposed Provisional Order.

The difficulty about the lighting of Cowdenbeath still continues. A meeting was held between representatives of the old Gas Company and of the proposed new Company, at which the former stipulated that they get £500 stock of the new Company for their plant. This was refused; and subsequently the Secretary to the new Company wrote to the Secretary to the old Company offering £200 if the old Company would consent to stand aside, but not as a purchase-price. This offer is under consideration; but in the meantime, a third Company have started, who, it is said, have made an offer to the Burgh Commissioners, which is being considered by the Commissioners.

Mr. A. Wilson, Manager of the Dawsholm Gas-Works of the Glasgow Corporation, writes (under date of the 6th inst.): "Permit me to call your attention to the paragraph in your 'Notes from Scotland' of this week, relating to testing of incandescent burners, &c., at Dawsholm, and to say there is no truth in the report."

The shipment of tar from Archangel rose from 63,783 barrels in 1898 to 89,310 in 1899, while that of pitch fell from 15,742 to 12,461 barrels. The weight of last year's export of both articles is given as 699,251 poods (about 11,278 tons), and the value as 399,447 roubles (£42,047). This once flourishing branch of Archangel trade is fast declining.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 8.

**Sulphate of Ammonia.**—Again the week opened with a quiet market, and prices declined about 1s. 3d. per ton. But later there was a recovery; and the closing quotations are £10 13s. 9d. to £10 17s. 6d. per ton, delivered f.o.b. at the ports. Scotland has been the best market, there being considerable requirements to be covered, and the improvement elsewhere has been mainly consequent upon this. Shipments during November, however, show a considerable decline as compared with those for November, 1899; but supplies do not appear too plentiful, although all production seems to be offered everywhere as it becomes available. There continues to be large inquiry for the spring months; but makers stick to their quotation of £11 7s. 6d. per ton, and speculators appear nervous about selling short. On the other hand, buyers will not pay the premium required; and their purchasing has consequently been mainly for January delivery, at £11 to £11 2s. 6d. per ton.

**Nitrate of Soda** is firm at 8s. 3d. to 8s. 6d. per cwt., according to quality, on spot. Ahead, there has not been much doing; but on the part of holders there is no disposition to give way.

LONDON, Dec. 8.

**Tar Products.**—The position and prospects of business, generally speaking, is unsatisfactory. Creosote is quoted lower, and difficult to place. Pitch is also quoted lower, although very little new business is being done at the decreased values mentioned; makers being largely sold. Benzol is moderately steady; but the advance in price which was expected has not come so far. Anthracene continues unsaleable; and lower prices are being paid for tar contracts.

Quotations during the week are: Tar, 15s. to 20s. Pitch, east coast, 33s. 6d.; west coast, 30s. Benzol, 90's, 10d. to 1s.; 50's, 1s. 1d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 2½d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 90s.; salts, 50s. to 70s. Anthracene, nominal, "A," 3½d.; "B," 2d.

**Sulphate of Ammonia** shows no change; but stocks and production are well taken up. The average value in all positions is about £10 15s. per ton, less 3½ per cent.

Half the members who were present at the last meeting of the Pickering District Council (four out of eight) are shareholders in the local Gas and Water Company; and this led to some difficulty when Mr. Thomas Frank introduced the question as to whether the Council should approach the Company, with a view to purchasing their works. The Clerk told Mr. Frank that, being a shareholder, he was not entitled to vote on the matter. Mr. R. W. Frank (a nephew) said he did not want to throw cold water on the proposal; but he understood that the Company were not inclined to sell. Being asked to move a resolution, Mr. R. W. Frank said: Well, as my uncle is interested and cannot vote, I move that we approach the Company, to ascertain if they will sell the undertaking. There was, however, no seconder to the resolution; but it is likely to be brought forward again at a later meeting of the Council.



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**COAL TRADE REPORTS.**

From Our Own Correspondents.

**Lancashire Coal Trade.**—Although a great deal of caution is just now being shown by large users with reference to entering into forward contracts of any weight, and there is a very considerable business of this description at present being held in abeyance, a generally steady position is being maintained throughout the coal trade of this district. Collieries are not at all pressing sellers, nor disposed to offer any very material concession upon current rates for forward deliveries. The general impression, however, is that prices have touched the top; and among large users there is a disposition to go on buying from hand to mouth, rather than contract over any extended period at the prices coalowners are asking. In the better qualities, there is not more than a moderate business doing for house-fire purposes; but nothing of any weight is going down into stock. Prices are exceedingly firm at the full list basis of 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Common round coals, notwithstanding the undoubted great depression throughout the iron trade, are still moving away fairly well for steam and forge purposes; and supplies are not at all excessive upon the market. From 12s. 6d. to 13s. per ton at the pit remain about the average figures. Of engine fuel, supplies continue plentiful from outside districts; but local collieries have no surplus output that they are pushing for sale, and are firm in holding to 10s. to 10s. 6d. per ton at the pit as their quoted rates for the better descriptions of slack. Negotiations are, however, going on for one or two very important contracts for next year, at a substantial reduction upon current rates. Shipping remains quiet; and it is only in exceptional cases where more than about 15s. 3d. to 15s. 6d. per ton is being obtained for steam coal, delivered at the ports on the Mersey. Furnace coals continue weak, and can be bought at about 14s. to 15s. at the ovens. Foundry qualities remain at an average of 28s. to 30s. at the ovens.

**Northern Coal Trade.**—The coal trade has shown a slight further falling off this week; and the tendency is still towards ease, though at the lower prices rather more orders are coming into the market. The open weather, however, limits the consumption of coals in several ways. Best Northumbrian steam coals are quoted at from 14s. 6d. to 15s. per ton f.o.b.; second-class steams are about 9d. lower; and steam smalls are from 7s. 9d. to 8s. The collieries have so far full work; but there is a difficulty in obtaining forward orders, unless at some concession in price. In gas coal, the deliveries are now at about the highest point of the year; but the supply is abundant, and there is therefore a rather lower price quoted for occasional cargoes—from 13s. 6d. to 14s. per ton f.o.b., for best Durham gas coals. Best Durham coke is 21s. to 23s. per ton f.o.b.; and blast-furnace coke is down to £1 per ton, at the Teesside furnaces. The price of gas coke shows no change; but in a short time new contracts for next year will more exactly determine the values. The present large output is fairly well taken up.

**Scotch Coal Trade.**—The old complaint about the scarcity of railway waggons is being put forward to account for broken time at some collieries. When railway waggons get scarce, the reason is not that the Railway

Companies restrict the supply, but that the coalowners fill them and cannot get them emptied. That is the case now. The demand has eased off so much that coal is getting plentiful. More ominous still is the fact that ironmasters are shutting down their furnaces. Coal has, since October, come down in price from 4s. to 5s. per ton. The rates quoted are: Main 13s. to 13s. 3d. per ton f.o.b. Glasgow, ell 13s. 6d. to 14s. 6d., and splint 14s. to 14s. 6d. The shipments for the week amounted to 183,202 tons—a decrease of 16,082 tons upon the previous week, and of 20,064 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,082,480 tons—an increase of 978,442 tons upon the same period of last year.

**Additional Water Supply for Keswick.**—On Monday last week, the first turf was cut in the Fitz Park, Keswick, in connection with the additional water scheme promoted by the Urban District Council. In the presence of the members and officials of the Council and friends, the ceremony was performed by Miss Philipson, daughter of the Chairman, Mr. William Philipson. The scheme will provide an ample supply for the district, and ensure a service being laid to the higher elevations in the added area.

**Carlisle Gas Committee Decide on Water Gas.**—The Gas Committee of the Carlisle Corporation held their monthly meeting last Wednesday, Mr. Coulthard, in the absence of Mr. Corbett, presiding. The question of the proposed gas-works extensions was considered, and a motion was submitted by Mr. Scott in favour of an installation on the present site of carburetted water-gas plant to produce 600,000 cubic feet of gas per day, as suggested by Mr. Corbet Woodall (*ante*, p. 965). On being put to the meeting the voting was even. The Chairman then gave his casting vote for the motion, and declared it carried. A suggestion was made in the course of the discussion which took place that plant to manufacture 300,000 cubic feet of carburetted water gas per day would be sufficient. No proposal was made for the removal of the gas-works to Kingmoor, or for the adoption of any large scheme of coal-gas manufacture at the present time.

**Welsbach Lighting in St. Andrew's Cathedral, Singapore.**—The following paragraph appeared in the "Straits Times" for the 15th ult., which reached us yesterday: "Reference was made at St. Andrew's Cathedral last Sunday evening by the Rev. D. Holland-Stubbs, at the close of the sermon, to the debt outstanding for the cost of re-lighting the cathedral; and an appeal was made for funds to pay off the small balance. We understand the estimate for the new Welsbach light amounted to \$1550, all of which has now been raised by donations and offertories. The new light is a decided improvement upon the old system—in fact, everything that could be desired—and we hear that the cost per month for maintenance, gas, and mantles, is only a trifle over one-third of the cost of the former light; so that while the light has been materially increased, the expenses have been considerably reduced. By a strange coincidence, the hymn at the close was 'Hail! Gladdening Light.' It raised quite an audible smile."

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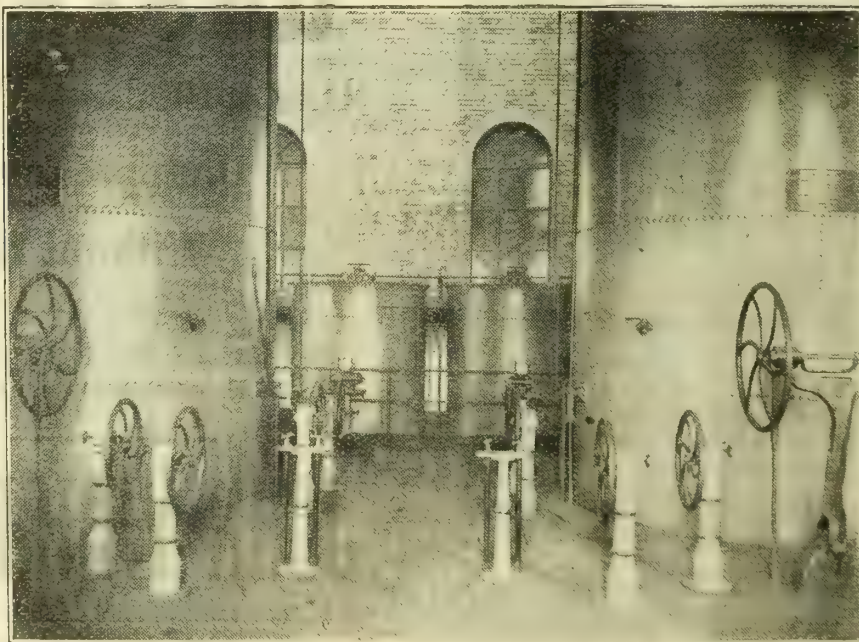
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this Company, is 10 MILLION CUBIC FEET.



**Opposition to the Mond Gas Scheme.**—At the meeting of the Oldbury District Council last Friday, the Clerk (Mr. W. Shakespeare) reported that he had received notice from the Mond Gas Company of their intention to apply to Parliament for power to supply gas within certain areas, which included a number of boroughs and urban districts. The Company, he explained, were asking for power to acquire 30 acres of land at Smethwick for the purpose of erecting works for the manufacture of gas from rubbish and other waste materials; and, if established, the Company would compete with the gas undertaking of the Council and also with their electric lighting scheme. It was decided to oppose the Bill; and the Clerk was instructed to take the necessary proceedings.

**Newport (I. W.) Water Supply.**—At the meeting of the Newport (Isle of Wight) Town Council last Tuesday, the Water Committee reported that Mr. E. T. Hildred had discussed with them the question of the construction of a new reservoir, and the supply and laying of mains, &c. He favoured the erection of a reservoir first, and the laying of the mains, &c., subsequently, as opportunity afforded. Mr. Hildred was prepared to get out the quantities for the reservoir at 2 per cent., and for the mains free of cost. The Committee recommended that tenders be invited for the construction of the reservoir, that Mr. Hildred be employed to get out quantities on the terms mentioned, and that he give no order for work outside the contract exceeding £50 without consulting the Council. The Chairman of the Committee (Mr. Rich) moved the adoption of the report, and dwelt upon the existing need for the reservoir. Mr. Salter opposed the proposition, and moved, as an amendment, that Mr. Hildred be asked to prepare plans for a reservoir of 400,000 gallons capacity only. A discussion ensued; but, in the end, the amendment was supported by the mover only, and the motion was carried.

**Progress of the Birmingham Corporation Water Scheme.**—At the meeting of the Birmingham City Council last Tuesday, Alderman Lawley Parker brought up the report of the Water Committee already noticed (*ante*, p. 1411), and in moving its approval said that during the half year ending in September about half-a-million gallons less water per day had been used than in the corresponding period of last year. They might congratulate themselves on having got through the summer extremely well—very much better, in fact, than in the years 1898 and 1899, although there was an estimated increase in the population of something like 20,000 a year, and 5000 houses had been built during each year. It was to be hoped the remaining years would be equally favourable in respect to the weather and the forbearance and consideration shown by the ratepayers in not wasting the water. He reviewed the progress which had been made in the Elan Valley portion of the scheme since the visit of the Council in June, and said that in regard to the laying of the mains from Frankley to the city a good deal of work remained to be done; but it would be systematically and quickly accomplished, so as to interfere with the convenience of the inhabitants as little as possible. The report was approved.

**Sales of Stocks and Shares.**—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold, by order of the Directors, £5000 of new ordinary stock of the Southend Gas Company, ranking for a standard

dividend of 5 per cent., the last declared on similar stock having been at the rate of 5½ per cent. per annum. It was put up in 50 lots, and was disposed of as follows: 5 at £105 10s., 36 at £106, 4 at £106 10s., and 5 at £107. A new issue of £10 "B" shares in the Crays Gas Company (last dividend £4 18s. per cent.) was placed at prices ranging from £10 to £10 10s. per share. Some original £10 "A" shares in the Harrow and Stanmore Gas Company (last dividend 8 per cent.), fetched £14 15s. each; and a few £10 fully-paid 6 per cent. guaranteed shares, £14 10s. apiece, *cum div.* On the same day, Mr. W. E. R. Randall disposed of several "B" (10 per cent.) shares of £10 each in the Sheppey Gas Company at £20 10s. each; and two "C" (7 per cent.) shares, of like nominal value, at £15 per share. On Wednesday, Mr. Frank Amos submitted £2500 new "A" and "B" stock of the Canterbury Gas and Water Company, for sale in £10 lots. Thirteen of them fetched £22 each, and the rest £21 15s. and £21 10s. apiece. On Monday last week, Mr. Henry Escritt sold £4000 of new consolidated ordinary 5 per cent. stock of the Grantham Gas Company in £1 lots, which fetched 23s. each. Messrs. Griffiths and Chennell have lately disposed of £450 of consolidated stock of the Newmarket Gas Company (last dividend 6½ per cent.) at from £81 to £82 per £50 lot. Last Tuesday, Mr. J. H. Cooper, jun., sold some 6 per cent. preference shares of £20 each in the Gravesend and Milton Water-Works Company at from £35 to £35 10s. each.

**Village Water Supplies and Water-Rates.**—Local Government Board inquiries were held last week at two places in the St. Germans Union to determine the reasonable cost of furnishing a supply of water to houses in the villages. The first was at Millbrook, a village largely occupied by workmen at the Devonport Dockyard. It was stated that about half the houses used water from the public supply, and the Rural District Council proposed that these should be charged a rate equal to 7½ per cent. on the rateable value. The proposal was resisted by the Parish Council, who contended that the supply was insufficient owing partly to the defective state of the reservoir, which one of the witnesses described as like a birdcage. Many of the villagers who now took the public supply would, it was asserted, cut the water off if a rate were charged. The second inquiry was in respect to the rate to be charged for the supply to houses at Down-derry, a little holiday resort on the south coast of Cornwall. The rateable value of the houses in the village is only £742 per annum; while the cost of the water supply, which has been provided by the St. Germans District Council, is expected to reach £2000. The Council suggested that the charge to houses in the village should be 7½ or 10 per cent. of the rateable value. A charge of 7½ per cent. upon the whole of the houses would yield £55 per annum, while the interest and sinking fund on the loan would amount to £100. Mr. E. P. Burd said the Local Government Board expected that people should pay for water just as they paid for bread. It was explained that the District Council thought the village would grow, and they did not want to prevent this growth by excessive rates. Complaint was made by ratepayers in St. Germans village that the supply to that part of the district was wholly inadequate. They had no objection to help Down-derry if their own wants received attention. The Inspector said this was a matter for the Council, but formal complaint could be made to the Local Government Board.

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**Southwark and Vauxhall Water Company.**—The report of the Directors for the six months ending Sept. 30 states that the number of new domestic supplies taken into charge during the half year was 928, estimated to produce an increased annual rental from this source alone of £1780. In addition, the income derived from meter supplies and other sources shows a satisfactory increase on the corresponding period of past years. The Directors recommend the declaration of a dividend at the rate of 5 per cent. per annum on the preference stock, and 7 per cent. per annum on the ordinary stock and class "D" shares of the Company.

The buildings and plant of the Bervie Gas Company were sold by auction last Wednesday at the upset price of £150.

The Workington Corporation have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for twelve beds, consisting of 96 retorts, with regenerative furnaces and ironwork complete.

The arbitration between the Glastonbury Corporation and the Gas Company on the price to be paid for the undertaking of the latter has been postponed till next month, and consequently the transfer will not take place till March.

The Gas and General Illuminating Exhibition which Mr. T. G. S. Hersey has organized at the Drill Hall, Bristol (see *ante*, p. 1290) has proved so successful that, instead of closing on the 6th inst., as originally intended, it will remain open till the 8th prox.

The electric lighting and tramways undertakings of the Cardiff Corporation have been combined, and placed under the supervision of Mr. Arthur Ellis, the Tramway Engineer to the Corporation. Mr. Appelbee, the Electrical Engineer, is leaving Cardiff.

In view of the report that their Electrical Engineer (Mr. W. A. Chamen) had been offered by one of the largest electricity supply companies in London a position as Chief Engineer, at a salary of £1250 per annum, with a share of the profits of the undertaking, the Glasgow Corporation have increased his salary to £1000 a year from Jan. 1.

The Gravesend and Northfleet Tradesmen's Association strongly object to the paragraph in the notice for the Gravesend and Milton Gas Company's Bill by which it is proposed to alter the illuminating power of the gas from 16 to 14 candles; and at a large meeting last Thursday, the members of the Association decided to request the Town Council to oppose the clause.

**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office not later than **TWELVE O'CLOCK NOON ON MONDAY**, to ensure insertion in the following day's issue.

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## EDITORIAL NOTES.

## The Government, the London County Council, and the London Gas and Water Companies.

THE results of the General Election and the new Government appointments will prove eminently satisfactory to the country, if the first promise of the Administration as regards domestic legislation is borne out. Short as the emergency session of Parliament was, it was quite long enough for the new President of the Local Government Board (Mr. Long) to receive a deputation from the London County Council, and to seize the opportunity—which came as a surprise—for making a most statesmanlike utterance respecting the intention of the present Government to deal with the weary London Water Question. At length we have a Government strong enough to take a distinct line pointing to the final settlement of this difficulty, and also bold enough to sketch out a plan for doing so in the spirit of justice to all parties. That Mr. Long's announcement to this effect is capable of being described by the Progressive newspapers as a "severe snub" to the London County Council, only serves to show how widely the present majority of this egregious body have departed from the fair and equitable principles which should have governed their action in the matter. We notice that the same newspapers are hoping that the results of the County Council elections in March will enable the present majority to persist in their arrogant and unfair policy; but all that is "on the knees of the gods." If London deals as faithfully by the County Council as it did with its old parliamentary representatives and the Progressive candidates for the Borough Councils, the tyranny of the present majority of vain and impracticable faddists will soon be ended. We deal elsewhere with the exclusively water aspect of the experience of the deputation. Here we desire to comment only upon the general bearing of Mr. Long's explicit statement of policy.

For, as "The Times" very aptly remarks, the arrogant water policy of the majority of the London County Council is only part of a much wider question, which is that of the aspirations of this body to be an *imperium in imperio*, dominating every interest in the region extending from the Cotswolds to the North Sea. Its peculiar line of policy in regard to the water supply has been pushed beyond the bounds of reason and fairness, and supported by a journalistic campaign of which the notorious Dr. Leyds need not have been at all ashamed. By every means available for influencing Metropolitan public opinion, the London County Council have urged their point, not merely that the water supply of London ought to be transferred from private ownership to public control, but further that the Council ought to have this control, and that it would be vastly to the interest of the public and the Metropolitan ratepayers that this should be so. With the object of carrying their point, the Council stopped at nothing that offered a chance of depreciating the value of the Water Companies' property. They placed every available obstacle in the way of the Companies' endeavours to perform their duty to the public by providing ample reservoir accommodation, and then turned round and abused their victims when the natural result followed. On the top of this, the Council vamped up, at enormous expense, a scheme for bringing water to London from Wales, which had no other object than that of prejudicing the future prospects of the Water Companies. Finally, they asked Parliament to sanction their buying out the Companies upon special terms, differing seriously, to the proprietors' detriment, from anything that Provincial Municipalities had had to pay for the same class of property.

In the face of all this, the Progressive Press keeps asking why London—meaning the County Council—should be deprived of the privileges enjoyed in regard to the public ownership of the water and gas supplies by the Municipalities of Birmingham and elsewhere. They are particularly careful not to tell the public that this is the very thing the County Council do not want. This is how the oracle is sought to be worked by the County Council-inspired Press. A London newspaper had the following luminous passage, after a glowing account of what was done for Birmingham under the Chamberlain dynasty: "When will London rise to its great opportunities, and turn its monopolies into 'revenue?' Here is the great work ready for the hand of 'the London statesman. The gas and water monopolies—which Birmingham bought up 25 years since—still grow



"rich at the rate of £2,500,000 a year by scantily supplying London with the first necessities (?) of its daily life. If "somebody would do as much for London with these two "monopolies only, the revenue would more than pay the "School Board rate, would pay off the debt of the County "Council in eight years, or would relieve the ratepayer by "four shillings in every pound he pays." Of course, this fervid Progressive forgot that in this wicked world most things, even a fancy bonus of £2,500,000 a year, have to be paid for. Neither did he suspect that, supposing his figures to be correct, and that the Gas and Water Companies have this trade profit to sell, it might not be worth buying, from the ratepayers' point of view.

The London County Council—or rather its scatter-brained majority of "unbusinesslike nonentities"—have learnt by experience, and lavish expenditure of the ratepayers' money, that Parliament is not in the least likely to give this body peculiar advantages for the purchase of statutory undertakings which Municipal Corporations and Local Authorities all over the country have never enjoyed. It has been a hard lesson to learn; but at last it has got home to the Progressive intelligence. The County Council have gone the length of offering to buy the Water Companies out upon fair terms; and there is no reason to suppose that the proprietors of these undertakings would raise any objection to such treatment. The obstacle in the way of this proceeding had come from an independent quarter. The report of the Royal Commission which recommended the expropriation of the Water Companies also declared against the London County Council being made the Water Authority, and more than hinted that the financial operation involved would not prove immediately beneficial to the ratepayers. This is as much as to say that, while for political, and what may almost be called sentimental, reasons it is desirable that the water supply of the Metropolitan area, which is much larger than the district of the London County Council, should not remain in private hands, the same reasons must be esteemed of sufficient weight to overbalance the immediate financial loss which will probably be shown on the face of the operations for transferring the property. And in order that the conversion of the supply into a public one shall be thorough, the authority to take it over must be representative of the entire area—not of any portion, however important, which might be governed in the administration by sectional considerations.

This, then, is the Government view, which is regarded as a snub to the County Council. Its deference to the recommendations of the Royal Commission is as loyal as its regard for the local interests concerned is fair and reasonable. There is the financial question, for instance. The Progressive newspaper view is that the transfer will sensibly benefit the consumers, or the ratepayers, or both; and there is no evidence that the present majority of the County Council, who are pressing purchase as a very urgent matter, have any reasonable convictions upon the point. They do not seem to know or care anything about it. On the other hand, the recently-formed Metropolitan Borough Corporations are greatly interested in this part of the question of purchase; and the Government are going to allow them a year to make up their minds on the subject. Why should these independent authorities be put out of court at the bidding of a County Council in a great and unnecessary hurry? They know full well that, if the Council were to have their own way, the latter would also take all the honour and whatever profit there might be going, and leave anybody else to pay the piper.

Necessarily, the gas would follow the water. Not that there is the smallest real political or economical advantage to be assigned to the municipalization of the London gas undertakings; but an excuse for an agitation to this end would not be wanting at the first fitting opportunity. Here, again, a suitable public authority might have the gas property, at a fair price; but there is no more demand for a London Gas Commission, on the part of the London County Council, than there is for a Water Commission in the same quarter. The public-spirited gentlemen who pull the wires of the County Council want to put their own fingers into the pie. Municipalization, as a general principle, has no charms for them, if they are not to be the municipalizers. They probably do not, in their honest hearts, believe that the job will be worth doing by anybody else than themselves. Is this true Municipalism? Not at all; it is Megalomania. And when it is seen who are

the patients most susceptible to this disease of local body-politics—when it is observed to pass over the large employers of labour, the bankers, the men of great affairs, high standing, and sound experience, and to rage most furiously among the small fry of Social Democracy and official Trade Unionism—then, indeed, is there found reason for thankfulness that the ultimate decision on these matters rests with cooler-headed legislators.

#### The Labour Outlook.

THE memorandum just issued by the Board of Trade, upon the state of the skilled labour market in November, confirms all other indications of the slackening of pace in the industrial world. The percentage of persons reported as unemployed in the industries making returns to the Labour Department, was, during the month of November, 3·2, as against 2·2 in the same period last year. An addition of one per cent. of the industrial population to the number of persons seeking employment must, if sustained for any length of time, necessarily have an ultimate effect upon the present upward tendency of wages. The falling off is most noteworthy in the metal industries. At the works of the 117 pig-iron makers covered by the returns, 341 furnaces were in blast at the end of November, as compared with 344 at the end of October, and 377 a year ago. At 204 iron and steel works, employing 80,000 workmen, the total volume of employment (taking into account both the numbers employed and the number of shifts worked) has decreased 1·6 per cent. as compared with October, and 6·5 per cent. from the level of November, 1899. In the tinplate trade, the number of mills in work has declined from 411 this time last year to 356 at present. The percentage of unemployed has likewise materially increased in the engineering, shipbuilding, and general building trades.

This decline in the activity of trade has been attended, as there has always been reason to fear that it would be, by an increase in labour troubles. Forty-eight fresh disputes, involving 18,099 workpeople, occurred last month. In November, 1899, there were only 31 reported, and they concerned 9707 workers. There is, indeed, too much cause to anticipate a considerable growth of labour difficulties in the future. The strike of the mineral guards on the North-Eastern Railway, because they consider that their particular fancies should be deemed of more importance than the expedition of the business of the Company, and the sympathy with their action shown by their fellow-servants, are fair indications of the spirit that is abroad among the men. The dislocation of business involved by such a strike appears to be considered as a matter of no importance whatever by the men concerned. Even granting, for the sake of argument, that the altered regulations made by the Railway Company constitute a real grievance, and will not serve their desired purpose, is it not a scandal that the guards affected should, without making any combined protest to the authorities, without taking any step to lay their case before the Directors—without, in fact, doing anything that reasonable men with a grievance would do—have simply struck work at a moment's notice, and thrown the whole business, not only of their employers but of the collieries of the North and that of their customers, into confusion?

Mr. Richard Bell, M.P., has gone to the scene of trouble, with a view, we are told, to inducing the men to resume work. Our fear is that, if he finds they remain obdurate, he will in the end take up their cause, as he took up that of the Taff Vale men, of whose action his Society were supposed to have disapproved. Certainly, Mr. Bell's latest reported utterances on the subject of the relations between capital and labour do not justify one in looking upon him as possessed of pacific intentions. In a recent interview with the representative of a contemporary, he remarked that there was a seething spirit of discontent among the working classes generally, and among railway servants in particular. Strikes for higher wages were being threatened all round. "The labourer," he said, "is not a political economist; he wants a living wage, and means to have it, and does not trouble himself where it comes from. I am afraid there is a big fight before us, and to my mind the only solution is a gigantic labour combination to enforce a living wage."

This is just on the old lines that lead to bitter and costly struggles; and their parallel is unfortunately to be found in the policy announced by the leaders of the coal miners, in Wales and other Federation districts. At the meeting



of the Joint Sliding-Scale Committee held on the 30th ult., at which the representatives of the owners declined to agree with the men's proposal for joint action in the matter of controlling output in order to bolster up prices, "Mabon" declared that, whether the owners agreed or not, the men were resolved to pursue their policy of limiting production, as they "were determined that their wages should be protected, and a minimum appointed on a permanent level." When, however, they, or any other labour leaders, are asked to define this "living" or "minimum" wage, no answer is to be obtained. They would never be able to agree among themselves upon an answer, even if they tried. But that is a minor matter which does not trouble Mr. Bell. The labourer is not a political economist, he says, and he evidently does not mean to try and teach the labourer the futility of ignoring the hard facts of which political economy is the scientific exposition. The labourer does not trouble himself as to where his "living wage" is to come from; "he means to get it," that is all—and Mr. Bell does not think it his business to explain to the labourer that one cannot get a quart out of a pint pot. 'Tis a sorry business, and these wide-awake leaders of the blind will have a heavy account to meet some day. Meanwhile, our foreign rivals in trade rejoice.

#### "Where Doctors Disagree —."

REVERTING to the subject of gas-oil prices, as to which Mr. A. G. Glasgow's letter of last week was sufficiently optimistic to gratify the natural human liking for good news, we have an obligation to discharge to another "doctor" belonging to the faculty of petroleum—Dr. Paul Dvorkovitz, at present Editor of the "Petroleum Review." Those who remember the earliest meetings of the Institution of Gas Engineers, will preserve the recollection of Dr. Dvorkovitz's contribution to the "Transactions" of the Institution for 1892. He ought to be a good authority on most aspects of the petroleum question, including that of gas-oil prices. We noticed, therefore, with satisfaction that he reproduced, without criticizing, our first observations on this subject, which appeared in these columns on Oct. 9. With respect to our denunciation of oil "cornering," on Nov. 20, Dr. Dvorkovitz protests in his own journal that the charge is baseless in regard to Solar distillate, the advanced price of which, he contends, is the normal economic effect of the increased demand for this commodity for gas making in the United Kingdom. He also claims, with justice, that he predicted this consequence publicly at the Institution meeting in 1892. The reference can be easily verified.

Our observations of the 20th ult., however, were not particularly restricted, as Dr. Dvorkovitz seems to have imagined, to the market price of Solar distillate. We wrote of "gas-oil" in general, and only mentioned Solar oil once, as selling at 3½d. per gallon in 1891. This figure was taken as an indication of the then market value of all oils suitable for gas making. That same year, Mr. Lane assured the members of the Institution that there was every likelihood of the future oil supply being so large that the tendency of prices would be downward. He, too, was no bad prophet; because he also told his audience that they might even get refined lamp-oil at prices which gas manufacturers could afford to pay. This, we all know, actually came to pass within a very few years. All this goes to show that neither in the past nor at present is the business interest of the gas maker in oil limited to the Solar brand of the commodity. The pinch of the actual situation is that every kind of gas-oil has been raised in price, simply because of the dearness of coal; thus disappointing the chief hope of those gas managers who had expected different things. We allege that this simultaneous advance of the prices of all brands of gas-oil betrays the existence of a power of control over prices, or at least a common understanding among oil sellers, practically amounting to "cornering." This argument is not shaken by Dr. Dvorkovitz's claim that the advance is quite natural in the case of Solar oil. Neither is it vitiated by Mr. Glasgow's prophecy of a "good time coming," when gas-oil will be dear at 3½d. per gallon. Most people believe that coal will be down at the old rates, or nearly so, within a period which is well inside the limits of ordinary business prevision and arrangement. If, therefore, oil falls about the same time, the circumstance will neither explain nor excuse the forced rise of the last two years.

In the current number of his journal, Dr. Dvorkovitz returns to the subject, vastly encouraged by what he understood of Mr. Dibdin's paper at the Society of Chemical

Industry, which leads him to urge that "it is the duty of all those who have the welfare of the petroleum industry at heart to let these experiments be as widely known as possible." Evidently, Dr. Dvorkovitz thinks that the paper was not written in the interest of the gas industry. In parentheses, it is worth recording that another view of Mr. Dibdin's lucubration has lately been expressed by the "Ironmonger," which has acquired from it the notion "that if the gas companies obtain power to reduce their gas from 16-candle power to 14-candle power, the consumer will pay nearly double for his light." Dr. Dvorkovitz will be disappointed in this witness, who goes on to state that "water gas, which is being largely used by the London Gas Companies, is said to be detrimental to health and pocket." To return to the "Petroleum Review," it now considers the British carburetted water-gas manufacturer first in the light of a consumer of Solar distillate, and quickly finds, as might be supposed, that there is an enormous discrepancy between the rated output of the known manufacturing plants and the actual purchases of Solar oil by the undertakings owning them. The curious result upon Dr. Dvorkovitz's mind of this sufficiently easy discovery is to elicit from him a groan over the perversity of the gas manufacturers in having selected the Lowe type of carburetted water-gas plant, because it works, in preference to his own experimental apparatus of 1892, which, so far as we know, is nowhere in use.

This is not business; but there is worse to come. Dr. Dvorkovitz indulges in the following reflections, inspired by a smattering of Dibdin: "Experience has shown that to enrich gas by 1-candle power does not cost more than ½d. per candle per 1000 cubic feet. This means that if the gas companies were desirous of supplying the most economical gas—that is, one of 19-candle power—to the consumer, they would have to expend only 2½d. per 1000 cubic feet, and the consumer would gain, if he profited in a like proportion to that of the South Metropolitan Gas Company, 2s. per 1000 cubic feet, or if in a manner similar to the Gaslight and Coke Company, who manufacture a 16-candle gas, he would, by spending an additional 1½d., have a net gain of 11d." The "JOURNAL" does not issue a Christmas Number, supplying riddles and other seasonable amusements for the family circle; but this ingenious passage from Dr. Dvorkovitz enables us to be reasonably "Christmassy" without quitting the field of gas technics. Dr. Dvorkovitz, however, is not joking. On the contrary, he is in deadly earnest. He sees in the advent of low-power gas a heavy blow to the Solar distillate trade. He implores his friends in the oil trade to move gas companies and consumers to hold fast to a high standard of illuminating power—19 candles, for choice; but the higher the better—in order that the trade of the future in gas-oils may be brisker than ever. "If all the gas companies in the United Kingdom could be induced to adopt a 19-candle power gas, or even higher, as their standard, the quantity of petroleum products required to supply this increased candle power would be equal to more than one million tons of Solar oil per annum." This settles it. After such a luminous exposition of the whole duty of gas companies, their future policy cannot remain doubtful for a moment.

#### More about "Mond Gas."

AN interesting paper on "Power-Gas" and its use for large gas-engines was read on Friday before the Institution of Mechanical Engineers, by Mr. H. A. Humphrey, of Northwich, who is already known as the author of a paper on "Mond Gas" contributed to the Institution of Civil Engineers. An abstract of the paper and a condensed report of the opening of the discussion will be found in another column. It seems to carry one far from the stage marked only a very few years since by Mr. Dugald Clerk, when he was obliged to confess that the "large" gas-engine, in the correct meaning of the term, did not exist. Naturally, the assumption underlying the author's statements is that "Mond Gas" is the best kind of power-gas for use with large units. Indeed, it is the only make of the article that Mr. Humphrey cared to talk about—a particularism which Mr. Emerson Dowson and others may be pardoned for not sharing. The amount of information bearing on the general subject which Mr. Humphrey did not include in his paper and its appendices is both voluminous and important. It must, however, be supplied by others. Still, it is open to be said that if the author meant only to talk "Mond Gas," he might have said so in the title of his communication,



which is too general for the class of paper that this composition turned out to be. So far as it goes, the contribution is likely to prove useful to students of the subject; provided that its limitations are kept before the mind.

#### The Ethics of Municipal Trading.

ALTHOUGH Progressive ideas as to what is legitimate in municipal trading are apt to be wanting in definiteness and altered to suit the circumstances of the moment, the doctrine that a corporation has a right to undersell its competitors is sufficiently novel to call for passing notice. That right is just now claimed for the Plymouth Corporation; and the significant fact is that it is not sought to establish it against outside competitors, but against some of its own ratepayers. Carried to its logical conclusion, this means that a corporation may use the money drawn from the general body of ratepayers to crush out of existence individual ratepayers competing with it in any business in which it may choose to engage. It is the tyranny of the American Trusts, *plus* the fact that the money of the victim is used to his own undoing. Circumstances have, it seems, made the Corporation of Plymouth owners of an estate upon which limestone quarries exist. On part of the land the municipal electricity works have been built. These works are to be enlarged; and some excavation is going on in order to level the site and prepare for the foundations of the building. The stone being got out is sold to a firm of builders. At a meeting of the Council last week, some questions were asked as to the price obtained for the stone, which is alleged to be worth 1s. 7d. per load. It was elicited that the figure at which the material is sold is 8d. per load; but it was contended that the stone is only ballast, used by the builder for making concrete, and of quite inferior quality to the building stone sold at 1s. 7d. by other quarry owners. The Chairman of the Electricity Committee (upon whom the immediate responsibility lay) admitted, however, that the question of the market price had never been considered. The Committee had to get rid of the stone to clear the site, and were, he argued, wise in fixing a price at which this could readily be done.

Considerable newspaper controversy has followed upon the discussion. In the course of it, the position that the stone sold at 8d. per ton is worth only that sum has been virtually abandoned; and in place of it there is set up the theory that it is to the interest of the ratepayers in general that the site should be cleared, and that if the ratepayers who own quarries are injured at all in the process, this is a misfortune to which they must submit. Owners of quarries are in any case a small minority; and if the question of market price is to enter into the municipal calculations, it must not be forgotten that the market price is virtually regulated by a monopolist clique. This contention is, of course, absurd, because there are bricks and other stone which can be used for building, and by which the price of the local limestone must necessarily be regulated.

But the most remarkable argument is that advanced by the Chairman of the Land Committee, which is primarily responsible for fixing the price at which the stone is sold. "It may," says this gentleman, "be open to the ratepayers 'to complain that the electricity works are costing too much; but I do not consider any quarry owner (as such) has a right to complain. If he is being undersold, let him 'buy at the fixed price and resell at a higher.' The fact that the Corporation command a very large supply of stone, which apparently anyone may have at the price, robs this argument of any force it might possess. But the principle that a Corporation may use its almost unlimited resources to 'crowd out' a competitor who may not choose to buy up the Corporation's stock, is positively immoral. One thing said by the Chairman of the Land Committee is, however, worth attention. It is that, if stone which is worth 1s. 7d. is being sold for 8d., then for every ton of stone removed 11d. should be added to the cost of the electricity works. We hope he may get it.

#### House of Lords' Judgments under the Workmen's Compensation Act.

THE House of Lords has been engaged in deciding appeals under the Workmen's Compensation Act; and it is remarkable that all their Lordships' decisions have so far been in favour of the claimant, and most of them reversals of the judgments of the Court of Appeal. Of course, these pronouncements have almost invariably been accompanied by denunciations of the drafting of the Act; even the Lord Chancellor permitting himself the admission that the Act presents difficulties of language and construction, and that

words have been used which very possibly are not the best chosen for the solution of the problem that lay before the Legislature. Complaints of this kind do not come well from members of the legislative body itself. If the wording of any particular Act is really bad, in the sense of being unintelligible, confused, or ungrammatical, why did the strong gang of lawyers in both Houses allow it to pass? We venture to think most of the difficulty that the Courts have found in interpreting the Act is due to the colloquial language in which it is couched—in this respect conforming to the new fashion in law-making which has frequently been noted, both by lawyers and laymen, with approval. This simplification of the language of Acts of Parliament, while it permits the lay reader to flatter himself that he understands the law, has its pitfalls and makes its own difficulties, especially for the Lower Courts, which have to be guided by old cases. It is clearly easier for the House of Lords to interpret the Act in agreement with its spirit, than for a County Court Judge to discriminate between the ordinary and the legal meaning of its wording.

The cases in question illustrate this observation. In *Hoddinott v. Newton, Chambers, and Co., Limited*, the dispute was as to whether a job of strengthening a building comes under the classification "construction," or "repairs," mentioned in the Act; and also over the meaning of the term "scaffolding." The ultimate decision is that strengthening or altering a building is "construction" within the meaning of the Act; and that the term "scaffolding" is to be broadly interpreted. It should be noted, however, that their Lordships carefully refrained from defining the word; explicitly stating that the facts must be considered in any case. In *Stuart v. Nixon and Bruce*, the issue was as to the basis upon which compensation is to be computed. The Act speaks only of weekly earnings, whereas in this case the claimant had only been continuously employed for four days before the accident happened. It had been held by the Courts below that, as the man had never earned any weekly money, there was nothing to go upon in assessing compensation; and consequently that the claim could not be entertained. This view has now been overruled; their Lordships holding that the right to compensation is coincident with the employment. In *Stuart v. Nixon*, payment of compensation was refused on the ground that the injury was sustained after the claimant had finished the kind of work actually specified in the Factory Acts, and while doing something else of an ancillary character. It was held that necessary, incidental, and consequential operations in connection with work conferring a statutory claim are covered by the nature of the latter. Difficulties of definition must arise from time to time in respect to all laws; and they are certainly not more common in regard to the operation of the Workmen's Compensation Act than of any other law, human or divine.

Mr. G. H. Hill, M.Inst.C.E., has been appointed Arbitrator on behalf of the Exmouth District Council to determine the consideration to be given and the terms on which the undertaking of the Water Company shall be purchased.

A correspondent, referring to the paragraph in last week's issue announcing that Mr. Livesey had joined the Board of the Commercial Gas Company, speaks of it as an "interesting incident." It should, he proceeds, "be of happy augury for both the South Metropolitan and the Commercial Companies. Anything that tends to bring the Metropolitan Companies into closer union and harmony of action and policy is welcome. Would that the greatest of them could also be drawn within some such bond!"

We learn from "The Times" that the Committee who have in hand the colossal work, referred to in the "JOURNAL" last week, of cataloguing all the scientific literature of the world have just had two meetings at which the object, scope, and organization, as defined by successive conferences held during the last four years, were brought into their final form, and all arrangements were completed for the definitive commencement of the work on the 1st prox. One or all of these conferences have been attended by representatives of the following countries: Austria, Canada, Cape Colony, Denmark, France, Germany, Greece, Holland, Hungary, India, Italy, Japan, Mexico, Natal, New Zealand, New South Wales, Norway, Queensland, Sweden, Switzerland, the United Kingdom, the United States, Western Australia, South Australia, Victoria, and Portugal, whose adhesion to, and co-operation in, the work may therefore be regarded as assured. The catalogue will at first be issued in annual volumes; but its form and rate of production will necessarily be governed to a great extent by financial considerations. As already mentioned, the responsibility for publication and for the initial expenditure is undertaken by the Royal Society; and the central office will be in London.



## WATER AND SANITARY AFFAIRS.

No one who has followed the Metropolitan Water Question through its various phases during the past few years will, we think, be disposed to underrate the importance of the events of the past week in this connection. At their ordinary weekly meeting on Tuesday, the London County Council obtained formal sanction to the promotion of the two Bills of which they had given notice—one being for the purchase of the undertakings of the Water Companies, and the other to provide that, in the event of this taking place before the year 1906, what are now generally known as the "sterilization" clauses in certain Acts of the Companies shall be deemed to be in operation up to that date. The scope of both measures had been set out in the reports of the Parliamentary Committee given in the "JOURNAL" last week; and though some important changes were made in the Purchase Bill, as compared with the one introduced in the past session, and rejected, it still contained sufficient defects to ensure for it the fate of its predecessor. The Committee flattered themselves that they had carried out the intentions of the Royal Commission in proposing that no compensation in the way of a *solatium* should be given to the Companies for compulsory purchase. True, the Commissioners thought the deprivation of an owner of water shares of his property was not a case justifying compensation, and that, in fact, it would be "improper" for an arbitrator to give it; but they were careful to add that he might "justly award something beyond the bare value of 'both present and prospective income, if any,' derivable from the undertaking represented by those shares. This being so, it may be questioned whether this clause of the Bill could be justly said, as the Committee claimed that it did, to substantially carry out the views expressed by the Commissioners with regard to the principles which should guide the arbitrators in determining the amount of the purchase-money. This, however, was not the chief point at issue, but the question of who was to be the purchaser. The Commission said most distinctly that the undertakings were to be acquired by a specially constituted Board or Trust; and the Committee were unable to accept the proposed constitution of that body, on which they would have one-third of the members, as affording London a just representation. Consequently, in their Bill they provided for the appointment by the Council of a Committee, to consist of members of their own body and outsiders. With regard to the severance of the works and sources, the Committee agreed with the Commission that this would be "very difficult and highly undesirable," and suggested the supply of water in bulk to the outlying authorities, and the sale of the mains and pipes to enable the purchasers to distribute it.

In the course of the discussion last Tuesday, Mr. Whitmore told the Council plainly that if, buoyed up by "the flowers of post-prandial rhetoric," they entertained the vain hope that their Bill would be accepted by the Government, that hope would be dashed to the ground. This prediction was verified to the letter within only two days. Pursuant to a resolution previously come to, a deputation from the Council waited upon the new President of the Local Government Board—Mr. Walter Long—on Thursday, to ask him to support their Bill. Bearing in mind the recent encouraging remarks of the Home Secretary to which reference was made by Mr. Whitmore, and possibly counting upon the President, owing to his recent appointment, not being closely posted up on the subject, they doubtless expected to find some evidence of the "more sympathetic policy" on the part of the Government to which the "Builder" alluded last week. But they were most cruelly deceived. Mr. Long, although but young at the Board, happily had a predecessor who had left behind him a perfectly clear exposition of the views of the Government on the water question—viz., that the purchasing authority must not be the County Council, but a statutory body constituted on the lines laid down in the report of the Royal Commission. From this position Mr. Long did not know that there was any justification for departing. Moreover, there were other parties to be considered. The new Borough Councils might be desirous of communicating their views on the subject to the Board or the Council. The President admitted that the Bill was an improvement upon the former one; but, nevertheless, he told the deputation frankly that if he were appealed to when it came on for second reading, he should feel it to be his duty to advise

the House to reject it, for the reason, among others, that he himself hoped to deal with the question by legislation—not next session, but in that of 1902. He would not pledge himself to details; but he went so far as to inform the deputation that in the framing of the purchase clause of the Bill the Government will be guided by the principle that it must be based upon what they conceive to be "fair and reasonable to all who are bought out." Here is a clear and straightforward declaration of policy; and it was no more than was to be expected. It was absurd to suppose, as we have pointed out again and again, that the Government would sanction any measure so utterly opposed to the recommendations of their own Commission as that brought forward by the Council. Mr. Long's announcement sounded its death-knell; and we should scarcely think they would have the temerity to risk the ignominy of witnessing its summary rejection by the House. Far better would it be to consign it at once to the waste-paper basket; or, if it must be preserved as another example of the Council's "wrong-headedness" on the London Water Question, let it be pigeon-holed with the Welsh scheme, which they have discreetly decided to keep in abeyance.

As far as that scheme is concerned, we venture to think it may be safely stowed away among the archives of the Council for the next twenty or thirty years; for serious consideration of the advisability of going to Wales for an auxiliary supply of water may, we are assured, be safely deferred for that period. Of course, as the Royal Commission acknowledged, there is something attractive in a scheme for bringing water from the Welsh mountains for the supply of London; and the successful execution of so gigantic a project would undoubtedly confer considerable *kudos* upon the engineer entrusted with carrying it out. They also acknowledged that there is much to be said in favour of procuring some supplementary source of pure water for the use of London. But is it imperatively necessary to spend £14,000,000 (a low estimate) in going to Wales for it, when there are unexhausted stores of water at our very doors? That is the point. The Royal Commission thought not; their opinion being that the supplies to be obtained from the watersheds of the Thames and Lea will be sufficient in quantity to supply London for "many years to come," and that, given effective conservancy of the rivers, and adequate treatment of the raw water, "the wholesomeness of the supply could be maintained." This being their view, they came to the conclusion that to neglect to utilize these sources of supply for the future, and incur the far larger expenditure involved by the Welsh scheme, would not only needlessly aggravate the financial difficulties which must attend the purchase of the water undertakings, but also "throw an unnecessary burden on the present and next generation of water consumers and ratepayers, and their immediate successors." Why should this heavy burden be put upon them when, as Mr. R. E. Middleton, who was engaged upon Lord Balfour's Commission of 1892-3, clearly showed in the valuable paper he read at the Surveyors' Institution on Monday last week (which we greatly regret to be unable to give in the present issue), we have enough water in our immediate vicinity to last for the next sixty years, supposing the population at that date should have reached 19,500,000. It will be sufficient, he said—and he spoke with authority—when we number 15,000,000, and the population is still growing, to ask ourselves whether London does or does not require any addition to its water supply which cannot be afforded by an extension of the existing works.

The practical *quietus* given to the Purchase Bill of the London County Council by the President of the Local Government Board will allow the Water Companies to have a little peace, and the effect will be to reduce their law and parliamentary charges. The extent of the economy resulting from a suspension of hostilities may be estimated from some remarks made by Sir Henry E. Knight when presiding at the meeting of the Southwark and Vauxhall Water Company last Tuesday. He told the shareholders that in the half year ending the 30th of September their expenses of management had been £1120 less than in the corresponding six months of 1899, owing entirely to the Company having been left alone. Of course, they had to pay more for their coal—about £4000; and the rates and taxes were £500 heavier. As the East London Company were in the fortunate position of not requiring assistance, not a penny of income was received from them, instead of a round £13,000 before. On the whole, the Company were



not able to show quite so much profit as in the corresponding half of last year; and they judiciously declared a dividend at the rate of 7 instead of  $7\frac{1}{2}$  per cent. Sir Henry strongly condemned the action of the London County Council in bringing forward their Purchase Bill when it had no chance of passing; and he spoke approvingly of the intercommunication scheme. While this will facilitate the furnishing of auxiliary supplies, the Companies are husbanding their resources by endeavouring to reduce consumption by checking waste. They have agreed upon a form of regulations which will in all probability receive the approval of the Local Government Board. At the half-yearly meeting of the Grand Junction Company on Wednesday, the Chairman (Mr. F. Tendron) also alluded to the intercommunication scheme, and stated that it would cost about £650,000, and impose upon the Companies collectively a charge of £20,000 a year, for which he thought they should receive credit from the consumers. The bulk of the Chairman's address had reference to the Company's connection with the Staines reservoirs scheme, which has given rise to some financial problems that can only be solved by a friendly suit. Of course, the proceedings did not close without some criticism of the London County Council; but it was mild in comparison with that which was passed upon that pertinacious body next day at Whitehall. The shareholders separated in the possession of good dividends, and left behind an augmented balance of undivided profits.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1536.)

THE Stock Exchange has had a quiet week, but not a bad one on the whole, taking all things into consideration. And the tendency was tolerably consistent and durable, so that markets were exempt from those disagreeable fluctuations which harass both investor and speculator. In all departments there was an improvement in prices, which was most conspicuous in the American Market. The gilt-edged division showed out to the least advantage, owing chiefly to the state of money. The general quietude was promoted by its being account week; but the settlement was not a heavy or formidable affair. The Money Market perceptibly tightened. A good Stock Exchange demand was easily met by an abundant supply; but discount rates hardened till the chances of a rise in the Bank rate on Thursday were discussed. Happily there was no change; and it is to be hoped that there will be none for the rest of the Nineteenth Century. In the Gas Market there was a marked increase of activity as compared with the preceding week; and the tendency was decidedly good. Several changes were made in quotations; and all were for the better. In Gaslight issues, the ordinary was quite active, and steadily advanced from  $97\frac{1}{4}$  on the opening day to 99 on Friday, which was the best of the week. The secured issues, too, were in good favour, especially the debenture. South Metropolitan was quiet and steady. For some reason or other, the quotation was opened out to a 5 per cent. range, which is undesirable, and should be unnecessary. Commercial were quiet, but both issues had a nice advance. The Suburban and Provincial group was quiet and strong. Brentford, Brighton, and Tottenham advanced. The Continental Companies were quiet and unchanged. Among the remoter undertakings, there was nothing to call for remark. In Water, the general tendency was firm, and a few quotations rose a little. The declaration of Mr. Long to the London County Council deputation came in good season, and well disposes of the amazingly indiscreet utterance that Mr. Ritchie allowed himself to make a fortnight ago.

The daily operations were: Business in Gas was moderately brisk on Monday, Tuesday, and Wednesday; prices remaining unchanged. In Water, West Middlesex debenture rose 1 on Monday, and East London debenture 1 on Tuesday. Gas began to rise on Thursday; Commercial old gaining 3, and Buenos Ayres  $\frac{1}{4}$ . Friday was active, and stronger still. Brighton rose  $2\frac{1}{2}$ , Commercial new and Tottenham "B" 2 each, and Gaslight ordinary and Brentford preference 1 each. Saturday was firm, and unchanged.

### ELECTRIC LIGHTING MEMORANDA.

Mr. W. Langdon on the Application of Electric Traction to Main Railway Lines—Nature of the Problem—Possible Consequences of its Solution—A Case for Gas Power.

A VERY noteworthy paper on the prospective supersession of the steam by the electric locomotive was recently read by Mr. W. Langdon, an electrician on the Midland Railway staff, before the Institution of Electrical Engineers. It is a striking sign of the times that such a paper should be written at all by a responsible person. It has often been shown in these columns that the

common pretension of electricians interested in traction business, that their progress in this regard has been hampered by legislative restrictions, is only partly justified. The railway service of the country has always been open to them; but as yet not a mile of full-gauge railway has been conquered exclusively by the electric locomotive. One of the chief drawbacks to effective progress in this regard has been the desperate attempts of certain electrical interests to secure proprietary rights over the new branch of business; and only the other day we had occasion to denounce an impudent pretension of this order, which was nevertheless supported by some well-known names. It cannot be too widely known that there is no exclusive property in any of the mechanical appliances necessary for the working of electric traction on any scale. The British market is completely open to this trade; and if electric traction could be proved to be expedient for any British railway, the necessary statutory powers would be granted for straightway making the substitution—provided, of course, that the interests of the proprietors of the line and of the public are not imperilled.

Mr. Langdon performed a useful service to the cause of science by registering as the datum for the new departure the actual cost of steam haulage over the section of the Midland Railway extending from Bedford to London. Mr. S. W. Johnson, the Locomotive Engineer to the Company, is responsible for this information, which was originally published in this gentleman's Presidential Address to the Mechanical Engineers in 1898. It appears that the cost of steam locomotion, including running expenditure and loco repairs and renewals, averaged over 24 years, is just under 9d. per train-mile. This figure does not include interest on the cost of the loco stock or buildings. The problem for electrical engineers is to beat this showing on equal terms. Mr. Langdon did not succeed in doing this—as, indeed, was hardly to be expected, seeing that all his electrical data were necessarily hypothetical. In his hands, there came out of the comparison an apparent saving, with electrical traction, of nearly 2d. per train-mile. This mounts up to £260,000 a year, which would, of course, bring electric traction in with a rush, if the figures could be trusted. Here is the weakness. Stripped of all technicalities, it comes down to the question whether stationary power generators can be relied upon to prove so much more economical in working than itinerant generators—to wit, locomotives—having regard to the transmission losses inevitable with the one, and the wasted running and stand-by coal consumption unavoidable with the other. The balance of expert opinion was that Mr. Langdon had been unduly kind to electricity in the getting up of his hypothetical case.

Yet the case for electric traction, subject to all proper and reasonable corrections, is not a bad one. For one thing, it has to be borne in mind that the working capacity of the heaviest lines of railway, with steam locomotion, is already taxed to the utmost. There is a limit to the power that can be got out of the locomotives; and this restricts the speed of the trains. Unpunctuality, also, is increased by the same cause. At the other extreme of the scale, the working of branch and district lines is very unsatisfactory under the present system; for if there is only one truck or coach to go, there must be an engine to haul it. The chief consideration that emerges from this initial opening-up of the general question at the instance of Mr. Langdon, is that the supersession of the steam locomotive by electric traction means far more than the mere substitution of one way of burning up coal for another. It might, and probably would, work a radical change in the actual system of railway working. Instead of heavy trains running at long intervals, during which the permanent way and all its accessories are doing nothing, there will be nothing to prevent the incessant dispatch of as many light trains as may be wanted. It has only to be shown that electric traction actually compares favourably with steam locomotion, upon a basis which railway experts can accept; and then the chief inducement for changing from one to the other will be the consideration of those things, as the "Electrician" puts it, which electricity can do for the lines, and steam locomotives cannot do. The project, which failed to commend itself to Parliament last session, for a high-speed electric railway between Liverpool and Manchester is nevertheless to be regarded by the dynasty of railway men as a handwriting on the wall.

This extension of electric traction will come by the good grace of the railway interest, or without it. Curiously enough, the prospect is closely linked with the industrial future of the large gas-engine, using cheap gaseous fuel mostly generated on the spot. For the working of branch lines, at any rate, the most economical source of power would obviously be gas, generated and converted in suitable-sized units, Mr. Langdon suggests on the Mond system. Mr. H. H. Cuninghame, of the Central London Railway, said, in the discussion on the paper, that "the lowest consumption of coal that he knew of in producing a kilowatt-hour is 3.6 lbs." Mr. Philip Dawson, who has reported so favourably in "Engineering," of gas-driven electric-power plants, can tell a better story than that. There is no reasonable doubt that, including lighting-up and stand-by consumption, the kilowatt-hour can be made easily from 2 lbs. of gasified coal, or, say,  $2\frac{1}{2}$  lbs. of gas-coke, anywhere and in any amount. The system which succeeds so admirably in the neighbourhood of Zurich could be adapted to any full-gauge railway branch in the United Kingdom in regard to which there might be a possibility of developing the traffic by a frequent train service; and one such example would be worth many hypothetical papers.



## A MANUAL OF GAS-FITTING.\*

THE publication of a cheap and handy book on gas-fitting, which those who know the craft can honestly recommend as good, is something to be thankful for. Considering the enormous amount of gas-fitting work that is done every day, the neglect of this handicraft by technological institutes and teachers is little short of scandalous. Gas-fitting, as a trade, has always been connected with plumbing, and is usually in sympathetic relationship with bell-hanging. Hence the complete mechanic, in this line, was once technically described as a "three-branch hand." As the range of what may be called Domestic Engineering continually widens, so the accomplishments of the plumber and house-fitter increase in number. We have had the curiosity to look into the advertisement columns of our excellent contemporary the "Ironmonger," for information upon this point; and learn from this unimpeachable authority that a "good all-round hand" may claim to be a specialist in plumbing; also in gas, hot and cold water, and electric bell fitting; whitesmithing; light forge work; range-fitting; and sheet-metal working. His field of usefulness is bounded by the cycle-fitter on the one hand, and the ventilation expert on the other. In the matter of "odd jobs," he may be required to know something of various other applications of the fitter's skill, according to local circumstances. Neither the lawn-mower nor the sewing-machine should have any secrets for him.

This all-round expertness is a glory to any man who really and truly possesses it; but it is not to be expected of the very best men for first-class work. Large employers find it necessary to keep fitters and plumbers to particular classes of work. This specialization suits both master-hands and men of ordinary and limited ability. The first-class hot and cold water fitter, for example, acquires a facility in training pipes, and getting a troublesome job of repairs out of hand with celerity and avoidance of unnecessary fuss and dirt, which renders him a *persona grata* to the householder. But this accomplishment would be valueless to a worker in sheet lead, who is paid for something altogether different. At the same time, by dint of doing nothing else, a man who is anything but brilliant develops into a reliable hand at a particular class of jobs. Specialization, therefore, is the road to the attainment of the best results.

There is plenty of room for specialization in gas-fitting; and it could be wished that technologists would understand this, and not leave gas-fitting in the position of the Cinderella of the Mechanics of the dwelling-house. We are therefore glad to welcome this little book on "Practical Gas-Fitting," which is admittedly a boil-down of numerous articles on the subject contributed from time to time to the "Building World." The writers of these communications are qualified by the Editor, Mr. Hasluck, himself an Honours Medallist in Technology, as "experienced;" and we are pleased at being able to commend their work generally. There is nothing bad, or misleading, or antiquated in the book, which may therefore with confidence be placed in the hands of any young man wishing to learn something about gas-fitting in this way. It is the natural desire of everybody interested in a particular subject, whatever its nature, to see a good book about it; and this manual is quite fit to stand for the latest "literature" of the craft of gas-fitting.

All the same, it is a book that leaves much to be desired. Its matter is right enough, so far as it goes; but it is not always the proper kind of matter, and many highly necessary things to be known are left out altogether. To begin with, it is a mistake to include "Gas Manufacture," to the extent of 46 pages, in such a book. It would have been quite right to give, in an introductory chapter, a condensed account of the origin, nature, and properties of coal gas, in order that the intelligent gas-fitter might know what he has to make use of for different purposes; but he is not interested in sketches of retort-settings and gas-holder-framing. In this case, he is given the latter superfluous information, and denied the useful knowledge. The trail of the technological passman is over all the beginning of the book. It is "gassy;" but not the domestic fitter's kind of gassiness. If, instead of this introduction, there had been a carefully-written statement of the elements of the science of artificial lighting, the book would have been infinitely more useful. As it is, the reader is nowhere told how much light to provide for any interior, so that he is left literally to grope in the dark among the details—correct enough—of piping and tools. The only mention of the requirements of lighting which we have been able to find is the following sentence: "The usual, and perhaps the best, system of lighting—especially in a dwelling-house—is to fix a pendant in the centre of the ceiling; and the light from this, which may contain any number of arms, is sometimes augmented by brackets placed round the room." This is, obviously, ridiculously inadequate. How is the fitter to know the sizes of his pipes, or anything else about the job, unless he starts with a complete understanding of lighting requirements? What is the rule, say, for lighting a public hall, or a church, or a public school? These fundamental data should not be left out of a "practical" manual.

Another grave defect is the avoidance of all mention of the precautions to be taken for the prevention of gas leakages, in

houses, and for dealing with them when they exist. The word "leakage" is not even in the index. Yet a fitter who does not realize the possible results of his own imperfect handling of such a dangerous thing as illuminating gas is when carelessly or ignorantly treated, and is not always on the alert to detect sources of danger, is worse than useless. It should be for the writer of a fitter's manual to point the lesson of all the gas fires and explosions that have been recorded in the "JOURNAL," since the beginning. People who call themselves technologists, and whose thoughts are of examinations and prize medals, apparently fail to perceive the gulf that separates the academic knowledge, or the class-room practice, of such a craft as gas-fitting, from the trade as carried on at the peril of frightful penalties for negligence, in the legal sense. Nobody would learn from this book that there are such things as dangerous gas-pendants.

There is a touch of pedantry, also, in the particular instructions given for working the algebraic formula for the discharge of gas through mains, without any addition of such hints as the workman—or more especially, the speculative builder—needs for proportioning the sizes of service and inside pipes. We do not object to mathematical instruction, which indeed is good; but it should have been supplemented with precise information relating to the piping rules and regulations published by those gas undertakings which are empowered to issue such instructions. Again, we object to such passages as the following: "If a high building is supplied from one rising main only, the gas will so rise to the upper floors as to necessitate the use there of burners different from those on the lower floors; or, alternatively, gas pressure-governors may be fixed on the various floors. The gas should escape at a certain pressure to form a solid flame; the burners being selected in accordance therewith. If the gas escapes feebly, a flickering flame will be the result, and a quantity of smoke will be given off." This is very amateurish, and not a little nonsensical, to say the least of it.

There are some odd jumbles of good practical "wrinkles" with this recurrent amateurishness. Thus, one is glad to recognize the value of the hint to use plenty of connectors in running iron barrel; to be careful in applying tools to nipples; and in making a connection of a large service to a small street-main (a common problem) to drill the hole some sizes smaller than the service. If this is done, and the small-size piece first screwed in is immediately enlarged, the flow of gas will not be sensibly diminished, while the strength of the main will be greatly saved. Otherwise sound workmen do not appreciate the importance of this expedient, and will drill a hole for a 2-inch service in a 3-inch pipe—an operation which, of course, leaves scarcely anything of the substance of the main after it. A hole for a 1½-inch nipple is quite large enough for the purpose intended. Another practical question is the disposition of the drip of the riser from a dry gas-meter. The usual practice is to put in a pipe-syphon on the house side of the meter; and this is essential where the old piping has been arranged for a wet meter, with a fall towards it. Where a house can be piped for a dry meter, however, it is preferable to slope the pipes the other way, and put the pipe-syphon at the farthest end of the system from the meter; thus avoiding the possibility of exposing the gas to all the condensed fluid on its way to the burners.

The book is very good on the subject of running pipes across joists, showing why joists should be notched, if necessary, near the wall and never in the middle. It might have been said, however, that where the latter course cannot be avoided, the structural weakening of the joists may be prevented by notching them deeply, to the middle, and plugging the top of the notch solid over the pipe again; thus restoring the resisting power of the beam in compression. It might also have been shown how wall brackets can be fixed anywhere, on the surface of a plastered or wainscotted wall, without cutting a chase, by simply enclosing the rising pipe in a vertical wooden casing made flush with the skirting, wide enough to take the back of the bracket, and finished off with a simple moulding about a foot higher. Painted the same colour as the other woodwork of the room, this arrangement, so far from being an eyesore, appeals to the judgment at a glance as a fit and proper thing. It is satisfactory to find that the book is sound on the point of what causes the discoloration of ceilings and walls over gas-flames; and also on "the necessity of having burners suitable to the quality of gas which is being used." The compilers are not ignorant of the merits of incandescent gas-burners.

We trust that when a second edition of this book is demanded, the Editor will endeavour to obtain the assistance of some good firm in the trade, so as to impart to the generally good matter he has already collected, that touch of businesslike actuality which it lacks in parts, and to make good its deficiencies.

Meanwhile, both for its own sake and as an illustration of what text-books and manuals unfortunately do not usually contain, we will give publicity to the following Workshop Notice, ascribed by the "Ironmonger" to a provincial tradesman:—

Operatives must take every precaution to prevent injury to life or property, and are to use safeguards to prevent accidents happening through the intervention of ignorant or mischievous persons. For instance, when executing work requiring the turning-off of the water, a notice should be attached to the stopcock warning everyone against tampering with it. If the work be left unfinished, the end of every open pipe should be plugged. Tying up the ball-valve is insufficient; and, in the case of gas-pipes, a light must not be used to trace escapes, especially when the leakage is in a confined place. Having well ventilated the apartment it is safer to trace the

\* "Practical Gas-Fitting (Including Gas Manufacture)." With numerous Engravings and Diagrams. Edited by Paul N. Hasluck, Editor of "Work," and the "Building World." London: Cassell and Co., Limited; 1900.



fault by smell. Should a light be afterwards used to test the work, the meter-tap should be turned off to extinguish any flame that may have been accidentally left burning. This done, the gas should be lighted at the highest outlets to empty the pipes, and the naked finger passed round the joint to ensure that no flame is left there.

This is the very antithesis of amateurishness and book-learning. It is the voice of the Master-Workman, which is not often reduced to the printed page. Mark the manner in which the man who is entrusted with a job of plumbing or gas-fitting is enjoined, not merely to be careful himself, but also to guard against the remotest possibility of his work being tampered with by others while in progress! Excellent counsel, indeed.

## GAS-ENGINES AND ELECTRIC POWER PLANTS.

[SECOND ARTICLE.]

ALTHOUGH success with the gas-engine preceded the successful development of the semi-water-gas generator, considerations of working expense barred the enlargement of gas-motors beyond, say, 50-horse power units, until a cheaper gaseous fuel than town's gas was made available for actuating them. This semi-water-gas, originally made continuously by Joshua Kidd, is just rich enough in combustibles to ignite cold and burn steadily. Siemens producer gas, and the gaseous product of the blast-furnace, will not ignite when cold, at ordinary atmospheric pressure. The latter kind of gaseous fuel is the poorest in use for generating power. Obviously, these poor gases not only facilitated the enlargement of the gas-engine—they made it imperative, if they were to be worth using. The economics of the problem were entirely changed, in their case. They cost very little, or almost nothing; and consequently they stood on a wholly different footing from the expensive town gas. First, therefore, the localized semi-water-gas producer, placed close to the engine, and worked solely for it; and next the blast-furnace gas, previously a wasted product, provided gas-engine makers with the necessary economic inducement to increase the size of their motors.

Advantage seems to have been first taken of this facility on the Continent. The "Simplex" gas-engine, invented by Messrs. Delamare-Deboutteville and Malandin, and using Lencachez gas, appears to have been the first large motor put in ordinary work. It is now made by the Société Cockerill up to 650 indicated horse power for a single cylinder. This firm and the Gasmotoren Fabrik Deutz have successfully adapted their engines to use blast-furnace gas, notwithstanding its low calorific value (90 to 112 B.T.U. per cubic foot), by greatly increasing the compression of the charges, with spark ignition.

Mr. Dawson admits that it was not found necessary to wait for large gas-engines before applying gas power to the generation of electricity. This was first done upon a considerable scale at Dessau, by the German Continental Gas Company. Mr. Dawson gives a number of tables showing the details and displaying the rapid modern extension of gas-driven electric lighting and power plants at home and abroad, commencing with the Dessau figures for 1895. Among the latest examples given are Leyton and Rugby School. The cost of generating the unit of electricity in these instances is approximately from 2½d. to 3d. This is less than the cost with steam power, except in very large steam-plants. Mr. Dawson points out that, under the most favourable conditions existing in the case of large, well-designed plants running practically continuously, steam can produce electric power at nearly one-quarter what it would cost if generated by a plant using producer gas. This is an ideal state of things for steam, however; while the case of the gas-engine is referred to actual and ordinary experience. Mr. Dawson admits that a fair comparison would be that of the maximum cost of production by steam and gas respectively. But, if this is done, the result is reversed; and it appears that gas power can generate electricity at practically one-quarter what it would cost to do it by steam.

So many considerations affect the result. A gas-power station, with producers, always shows a better duty for the fuel consumed than a steam-power plant. Weight for weight of coal per horse power or per unit of electricity generated, the producer-gas-engine beats the steam-engine hollow. It also occupies less room, producers included, and shows a saving of skilled attention. The cost of buildings is less; and no high chimney is needed. On the other hand, the ordinary producer requires a supply of anthracite, or non-caking coal, or coke. The engine, too, is high priced. Taking one consideration with another, Mr. Dawson finds definitely that for localities where fuel is dear, where the amount of power required is not very large, and where the hours of running are comparatively short, gas power is likely to prove far more advantageous than steam. Even with gas-producers, there is the advantage that there is not much waste of fuel. Of course, the height of economy in this respect is attained by the engine using town gas, which only consumes the actual quantity of fuel it requires for its work. Every case presents its own special conditions; but Mr. Dawson holds that, for a moderate-sized electric lighting and tramway driving installation, working between the hours of seven in the morning and ten at night, gas power, with a sufficiently large battery of accumulators, would satisfy the practical requirements with a single shift of men. One more good point about the gas-

engine is that it makes a fair economical showing when under-loaded. This consideration encourages the design of gas-power plants for easy working. Mr. Dawson gives some useful advice about the details of gas-engine power-stations—industriously collected from many sources, chiefly Continental.

An interesting installation of the kind, using Crossley engines, is that which works the Zurich tramway. There is a larger one at Lausanne, put down by M. Palaz. The gas-producers here are of the Fichet and Heurtey type, making what is called in France "gas mixte." This is a semi-water-gas, which is intended to use a large volume of steam, and make a product of relatively high calorific value—168 to 196 B.T.U. per cubic foot. One wonders if it really does. At any rate, the station is a very economical one; for the average cost per unit of current delivered in to the line, everything included, works out, over three years, at 1'354d., with coal costing from 24s. to 28s. per ton. It would be hard to beat this figure. Interest on capital outlay is charged at 4 per cent.

An instructive case, also, is that of the combined traction and lighting plant of St. Gallen, Switzerland, which uses town's gas for generating the electricity. This interesting installation was described and illustrated in "Engineering" on Sept. 14. The Local Authorities there own the gas-works; and when they resolved to supply the electric light and work their tramways electrically, they decided to generate the current by using the town gas, which they could make in plenty, instead of spending fresh capital on producers. The equipment of the station (which is a department of the gas-works) was carried out by the Maschinenfabriken Oerlikon; and the whole thing is a great success. The lighting is on the three-wire system, 260 volts between the outside conductors; and the tramway is worked at 550 volts. Mr. Dawson highly commends the plant. The same contractors put in a gas-driven traction plant for working the tramway between Zurich, Oerlikon, and Seebach. The Deutz firm supplied the Otto engines (which are all of 110 brake horse power), and also the gas-producers. The average consumption of anthracite is a ton a day, which runs nine cars from five in the morning until eleven at night. The average car-miles run per day are approximating 1000; so that the work is done for an average coal consumption of 2½ lbs. per car-mile. This seems an astounding result.

Another good example of the addition of an electricity branch to a town gas-works cited by Mr. Dawson is at Bâle; the contractors being the Gasmotoren Fabrik Deutz. The gas-producers use coke, which is an interesting variation from the St. Gallen practice. The consumption of coke works out at the rate of 2'43 lbs. per Board of Trade unit. Evidently it is found expedient in this case to sell the good town gas, which will bear distributing, and make the power gas where it can be used on the spot. The Orleans tramways have their electrical power generated by gas-engines supplied from producers. This, of course, is a French installation throughout, with Crossley engines and Fichet-Heurtey generators. Oddly enough, these generators burn a kind of anthracite brought from Anzin, Belgium. The only British plant of the kind which Mr. Dawson has been able to find is at King's Lynn, where a Dowson gas-power installation, by Messrs. Fielding and Platt, does the local electric lighting. The consumption of fuel (anthracite peas) is stated to be under 1 lb. per indicated horse power per hour. The engines are in 100-horse power units. This seems to be an establishment of the latest type; and the working results should be interesting. Mr. Dawson concludes his survey with an account of a Körting plant at Clausthal, in the Hartz.

The casual reader, glancing through all this long story of Mr. Dawson's, would perhaps be inspired to join in the parrot-cry that British practice in this regard is behindhand. Certainly, no English local authority of the rank of that of St. Gallen have attempted to do anything like this Swiss Municipality have so far achieved. Circumstances, however, alter cases. It must be remembered, also, that the English parliamentary system is inimical to experimenting by local authorities and gas companies; outside the beaten track. It is arguable, moreover, that the English patent system is a hindrance to the exploitation of mechanical appliances for serving the public at the cheapest rate. Only the other day, some "Syndicate" advertised an impudent claim to the possession of a "master patent" for the utilization, for the generation of motive power, of blast-furnace gases. So English industry and enterprise are hampered and baffled; while foreigners go ahead, and the papers sapiently declare that it is due, in large measure, to their superior technical education.

In the last of the articles as to the Paris Exhibition which appeared in the "JOURNAL" some months ago, reference was made to the show of luminous microbes in one of the rooms in the Optical Palace, which was described as "a feeble attempt to displace incandescent gaslight." The lamps shown were regarded by most visitors as interesting toys; but it appears that really serious endeavours are being put forth to utilize photobacteria as sources of illumination, for in the November number of the "Journal de Physique," M. Raphael Dubois describes in a short note some experiments in this direction. He states that, by cultures on a large scale, with liquid nutrient media, he is able to satisfactorily illuminate a room "with the brilliancy of moonlight."



## PERSONAL.

Mr. W. H. PLUMMER has been appointed Secretary of the Southam Gas Company, in succession to Mr. H. G. R. Davies deceased.

Mr. RALPH ERNEST GIBSON was a successful candidate at the recent examination for associate membership of the Institution of Civil Engineers.

Mr. S. ARTHUR CARPENTER, Manager of the Sandwich Gas-Works, was presented with a timepiece by the staff, on the occasion of his recent marriage.

## OBITUARY.

The death is reported as having taken place on Nov. 28, of Herr J. ISLER, the Manager of the gas and water works at Winterthur, Switzerland.

Herr F. DRECHSLER, the Manager of the gas-works at Grimma, Saxony, met his death at the end of last month through the collapse of the roof of a coal-shed on the works.

The recent death is announced of Mr. A. W. MARKS, who for a period of 36 years was Secretary of the Sheppey Gas Company—a position which he relinquished, through failing health, about two years ago, the Directors giving him a retiring allowance and a seat on the Board.

We regret to record the death, on the 8th inst., at his residence, Oakhill, Stoke, as the result of a gun accident, of Alderman WILLIAM OTTEY BRIGGS, J.P., who was Chairman of the Gas Committee of the Stoke Corporation from their acquisition of the works in 1881 until 1897. During that period they were entirely rebuilt; and the undertaking was carried on so successfully that about £20,000 was voted out of the profits in relief of the rates.

"Het Gas" reports the death, in his eightieth year, of Heer J. M. VAN DER MADE, an Engineer who, after work on railways in England and elsewhere, turned his attention chiefly to gas-works. In 1851 the first gas-works in Holland, under purely Dutch auspices, were built at Dordrecht, and the deceased gentleman was appointed Manager. He subsequently constructed the gas-works at Bergen-op-Zoom, Groningen, Sneek, Utrecht, Zutphen, Moscow, Batavia, and some fifteen less important places, and extensions at Arnheim, Breda, The Hague, and elsewhere. He retired from active life in 1889, and died on Oct. 7 last.

Death has removed, at the age of 80 years, Mr. W. BLAND, the Cashier of the Sheffield Corporation Water Department. Joining the old Sheffield Water Company so long ago as 1845, at a time when the staff consisted of three only, he witnessed the growth of the undertaking from its infancy to the present day. When the Corporation took over the old Company, he was transferred to the Town Hall to occupy the post of Cashier; and thus for 55 years he remained in continuous service of the water undertaking, being in attendance at his duties so recently as Tuesday, the 4th inst. It was a singular coincidence that the following day—the day when deceased had the stroke which brought on his death—a resolution was passed by the Water Committee to grant him a pension on which to retire.

## NOTES.

## Tar Macadam Roads in Canada.

Tar macadam roads have made their appearance in Canada; the city of Hamilton (Ontario) being the first to adopt the system as a general practice. Mr. A. W. Campbell, a Highway Commissioner, reports that the addition of tar renders the pavement less pervious to moisture, and prevents mud and dust. It is easily repaired, and requires less scraping than does ordinary macadam. Its durability surpasses that of the ordinary macadam; and the additional cost locally is only 15 cents per square yard. With a soft, porous stone, the use of tar would be a decided improvement, as it would add very much to the life of broken stone pavements. The method of construction is, in the preliminary stages, similar to ordinary macadam. Only the last two layers of broken stone, together with the top dressing of fine stuff, are treated with tar. The process of saturating the stone with tar consists in drying the stone as thoroughly as possible in the sun, and pouring the boiling tar over it; the mixture being turned over with shovels meanwhile. It is then wheeled in barrows to the work, spread to the desired thickness, and rolled. An inch of fine tarred stuff is spread on the top, rolled to a hard finish, and sprinkled with portland cement.

## The Cost and Price of Hard Coke.

Discussing the prospects of the metallurgical coke trade of the country, the "Iron and Coal Trades Review" recently remarked that for the past two years the price of this coke has been unnaturally high. It is an interesting question what the natural cost of the product is at the present time. It is stated that the ordinary cost of underground labour is 2s. 9d., and of above-ground labour about 9d., per ton of coal. With a good system, it is usual to reckon on a yield of a ton of coke for 30 cwt. of coal, which means that the cost of the raw material should not be

more than 6s. per ton of coke. The cost of coking, by the bee-hive oven, is put at 1s. 11d. per ton, which seems high. At any rate, over a number of years it appears that good coke ought to be made and sold at a profit for something like 8s. per ton, which consequently should be the natural price. There used to be, in Yorkshire, only two or three years ago, plenty of small coal suitable for coke making, to be had for 2s. to 3s. per ton. It is evident, therefore, that the recent exorbitant prices of hard coke have no relation to the cost of its production. A serious matter in this connection is the growing scarcity of good coking coals. At present, the coking industry is concentrated in comparatively few hands, and fresh supplies are not forthcoming. Eventually, the production may be expected to become a monopoly, and be priced accordingly.

## The Banki and Diesel Motors in Paris.

The Special Commissioner of the "Engineer" to the Paris Exhibition speaks highly of the Bánki and Diesel gas-motors, briefly described in an earlier "Note" (*ante*, p. 1265). He remarks that the idea of using water in a gas-engine cylinder, which is the peculiar feature of the Bánki motor, is not new; having been tried by Hugon in 1861. It has never proved advantageous, however, until now. Professor Bánki states that the error of the old manner of using water was that too much of it was introduced, with the idea of utilizing the expansive force of the steam. He employs very little water—only just enough to cool the compressed charge, prevent premature ignitions, and reduce the shock of the explosion. In other respects, the Bánki engine follows the usual Otto four-cycle type. A 75-horse power engine was shown at Vincennes, but not, apparently, in action. The Diesel motor compresses the air only, to the point where its heat is sufficient to ignite the charge. The consumption by the motor of common coal gas is stated to be 16.6 cubic feet of gas per brake horse-power-hour. The air was compressed up to 560 lbs. per square inch. As an oil-engine, the Diesel motor works well, using less than  $\frac{1}{2}$  lb. of petroleum per brake horse power. This represents a heat efficiency of 31 per cent., compared with 15 per cent. for the best and largest steam-engines.

## Oiled Roads in California.

A paper on "Oiled Roads," read by Mr. O. W. Longden before a Californian Association, has been published in the "Engineering Record." The author stated that, in the dry climate of the Pacific Coast, where the dry season lasts eight months, and the rainfall is light, the condition of the roads was deplorable. Watering was tried, at great expense; but in droughts there was no water to be had for the purpose. The first application of oil to the main roads of Los Angeles County, for the purpose of laying the dust, was made in the summer of 1898; six miles being thus treated. In 1899, the same roads were oiled again, and seven miles of new roads added to the field of operations. This year 50 miles of roads have been oiled, mostly twice; and the result has given great satisfaction. While there is yet much to learn as to the best way of using oil to lay dust, it is agreed that well-oiled roads are dustless; which is the main thing. Oil is unlike water in this respect, that it helps to mend a road surface, and remains part of it; while water soaks in, runs away, or makes mud which sticks to the carriage wheels. The oil is sprinkled as hot as possible, preferably during the heat of the day. The heaviest oils are used, and the dustier the road surface at the time, the better. During the first year, three oilings are given, during the second year two, and the third year one. The first application, to a width of 12 feet, takes 60 barrels of oil per mile. Eventually, the dust and oil make a kind of asphalte.

## The Boiling-Test for Cement.

A correspondent of the "Engineering Record" discusses the Michaelis boiling-test for portland cement. He points out that a test of this kind has appeared in numerous specifications issued in recent years, although it has not yet received official recognition by any Government or professional authority. The methods prescribed for making it vary considerably, which tends to bring the test itself into disrepute. The writer remarks that, in all kinds of materials-testing, the preparation of the specimen and the method of conducting the operation are as important in their influence upon the result as the character of the test itself. This is conspicuously the case with tests of portland cement. Michaelis has given very precise directions in this regard. He specified that a clear pat of portland cement, made up on filter paper on a glass plate, should be allowed to harden in air and in water 24 hours. At the end of this time, it was to be put into a vessel of water at normal temperature, which was to be brought slowly to the boil, and kept at the boiling-point for three hours. If the pat at the end of this time was firm and hard, and free from cracks, the cement was considered good; if not, it was rejected. This prescription conveys the principle. In carrying it out, there are some details to be considered. The pat should be made up in a clear paste, with 2 to 3 per cent. more water than is required for forming briquettes, and worked well for several minutes with a putty knife. It is to be thoroughly shaken and worked out on the glass, to get rid of air-bubbles, and then spread as a pat about 3 inches diameter,  $\frac{1}{2}$  inch thick in the middle, and drawn out fine at the edge. It should be put at once under a damp cloth or in moist air until hard set, then placed in water at normal temperature for 24 hours, and boiled as directed.



## COMMUNICATED ARTICLE.

## THE FUTURE OF THE GAS PROFESSION.

BY ONE OF THE PAST.

*(Continued from p. 1452.)*

Another point against the directorial board is that it is given to follow a stereotyped practice; and that, when a manager retires, his assistant is appointed to the vacancy in preference to a possibly more suitable man who may be found among the juniors on the staff, or elsewhere. I think that the cases where this practice proves to be a mistake are few and far between. For one thing, when one does not know the country, it is wise to keep to the beaten tracks. Two old proverbs—"Out of the frying pan into the fire" and "A bird in the hand is worth two in the bush"—are rightly held in esteem by business men. The mere fact of a man having been appointed to the post of assistant, is a strong recommendation in his favour. He would not have been selected for, or allowed to retain, this position if long past his prime or approaching a state of dotage, or suffering from bodily or mental deficiency. I do not urge the claims of the assistant for special consideration, from the fact that he has probably been faithfully serving the company for many years on a distinct understanding—none the less real because it has never been put down in legal black and white—that he should have fair treatment in regard to the higher post whenever a vacancy occurred. The directors have proof of his ability, as he has taken charge of affairs in the absence of the manager—perhaps for weeks or months at a time, in case of accident or illness—is respected by the employees and by the customers, and in a general way "knows the ropes" of the whole concern. He possesses special information that a novice, however clever, could not acquire in a year nor yet in two. Having regard to the capability of the directors for recognizing the particular kind of skill or ability they require, would it be wise to throw over the unique knowledge of their affairs, the special experience, and mature judgment which in all probability they know to be centred in their assistant, in favour of youthful enterprise and energy as represented by a promising or plausible junior? It may be a mistake to pass over the opportunity of giving a clever youngster a chance to win his spurs or to acquire his experience at the expense of the company; but it is a greater mistake to throw away experience and ability that is waiting ready to hand.

The matter may be regarded from another point of view, and that is the effect of any action of this kind upon the younger portion of the staff, or upon the beginner who contemplates joining the profession. A permanency of employment, with a fair prospect of promotion, is always a great inducement to the young man and his friends. There is no lack of able candidates for the position of policeman, postman, railway porter, &c., even if a mere living wage is offered, because the prospect of permanency is considered, and this apart from the question of old-age grants or other advantages. Young men of good parts will accept a junior post in a bank for a mere trifle to begin with, on account of the permanent position offered; and there are many who enter the gas profession and serve the best years of their life in a subordinate capacity, under the impression that they are working their way up, and that their diligence and perseverance will receive proper consideration when the time comes. In some other businesses, it is said that the middle-aged man finds it desirable to dye his hair, to resort to other methods of keeping up a youthful appearance, and to conceal his real age; and such practices cannot be conducive to the real prosperity of the industry. It may be sound financial policy to turn the old horses out to grass the moment their pace or their wind fails; but no industry can be successfully run upon purely financial considerations. If it becomes known that the higher appointments are to be thrown open to the world at large, and the position and claims of those who have borne the burden and heat of the day are to be set aside in favour of some youthful prodigy from nobody knows where, and consequently that every year's service diminishes the prospect of promotion, the confidence of the young men of the first order, who as it is look askance at the gas profession, will not be increased.

But however this may be, the directors of a company are not sufficiently in touch with the daily operations and the labours of each member of the staff to be able to assess the ability of one as compared with another. Some men have a knack of pulling themselves together and putting on an abnormal quantity of steam when a director heaves in sight; and others, in scorn of such double-facedness, go to the other extreme, and scarcely do themselves justice. Granting that the second or third hand may be capable of making a better manager than the first assistant, the directors are not likely to know it. The principal who superintends the work will be clear on the point. But I venture to think that, whatever may be the case in other industries, the pushing young man has a fair field if no favour in the gas undertaking. Many who hold important positions as managers or secretaries to-day began in a small way, and owe much of their success, especially at the first start, to the recognition of their capabilities and to the kindly encouragement of their predecessors in office. They have advanced from day labourer to retort-house hand, to works foreman, and to the

managership; or from office boy to rental-clerk or collector, thence to chief clerk, and finally to secretary. Such men will usually speak with considerable feeling of the sympathy and encouragement received from their superior officers. And every head of a department having a dozen or more subordinates, finds opportunities of assisting and encouraging deserving young men, and a pleasure in doing so, apart from the fact that he is also serving the interests of his employers. It is all very well to talk of enterprise and energy, but no business of any magnitude would hold together for a year without the patient, plodding conscientious subordinate, who will not see the firm defrauded of a penny, and labours on contentedly from year to year, never rising to the surface, and receiving just enough remuneration to enable him to take up a position slightly above that of the labouring classes.

One great defect in the gas profession, then, is the appointment of directors who have no special qualifications for the office. A second, and equally important, one is the absence of any recognized rule or custom as to where the director's authority ends and that of the manager begins. In this respect, every board is a law to itself; and the new accession to the board may be a strong believer in reform, and set himself to re-arrange the whole order of business, without knowing exactly what he is doing or being certain that his reform will be a real improvement. The duty of the directors is to engage a competent staff to carry on the business. Some boards attend a meeting once a month to hear and discuss reports from the manager, who is left to himself the rest of the time. Others go down, either as a whole or in committee, and examine the books once a week; they peep into the furnaces, and discuss technical details with the workmen; and they look up to the tops of the holders, and down into the store-wells. The manager must not buy a truck of coal, or discharge a workman, without their permission. The result is that the experienced gas manager, when looking for a berth, finds it a desirable precaution to know something about the views and customs of the directorate. One does not like to be invidious; but it is an open secret that there are boards of directors whom no man would care to take office under, while others are held in esteem. One often hears at an Association meeting some such scraps of conversation as: "Where is — now?" "Oh! didn't you know. He is appointed at — in place of —." Then comes a significant "Poor fellow," or a more cheerful "He will be all right there." It is a remarkable fact, and one pregnant with significance as regards the best interests of the industry, that a man is appointed to one place, and is condoled with; while he may be appointed to another, where the responsibilities and emoluments are as nearly as possible equal to the first, and be congratulated.

Some of your readers appear to look upon the gas managers themselves (either as individuals or as collectively represented by their Associations) as to a great extent responsible for all the deficiencies, not of the profession alone, but of the industry at large, and in duty bound to provide a panacea for every ill. Scarcely any important defect or grievance is discussed in your columns without at least one correspondent coming down like a thousand of bricks on "the representative Institutions," and telling the Gas Institute or the Institution of Gas Engineers, with more force than elegance, that they could improve matters if they chose. Writers in this vein appear to be rather in the clouds as to the real position, the finances, and the scope of influence of these Associations. There is a tacit assumption that they are well-to-do societies, representative of, and supported in an adequate degree by, the whole of the gas industry, and that their decisions are regarded as of equal importance by all parties—engineers, secretaries, shareholders, and directors. We are accustomed to hear that the representative bodies ought to improve the status of the gas profession, to offer educational facilities, to appoint boards of examiners, and to formulate methods of procedure for directors and for consumers. Undoubtedly a full-fledged Association could do all this, and more. On the few occasions when the whole industry has gathered for a united effort, there has been no uncertainty as to its capabilities. We hear of a strong educational movement in gas circles in America; but I have yet to learn that the gas managers or their Associations there are called upon to bear the whole brunt and expense.

There is a tendency to forget that the bodies spoken of as the representative Associations of the gas industry, are to all intents and purposes Gas Managers' Associations, supported by the gas managers alone. I do not overlook the fact that a few companies—a trifling percentage of the whole—are far-seeing enough to assist in their financial support. But the attempt that was made some twenty years ago to establish a permanent Gas Institute that would adequately represent the whole of the interests concerned in the gas industry, failed entirely to secure sufficient support from the class upon whom it had the greatest claim—the financial interest, as represented by the directors of gas companies. Of the few who do subscribe, the greater part give a mere nominal sum—such as they might hand to a local goose club or a similar fund—rather than a contribution equivalent to the capabilities of an "Institute" in relation to the well-being of the gas industry. One cannot help thinking that the nominal subscription is often given merely as a sort of compliment to the manager, or in good-humoured deference to his recommendation, rather than on account of a clear comprehension of the question and its connection with their own welfare. The boards who



believe that the gas manager's place is at his desk, rather than at the Association meeting, have not yet ceased to exist. Others regard the annual gathering more as an excuse for bean-feasting and junketing than as an opportunity for serious business; and this mistake is to some extent the fault of the public Daily Press, who invariably give more prominence to the *menu* card at the subscription dinner than to the readers of the papers, and to the details of the public hospitalities (if such are offered) rather than to the proceedings at the meetings. It is not necessary to labour this point further. The work of the Associations does not come before the immediate notice of the board, and need not be considered in connection with the dividend or the price of gas. Like the technical side of the gas manager's duties, it too often goes unfostered and altogether neglected simply from sheer ignorance.

If the gas managers in their corporate capacity decide, of their own free will, to take up the subject of educational facilities or any question relating to the welfare of the industry, no one is likely to raise any objection. But there is no obligation in the matter; and they could not be blamed if they followed the example of other bodies—such, for instance, as the commercial travellers—and applied the few guineas they have to spare exclusively to the benevolent fund. When privileged to dine with the gentlemen of the road, I have often had the pleasure of subscribing to the pence-box; but the company would probably stare if it was proposed that the contents of the pence-box should be forwarded to a fund for benefiting the business of the firms they represent. Yet there are some who seem to think that the gas manager is wanting in public spirit if he does not devote a portion of his (already in many cases inadequate) salary to purposes more intimately connected with his employer's interests than with his own. By greater facilities for education, I take it, is intended something like evening classes with nominal fees, on the lines of those that already exist in our principal towns, which practically enable any and every student to obtain necessary knowledge at an inconsiderable expense. The most successful gas engineers are those trained at a gas-works; but evidently this kind of "facility" is not in view, for it cannot be said that the gas engineers of the country are suffering from a plethora of pupils, or that those who wish to enter articles are unable to find anyone to take them.

Free education may be a benefit to the financial interests and to the public generally; but gas engineers, when appealed to on the subject, are entitled to ask whether it will improve the status and emoluments of the profession. Improvements of this kind are the only things to attract a better class of workers into the profession. Has free reading, writing, and arithmetic improved the position of the ordinary clerk, or the prospects of those desiring to attain to the dignities of quill-driving and a seat at the desk? It has simply flooded the market to such an extent that a man who wants his ledgers posted can get it done at about half the rate of pay that he would have to offer if he desired to get a load of dirt wheeled away from his front door. The electrical engineering profession is popular, and has attracted a large number of students for whom full educational facilities have been forthcoming, with the result that a fully qualified electrical engineer, capable of managing an electric light works, can be secured at about the same remuneration as would be demanded by a retort-house hand. The young man of ability and enterprise will not fail to mark this point, because, while ambitious to distinguish himself, he also looks to the securing of adequate remuneration for his pains.

After careful examination, I can come to no other conclusion than that, so far from a deficiency in technical skill and ability, there is on the staff of almost every gas undertaking an excess of energy and enterprise. Many of them may be slow and behind the times; but it is not the fault of the staff. Whoever heard of objections to generator furnaces, sloping retorts, slot meters, letting apparatus on hire, or other advancements coming from the salaried staff? I would like to see replies from a dozen or so of the younger members of the gas profession—men who were able to take advantage of modern educational advantages—to questions as to the exact extent of the benefit of their high-class technical knowledge, how far it had assisted them in gaining their present positions, or whether it was a recognized factor in regard to salary. It often happens that energy and enterprise are regarded as dangerous qualities to be kept in check by the directorate, who have a keen eye to expenditure, and are apt to confuse outlay on extensions with current expenses for material and wages. If it was understood that the directors would recognize, and adequately reward, zeal, energy, and ability in the interests of the company, there would be no occasion to talk about increased educational facilities and bringing in a better class of men from outside; but it would soon be evident that the gas profession is comparable, in the matter of education and of ability, with any other.

(To be continued.)

## TECHNICAL RECORD.

### POWER GAS AND LARGE GAS-ENGINES FOR CENTRAL STATIONS.

At the Ordinary Meeting of the Institution of Mechanical Engineers last Friday, a paper on the above subject was read by Mr. HERBERT A. HUMPHREY, of Northwich. The President, Sir WILLIAM H. WHITE, K.C.B., occupied the chair; and all the available seats were occupied, and even much of the standing room in the large theatre.

In his introductory remarks, the author said that during the next few years the design and erection of large central power-stations for the generation and distribution of electric energy in bulk promise to be the most important and interesting problem with which mechanical engineers in this country will have to deal. The new stations will not only be larger than any now existing, but every possible effort will be made to reach a degree of economy in the production of power, such as will surpass any previous results. But it is neither for lighting nor for tramways that the real bulk of the energy will in the approaching future be required, but rather for manufacturing purposes. When electric energy can be generated and distributed at such a cost as to displace the use of the steam-power plants now operating in manufacturing works, the inauguration of a new era of centralization in the supply of power will have commenced, the importance of which cannot be over-estimated. The average total cost of a unit of electricity generated by electric supply undertakings in this country for 1898 was 2·81d., of which the expenses of generation amounted to 1·79d. With improved load-factors, this figure would be less; but those who know the actual cost of steam-power generated on manufacturers' premises, will appreciate how much this figure must be lowered, if the manufacturers are to be induced to take electric energy in bulk from outside companies. It is known that several companies will, under certain conditions, supply electric energy for power purposes at 1d. per unit—this being possible because of the higher price paid for lighting current; but even this figure is too high for manufacturers who would require large currents. In an appendix, the author tabulated the approximate cost of power under different circumstances; and from these figures it becomes clear that, unless the price is reduced to something like ¾d. per unit, only the smaller manufacturers will benefit by the wholesale adoption of current for power purposes supplied from central stations.

Where then, he asks, is this cheap supply of electric energy to come from? In this country we have not the Niagara Falls with their 7,000,000-horse power to draw upon, or even the 600,000-horse power of waterfalls said to be available in Switzerland; and it is certain that we must rely on the coal supply as the only cheap source of power available in really large quantity. It is the object of the present paper to inquire into the question of the use of power-gas and large gas-engines as a factor in the solution of the cheap-power problem.

The central stations which have so far adopted power-gas and gas-engines in this country are comparatively few and small. Of a total of seven stations, the largest has an aggregate of 650-horse power, and the largest unit in use is 200-horse power. The reason for this state of things may be easily summed up. In the first place, until recently no gas-producer was commercially available which could make a reliable gas sufficiently cheaply or from any but expensive fuel, such as anthracite or coke; and secondly, no gas-engines of large size had been in use for a sufficient period of time to satisfy electrical engineers as to their suitability for working under station conditions. These reasons exist no longer; for there is in the Mond producer plant the means of converting cheap forms of bituminous coal or slack into a clean gaseous fuel, suitable in every way for use in gas-engines, and at the same time recovering the ammonia of the coal as a valuable bye-product. The net effect is that the fuel cost per unit of electricity generated is (including all cost of labour, repairs, &c., at the gas-producer and recovery plant) less than one-twentieth of a penny per unit at the switchboard. This figure represents the cost under actual conditions of continuous running at Winnington, without allowing full credit for the sulphate recovered.

Secondly, gas-engines of 500-horse power are already numerous, and one of 650-horse power has been at work over a year; while others of 1000 and 1500 horse power are building. The author has been on the Continent and in America with the special object of studying the question of large gas-engines, and has had the opportunity of seeing the easy, comfortable way in which the 650-horse power Westinghouse engine does its work. Mr. George Westinghouse told the author that the Westinghouse Machine Company had sufficient experience to make them feel quite confident of their ability to build 2000 and even 3000 horse power engines, and run them with perfect success.

The special features of gas-engine practice which have enabled gas-engines to be made of powers far beyond those formerly thought possible, may be briefly stated. The most important is the improvement in the design of the cylinder-liner, the piston, and the valves, whereby they may all be efficiently water-cooled; and probably a time will soon come when no engine of more than 17 inches in diameter will be constructed without a water

The proportion of vapour of petroleum, gasoline, or pentane which ordinary air is able to take up varies with the temperature and the degree of volatility of the petroleum. One hundred volumes of air will retain 5·7 per cent. (by volume) of gasoline at 14° Fahr., 10·7 per cent. at 32°, 17·5 per cent. at 50°, and 27 per cent. at 68°; the gasoline having a specific gravity of '65.



cooled piston and a high degree of compression. The better shape given to the clearance space, the disposition of the valves in this space, the introduction of induced and positive systems of scavenging, and the better understanding of the causes of pre-ignition, have all aided in the forward progress of the gas-engine, and a noticeable strengthening up of all working parts has taken place. Thus the Westinghouse practice is to make the crank-shaft half the diameter of the piston, and in larger sizes even more. For example, with a 34-inch piston, the crank-shaft is made 19 inches diameter. Improvements in the breech-end castings, better arrangements for the contraction and expansion of the metal, improved means of ignition, and items of this nature are too numerous to mention, but all help in marking a step-by-step progress in the attainment towards gas-engines of great power.

The results of a trial of a 400-horse power Crossley gas-engine carried out by the author, show that the normal-load trial gave a consumption of 60 cubic feet of Mond gas per hour per indicated horse power, equivalent to a thermal efficiency of 26.2 per cent. The gas was measured by a large wet station meter of 50,000 cubic feet per hour capacity, erected specially for the experiments, and precautions were taken to ensure great accuracy in all the measurements of quantities involved in this trial, and in the other experiments recorded in the paper. Indicator diagrams of the Crossley engine with their isothermal and adiabatic curves, together with the equations to the actual expansion and compression curves, showed how large the fluid resistance may become in a big engine, especially if the governor is cutting out explosions so that the suction-stroke takes air only. The length, size, and arrangement of the various pipes also have considerable effect; and these matters are worth careful study in each individual case. It was anticipated that the engine would give fully 30 per cent. thermal efficiency; but the makers have kept down the degree of compression to so low a figure that the average effective pressure is only a little above 60 lbs. per square inch. Although the engine runs at full load day and night, this extreme measure of precaution would be quite unnecessary if the pistons were water-cooled.

More economical results were expected from a 500-horse power "Premier" gas-engine; but, unfortunately, it was not delivered early enough for the tests to be carried out and the results included in the present paper. This engine, when tested at the Premier Company's works at Sandiacre, with Mond gas, showed a mean effective pressure of 103 lbs. per square inch; but there were no means of accurately determining the gas consumption. It is expected that 650-horse power will readily be obtained from this engine, which is now one of the largest two-cylinder engines in existence.

Though Mond gas is a most perfect fuel for gas-engines, there is another ideal fuel which, unfortunately, is not found in this country. The use of natural gas in the Pennsylvania and other districts of America has given a stimulus to the employment of gas-engines in the United States; but in a comparatively few years' time the present sources of supply of this gas will be practically exhausted. A brake trial for a Westinghouse gas-engine using natural gas (abstracted for the author from the books of the Westinghouse Machine Company), showed the excellent economy of over 24 per cent. thermal efficiency, calculated on the brake horse power and in a comparatively small engine. The system of governing, by controlling the quantity of gaseous mixture of constant quality, has been well worked out in Westinghouse engines, but is really only applicable to the case of a rich gas. It was stated that in the large engines a consumption of 9 cubic feet of natural gas per brake horse power hour had been reached; and there are hopes of lowering the record to 8 cubic feet with the 1500-horse power engines.

America, France, Germany, Belgium, and (lastly) England are now turning out large gas-engines; and the author has information to show that the orders for large gas-engines exceeding 500-horse power collectively amount to over 100 engines. With such results before us, the time has certainly arrived for a careful study of the advantages to be gained by the adoption of a combined Mond producer-plant and gas-engines; and the subject may be considered under the following headings: 1. The possibility of using cheap fuel, and of recovering its ammonia. 2. The greater economy of gas-engines as compared with steam-engines. 3. The simplicity and reliability of gas-engines. 4. Gas-producers better than steam-boilers. 5. Costs.

The first of these headings has been the subject of Dr. Mond's experimental work on gas-producers started in 1879, and carried out on a large scale for a number of years at Winnington, Cheshire. This work resulted in the solution of the difficult problem of converting the cheap forms of fuel into good gas of uniform quality, in such a way that the ammonia existing in the fuel is not destroyed, but recovered as a bye-product. Common bituminous slack, brought by railway waggons into the works, is mechanically handled by elevators and creepers, and deposited in hoppers above the producers. From these it is fed in charges of 8 to 10 cwt. at a time into the producer-bell (fig. 1), where the first heating of the slack takes place, and the products of distillation pass downwards into the hot zone of fuel, before joining the bulk of the gas leaving the producer. This destroys the tar and converts it into a fixed gas, and also prepares the slack for its descent into the body of the producer, where it is acted upon by an air-blast saturated with steam at 85° C. (185° Fahr.), and superheated before coming into contact with the

fuel. Unlike other producers, the quantity of steam introduced into the blast is relatively very large. It amounts to 2½ tons for every ton of fuel gasified. This large quantity of steam keeps down the working temperature of the producer within such limits as to prevent the formation of clinkers or the destruction of the ammonia, yet permits the fuel to be so thoroughly burned that good ashes are obtained. Half a ton of steam is decomposed in the producer for every ton of fuel burnt, yielding thereby free hydrogen to the extent of 29 per cent. by volume in the final gas. The hot gas and undecomposed steam leaving the producer first pass through a tubular regenerator in the opposite direction to the incoming blast. An exchange of heat takes place; and the blast is still further heated by passing down the annular space between the two shells of the producer on its way to the fire-grate. Then the hot products from the producer are further passed through a washer, which is a large rectangular wrought-iron chamber with side lutes; and here they meet a water-spray thrown up by revolving dashers, which have blades skimming up the surface of the water contained in the washer. The intimate contact thus secured causes the steam and gas to be cooled down to about 90° C. (194° Fahr.); and by the formation of more steam, tending to saturate the gas with water-vapour at this temperature, the bulk of the sensible heat is converted into the latent form. Then passing upwards through a lead-lined tower, filled with tiles to present a large surface, the producer-gas meets a downward flow of acid liquor, circulated by pumps, containing sulphate of ammonia with about 4 per cent. excess of free sulphuric acid. Combination of the ammonia of the gas with the free acid takes place, giving still more sulphate of ammonia. To make the process continuous some sulphate liquor is constantly withdrawn from circulation and evaporated to yield solid sulphate of ammonia, and free acid is constantly added to the liquor circulating through the tower.

The gas, being now freed from its ammonia, is conducted into a gas-cooling tower, where it meets a downward flow of cold water, thus further cooling and cleaning the gas before it passes to the various furnaces and gas-engines in which it is used. The cooling of the gas with its burden of steam results in the

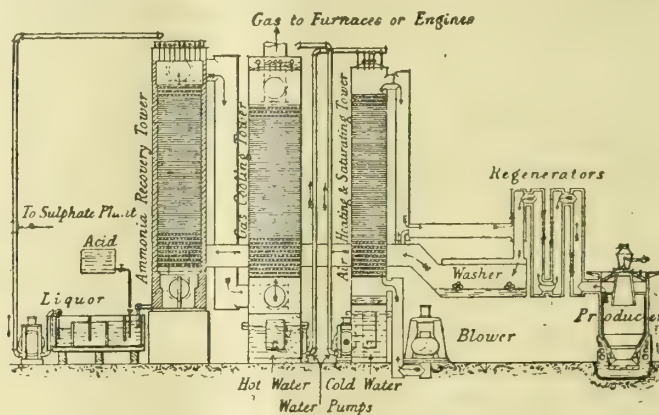


FIG. 1.—METHOD OF WORKING MOND PLANT.

condensation of the steam, and raising the temperature of the cooling water, so that the latter leaves the tower as hot water, and is utilized in a third tower—called the "air-heating tower"—through which the air-blast from the blower is directed. Here the contact of hot water and cold air gives hot air, saturated with water vapour at 73° C. (163° Fahr.), and cold water.

By this method of utilizing the heat of the gas from the producer, nearly a ton of steam is added to the producer-blast for every ton of fuel gasified; and this cyclical exchange of heat is always going on, and forms one of the distinctive features in the economy of the plant. It will be understood that the hot water from the gas-cooling tower is circulated through the air-heating tower, and, being cooled thereby, is again pumped up to the top of the gas-cooling tower. Both towers are filled with tiles to give large surfaces of contact; and the circulating water acts as the heat-carrying agent between the hot gas and the cold air. The charging of the fresh fuel into the top of the producer, and the withdrawing of ashes from the bottom, in no way interfere with the continuous steady work of the producer. Also the large volume of steam employed acts as a perfect regulator in keeping the quality of the gas uniform. Each Mond producer of the ordinary size used at Winnington is capable of gasifying 20 to 24 tons of slack per day of twenty-four hours; and the volume of gas furnished from 1 ton of fuel fed into the producer varies from 140,000 to 160,000 cubic feet, according to the quality of the slack, and is sufficient to develop 2000 indicated horse power hours when utilized in a gas-engine. The value of the sulphate of ammonia recovered from 1 ton of fuel is, at present prices, 8s. naked at the works.

Three views of a plant to supply gas for 10,000-horse power of gas-engines are shown in fig. 2; and a more recently designed plant for six producers, with sulphate plant, is shown in (ground plan) fig. 3.

Dealing next with the question of fuel economy, the author showed in a striking manner by a diagram (fig. 4) how much more economical gas-engines and Mond producers are than steam engines and boilers. The economy is about three-fold, because:



(a) The fuel for generating Mond gas is cheaper than the fuel used at central stations for producing steam. (b) For a given expenditure of heat, the calorific value of the Mond gas from the producer is greater than the calorific value of the steam from the boiler. (c) The gas-engine utilizes the heat it receives much more efficiently than the steam-engine. The actual results obtained at Winnington are not only far superior to the actual results for any central station using steam-driven plant, but "are a long way better than the ideal figures for the latter."

With regard to the reliability of gas-engines, the author gave

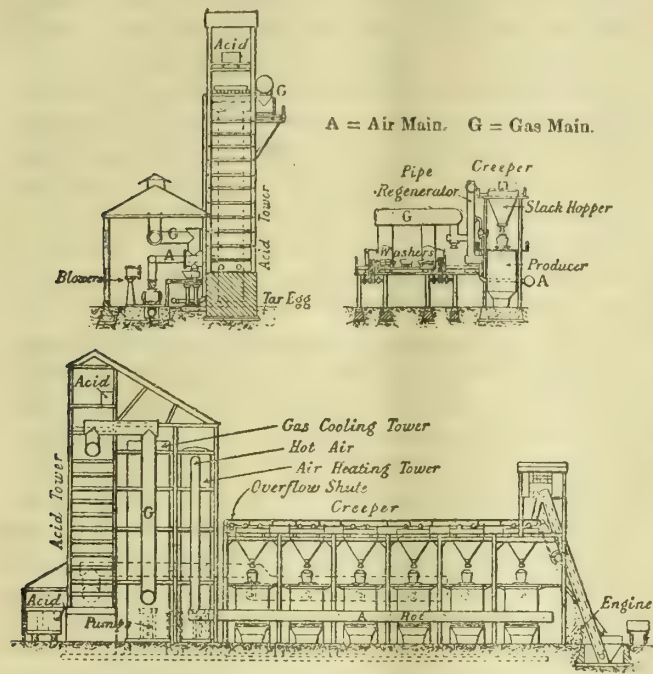


FIG. 2.—MOND SIX-PRODUCER PLANT TO SUPPLY GAS FOR 10,000-HORSE POWER OF GAS-ENGINES.

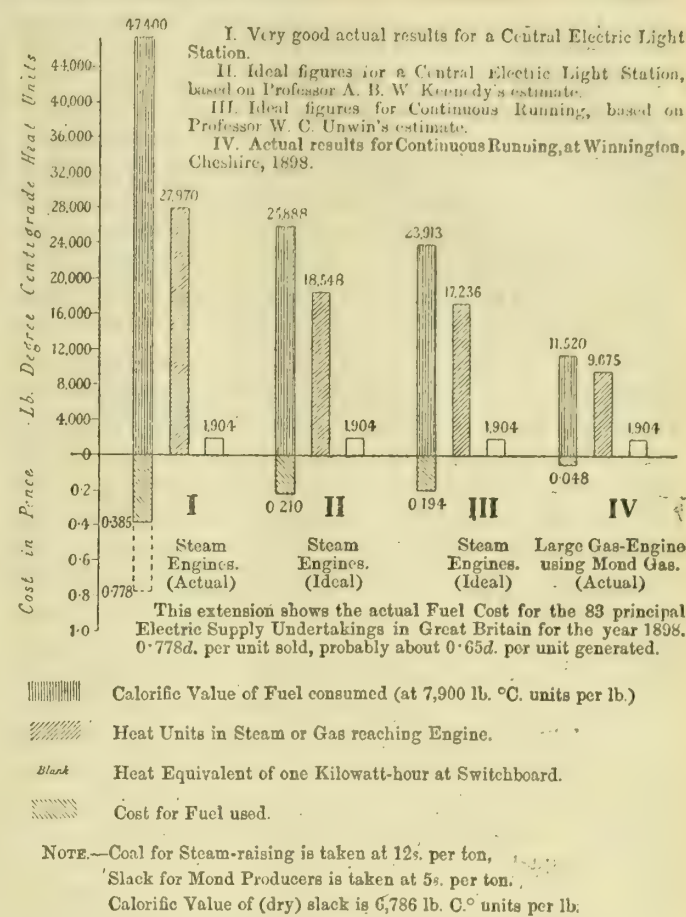


FIG. 4.—HEAT CONSUMED IN PRODUCING ONE KILOWATT-HOUR [See Appendix II.]

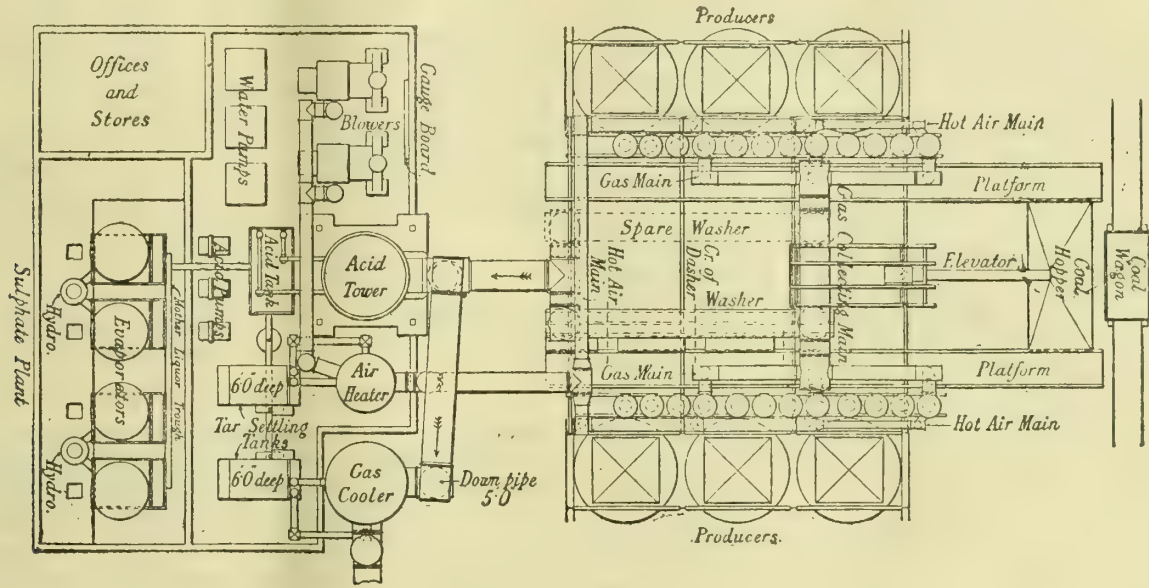


FIG. 3.—RECENTLY DESIGNED SIX-PRODUCER PLANT, WITH SULPHATE STILL.

some remarkable figures relating to a gas-engine (called by Messrs. Crossley Brothers a 60 nominal horse power gas-engine), direct-coupled to a Siemens dynamo, in use at the works of Messrs. Brunner, Mond, and Co., where it is employed along with steam-engines generating current for an electrolytic process. This power plant has been under the author's supervision since it started in 1897; and all the gas used by the engine has been measured through a large wet meter, so that the exact quantity used during two years' work is known. The plant runs day and night, and hourly readings of output and all other quantities involved are kept throughout the year. The figures for the two years (given separately) showed the difference in results when working on the "hit-and-miss" principle of governing, with some missed explosions, and when exploding every possible time with a somewhat weaker mixture, so as to keep the output about the same in both cases. The engine ran, with an average output for the two years of 88.8 effective horse power, for 16,930.9 hours out of a possible 17,520 hours, or 96.6 per cent. of the whole time. The running included a period of 138 days and nights, during which the engine was run continuously without a single stop. The average indicated horse power was 114.7; and the average thermal efficiency for the whole of the two years was 25.1 per cent., calculated on the indicated horse power, and the calorific

value of the gas used. The consumption of coal fed into the producer averaged 1.05 lbs. of slack per indicated horse power hour; and the consumption of oil for the last year worked out at 0.0235d. per unit. In considering the application of gas-engines to central-station work, it must be borne in mind that the large central station of the future will employ three-phase alternating currents; and the important question arises, Are gas-engines, coupled to alternators, suitable for running in parallel? In answer to this, the author has seen, at the works of the Solvay Process Company, Syracuse, U.S.A., the first gas-alternator which successfully accomplished such parallel running. It is a 150 brake horse power, three-cylinder vertical enclosed type, Westinghouse gas-engine. The cylinders are 13 inches diameter, the stroke 14 inches, and the speed 300 revolutions per minute. The alternator is direct-coupled, and of 75-kilowatt capacity, generating two-phase current of 60 cycles per second at 400 volts, and running in parallel with Westinghouse steam-alternators in the same station. No difficulty has been found in running this engine in parallel with the others. The three-cylinder Westinghouse engines are now being made in the vertical type up to 1500 brake horse power. Such an engine, which the author saw under construction, had cylinders 34 inches diameter and 5 feet stroke, and was



intended to run at 100 revolutions per minute. This type is well suited for direct-coupling to alternators. With the more general introduction of such engines, there is little doubt that the difficulties of parallel running of gas-alternators will be completely overcome, even if MM. Leblanc's invention of the "amortisseur" has not already solved the problem. With an additional outlay of capital, the question of paralleling the alternators may be completely removed, and an extremely elastic method of working adopted. It would consist of working all the gas-dynamos on direct current, and using this current to run motor-alternators. The latter would be situated in a separate building along with all the service switchboards and appliances, and would form an ideal installation as regards ease of control, freedom from noise and heat, and adaptability to supply electric energy in more than one form, so as to meet various requirements.

Steadiness of running is a matter of great importance in a gas-engine; and the author has made a number of experiments on the 400-horse power Crossley engine installed at Winnington. The results show that, with the cyclical speed-variation brought within such small limits that alternators can be safely run in parallel, the ordinary speed-variation, as controlled by the governor, can be readily dealt with. In this connection, it is important to bear in mind the wide range over which Mond gas will form mixtures with air of various explosive intensities. The output of the engine can be controlled by controlling the quantity of gas per stroke, instead of by a "hit-and-miss" system; the thermal efficiency curve is sufficiently flat over a wide enough range to admit this kind of governing, without much loss of efficiency. The 400-horse power Crossley engine used is fitted with a graduated or stepped gas-die, upon which the gas-lever and knife-edge strike. The governor determines the position of this die, and consequently also the amount of gas admitted. This principle is, however, not new. The ordinary speed-variation under actual working conditions and with different systems of governing, has been recorded by means of a drum, driven direct by the engine-shaft, and carrying smoked paper upon which a standard electrical tuning-fork draws the vibration curves of equal time intervals. With the ordinary "hit-and-miss" method of governing, the speed varies 0.976 per cent. on either side of the mean; but if the engine is allowed to explode every possible time (and this is the usual method of working at Winnington), the running is so steady that the variation is only 0.0937 per cent. above and below the average. It was intended to measure the cyclical speed-variation; but the author found this to be so small that the possible error of measuring the length of a fixed number of vibrations, during fractions of a revolution, was about of the same order as the differences to be determined, and in consequence he calculated the variation throughout the stroke. This method was long and tedious, but is undoubtedly more accurate, although it neglects the effect of engine friction.

Turning now to the subject of gas-producers as compared with steam-boilers, it will at once be obvious that gas under a slight pressure is much easier to handle than high-pressure steam; and when steam-mains cease to be necessary, a cause of danger and trouble is removed—also the losses due to condensation disappear at the same time. It is perhaps of still greater importance that the working, as between producers and gas-engines, can be controlled automatically in the most perfect manner; so that the gas supplied is always equal to the gas consumed. At Winnington, where a million cubic feet of gas is consumed per hour, and demands for gas are by no means regular, there is no gasholder or storage of any kind. A Mond producer will respond at once to a sudden increase in demand for gas, whereas a steam-boiler takes time to rise to the increased output, and the boiler foreman has an anxious half hour as the peak of the load-curve arrives for his station. The speed of the air-blower furnishing the blast to the producers can be controlled by the pressure of gas in the supply mains; and any fluctuation is automatically balanced so as to keep the supply pressure constant. The limits within which a Mond producer will make good gas are surprising; and a producer can be shut down and left with fire in it for over a week, and still be quite ready to start again at short notice. With producers the stand-by losses are reduced to a minimum; and thus another serious waste is avoided when compared with steam practice. It should be made quite clear, however, that when the Mond plant is arranged for the recovery of ammonia, some steam is required in order to provide the balance of water-vapour necessary to saturate the producer-blast. This steam can be raised by utilizing the heat of the exhaust gases leaving the gas-engines; and a large plant has been designed, and will be erected, in which all the extra steam required will be raised in this manner. But where it is not convenient to extract the heat from the exhaust gases, some steam-boilers become necessary. Such boilers could be gas-fired, and the control rendered automatic. If the recovery of ammonia is not attempted, less steam is required in the blast, and arrangements can be made to do without the steam-boilers. In a large station, however, the sacrifice of the ammonia represents about 4s. 6d. per ton of slack. Also, as the recovery plant is very simple, station engineers should welcome this source of economy with the same readiness with which they will appreciate the use of cheap bituminous fuel.

In the Mond gas plant is found a perfect system of producing cheap power-gas, which, when combined with the use of gas-engines, forms the cheapest, the most scientific, and economical method of dealing with fuel. Several companies have grasped

this fact and adopted the system; and soon there will be some 2000 to 4000 horse power plants at work. It is significant that the Northwich Electric Supply Company preferred to buy Mond gas, and pay as much as 2d. per 1000 cubic feet for it delivered under pressure on their premises, rather than use the water-power available in the district.

The question of cost is the crucial test, when once the absolute reliability of the system is assured; and its recommendation must be based on the commercial results to be obtained. The cost figures can be fairly closely estimated on the basis of the Mond plant at Winnington, where 150 to 230 tons of fuel per day are gasified. All that can be attempted in the present paper is to give a general idea of the cost of working a central station under a fixed set of conditions; and in Appendix I. all charges on capital outlay for land, buildings, gas-dynamos, &c. (being capable of estimation from data, which would be somewhat modified to suit each individual case), have been purposely omitted. The station has been chosen at 20,000-effective horse power, and the load-factor assumed at 100 per cent., 50 per cent., and 33 $\frac{1}{3}$  per cent. respectively. The first case only applies to an electrolytic plant; but the others may well represent a central station of the future supplying energy in bulk. The cost of fuel, oil, labour, repairs, and maintenance, ranges from 0.082d. to 0.241d. per unit sold, according to the load-factor and the price of coal.

As regards capital outlay, the combination of Mond producers, recovery plant, gas-engines, and dynamos, compares favourably with the best class of steam-driven plant, when the boiler-house, chimney, slack-handling plant, foundations, and erection, are included in the cost of steam-dynamos, boilers, condensers, and auxiliary machinery. From actual experience with 400-horse power units, the cost of gas-engines, dynamos, fly-wheels, &c., with foundations and erection, is £12.42 per effective horse power capacity, or £16.64 per kilowatt. Adding to this the cost of the complete producer and recovery plant, with its buildings, &c., at £4.62 per kilowatt (including 20 per cent. reserve), a total is obtained of £21.26 per kilowatt. With large units this cost would be materially reduced, and £15 or £16 per kilowatt would probably cover the cost with a 20,000-effective horse power plant.

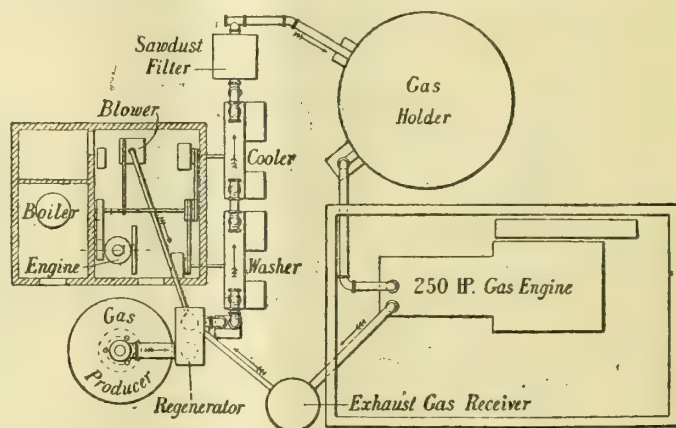


FIG. 5.—MOND GAS PLANT OF 250-HORSE POWER SIZE.

To pass for one moment from large schemes to small ones, it may be of interest to state that Mond producer-plants have been designed to supply gas for small powers down to 250-horse power gas-engines. These plants are very simple in construction, as shown in fig. 5, and work under an important patent of Dr. Mond's, whereby a portion of the exhaust gases from the gas-engine is introduced into the producer blast, thus keeping down the temperature of the producer without the use of extra steam. In these small plants no recovery of ammonia is attempted; and the apparatus is only intended to supply the requirements of isolated places where a good power of heating gas is necessary.

#### APPENDIX I.

##### Estimate for a 20,000 Effective Horse Power Central Station Gas-Engine Plant Worked with Mond Gas.

*Conditions of Working.*—Mond gas-producers and recovery plant worked in conjunction with gas-engines and dynamos. All extra steam raised by utilizing the gas-engine exhaust gas. The electric energy (1) consumed on the premises for an electrolytic plant, (2) transmitted a short distance and sold in bulk with a 50 per cent. load-factor, or (3) with 33 $\frac{1}{3}$  per cent. load-factor. A gas-dynamo at full load takes 105 cubic feet of Mond gas, at 0° C. to give 1 unit (kilowatt-hour). Allowing for a somewhat reduced efficiency at part load, and for driving auxiliary machinery, &c., the liberal figure of 125 cubic feet per unit will be taken. Then 1 ton of coal will yield gas for 1059 units; and it is assumed that 1000 units are actually sold.

##### Output—

Number of units sold per ton of slack gasified . . . . . 1000

##### Slack Cost per Unit Sold—

Slack at 3s. per ton	0.036d.	Slack at 7s. per ton	0.084d.
" 4s. "	0.048	" 8s. "	0.096
" 5s. "	0.060	" 9s. "	0.108
" 6s. "	0.072	" 10s. "	0.120



Working Producers, Recovery, and Sulphate Plant—	
Cost of discharging and handling slack, working producers, recovery, and sulphate plant, and including administration, wages, repairs and maintenance, stores, acid, lighting, &c.	
Per ton of slack gasified . . . . .	3s. 6d.
Value of Sulphate Recovered—	
At £10 per ton of sulphate, naked at works; and with 25 tons of slack gasified, yielding 1 ton of sulphate of ammonia.	
Per ton of slack gasified . . . . .	8s.
Profit due to Sulphate Recovery—	
Being credit for sulphate, less working expenses.	
Per ton of slack gasified . . . . .	4s. 6d.
Per unit of electric energy sold . . . . .	0'054d.
Net Cost of Mond Gas per Unit Sold—	
Slack at 4s. 6d. per ton . 0'000d.	Slack at 8s. per ton . 0'042d.
" 5s. " " 0'006	" 9s. " " 0'054
" 6s. " " 0'018	" 10s. " " 0'066
" 7s. " " 0'030	

	Load-Factor.		
	100 p. ct.	50 p. ct.	33½ p. ct.
Power plant (pence per unit sold)—			
Oil, waste, and petty stores . .	0'030	0'030	0'030
Labour and attendance . . . .	0'034	0'051	0'068
Repairs and maintenance . . .	0'036	0'058	0'077
Total cost per unit sold (pence)—			
Slack at 3s. per ton . . . . .	0'082	0'121	0'157
" 4s. " " " . . . . .	0'094	0'133	0'169
" 5s. " " " " . . . . .	0'106	0'145	0'181
" 6s. " " " " . . . . .	0'118	0'157	0'193
" 7s. " " " " . . . . .	0'130	0'169	0'205
" 8s. " " " " . . . . .	0'142	0'181	0'217
" 9s. " " " " . . . . .	0'154	0'193	0'229
" 10s. " " " " . . . . .	0'166	0'205	0'241
Capital account (producers and recovery plant only, and allowing 20 per cent. reserve on all plant)—			
Slack handling, regenerator plant, and gas-producers . .	£26,500	£26,500	£26,500
Acid towers, recovery and sulphate plant . . . . .	23,500	18,700	17,100
Steam-raising plant and sundries .	19,000	19,000	19,000
Total . . . . .	£69,000	£64,200	£62,600

Note.—No charges on capital account, rent, rates, or taxes are included in the above figures.

APPENDIX II.

Notes on Heat Consumed in Steam and Gas Engines (see Fig. 4).

- Case I.—The fuel used is here taken at 6 lbs. per unit. This is a very good result for an electric light station.
- Case II.—Professor Kennedy's ideal figures are—  
10½ lbs. of water evaporated per lb. of coal.  
8½ lbs. of steam at engine per lb. of fuel burnt.  
16 lbs. of steam give one indicated horse power hour.  
Combined efficiency of engine and dynamo at ¾ full load, 77 per cent.
- Case III.—These figures are based on Professor Unwin's estimate of 2·1 lbs. of coal per brake horse power hour for continuous work. An evaporation of 9 lbs. of steam per lb. of coal, a 5 per cent. loss, and a dynamo efficiency of 93 per cent.\*
- Case IV.—The slack used in Mond producers costs about 2s. 6d. per ton at the pit, when prices are normal. Delivered at Winnington works, the cost is about 6s. 9d.; and as the gas producers are worked as a separate department, this price is charged to the gas-engines for the gas from one ton of slack, the profit on bye-products (after paying the cost of working the producers, &c.) being retained by the department. In the diagram, fuel has been taken at 5s. per ton as an intermediate figure, making some allowance for the above fact. If exhaust steam is not available for use in Mond producers and live steam has to be raised in boilers, then 20 to 25 per cent. should be added to the amount and cost of the fuel.

Heat Consumed to Produce One Kilowatt-Hour of Electric Energy at the Switchboard.

- Calorific value of coal taken at 7900 centigrade heat-units.  
Calorific value of slack taken at 6786 (on dry sample).  
Price of coal taken at 12s. per ton.  
Price of slack taken at 5s. per ton.  
Heat in 1 lb. of steam at 180 lbs. pressure = 666 lbs. centigrade heat units.

	Coal Used per Kw. Hour.	Steam at Engine per Kw. Hour.	Heat Units in Coal.	Heat Units in Steam or Gas.	Cost of Fuel per Kw. Hour.
	Lbs.	Lbs.			d.
Steam—					
Case I.—Central station (good actual)	6	42	47,400	47,970	0'385
Case II.—Central station (ideal)	3'277	27'85	45,888	48,548	0'210
Case III.—Continuous running (ideal)	3'027	25'88	23,913	47,236	0'194
Gas—					
Case IV.—Actual results	1'790	..	11,520	49,675	0'048
Actual fuel cost for 83 electric supply stations (on units sold, year 1898)	..	..	..	..	0'778

\* "Development and Transmission of Power," Unwin, p. 64, 1893 edition.

Discussion.

The PRESIDENT expressed the best thanks of the members to Mr. Humphrey for his interesting and valuable paper.

Mr. HUMPHREY said, before the discussion opened, there were one or two points which were of special interest, and which he desired to mention. In the first place, he wished to inform the members that the large gas-meter which was used to record the gas consumption of the engines as tabulated in the paper had been checked at working speed against the fall of a gasholder specially erected for the purpose, and had been found accurate within one-fifth of 1 per cent. This relieved him of a certain amount of uneasiness which he confessed to feeling while there were no means of calibrating the gas-meter, except at low rates of flow. Then, in the matter of thermal efficiencies, he had throughout the paper used the "higher" calorific value of the gas, including the latent heat of the condensation of the steam formed. By using the "lower" heating value (which he admitted was more usually adopted in this country), the figures representing the thermal efficiencies were increased by over 10 per cent. in favour of the gas-engine. He took this opportunity of mentioning the fact that the Campbell Gas-Engine Company were now building four single-cylinder engines, each to develop continuously 250 brake horse power. Mr. Crossley, whom he was pleased to see present, would be glad to learn that, unlike the steam-engine, the efficiency of the gas-engine supplied by his firm had gone up, after six months' hard work; and he (Mr. Humphrey) was able to record the fact that its thermal efficiency was 1 per cent. better than when they tried it in April last. He then directed attention to the results of a recent trial of a 600 indicated horse power "Premier" gas-engine. They made a world's record for trials with producer gas; and the remarkable result was shown of 1 indicated horse-power-hour from an expenditure of 0'88 lb. of common cheap slack, of so poor a quality that it only contained 62 per cent. of carbon. At present, he had no means of absorbing the full load of the engine; but he felt quite justified in saying that, at full load, the thermal efficiency per brake horse power would be 27 per cent., calculated on the "lower" heating value of the gas.

Dr. MOND said the great importance of the paper was no doubt apparent to everyone; and he thought it might be said with propriety that, in the deliberations of the Institution, the paper had fitly closed the century of steam, and fitly inaugurated the century of power gas. The paper dealt more prominently with the application of power gas to the production of electricity, which undoubtedly was at the present time the most convenient way of transporting and distributing energy. But there were certainly also other methods of transporting energy efficiently over great distances and for distributing it which were equally, and in some instances more, economical, and which were easily adaptable to power gas. He might remind those present that, in the United States, natural gas was transported in immense volumes over more than 100 miles, and distributed over very large districts. It was true, this gas would yield per cubic foot about six times the power that his producer gas would; but this only meant that, either the mains would have to be rather more than doubled in diameter, or the engines employed at certain intervals along the mains for propelling the gas through them should be increased in number, and placed at shorter distances. Probably a medium course—of increasing the mains to some extent, and decreasing the distance between the propelling engines—would be adopted. The transportation of energy in the form of gas had the advantage that the loss of energy by friction was less than the loss of energy by resistance in electrical transmission. Having made mention of the time and trouble Mr. Humphrey had devoted to his calculations and the elaboration of his tables and diagrams, he said the tables showed that the production of power by means of gas-engines, and more particularly by the use of cheap producer gas, had made fair progress since Mr. Humphrey reported in the paper read before the Institution of Civil Engineers in 1897 the results of his first inquiry into the subject. The principal advance made was the great increase in the size and power of gas-engines, without which their application to large industries would have been impossible. Many gas-engine builders in many countries had tackled this problem, and had achieved success. The tables showed that England had not lagged behind other countries in this important movement; and that two of our gas-engine builders—Messrs. Crossley Bros., Limited, and the Premier Gas-Engine Company—had turned out engines of 500 and 650 horse power respectively which were running with most satisfactory results in connection with the electrolytic plant of Messrs. Brunner, Mond, and Co. He could not help stating that it was a great satisfaction to him that this firm had been instrumental in promoting this important progress, and in making the participation of England in it possible by giving the English gas-engine builders their chance of showing what they could do if called upon. The thermal efficiency of these engines had likewise been improved; and in this respect also the engines built in England—and in particular the "Premier" engine—had given results equal to the best results claimed elsewhere. As the "Premier" engine during its trial was only working at two-thirds load, it would be apparent to anyone conversant with the subject that it must at full load give a still higher efficiency, and prove superior in this respect to any gas-engine the results of which had so far been published. It should not be forgotten that the large gas-engines spoken of in the paper were really the first that had ever



been made, and that, in the nature of things, the experience gained with them would and must lead to further improvements. One point, however, had been fully established already: There was no longer any limit to the size and power of gas-engines; and any demand that might be made upon them could now be supplied. It was a great satisfaction to him that the Nineteenth Century had solved this important problem before its unrivalled career closed, and that it left its application as a legacy to its successor.

Mr. W. J. CROSSLEY (Manchester), in the course of a speech of some length, said, from the gas-engine makers' point of view, the tables and the accurate records given by the author could not fail to be of the highest importance. Few engineers had had such opportunities for making tests; and he thought there were few indeed who could have turned out such remarkable records with such accuracy as Mr. Humphrey. So much had been said about the 400-horse power engine made by his firm, that perhaps he might be pardoned for saying a few words in regard to it. He had almost to begin with an apology—at any rate, he would say frankly they were a little disappointed the engine did not show at first a higher thermal efficiency. In the paper it said 26·2 per cent.; but he thought he heard the author state it had gone up 1 per cent. since. He did not catch what Mr. Humphrey said with regard to the "Premier" gas-engine. [Mr. HUMPHREY: The thermal efficiency in the latest tests was 30·38 per cent.] He (Mr. Crossley) thought that one reason why his firm's engine did not do better was on account of the long suction-pipes and the arrangements for the filtration of the air. Perhaps, too, the engine suffered from newness, because the author stated that a 60 nominal horse power engine, after three years' use, was still improving its record. (Laughter.) However he must candidly admit they had three reasons for keeping down the compression in their engine. Firstly, they took into consideration that the engine was intended to run with a heavy load night and day for a long time, and that it was absolutely important there should be no stoppages of any kind. Secondly, with regard to the large pistons, when they began to make this engine, they did not know very much how they would behave under these constant heavy loads. Thirdly, they took into consideration the fact that there was an excellent supply of very cheap gas; and, although to make a record would have been a delightful thing, they thought that good, steady, plain running of more importance. But with their present experience, they certainly would not hesitate to put the pressure at a higher pitch, and would expect no difficulty whatever in reaching a 30 per cent. thermal efficiency—in fact, with a 55-horse power engine running on coal gas, and indicating 150 horse-power, they had obtained a thermal efficiency of no less than 31½ per cent. This was with gas which at the time, was showing about 647 British thermal units, and a consumption of 12½ cubic feet per indicated horse power. This he regarded as no mean record with an engine with a 20-inch cylinder only. Mr. Humphrey had mentioned the large size of the Westinghouse engine shafts; and it was very interesting to him (Mr. Crossley) to read about other people's work. These shafts might well be large when one considered that the compression (as shown in one of the diagrams) was 140 lbs., and that the thermal efficiency of the gas, he believed the author had stated, was 1000. It might be interesting to their (Messrs. Crossley's) friends to know that they calculated all their strains on a maximum pressure of 400 lbs. While the gas never exceeded 700 thermal efficiency, the compression never exceeded 100 lbs.; but still they reckoned they might get a pressure of 400 lbs. So they might suppose that, with a compression of 140 lbs., and a thermal efficiency of 1000 for the gas, the Westinghouse people might get 600 lbs. maximum pressure per square inch on their cylinder. They adopted the three-throw principle, and required stiffness to keep it in line. But he was glad to know their thermal efficiency was only 24½ per cent. Therefore he hoped he might take it as true that they had gone a little better than their American friends for once. Regarding the fluid resistance, this was a point to which he had given a great deal of attention for a long time; and he quite appreciated the remarks made in the paper as to the extra fluid resistance when an engine was missing a stroke. Having explained generally the character of the patents that he had taken out in connection with this matter, he proceeded to say that he was sorry to have to agree that the sequence of rotation in his firm's system of tandem engine did seem somewhat irregular, but it made very little difference in the turning movement. He believed that their system of making tandem engines was much the best, and had a great many advantages; and the pistons were in reality very accessible. If they doubled the engine and made it a four-cylinder one, then it came in as the best design of all. It might be interesting if he stated here that they had a Mond plant in operation at their works, and doing very nicely indeed for quite a new plant. They were getting clean gas from it of 147 thermal units; but they were still troubled with their old enemy tar. He thought himself there would be no difficulty in getting rid of this; but at present they had to change the sawdust too often. When the sawdust was clean, the gas was absolutely so; and a test-paper put against the gas for four or five hours showed little moisture. Could not they have improved scrubbing, so as to make the sawdust last longer? It seemed they were on the high road to success, if they could get over this slight difficulty. His firm were the first to drive large works with water gas. He thought it must be well known that, for nineteen years, they had

driven the whole place with Dowson plant; and they scarcely ever had a hitch with it. They did not repair the generators once in two years; and they only blew them out once a year. The only reason they changed to Mond gas was the difference in the price of the fuel, which, in the North, was unfortunately considerable.

Sir FREDERICK BRAMWELL remarked that to play the part of prophet was a dangerous thing. He had prophesied; but the time of his prophecy had not yet expired—only nineteen years had gone out of fifty. At the British Association meeting at York in 1881, in Section G, he said he thought that, when the next fifty years came round, the steam-engine, unless important improvements were devised, would be found only in museums. As it appeared to him, it was a round-about way of going to work, to turn the heat of the coal into steam, and then use the steam, when they might use direct the product of the coal in the engine itself. He hoped he might be one of those prophets whose predictions came true—at all events, they seemed to be in the way of it. He believed that it was now something like 35 years ago that Sir William Siemens attempted to get a Bill through Parliament for bringing producer gas from the coal pits to all places requiring the use of it; and Parliament, with its usual "ability," determined that this was something very shocking, and the Bill was not allowed to pass. Now they heard from Dr. Mond that his view was perfectly feasible and promising.

Mr. ISAAC CARR (Widnes) was sure the author of the paper had placed the engineering world under great indebtedness. He would not, however, take up time in eulogizing, but would put at once the two or three questions he wished to ask. The author did not state the class of coal used in the producer in the course of these experiments. He (Mr. Carr) would much like to know what coal was used; and also if any such coal as Lancashire or Yorkshire was equally applicable for working these producers. He might say he asked this question because he understood the United Alkali Company had, at their works at Fleetwood, adopted a simple form of producer (known as the Duff producer), fitted with ammonia-recovery plant, and with which any class of slack could be employed. Another question was, could town's refuse be used in connection with this producer? (Laughter.) He expected this inquiry would be followed by a smile; but he might inform the gentlemen who smiled that this was a practice that was much in vogue. It might, too, add further to their amusement when he told them that the system had been fitted with ammonia-recovery plant. (Further laughter.) In talking of the gas-engine makers of this country, he thought it only fair to say, on behalf of the Stockport people, that they had erected recently at Widnes an engine of 260-horse power, fitted with all the latest improvements of water-jacketed pistons and valves, and working with coke-oven gas. Could he further inquire, Mr. Humphrey give some information with reference to the tar? Nothing was said about it in the paper; but Mr. Crossley had mentioned it. What was the amount of tar obtained per ton of coal, how was it disposed of, and what was the value of it? The question of gasholders occurred to the ordinary mind in connection with this subject; and he should like to have the author's opinion upon this point—as to whether in a large installation a gasholder would be necessary; and, if so, the capacity of the holders per unit of producer.

Mr. J. EMERSON DOWSON (London) observed that the paper dealt to a certain extent, if he might say so, with the possibilities of gas power for large stations. For instance, the author had given them an illustration of a proposed electric station, with some twenty engines, in perspective, of 1500-horse power; but it was perhaps just as well to realize that the largest engine as yet built was only of 650-horse power. Of course, it was no doubt useful to their minds to be prepared for what was probably coming in the near future. The last speaker happened to allude to the question of not using gasholders in connection with the system dealt with; and he (Mr. Dowson) thought this was really a very important point. They were told in the paper that the total quantity of gas consumed at Winnington was 1 million cubic feet per hour. This was a large quantity; but there was no gasholder or storage whatever. It would no doubt be a good thing for all those who were concerned in gas power if they could really see their way to dispense with the cost of a holder, and also to save the ground space occupied. But he thought, before they accepted the ruling of the author upon this question, it needed to be closely looked into. He did not know the consumption of gas by the engines at Winnington; but, assuming for a moment that there was an aggregate of (say) 1000-horse power, they would then find that the engines consumed only about one-twelfth of the total volume of gas used. In other words, eleven-twelfths were consumed in the furnaces. Moreover, it went without saying that the mains conveying this large volume of gas must necessarily be very big. Now they all knew that in a gas-engine the gas suction was considerable; and with the full load on, there was generally from 70 to 80 of these suctions per minute. The consequence was there were great fluctuations in the pressure of the gas in the main. He had himself seen fairly large gasholders, at a considerable distance from the engines, rise and fall with each suction, although the gasholder was working freely; and the variation in pressure—the jump up and down in the gauge-glass—was seldom less than 6 inches and he had even noticed a variation of 12 inches. When there were two or more engines drawing from the same main, the case was made rather worse, especially when the engines synchronized. He



had seen, even where a gasholder was working fairly well, the gas-bags drawn almost flat. All this he thought tended to show that they did want some means of making up or equalizing the great fluctuations in pressure caused by the suction of the pistons. Then it might be asked, why was it that no gasholder had been wanted at Winnington? He thought the explanation probably was that the mains were very large, and that the proportion of the gas consumed by the engines was relatively small. [Dr. MOND: You are quite right, Sir.] In such a case as a central station with many engines drawing off, he could not help feeling that they must either have a gasholder or some equally efficient governor of pressure. Of course, for furnace work, no gasholder was wanted. He spoke from his own experience. He had producers in operation at Brown's works in Sheffield, where  $\frac{1}{2}$  million cubic feet of gas were consumed per hour. All the gas from the producers was led into one flue, and then flowed to the furnaces. There was no gasholder and no engines. He was immensely impressed with Dr. Mond's plant; but they were still faced with the fact that the gas contained 16 per cent. of carbonic acid—in other words, that something like 55 per cent. of the carbon of the fuel remained in the state of carbonic acid in the finished gas. It looked, therefore, as if there were possibilities of improvement in this direction. Probably the large percentage of carbonic acid was compensated for, to a certain extent, by the high percentage of hydrogen, which he thought was 29 per cent. But at the same time, it was not ideal. In his own practice, the hydrogen was not so high as 20 per cent.; and the carbonic acid was from 4 to 6 per cent. He could not quite follow the idea of working a plant of this kind without the recovery of sulphate of ammonia, because it seemed to him it was that recovery which was a great set-off to the large percentage of carbonic acid. No doubt, if the recovery was given up in any particular case, there would be less need for steam, and there would be less hydrogen, and a lowering of the carbonic acid. Notwithstanding all this, he could not imagine that the system would be an efficient one.

Mr. A. ROLLASON stated that a small plant, with sulphate of ammonia recovery, had been erected at the works of the Premier Gas-Engine Company at Sandiacre. The plant had a capacity of 1000-horse power; and it would work down to 300-horse power with the same economy. Common Nottingham slack was used; and 3 to 8 cwt. per hour could be gasified with practically the same results. When the plant was making 75,000 cubic feet of gas per hour, the gas produced per pound of coal was 72·26 cubic feet; and when it was working at the lowest—300 lbs. of coal—the gas made was 70 cubic feet per pound. The gas had a heating value of 145 British thermal units per cubic foot. Among other particulars, he said the average analyses of the gas (taken hourly over a period of a week) gave approximately: Hydrogen 26 per cent., carbonic oxide 14 per cent., carbonic acid 12 per cent.,  $\text{CH}_4$  2·5 per cent., and the rest nitrogen. The heating value of the gas did not vary more than between 142 and 145 thermal units per cubic foot.

At this stage, the discussion was adjourned to the 18th prox.

#### MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the above Society was held in Manchester last Saturday. In the afternoon, a visit was paid to the works of Messrs. Mather and Platt, Limited, at Salford. The members were received at the works by Mr. Sidebottom, and several members of the staff, by whom they were conducted through the various sections of the establishment. At the close of the visit, a vote of thanks was, on the motion of the Vice-President (Mr. R. H. Garlick), unanimously accorded to the firm for their courtesy in allowing the members to go through the works and make what had been a very interesting inspection of the several departments.

In the evening, the members assembled at the Technical School, Princess Street, for the transaction of the business—Mr. R. H. GARLICK, in the absence of the President, occupying the chair.

On the motion of Mr. BARBER, a resolution was adopted to the effect that the rules of the Society should not be altered or added to except at the annual general meetings.

Mr. S. B. CHANDLEY (Warrington) read the following paper:—

#### THE WORKING OF REGENERATOR FURNACES.

Perhaps there is not a more important feature in the working results of a gas undertaking than the heating of the retort-settings. It has often been said that the money of a gas company is either made or lost in the retort-house. In Newbigging's "Handbook," one of the "Golden Rules" set forward is "Keep up the heat of the retorts." It becomes the duty of the gas engineer to adopt a system which will keep his retorts at the best heat for the production of gas, combined with the greatest economy of fuel and labour.

As you are all aware, the heating of furnaces by generator gas, with or without heated air supplies, is acknowledged to be the system of the day which has unquestionably the greatest economical advantages of any process for the generation and utilization of heat. All the principal gas-works now being erected or in course of reconstruction adopt one or more of the many patterns of generative or regenerative retort-settings now before the profession; and the complex question of which is the best or

most suited to the special cases has to be gone through, and a final selection made. Although the title of this paper is "The Working of Regenerative Settings," I find it very necessary to dwell on the construction and general arrangement, as well as the working; for not without a thorough knowledge of the former can the latter be obtained.

In most of our English regenerative settings, there is a gas-producer to each bed of retorts—in fact, it generally forms part and parcel of the setting which it is called upon to heat. This, however, is by no means always the case. It is not at all infrequent to find one producer working two or more beds of retorts which may be some distance from the gas-producer; and in some cases the retort-settings are heated from gas-producers placed outside the retort-house altogether, at a distance of as much as 50 yards—the producer gases being conducted to the settings by means of cast-iron flues with fire-brick linings. There is, of course, loss from radiation when the generator or producer is away from the setting; but although this is said to be small, the practice of placing the producer away from the setting does not seem to have found favour among the gas engineers of this country.

The systems of regeneration are many; and it would be quite impossible to go into the details necessary to examine them in this short paper. Siemens in his original system passed the waste gases from the furnace through chambers of chequered brickwork for a given time; heating the brickwork to a high temperature. The direction of the waste gases was then reversed, and the secondary air supply passed through the brickwork to absorb the heat which had been previously imparted to it by the waste gases. This intermittent system gave very excellent results, but has a great disadvantage in requiring the direction of the waste gases to be changed periodically, which involves a certain amount of complicated machinery. Siemens's systems of heating in the various manufacturing industries of the world are very extensively applied, perhaps more so in the iron-smelting processes than any other. Twenty years ago there were about 10,000 Siemens furnaces in operation; and since then the number must have increased many times.

The function of a gas generator or producer is the conversion of a carbonaceous fuel into a combustible gas composed mainly of carbon monoxide, instead of by direct combustion into carbon dioxide. In ordinary working, without generators, a very large quantity of air is drawn into the retort-setting in excess of what is necessary for its proper working, and hence a loss of heat by its being withdrawn with the large quantity of waste gases. With a gas-producer, this is not the case, as the exact amount of air required can be added to a nicety.

The usual system of regeneration is by sandwiching the waste gases with the secondary air supplies; the latter obtaining their heat from the former by radiation through the intervening material. This material is generally brickwork. Iron pipes are sometimes used; but although the amount of heat which will radiate through iron is forty times greater than the same thickness of brickwork, it is seldom used on account of the rapidity with which it burns away. Regeneration is understood to mean the transferring of the heat from the waste gases to the air required for burning the gas from the producer. This, in many cases, is heated to 1000° Fahr., and the waste gases leave the setting at 600° Fahr.

Although the advantages of gaseous firing are unanimously acknowledged, this is not the case with respect to regenerative firing. Competent authorities contend that the extra cost of settings with the regenerating arrangements is not compensated for by the saving in fuel which they accomplish. This is no doubt perfectly true in respect to the more complicated systems, where a very heavy capital expenditure is involved; but it can hardly be the case with the less elaborately constructed settings, and the usual estimate of economy is 20 per cent.

Mr. C. C. Carpenter, now Chief Engineer to the South Metropolitan Gas Company, in a paper on the subject,\* said he found no great advantage in regeneration over generation; and in an arrangement by which he could bye-pass the regenerating portion of his settings, he only obtained a reduction of 1 lb. per 100 lbs. of fuel used, by regenerating the secondary air supply of the furnace. The same authority contends that the working of several settings from one generator is the method to be preferred above others; and the results obtained by him certainly justify his remarks.

*Principle of Regenerative Firing.*—The principle upon which regenerative firing is worked is as follows: Primary air enters the furnace, and on reaching the red-hot fuel at the bottom combines with it and forms carbon dioxide ( $\text{CO}_2$ ). This goes through a further quantity of fuel, and combines with another atom of carbon, and becomes carbon monoxide ( $\text{C}_2\text{O}_2$  or  $\text{CO}$ ). The producer gas issues through the nostrils of the producer into the combustion-chamber, where it meets the secondary air supply necessary for its combustion, and then finds its way into the setting, and after heating the retorts therein makes its way into the main flue, heating the secondary air supply on its exit.

*Advantages of Gaseous Firing.*—The advantages claimed for gaseous firing are well known to you all. Perhaps, however, it will not be out of place to mention them here. The most important is the saving of 50 per cent. of the fuel used, which includes the saving by firing with red-hot coke direct from the

\* See "JOURNAL," Vol. XLVIII., p. 875.



retorts. This might, of course, be done in direct-fired furnaces to a certain extent, by having them specially constructed for the purpose. I have never seen any which permit of this being done, but know of no reason why it should not be so.

*Temperature of Setting.*—Another important factor is the uniformity and certainty with which the temperature of the setting can be maintained. Any desired heat can be obtained in a properly designed setting. In most cases, simply regulating the primary and secondary air supplies will do this.

*Clinkering.*—Again, the laborious process of clinkering is reduced to a minimum, and the process does not admit large quantities of cold air into the setting, as is the case with direct-fired furnaces.

*Durability of Retorts.*—The durability of the retorts is of no mean importance, and should certainly be mentioned in connection with the advantages of gaseous firing.

*Other Advantages.*—Cleanliness of retort-house; handling of coke; and many other advantages will strike those who have had both systems in use as certainly worthy of mention.

[The author next proceeded to describe, by means of a diagram, an improved form of Klönne's regenerative retort-setting which is, at the present time, in use at a number of places, including Warrington.]

*Construction of Setting.*—And now a few words on the construction of the setting. It is, of course, absolutely essential that the whole of the materials used in the construction of the stack and the lower portions of the settings be the best of their respective kinds. It is false economy to use inferior material, though lower in price, for this part of the work, as it would probably last fifteen to twenty years if properly put up, and of good material to start with, and will in this instance fully repay any extra expense which may have been necessitated by superior quality of workmanship and material. In the case of the upper portion of the setting, containing the retorts, the material is not quite of the same importance, as they will require renewing every two or three years. This makes the use of high-class materials not quite so imperative.

*Labour.*—Material, however good, is useless in the hands of unskilled labour; and it is only by the most careful supervision that the best work can be obtained. There is a great temptation, even among good-class men, to get through work and make an external show. I say "external," because, when looked into closely, it often proves to be simply a mass of brickwork thrown together, not built.

*Ordinary and Fire-Clay Work.*—Building fire-clay work is not like ordinary bricklaying, where a joint may be  $\frac{1}{2}$  inch to 1 inch in thickness without any very serious results. Fire-brick should be laid with only a skimming of finely ground fire-clay; the brickwork being brick and brick well bedded with a mallet. In filling in spaces, the fire-bricks should be cut to fit the places where they have to go, and not small bits put in and flushed up with fire-clay. Ordinary brick-setters, used to outside work, can hardly be expected to change their usual mode of working, and use the care and skill necessary for building retort-settings.

*Turning Arches.*—In the turning of the arches of the stack, particular attention is necessary to ensure good work, especially if there is not much rise in the arch. The fire-clay drops out of large joints, the key for the bricks is lost, and the arch gives way on the top of the retorts in the setting, causing them to be pushed out of shape; and no end of trouble is involved.

*Gauging Bricks.*—In turning arches of any importance, the bricks should be carefully gauged, and any which are not a good shape rejected. The remainder should be sorted out, and put in heaps of their respective kinds, and one course lengthways run with one shape, and then another course of another shape, and so on till the whole are used up. In this way, a good job may be made from bricks not actually uniform.

*Combustion-Chamber.*—It is necessary to use special Silica material in the combustion-chamber, to withstand the high local temperature which is produced there. It is only by using material of a highly refractory nature that the fusion of the combustion-chambers can be prevented.

*Shields.*—The special Silica material is also used for shields, to prevent the direct action of the heat on the two outside middle retorts.

*Division-Walls.*—Another point requiring consideration is the  $\frac{1}{2}$ -inch wall between the waste-gas flues and the secondary air supply. If not perfectly built, and any cracks are left between the two flues, short circuiting would be the result; and the arrangement of dampers, &c., would be upset in consequence. To prevent this, the division-wall is sometimes built with tongued and grooved bricks; and this certainly minimizes the risk of short circuiting.

*Carbon Recuperation.*—At this point, I might mention a comparatively new process of recuperation, in which a portion of the waste gases (say, 20 per cent.) are returned under the producer. This was described in a paper read before the Institution of Gas Engineers last year, and called "carbon recuperation."\* The system combines recuperation of the carbon from the waste gases and the heating of the secondary air supply. It has no advantages from a theoretical point of view; but it has been found conducive to economy by reducing the amount of carbon dioxide to carbon monoxide. An amount of heat is absorbed by this; but as the waste gases are drawn in hot, the balance of heat is

about equal. Steam in this system is absolutely necessary, as great heat is produced just above the fire-bars, which would quickly burn away without the influence of the steam to keep them cool. I mention this process of carbon recuperation so that it may be distinctly understood that the waste gases returned to the setting are returned under the fire-bars of the producer, and not into the secondary air supply, which would take them direct to the combustion-chamber, where the carbonic acid would be determined.

*Cost of Setting.*—One objection to the setting I have described is its high structural cost, which the number of special bricks necessitate—some of which cost 7s. 6d. to 8s. each. But as all the expense is in the lower portions of the setting (the top part being of ordinary bricks), the first impression of excessive capital expenditure is somewhat removed when it is remembered the length of time they will be in use. Many settings are in existence which are considerably less expensive in their first cost, and are composed of ordinary bricks; but they cannot be so durable, and are not so complete in their regeneration of the secondary air supplies. In the working of regenerative systems of heating retorts, there are many points requiring attention to ensure good results.

*Fuel.*—This should be supplied red hot direct from the retorts into the producer. It should also be as uniform in quality as possible—that is to say, fuel having the same quantity of ash in it—as the amount of draught required to burn fuel with 7 per cent. of ash is not the same as that for fuel with 25 per cent. of ash, contained in (say) cannel coke. Some classes of fuel are productive of much trouble, not only in the amount of clinker formed, but also owing to the soft stickiness of some clinkers preventing their being removed in a satisfactory manner. Experience only can determine which fuels are free from this objectionable property, as the quantity of ash alone will not furnish a sufficient indication of its clinker-forming capacity.

*Keeping Furnaces Full.*—It is of the utmost importance that the furnace be kept full of coke. If allowed to get low, the producer gas may burn in the producer and melt down the nostrils, which are not composed of Silica material, and were never intended to be put to such a test. The producer must be filled at regular intervals, as the consumption of fuel may require.

*Dampers.*—The dampers should be regulated to give rather more than sufficient draught to work the setting when first starting, as this will gradually diminish as the flues become made-up with deposits of soot and dirt, which become a serious obstruction in course of time, and have to be removed from the various passages by scraping, through the boxes provided for the purpose. The two dampers on each side of the setting should be so regulated that the heat is evenly distributed over the whole of the setting. The amount of heat may be increased or diminished by opening or closing the supply of air to the producer on the primary-air doors of the furnace.

*Nostril-Bricks.*—In many forms of setting, the nostril-holes on the top of the producer require closing in the centre of the setting, and gradually increased in area towards the front of the setting. This may be done by placing bricks partially over the holes; thus throwing the heat more to the front of the setting, which is generally cooler. The dampers, when once regulated, should be pointed up or fastened in some way to prevent them being tampered with. Nothing is more detrimental to the working of the regular heats than the constant altering of the dampers. As I mentioned before, the amount of heat should be regulated by the quantity of the primary air admitted; thus burning a larger or smaller amount of fuel, as the case may be.

*Secondary Air.*—The secondary air supply requires carefully adjusting. If too much is added, the excess cools the setting very considerably. If an insufficient quantity is added, the carbon monoxide burns in the flues or escapes up the chimney-shaft, and is wasted. Just sufficient secondary air should be added to burn the whole of the producer gas formed, and no more. Experiment and inspection, or still better chemical analysis of the spent gases, will be the guide as to when the right quantity of secondary air is being admitted. If the secondary air supply is shut off altogether, a blue flame of carbonic acid will be seen burning in the waste-gas flues, and they rapidly become heated. Now gradually open the secondary air supply; and it becomes less until it disappears, and the flue will keep losing its heat till it becomes black, as excess of secondary air is added.

*Excess of Secondary Air.*—It is quite a mistake to think that when the waste-gas flues are black there is no waste going on, and that the whole of the heat is being absorbed by the setting. Nothing is easier than to add an excess of secondary air to the setting and have all the waste-gas flues cool. But this is not economy; and the air over and above what is necessary to burn the producer gas to carbonic acid is simply cooling the setting.

*Insufficient Secondary Air.*—A blue flame is sometimes seen burning on the top of a chimney-stack. This is caused by an insufficient supply of secondary air being added. The carbon monoxide, not being wholly burnt, is carried forward; and on coming into contact with the atmosphere, burns there instead of in the retort-setting.

*Gas Analysis.*—I have not thought it here necessary to enumerate the various processes of gas analysis applicable to the testing of furnace gases, with which no doubt most of you are more familiar than myself.

*Composition of Various Gases.*—The producer gas should theoretically contain 34·7 per cent. carbon monoxide and 65·3 per cent.

\* See "JOURNAL," Vol. LXXIII., p. 1271.



of nitrogen; and the waste gases would then contain 21 per cent. of carbon dioxide. These, of course, are theoretical figures, and are never obtained in working. It may be considered good working if the producer gas contains 6 per cent. carbonic acid and 30 per cent. carbonic oxide, and the waste gases 12 per cent. carbonic acid and about 3 per cent. oxygen. Hydrogen is always found in the various gases. This is caused by the water from the ash-pans being evaporated and being decomposed. An analysis of waste gases from a Klönne regenerative setting gave the following results: Carbonic acid 12 per cent., carbonic oxide 7·6 per cent., oxygen *nil*, hydrogen 6·6 per cent., and nitrogen 73·8 per cent.

*Aim of Working.*—The aim in working a gaseous-fired setting should be to produce as much carbon monoxide as possible in the producer, and to burn the whole of it to carbon dioxide in the combustion-chamber. The nearer this state of perfection is reached, the greater will be the heat of the setting.

*Heat at Points of Setting.*—The heats of the different portions of the setting, as given by Graham, are about as follows:—

Producer gas, 2000° Fahr.  
Secondary air, 1800°  
Products of combustion, 2500°  
Waste gases enter regenerating flues at 1900°  
" " leave " " 500°

*Clinkering.*—It is a mistake to be constantly clinkering a fire. It should be done at regular intervals, and done thoroughly. Clinkering necessitates a certain loss of coke during the operation; and the clinker is not so efficiently removed if it is not allowed to form properly. How often a furnace is to be clinkered will depend largely on the class of the fuel used. It will usually run 24 to 48 hours after clinkering.

Clinkering of the Klönne furnace is performed as follows: A number of pieces of flat iron called needles, about 5 feet long, 3 inches wide, and  $\frac{3}{4}$  inch thick, having a hole in one end to withdraw them by, are forced through the mass of fuel just below the water-pan on the top of the dead-plates; the ends or points resting on a wall at the back of the setting. These false bars hold the fuel up while the ordinary fire-bars are removed and the clinker is thoroughly cleaned out. It is important that this should be carefully done, as the clinker will form more rapidly if there is any left sticking to the sides. When the clinkering is finished, the fire-bars are replaced and the false bars are withdrawn; and the fuel falls into its proper place.

*Water.*—The water supply first runs into the cast-iron dish, then overflows over the dead-plates, and finally finds its way to the ash-pan, from which it evaporates and keeps the fire-bars cool. It also keeps the front of the setting cool; but the most important function of the water which is evaporated from the ash-pan is the prevention of the formation of clinker by reducing its temperature. This makes it more of the nature of an ash, when it is much more easily removed. Steam is frequently introduced into the furnace under the fire-bars for the same purpose.

The water of evaporation and the introduction of steam produces the hydrogen which is found in the producer gas. Thus the aqueous vapour ( $H_2O$ ) is split up into oxygen and hydrogen. Although at first sight this might appear a beneficial reaction, the heat absorbed by the decomposition hardly makes it of any thermic value.

#### Discussion.

Mr. BRADDOCK pointed out that the author had not said anything about the quantity of coke used with the regenerator furnace per 100 lbs. of coal carbonized. In their case, they found that in furnaces with inclined retorts it was about 13 lbs., as against something like 27 lbs. with direct firing. Of course, it was difficult to get at the exact quantity; but these figures gave them a rough idea of the amount used. He would also like to know something as to the state of the bed during stoppages of (say) 12 or 24 hours, as on Sundays. At their own works, they found some little difficulty on such occasions.

Mr. HILL remarked that the coke in a furnace did not always settle down as it should do, and if it were not pushed down it left a channel on each side, which, he conceived, might cause inconvenience in connection with the ascent of the gases. He had an idea that the furnace might be made in a form similar to that of a cupola, so that the coke would drop properly without leaving the crevices or channels to which he had referred.

Mr. MOTTRAM said the author had told them that at most gas-works they were building either generator or regenerator furnaces. He would like to ask if Mr. Chandley did not know of any other method whereby the work could be done equally well, and also what quantity of gas per ton of coal he could sell with the regenerator system. Mr. Newbigging, at Macclesfield, sold 10,500 cubic feet to the ton, with a direct-fired furnace of his own improved setting. It was claimed that this was a very good paying arrangement. Of course, the question of making the thing pay had to be looked to. In the case of the regenerator, they had to consider the cost of removing naphthalene, which obstructed the pipes over the town. This was due to high heats. At Hyde, on the other hand, with direct firing, they never had a case of such stoppage. The expense involved in clearing the pipes was consequently an item not to be overlooked, in the case of regenerator furnaces; and he believed that in some towns it was pretty considerable. There was also the cost of clearing the stopped ascension-pipes. He knew of one place where they kept two men at the top of the stack, day and night,

doing nothing but clear out the pipes. This was not necessary once in two or three weeks at Hyde, which meant a saving in wages. Then, again, they obtained a better price for their tar, when they had the direct fire.

A MEMBER asked what was the amount of vacuum required at the damper to work the setting in the furnace described by the author.

Mr. HILL said, in his opinion, the deeper they made a furnace the better results they would obtain. There was what he might term a longer mass of hot coke, and a better chance of carbonic oxide being formed.

Mr. STODDART said he understood the author to say that the hydrogen had no effect in giving off heat; but he (Mr. Stoddart) could not help thinking that it must give off a certain quantity. The theory of regenerators was very good, but the question was whether it would pay to go into the increased make of gas per ton of coal carbonized. There was the naphthalene trouble, and the deteriorated value of the tar.

Mr. BRADDOCK remarked that there was not trouble with naphthalene in all cases where they had regenerator furnaces. In many places there was not the slightest difficulty in this respect.

Mr. CRITCHLEY said that from 24 to 48 hours seemed to be a long interval to allow between the times of clinkering.

The CHAIRMAN asked the author whether there was very much to be gained by adopting regenerator in place of generator furnaces, and whether they got a proper equivalent for the increased cost of the former type. With regard to the quality of gas, he had often heard customers complain when the illuminating power was exceptionally high, and say the light was better when the power was actually lower.

Mr. CHANDLEY, in replying on the discussion, said he had not gone into the question of the amount of fuel used for working regenerator furnaces; but taking the balance-sheets of the two systems—viz., ordinary fire settings and regenerator furnaces—he had found a gain of exactly 51 per cent. in the amount of fuel used. He did not mean to say this was always the case; their direct-fired furnaces might possibly have been particularly bad specimens. The amount of fuel used in the setting, however, would probably be about 30 cwt. for every 6 tons of coal carbonized. With regard to the hydrogen, what he had meant to say was that, taking into account the heat absorbed by the conversion of the water of the steam into hydrogen, it was not compensated for by the value of the hydrogen when burning. As to stopping the retorts at the week-ends, they never did this, but had the bed stopped for two or three days; and the only danger was that it got exceedingly hot. By closing off the primary-air supply, they could reduce the setting to whatever temperature they wanted. As to the advantages of regenerator furnaces, he could not go into figures as to the quantity of gas sold per ton of coal. Using 4-foot cannell, they would get a good amount; but with slack they would not. They had to consider the kind of fuel used, which greatly affected the result. The saving of 50 per cent. in fuel which he had mentioned was, however, sufficient reason for putting in regenerator in place of direct-fired furnaces. Of course, the points of cheaper working, higher heats, and greater make per ton of coal carbonized, did come in; but the saving in fuel was quite sufficient justification for adopting regenerator settings. Of course, there would be a difficulty as to stopped pipes, even with ordinary furnaces, when they were allowed to get too hot. With respect to naphthalene, it was produced by high heats, to a certain extent; but there was a lack of definite information on this point. As to tar, they would not get as much benzol in it with high heats; but unless they obtained proportionately higher prices for the tar according to quality, the point was not of very much importance, as if they did not get the value in the tar they got it in the gas, so that it was not lost. He did not think there was much difference in the prices obtained for tar. He fancied that tar distillers did not go closely into the chemical analysis of the tar, before giving a price. The vacuum on the setting shown in the sketch was about 1 inch on the chimney-shaft, though it depended on the state of the flues. With regard to clinkering, he had known men to "tickle" every two hours, but not to clinker anything like so often. They clinkered every 24 hours; and in some works every 48 hours. As to the quality of gas, he thought that the average outsider's opinion on gas matters was not one to be taken seriously.

The proceedings closed with the usual vote of thanks.

**Culinary Exhibition in Brussels.**—A very pretty and complete exhibition of comestibles and culinary appliances was opened in Brussels on the 8th inst. by the Comte and Comtesse de Flandres. The leading hotels and restaurants of the city, as well as first-class dairies and large business houses connected with the preparation of cooked and uncooked food, participated therein; and an exceedingly effective display was made. The capabilities of gas as an agent in culinary operations were ably demonstrated by Madame Altling-Mees with the aid of one of Messrs. Fletcher, Russell, and Co.'s cookers (No. 170), which she showed was equal to dealing with meat, fish, and light pastry at one time. The exhibition has attracted the attention of the *élite* of Brussels; the Prince and Princess Royal having visited it on Monday last week, while the King was expected to honour it with his presence on Wednesday.



**HISLOP'S LIGHTING TORCH.**

In our "Register of Patents" to-day will be found an abstract of the specification of a patent taken out by Mr. R. F. Hislop, of Paisley, for a lighting-pole for street and other lanterns. The details of the device are, of course, given elsewhere; but we here illustrate its application to two systems of incandescent gas lighting fitted with anti-vibrators. We are informed that the



SUGG'S ANTI-VIBRATOR.



THE WELSBACH ANTI-VIBRATOR.

Corporation of Paisley have decided, on the recommendation of the Superintendent of Lighting, to erect 100 lanterns fitted with the device, which effects the lighting of the burner at one operation. As the result of a trial of nine lamps, continued over as many months, it was found that the number of mantles required per annum is at the rate of 1'33 per lamp.

**THE INSTALLATION OF HIGH-PRESSURE GAS LIGHTING IN THE STRAND.**

In the "JOURNAL" for the 16th of October (p. 941), we noticed the installation of high-pressure incandescent gas lighting with which Messrs. W. Sugg and Co., Limited, have illuminated the portion of the Strand at which this important thoroughfare is

crossed by Wellington Street. There are six lamps of the "Westminster" pattern, each consuming 30 cubic feet of gas per hour, and giving a light of 1000 candles; and their location is shown in the accompanying illustration. Those of our readers who have not seen the installation will be able, by a glance at the picture, to form an idea of the effect produced by such a disposition of brilliant light-centres. As has been already pointed out, it makes all the neighbouring lights, of whatever kind, look dim. The pressure increaser and automatic gas and water regulator are fixed in the underground lavatory in immediate proximity to the lamps.

**SOCIETY OF ENGINEERS.**

The Forty-seventh Annual General Meeting of the Society of Engineers was held on Monday evening last week, at the Society's Rooms, No. 17, Victoria Street, Westminster. The proceedings were merely formal—for the purpose of electing by ballot the Council and officers for the ensuing year. Mr. Charles Mason was selected as President; the Vice-Presidents being Mr. Percy Griffith, Mr. J. P. Barber, and Mr. D. B. Butler. The Hon. Secretary and Treasurer (Mr. George Burt) was re-elected, as also the Hon. Auditor (Mr. Samuel Wood, F.C.A.). In the course of the evening, it was announced that Mr. Burt had presented to the Society a President's badge of office in gold and enamel. After the award of premiums for the papers read during the past session, votes of thanks were accorded to the President, Council, and officers for this year.

The annual dinner of the Society was held at the Hotel Cecil, on Wednesday, when the outgoing President (Mr. Henry O'Connor, Assoc. M. Inst. C.E., of Edinburgh) occupied the chair. Responding to the toast "Success to the Society," Mr. O'Connor acknowledged the assistance he had received during his year of office from the Members of Council, as also from the Secretary (Mr. Perry F. Nursey). He later on announced that Mr. James Mansergh, President of the Institution of Civil Engineers, had been nominated as an honorary member of the Society. Among the other toasts duly honoured was that of "Kindred Institutions," proposed by Mr. Percy Griffith and responded to by Mr. H. E. Jones, M. Inst. C.E.

About 16,260 metric tons of coal tar and pitch resulting from the distillation of tar were imported into France from Belgium in the year 1899, against 17,229 tons in 1898. The exports from France for the same years were 18,139 and 16,096 metric tons.



THE HIGH-PRESSURE GAS INSTALLATION IN THE STRAND.



## CONTROL OF WATER UNDERTAKINGS AND SOURCES OF WATER SUPPLY.

As mentioned in the report published last week of the general proceedings at the winter meeting of the British Association of Water-Works Engineers on the 8th inst., the Water Boards Committee to whom had been delegated the duty of considering the above question presented their report. The members composing the Committee were the President (Mr. C. H. Priestley, of Cardiff), Mr. H. Ashton Hill (South Staffordshire Water Company), Mr. W. Whitaker, F.R.S., F.G.S. (Croydon), Mr. W. Matthews (Southampton), Mr. F. Griffith (Leicester), Dr. J. C. Thresh (Essex County Medical Officer of Health). It should be stated that Mr. Ashton Hill dissented from portions of the report.

### REPORT OF THE WATER BOARDS COMMITTEE.

Having held several meetings for the discussion of the question referred to us, and having carefully considered the various opinions expressed at our last winter meeting, we think the time has arrived for issuing a report upon the question of amending the existing system upon which water-works undertakings in this country are initiated, authorized, carried out, and maintained.

We must, however, confess that, owing to the enormous scope of the problem put before us, we are at present unprepared to lay before you anything but an outline of the points which appear to merit special attention, together with a few suggestions which we think are sufficiently simple and practicable to be undertaken by the Association itself as a preliminary to more effective action later on. We therefore first submit a brief summary of the principal features of the existing system which, we are convinced, could and should be amended, adding a few comments under each head.

#### 1. *The Present System of Control over Undertakings for Public Water Supply is Unsatisfactory.*

The principal causes for complaint under this head are: Firstly, that the general control is shared by four independent public authorities—viz., the two Houses of Parliament, the Local Government Board, and the Board of Trade; secondly, that the decisions of Parliament are often contradictory as between the two Houses as well as between successive sessions; and thirdly, that rural districts are often unable, for financial and other reasons, either to secure proper water supplies or to protect their natural rights in them.

In our opinion, water supply is a matter of such a technical nature and of such vital national importance that, failing the establishment of a single department whose duty would be to deal with this subject, the existing authorities would be in a better position to deal with it if they were constituted with more regard to their personal knowledge of water-works problems, or else were assisted in their deliberations by independent experts having special experience and knowledge of the subject. It is also generally acknowledged that the time taken in complying with formalities, and in passing schemes through the many stages at present necessary, is a serious disadvantage, especially when, as is so frequently the case, the provision of new or additional supplies is urgent, and we feel confident that some curtailment of the present procedure could be safely effected. Finally, we would refer to the inability of many rural populations to provide themselves with a proper supply of water, owing principally to the great cost of the necessary works (due to the wide distribution of the houses) and the low rateable value of rural property. We would suggest that, as a sufficient and proper supply of water is essential to the well-being of the whole community, some system might be devised by which the poorer rural districts should be, as far as necessary, assisted in obtaining a water supply by wealthier towns in the immediate neighbourhood.

#### 2. *The Existing Powers for Enforcing a Proper Water Supply are Inadequate.*

In dealing with this point, reference should be made to Section 299 of the Public Health Act, 1875, and Section 3 of the Public Health (Water) Act, 1878. In spite of the apparently comprehensive nature and uncompromising wording of these clauses, it is a striking and undeniable fact that many small towns and rural districts in this country are still without any public water supply, and are entirely dependent upon private wells, which are frequently subject to serious contamination, and are, moreover, under little or no responsible supervision. That such a state of affairs should still exist is, we think, conclusive proof that further legislation is necessary. We would further point out that, under existing Acts of Parliament, it is difficult to decide upon whom the responsibility rests for providing a proper water supply—i.e., whether the householder or the local authority, the latter being merely required to see that a proper water supply is provided, and both being equally liable to be proceeded against in case of default.

#### 3. *The Areas Allotted to Existing Local Authorities are altogether Independent of the Sources of Water Supply, and the Trouble and Expense of Forming "United Districts" and "Joint Water Boards" are Unnecessarily Great.*

The fact that the boundaries of urban and rural sanitary authorities have been fixed without regard to the question of

water supply is in itself sufficient to indicate that these bodies (as at present constituted) are not necessarily the best qualified to act as water authorities, except to the extent of superintending the distribution of water within their districts. The larger corporations and councils are constantly seeking new sources of supply further and further from their own limits of control, in some cases without affording any proof that they have fully utilized those within their own boundaries; and it cannot be denied that the allocation of available sources is often inequitably carried out. The difficulties attending the formation of united districts and joint water boards have been well illustrated by several notable cases recently before Parliament; and although it must be admitted that in recent years advances have been made in this direction, the small number of such joint boards yet formed is an indication that the facilities afforded for their formation are at present inadequate.

#### 4. *The Law Relating to Underground Water is Inequitable, and a Standing Danger to Many Public Water Supplies.*

This, we think, is a fact now acknowledged by most authorities on water supply, and is best proved by the enormous amount of litigation which has taken place in connection with this subject, and which has, in consequence of the present state of the law, resulted in many cases of injustice. As, however, we are dealing primarily with the position of undertakings for public water supply, we will confine ourselves to remarking that a condition of affairs whereby any person or persons can with full legal sanction deprive a public water undertaking of its supply by merely sinking a well in an adjoining property, as is now the case, is one that, in the interests of public health, should be promptly amended.

#### 5. *The Law Relating to the Pollution of Water Requires Revision.*

Although this subject has received considerable attention in recent years, the pollution of public water supplies has by no means been rendered impossible; and it must be admitted that the law as it stands is inadequate to prevent water undertakings supplying impure water. Several cases have also occurred where sources and works which, at their initiation were of a perfectly satisfactory character, have subsequently become polluted. It is further a serious defect in the present system that, however carefully the details of a scheme may have been considered by Parliament, the Local Government Board, or the Board of Trade, there is nothing to prevent such alterations being made in the actual work as to seriously affect its efficiency and safety; and we therefore think that some system of continuous supervision is much to be desired. These questions should, in our opinion, secure attention from the Legislature.

#### 6. *The Provisions for Preventing Waste are Insufficient.*

The question of reduction of waste is too large a one for us to deal with fully in this report; but we are of opinion that it is of sufficient urgency to warrant its being more strictly and generally insisted upon by the superior authorities, and no longer left to the discretion of the individual water authorities. Unnecessary and preventable waste has been proved a cause of water famine in many instances; while the conservation of water now wasted would be the means of enormously increasing the resources of the country generally, of relieving the strain arising in seasons of drought, and affording a surplus sufficient to meet the needs of many districts at present altogether neglected.

#### 7. *The Collection and Publication of Official Returns relating to Existing Undertakings is much to be Desired.*

In this respect, this country is far behind others. It is obviously impossible to secure complete and reliable returns of the whole of the water-works undertakings in the country unless such returns are required compulsorily. Until, however, such official returns are forthcoming, we think the Association itself might well make some attempt to collect such data.

Having indicated some of the most apparent defects in the existing state of affairs, it may be expected that we should make some suggestions as to remedying them; but it is hardly necessary to point out that, with one exception, the remedy is entirely beyond the power of an Association such as ours, and requires the intervention of Parliament. We would, however, suggest that the members of the Association should be urged to use their influence to bring the points in question into prominence, with a view to securing the attention of the various ruling authorities to them at the earliest possible moment.

In the meantime, the following recommendations will, we think, be found to come within the scope of our Association, and we therefore conclude by suggesting—

1. That the Association endeavour to organize the systematic collection of data relating to the following subjects: (a) The available supply obtainable from various sources; (b) general information concerning existing water-works; (c) information concerning districts not adequately supplied with water.

2. That a form for the entry of the above and other particulars be prepared and circulated among the responsible officials of all existing water undertakings and such other persons as may be in a position to obtain or supply the information required.

3. That the information thus collected be tabulated and published for the use of the Association.

4. That the general funds of the Association be available for carrying out the above recommendations so far as they will go



without involving a deficit in any year, and that the Council be authorized to raise such additional sums as may be necessary in any manner they may think fit other than a general levy on the Association.

#### *Discussion.*

The PRESIDENT (Mr. C. H. Priestley), in opening the discussion, said the Water Boards Committee (which was appointed two years ago) had held many meetings, and had gone very closely into this matter. While one of the members dissented from one or two points, he (the President) thought that, generally speaking, the Committee were in accord on the report as it now stood. The President of the Institution of Civil Engineers (Mr. J. Mansergh), in his Inaugural Address a few weeks since, touched upon subjects similar to those brought forward in the report; and he pretty plainly indicated that legislation was necessary in the direction which had been foreshadowed. Such legislation would become more necessary year by year. The available watersheds of the country were being taken up very rapidly, and in many cases by the largest cities and towns; but while such places could look after themselves fairly well, it was felt that the smaller towns and villages were not quite in such a good position. In cases where the supply was taken from another district by a large city or town, some provision ought to be made for supplying that district. The question of pollution was also one that required looking into very closely. As the population increased in rural districts from which water was derived, there was great danger of pollution; and the law as it now stood did not give sufficient protection. Then as the country became more densely populated, it was the more necessary to prevent waste. A question which was likely to come forward more prominently in the future was the duplication of supplies. If towns could take (say) one-third of their water supply from streams and rivers the waters of which were not good enough for drinking purposes, but would do for trade and municipal purposes, this would result in a great saving to the water supplies of the country. Another point was that in many countries in Europe, official returns were compulsorily made by water undertakings; and there was little doubt that great advantage would be derived if they had similar returns in England. It was suggested in the report that a start should be made in this direction; but he did not expect they could do anything in a comprehensive way to begin with; but if a beginning was made, it might lead to better things. He proposed "That the report of the Water Boards Committee, dated Nov. 5, 1900, be adopted, and that it be printed and circulated."

Mr. W. MATTHEWS (Southampton) seconded the motion. He remarked that there had been some murmurings and an apparent diffidence on the part of some members as to backing up the Committee by adopting the report. They seemed to entertain certain fears that the Association were committing themselves. Some idea existed that the Committee were inclined to suggest that an authority should be created which would have undue powers of supervising their work. Any gentleman who got up and made a strong point of that would be in a rather peculiar position. So long as they were conscious that their affairs were in order, he could not see they had anything to fear in having some good authority placed over them. All that the Committee had done was to bring up a report showing that, in their opinion, there were seven things which required alteration, or in which the law needed strengthening—in fact, the report was about the mildest thing they conceivably could have drawn up. When the Committee were first charged with considering this question, he thought it was expected they would suggest almost the nomination of a State Department, or that they would approach the Local Government Board and insist upon the initiation of fresh legislation. But theirs was only a young Society; and if bodies like Parliament and the Local Government Board were not easily moved by authorities having large powers, they were not likely to be moved by the Association just at present. The main points of the report were beyond the scope of the Association; and they could not possibly deal with them. The collection of information, however, would be a beginning, would do a great deal of good, and would keep the Association in the position of pioneers in this matter.

Alderman E. J. HALSEY, Chairman of the Surrey County Council, and representing the County Councils Association, desired to speak chiefly upon the subject of the right to underground water. In dealing with this question, the first difficulty the County Councils Association found was in regard to vested interests—the already existing interests of water undertakings, whether private, municipal, or otherwise. Representatives of the County Councils Association had a long meeting with delegates from the Association of Municipal Corporations; but they soon found there was considerable jealousy on the part of the latter to anything the former might try to initiate or do. The point upon which negotiation had dropped was in regard to the rights of landowners to deal with subterranean waters. The County Councils Association did not believe Parliament would settle the matter in such a simple manner as saying, "We are going to alter the law, and take away the right of underground waters from their present owners." The Association considered, however, that it could be done in a different manner altogether. They had had a Bill prepared, which he hoped would be introduced into Parliament, for the purpose of raising a discussion upon the question. He agreed that it was not likely Parliament would be moved by any one body; but if they had all the

different interests in this great water question working together, bringing their individual and joint pressure to bear upon the opinions of members of Parliament and the public authorities generally, he thought they might make some progress. What occurred to the County Councils Association was that the Local Government Board should have power conferred upon them, on the application of the council or councils of one or more counties, or of county boroughs, after due inquiry, to constitute an authority for certain purposes, and to define the area in which that authority should exercise certain powers in regard to the question under consideration. The composition of such Boards would be administrative county councils, county and non-county boroughs, and urban and rural district councils; and the powers of such an authority would be the promotion and opposing of Bills in Parliament, levying and raising rates, enforcing the Rivers Pollution Prevention Act, protecting sources of water supply, taking action against waste, compelling water companies and authorities to keep records, and consenting or otherwise to water being sold outside the district from which it was taken. But it was also proposed that existing undertakings should be safe from undue interference by such authority. These proposals would no doubt limit the right of owners to the water under their land; but they would not cramp their use of water for the purposes of their own land. It would only limit the power of owners selling water away from the land, to the detriment of their neighbours and for private profit. Nearly all of the points in the report coincided with the ideas of himself and his colleagues. As to the collection of returns, a great deal might be done and was being done. In Surrey they had an excellent Medical Officer of Health; and it had been his duty to collect these returns. He (Alderman Halsey) did not think they had a single water undertaking in Surrey who did not put the most complete information regularly at their disposal. If all county councils did the same thing, a good set of returns would be obtained. He was afraid, however, if too many different authorities went to the water undertakings for the same returns, the Secretaries would object. It would be a good thing if some central body could be established for the purpose of receiving such returns. If his Association introduced their Bill into Parliament they would come to the Association of Water-Works Engineers and ask for their assistance.

Major LAMOROCK FLOWER, the Sanitary Engineer of the Lea Conservancy, and representing the Sanitary Institute, said he found in the report that many ideas which he had brought forward during, he might almost say, the past half century, were beginning to bear fruit. The establishment of Water Boards was one thing he had constantly advocated; also the control of areas from which water was drawn; and again continuous supervision of those areas. He had had the honour of looking after such a watershed area, and was, in fact, the first-appointed officer in the kingdom with such a charge. He therefore knew from practical experience how valuable such supervision was. It was a curious fact that when the Conservancy of the Lea was appointed in 1868, it was thought almost possible to do this work free and easily. Anyhow there were no funds provided, or very insufficient funds, and the work had to be done practically by any individual. Fortunately, in the last session of Parliament, on the request of the Conservators themselves, this was rectified; and he hoped they would have greater success in the future than they had had in the past.

Mr. E. DURANT CECIL, representing the Institute of Sanitary Engineers, congratulated the Committee upon the substance of their report. He thought the practical result of such a report as this was likely to be greater than insisting upon one particular method of reform, upon which very grave differences of opinion would probably exist. He had read the report with particular gratification, because it contained such definite and pleasing references to the needs of rural districts. In the first section, it was stated that the general control of the water supplies of the country was shared by four independent public authorities. Whatever might be done as to the constitution of a central water authority or the establishment of district water boards, the Houses of Parliament would always be supreme; and therefore it was useless to hope to get away from two out of the four authorities referred to. But it ought to be impressed on those who had any influence in the preparation and promulgation of amending legislation, that it was highly desirable that some authority should be constituted, other than and below the supreme authority of Parliament, who would adjust and arrange the conflicting interests of various districts and corporations, in order that there might not be the selfish scramble such as there now was for the water needed by various populations, who often ignored altogether the first rights of those who were living in the district from which the water was taken. Regarding the difficulty of dealing with the supply of rural districts, the speaker proceeded at some length to deal with the question of utilizing the rainfall by providing corrugated iron roofs and galvanized iron tanks, as in the Australasian Colonies. By this means, he thought the urgent needs of rural inhabitants could be met.

Professor EDWARD HULL said the proposals in the Committee's report commended themselves to his judgment. He thoroughly agreed with the necessity for protecting rural districts, and for preventing contamination.

Mr. C. E. JONES (Leyton) said the question under discussion was a very big one to deal with in all its aspects and phases. They still found the water supply of the nation was in a very



conflicting and parlous state. Sources of supply, particularly gathering-grounds, were being scrambled after and appropriated by authorities who had a sufficient supply of water for their immediate needs, and for a long time to come. This scrambling process was spreading; and there was no one to say where it should stop, except the High Court of Parliament, who, to his mind, was not a properly qualified body to deal with some of the technical aspects of the question. They also found there was no systematic inspection of gathering-grounds. It was anyone's business to ascertain whether water which was supplied for drinking purposes was of a character above suspicion—that its purity could be guaranteed. As one who had had active charge of water-works for above 25 years, he said that in many cases (he did not say generally) his conclusion was that the line of demarcation between pollution and non-pollution in sources of water supplied for public use was a very thin veneer indeed; and the worst view in connection with it was the utter indifference of the people generally interested. Regarding the control of gathering-grounds, he remarked that the larger authorities could take care of themselves, but the poor, impecunious rural districts had often to go to their neighbours, and beg a portion of the water which years before had probably been taken from them. For this they were charged a higher rate than those who lived within the privileged municipal boundary. This was a great injustice, and should, if possible, be removed. The various recommendations that had been made to produce reform lacked one essential—there was no one to enforce the decree. He thought a separate department of the Board of Trade might easily be established. There were electrical, gas, railway, and other departments; and it would be an easy matter to get an extension of the functions of the Board to the control of the water supply of the country. With the seven points in the report he agreed in the main. Regarding the Public Health Act, although it was a cumbersome Act, the evil was that there was no public body who would put it in motion, because the public bodies whose duty it was to put it in motion at the present time were generally the greatest sinners themselves. From all aspects, the question was a troublesome one to deal with; and particularly was it so in regard to the law of underground waters. The theory of the law was that a man who owned land owned it down to the centre of the earth—the minerals and everything else belonged to him. In the London district, Parliament had at any rate broken that law. They had enabled underground railways and twopenny tubes to be constructed, without any compensation to the landowner. But in regard to underground water, if they interfered with the rights of property in that respect, they would bring such a storm about their ears that was never known in this country. He considered that returns of water undertakings should be furnished to the Board of Trade once a year in the same manner that returns of gas and other undertakings had to be made.

Mr. C. H. W. BIGGS (London), who had rendered great assistance to the Committee by the collection of information for their guidance, thoroughly agreed with the report, and approved of the course recommended by the Committee.

Mr. JOHN FAGG, Chairman of the Tonbridge Water Company, considered the report would be most useful; and upon the beginning which it was proposed to make, something further might be built up. For the purpose of protecting their watershed, the Company he represented had purchased 53 acres of land. Their object was to get control, as the land had been let for various purposes. The area might still be let for other uses; and so the Company hoped to get a return from it.

Mr. W. G. PEIRCE (Richmond) agreed with the President that one way in which the portable water of the country might be conserved was by having auxiliary supplies. A great deal could be done, and was being done, in utilizing waters that were unfit for drinking purposes. Certainly about one-third of the water supplied was used for sanitary purposes. Mr. Rodda, of Eastbourne, had given him a list of towns that had adopted the auxiliary system; and he (the speaker) was of opinion that there was room for much extension. At Richmond, it effected a great saving. The Council did not hesitate to continue increasing the mains year by year; so that, in course of time, every street in the town would be supplied with water drawn direct from the river for sanitary, trade, and such like uses.

Mr. W. WHITAKER, F.R.S., F.G.S., declared that he was utterly disappointed with the discussion, which had merely dealt with general principles. He proceeded to condemn the present parliamentary procedure in connection with Private Bills. A Bill, he remarked, might be carried triumphantly through one house; and the other would reject it—in the one case, the promoters were told they were right, in the other that they were wrong. Although this kind of thing was good for the experts, it was not fair; and it entailed unnecessary expense. He had himself often felt that he was doing work and making people pay for it under false pretences. Besides the Houses of Parliament, they had the Board of Trade and the Local Government Board doing the same kind of work. What, he asked, did they want with two executive departments doing similar work? One was surely quite enough; and for preference he would have the Local Government Board. Increasing deference was being paid by the Houses of Parliament to the Local Government Board reports on Bills. These reports now went a long way in influencing the decisions of the Committees; and he thought it was rather a wholesome thing to find the expert assessor helping the Parliamentary Committees. The question of protection against contamination of

water supplies was one that was coming forward in most new schemes. In fact, measures to control contamination were beginning to be almost essential in such schemes; and Parliament, he believed, was anxious enough to insist on such provisions being introduced. They might also fairly consider that Parliament was addicted to the taking care of the poor in connection with water-supply schemes; and provisions were now generally introduced into Bills to the effect that small bodies should be protected. But they wanted to see that this was always done. He disagreed with Mr. Jones regarding parliamentary returns. If they wanted an elaborate piece of work hidden away from the public eye, his advice was to get it put in a parliamentary return. The form of the blue-book was most repulsive; and it generally got thrown into the waste-paper basket. How many people he should like to know had studied the two or three volumes of the reports of Lord Balfour's Water Commission; how many people knew of all that was enshrined in them? People would not look into such volumes for general information; they wanted it served up in a more pleasant form. The little report before the members represented a large amount of labour on the part of the Committee. Their Secretary (Mr. Percy Griffith) took infinite trouble in the matter; and they were also helped by Mr. Biggs. To Mr. Griffith, the Committee owed their thanks for the able way in which he had brought before them the points which they could discuss.

Mr. GRIFFITH thanked Mr. Whitaker for the very kindly feeling that had prompted his remarks.

Dr. J. C. THRESH, County of Essex Medical Officer of Health, said he believed the whole of this work had arisen from the suggestion he made at a meeting of the Association about two years ago. Since that time the Committee had worked assiduously in order to bring something before the members that would be really practicable. He was glad to find the members were adopting the suggestions of the Committee without comment. It had not been pointed out that they were only just commencing their task; and in order to carry it out efficiently, there must be systematic organization, so that the Committee's work was not complete.

Mr. W. JONES (Pontypridd) said it had occurred to him that the most practical suggestion that could be made in furtherance of this movement was that application should be made to Parliament to give greater powers to county councils. As was perhaps well known, county councils had no power to promote Bills, but they had power to oppose them. If the Glamorganshire County Council had had power to promote Bills, they would ere this have done so, in order to secure complete control over the water supply of the county. Personally, he was much disappointed with the report. He thought the Committee should have given the members more information, and made some practical suggestion. He hoped they would be asked to proceed with the work, and to make, at the next meeting of the members, a far more practical recommendation than on this occasion.

Mr. MATTHEWS wished to say that what the last speaker was anxious should be done was being practically carried out, or an endeavour was being made to carry it out, by the County Councils Association. They were trying to initiate such legislation; and this was within the knowledge of the Committee when they drafted their report.

The PRESIDENT thought he might say for the Council and the members generally that they would be pleased to assist in every possible way the County Councils Association, who were perhaps, in many circumstances, better able to initiate work of this character than their own Association. Replying to a question, he added that it would be within the power of the Council to re-appoint the Committee.

The resolution was then unanimously carried.

**Peat as Fuel.**—The latest step in the direction of utilizing peat as fuel appears to be that of M. Vilen, who takes ordinary peat turf, which he heats to 518 Fahr.; subsequently lowering the temperature to 126°. The carbonization is not in large retorts, as formerly, but in comparatively small cylinders of ordinary iron plates embedded in brickwork. By this method the turf possesses 6000 heat units, whereas peat turf proper has only 2514. Analysis has proved that the coke obtained contains nearly 59 per cent. of combustible matter, and the gases more than 28 per cent.—in all about 87 per cent. The fuel will cost, it is estimated, from 13s. 6d. to 16s. per ton.

**The Coal Production of India.**—According to the statistics of the mineral production of India for the ten years 1890 to 1899, the coal industry has expanded without a break from 2,168,500 tons to 4,937,000 tons—a growth of 128 per cent. Coal of varying quality is found over a very extensive area in India. Of the yield last year, about 79 per cent. came from Bengal, which contains important mines. The Nizam's territory, Assam, Central India, and the Central Provinces are at present the only other coal centres of note. Bombay, which requires large quantities of coal for its mills, is too remote from the chief mines to obtain the fuel economically, especially as British steamers carry coal thither under easy conditions as to freights. Hence the recent rise in coal imports into India in spite of increased production. In 1899-1900, 422,000 tons were imported, of which Bombay Presidency (including Sind) took 369,000 tons. On the other hand, India exported 304,500 tons of her own coal from Bengal; Ceylon, with 181,500 tons, and the Straits Settlements, with 87,000 tons, being the chief purchasers.



## REGISTER OF PATENTS.

**Enrichment of Gas.**—Schniewind, F. W. C., of New York. No. 10,588; June 9, 1900.

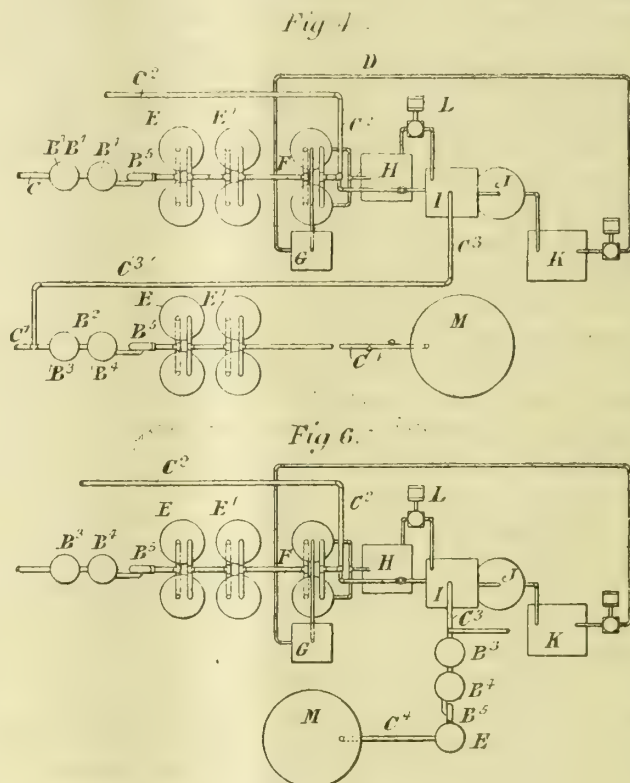
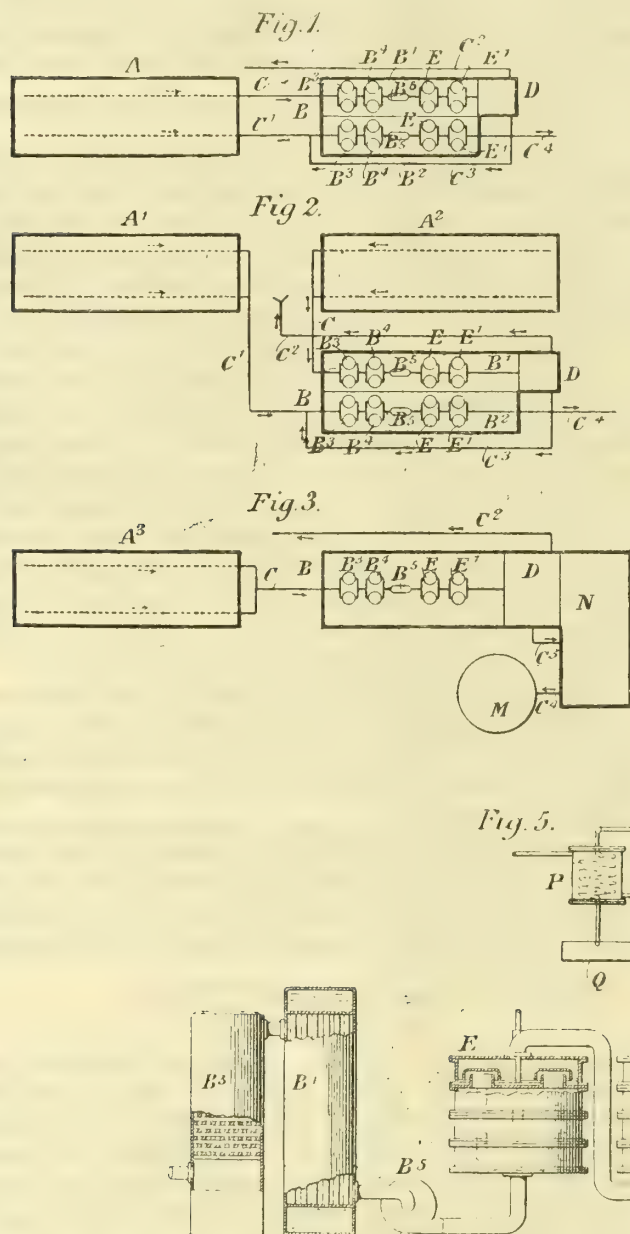
This invention is particularly, though not exclusively, adapted to the treatment of gases produced as a bye-product in the manufacture of coke from bituminous coal, and the production of a rich illuminating gas from such gases.

In its broader sense, the invention (to quote the patentee's own words) consists in separating from one volume of gas the illuminants contained in it, and then, "without further concentration or condensation, and the expense and loss of illuminants incident thereto," gasifying or vaporizing the illuminants and adding them to another volume of gas to increase its illuminating power.

In its commercial development, the invention consists in drawing off separately the richer and poorer gases produced in any system of generation, extracting the illuminants from the poorer division, and adding them to the richer division—thereby, as a result, producing a rich

illuminating gas and a fuel gas practically free from illuminants. The division into two volumes of gas may be made: 1. In the gaseous product produced, by treating the raw material by a single method—as by drawing off the richer gas produced in a coke-oven during the early stages of the coking process into one main, and the poorer gases produced during later stages into another main. 2. In the gases produced from the same raw material by different methods. 3. In the gases produced by treating different raw materials in the same method. 4. In the gases produced by treating different raw materials by different methods. It will be understood that, in its broader sense, the invention is adapted to the treatment of the two volumes of gas to enrich one at the expense of the other, irrespective of the way in which the two volumes are generated and separated.

The illuminants contained in gas produced by dry distillation of bituminous coal are (the inventor points out) chiefly benzol and its homologues, in the proportion of from 65 to 80 per cent., the remaining 20 to 35 per cent. being hydrocarbons of the paraffin and olefine series (ethylene and its homologues); and in the treatment of such gases subsequent to generation, the illuminants remain in the gas with small loss



due to condensation and washing. It has also been ascertained that, in the distillation of coal, the greater part of the illuminants pass off in the gases evolved during the earlier stages. For example, in the gases evolved from bye-product coke-ovens, out of a yield of 10,000 cubic feet, the fraction first evolved of 5000 cubic feet, which was available as a surplus, contained about 62 per cent. of illuminants; while the second fraction of 5000 cubic feet, used for heating the ovens, contained but about 38 per cent. of illuminants. The proposal here is to extract the illuminants from this second fraction, and add them to the richer fraction, "the illuminating nature of which they greatly increase, while the fuel gas fraction loses but little of its value as fuel by its loss of illuminants."

There are several known methods of removing illuminants from gas—notably the cooling process, in which the illuminants are condensed by exposing them to a low temperature, and the absorption process, in which the gases are washed with oils having the capacity to absorb the illuminants; the illuminants being afterwards driven off by distillation or heating of the oils. The absorption method is best suited for this process; and in driving off the illuminants from the oils, the patentee finds it advisable to pass a current of gas through the still, which greatly hastens the separation, and is not objectionable in admixture with the illuminants, because it carries them into admixture with the gas to be

enriched. In many cases the separated illuminants are contaminated with sulphur compounds, especially bisulphide of carbon; and to avoid adding such compounds to the gas, the gasified illuminants are purified either by fractional condensation or by any process based on the chemical reactions of carbon bisulphide—as, for instance, the formation of sulpho-carbonate.

It is preferred, in practice, to add the illuminants to the gas to be enriched after it has been treated for the removal of tar, because, if added before, an appreciable percentage will be absorbed by the tar. It is also preferred to add the illuminants before the gas is scrubbed for the removal of ammonia, &c., not only because in this way the soluble impurities in the illuminants are also removed, but also because the benzol tends to prevent the deposit of naphthalene and similar hydrocarbons.

Fig. 1 is a diagrammatic illustration showing an arrangement of plant embodying a bank of coke-ovens or gas-retorts, from which the richer and poorer gases produced at different stages of the coking operation are drawn off in separate mains. Fig. 2 is a plant in which the gas to be enriched is drawn from one set of generators and the gas furnishing the illuminants from another and independent bank of generators. Fig. 3 is a plant in which the gases drawn from a bank of coke-ovens are treated for the extraction of benzol, which is then used to enrich gas produced as by a water-gas generator. Fig. 4 is



a plan of the portion of the plant indicated in figs. 1 and 2, in which the gases are purified, the benzol extracted from the poorer gas, and mixed with the richer gas. Fig. 5 is an elevation of such a plant, with parts of the apparatus indicated in greater detail. Fig. 6 is a plan of the purifying and benzol-extracting portion of the plant in fig. 3.

A (fig. 1) indicates a bank of coke-ovens, each connected with a main C for poor gas, and a main C<sup>1</sup> for rich gas. A<sup>1</sup> (fig. 2) indicates a bank of coke-ovens or generators connected with the rich-gas main C<sup>1</sup>; while A<sup>2</sup> indicates a bank of coke-ovens connected with the poor-gas main C. A<sup>3</sup> (fig. 3) indicates a bank of coke-ovens connected with the condensing-house through a single gas-main C. B is the condensing-house, which in figs. 1 and 2 is divided into two separate condensing plants B<sup>1</sup> B<sup>2</sup>; while in fig. 3 there is a single condensing plant through which all the gases from the coke-ovens are passed. The condensers B<sup>3</sup> B<sup>4</sup> are followed by gas-washers E E<sup>1</sup>, with a suction-blower B<sup>5</sup> in the conduit connecting the condensers B<sup>4</sup> and the washers E. C<sup>2</sup> is a conduit for the poor gas leading from the benzol-house D, preferably (when the method is used in connection with a coke-oven plant) back to the ovens. C<sup>3</sup> is the conduit for benzol vapours leading from the benzol-house D to the rich-gas main C<sup>1</sup>, or to a point in the condensing plant B<sup>2</sup>. C<sup>4</sup> is the conduit for the enriched gas leading from the condensing plant B<sup>2</sup> to a gasholder M.

In the benzol-house D is placed a plant (fig. 5) consisting, first of all, of a benzol-washer F, in the head of which is an oil distributing and supplying device. Below this the washer is filled with trays, over which the oil flows, and under and between which the gases pass upward. Below the trays is the oil-collecting chamber, into which also enters the end of the conduit leading from the gas-washer E<sup>1</sup>, and from which the oil-pipe leads. G is an oil-tank connecting with the distributing device; and from the top or head of the benzol-washer the poor-gas pipe C<sup>2</sup> leads. H is an oil-tank, receiving oil from the washer F, from which a pipe leads attached to a pump L, by means of which the oil is drawn from the tank and forced into the head of the benzol-still I. The oil is preferably first passed through some process for separating the bisulphide of carbon. O is such a still for this purpose. The oil then passes to the benzol-still (which should be below the bisulphide still), and the bisulphide vapour to a condenser P. The coil in the condenser-tank connects at the bottom with a bisulphide receptacle Q. The still (fitted with a heating coil) is divided horizontally by a series of perforated partitions, by means of which the oil passing down from partition to partition is constantly brought into contact with the steam-coil. From the head of the still leads the benzol-conduit, and by preference a gas-conduit also, by which gas is led into the still preferably from the rich-gas pipe C<sup>4</sup>, though it may be brought also from the poor-gas main, as shown in figs. 4 and 6. From the bottom of the benzol-still, a pipe leads into an oil-cooler J, divided into three chambers. A water-pipe enters the bottom of the chamber, a waste-water pipe leads from the top, and another from the lower compartment into an oil-tank K, from which a pipe leads to the oil-tank G. A pump draws oil from one tank to the other.

At N (fig. 3) is indicated the presence of water-gas plant; and in fig. 6 a pipe is shown, leading from a water-gas generator (not shown) through scrubbers, condensers, and washers.

The poor gas, which is to be treated for the extraction of benzol passes through the generating plant through the conduit C to the condensing plant B<sup>1</sup>; and after having been deprived of its tars and other impurities, it passes into the bottom of the benzol-washer F, through which a constant flow of tar-oil is maintained, which absorbs practically all the benzol in the gas—the impoverished gas passing off through the pipe C<sup>2</sup> to the coke-ovens or other points of use. The tar-oil drawn from the tank G, and passing through the washer F, is collected in the tank H, and pumped up into the head of the benzol-still I, where the greater part of the benzol is extracted from the oil as it passes down through the still. The benzol vapours pass through the pipe C<sup>3</sup> to a connection with the main C<sup>1</sup>, in which the rich gases are passed to the condensing plant B<sup>2</sup>. Ordinarily the benzol should mix with the rich gas in the condensing plant between the condensers and scrubbers. In cases, however, where the gas contains a great deal of naphthalene, the benzol, mixing with the rich gas before it enters the condensers, serves to prevent deposits therein. The impoverished tar-oil from the still is cooled in the oil-cooler J, collected in the tank K, and pumped back into the supply-tank G, which feeds the washer F. A regulated amount of rich gas may be permitted to enter the benzol-still.

**Lighting and Extinguishing Gas-Lamps.**—Hislop, R. F., of Paisley. No. 797; Jan. 13, 1900.

This invention—applicable to street-lamps fitted with incandescent mantles—is designed to permit of lighting and extinguishing by the insertion of an ordinary lighting-pole through a covered orifice in the lantern-body.

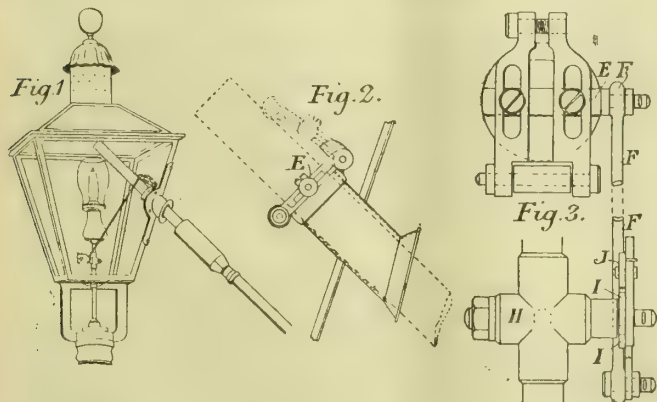


Fig. 1 is a perspective view of a street-lantern with the ignition-end of the lighting-pole in position within the lantern-body. Fig. 2 is an elevation to a larger scale of the pocket formed in the lantern body.

Fig. 3 is a plan of the hinged door, showing its connections to the gas-supply tap. See also *ante* p. 1578.

The patentee proposes to form a pocket for the insertion of the lighting-pole at the corner of the lantern. It is placed at a suitable angle, and normally closed by a hinged door. To the door is attached, by means of an adjustable disc-piece E, a rod F to a lever G, arranged to operate the gas-tap H inside the lantern, and to turn the gas on and off alternately and simultaneously with the raising of the door when the lighting-pole is inserted. The time ordinarily required for turning on the gas is thus saved.

The lever arrangement for turning the gas-tap is constructed as follows: On the end of the gas-tap plug there is a wheel I, having four notches into which works a pawl J centred to the lever G, and free to rotate on the axis of the plug of the tap. To the end of the lever carrying the pawl, the rod F is connected, attached to the door so that it is raised to an unvarying extent, and the gas-tap plug is also rotated to the extent of a quarter revolution. When the pole is withdrawn, the lid closes and the pawl on the lever is released and falls into gear with the next notch on the periphery of the wheel. It is thus in a position to rotate the gas-tap another quarter of a revolution, in order to shut the gas off on the re-insertion of the pole. At the outer end of the lid of the pocket a small roller K is attached, so that the insertion and withdrawal of the pole from the pocket is accomplished with the minimum of friction.

The arrangement mentioned is preferably so adjusted that the radius described by the lid at the point of connection with the rod F is greater than that covered by the lever G on the axis of the gas-tap—thus ensuring that the pawl J will so catch into the notch or wheel I that the limit of travel of the door either ensures the gas being turned full on or being completely shut off. Thus the insertion of the lighting-pole turns on and shuts off the gas alternately. Sufficient play or lost motion between the pawl and notch in the wheel may be allowed to permit of the partial opening of the lid before the gas is turned on or off.

**Increasing the Illuminating Power of Gas-Burners.**—Theobald, W. & G., of Catford. No. 18,208; Oct. 12, 1900.

This "invention" consists of a cap placed upon the top of the lamp-chimney of an incandescent burner, or an ordinary globe, "which alters the draught." The cap is of refractory material—such as clay—of hollow or cup form, provided at its upper edge with projections to rest on the top of the chimney or globe, and to support the cap in the required position, or it may be fitted in a case or holder placed on the chimney or globe. The passage at the top of the chimney is thus contracted, and "the effect is to produce a marked increase in the light emitted." The device is said to be more particularly adapted for use with incandescent mantles, and is effective especially when the gas is only partly turned on "so that without the cap the mantle gives out a feeble light."

#### APPLICATIONS FOR LETTERS PATENT.

- 21,658.—BRETT, C. G., "Instantaneous flash-light igniter." Nov. 30.
- 21,676.—BLAKE, M., and SMART, R. H., "Conveyors." Nov. 30.
- 21,681.—BOENDEL, H. H., "Portable lamp for producing gas for illuminating purposes." Nov. 30.
- 21,726.—FOX, J. P., "Combined internal combustion engine." Nov. 30.
- 21,733.—THWAITE, B. H., "Charging of motor engines worked by blast-furnace gases." Nov. 30.
- 21,744.—BOULT, A. J., "Lighting devices for gas-burners." A communication from W. Frenz. Nov. 30.
- 21,746.—LERY, J. B. DE, "Incandescent burners and mantles." Nov. 30.
- 21,752.—BAKER, H. E., "Acetylene generators." Nov. 30.
- 21,816.—SCHROEDER, F. W., PETERS, J., and MORAN, P. W., "Globes for incandescent and other burners." Dec. 1.
- 21,831.—EDGAR, W., "Gas-fires." Dec. 1.
- 21,890.—THOMPSON, W. P., "Burners for incandescent gaslight." A communication from B. Jolles and the firm of Zietz and Bruno Gesellschaft mit beschränkter Haftung. Dec. 3.
- 21,923.—OUGHTON, W., "Conveying coke, coal, &c." Dec. 4.
- 21,973.—SUGG, W. T., "Water-motor for operating a pump for compressing gases." Dec. 4.
- 21,974.—BRONDER, G. A., "Discharging gas-retorts." Dec. 4.
- 21,977.—BOLE, W. A., and RUND, E., "Gasifiers for internal combustion engines." Dec. 4.
- 21,997.—LACROIX, P., "Atmospheric gas-burners." Dec. 4.
- 22,047.—LECLERC, L., and RIBANDEAU, A., "Elevators for coal and other substances." Dec. 5.
- 22,058.—DEMPSTER, R., and SONS, LTD., and BROADHEAD, J. W., "Conveyors or elevators for coal, coke, or the like." Dec. 5.
- 22,088.—GLUTH, C., "Incandescent gas-burners." Dec. 5.
- 22,104.—SUGG, W. T., "Flash-lights for incandescent gas street-lamps." Dec. 5.
- 22,125.—KENT, W. G., "Liquid meters." Dec. 5.
- 22,129.—GOSSWEILER, K., "Gas-generators." Dec. 5.
- 22,206.—BOULT, A. J., "Carburettors for air and gas." A communication from A. E. Grasset. Dec. 6.
- 22,223.—KRAMER, F. M., "Reducing-valves." Dec. 6.
- 22,226.—BERTHOLD, C. E. J., "Automatic gas-lighters." Dec. 6.
- 22,237.—SCHUBERT, M., "Measuring the pressure of gases." Dec. 6.
- 22,277.—SCHMITZ, W., "Gas-boilers." Dec. 7.
- 22,366.—THORNTON, H., and CHAPMAN, E. F., "Mixtures of vaporized oil and air for heating, lighting, and motor purposes." Dec. 8.
- 22,388.—BLEICHRODE, J., "Making an incandescent pile." Dec. 8.

**Abundance of Water in Leeds.**—At a meeting of the Water Committee of the Corporation last Friday, it was reported that the quantity of water in the reservoirs of the Washburn Valley was equal to a supply for 114 days, as compared with a supply for 51 days on the corresponding date last year. The storage, it was stated, amounts to the large total of 2940 million gallons. As a result of the exceptionally wet weather that has lately prevailed, the reservoirs are actually running over, so that for some time about 7 million gallons have been going to waste in the valley every day. Such a state of things is said to have never happened before—not, at any rate, since the gathering-grounds of the city's water supply assumed their present dimensions.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Mr. Dibdin's Chemical Industry Society Paper.

SIR,—I have read with interest Mr. Dibdin's paper and remarks, as given in the "JOURNAL;" and as Mr. Dibdin invites criticism, I shall be glad of some explanation (which seems necessary) in connection with the method he adopted in testing the various samples with which he experimented of prepared and unprepared gases used, in ascertaining their true maximum lighting value.

For instance, take the various qualities of gas given in the table found on p. 1395 of the "JOURNAL" for the 4th inst.—namely, 11 candles, increasing by 1 candle to 19. A description is given of how he made the poor and rich gases; but I find no mention of how the qualities were adjudged to be equal to this or that number of candles. Am I to understand that these many qualities were found by using the London argand with a 6-inch by 2-inch chimney, and consuming each gas at the rate of 5 cubic feet per hour?

What am I also to understand by Mr. Dibdin when he speaks of "unit-light with certain representative burners?" In the editorial, you refer to "unit-light" as 16.2 candles; but, after reading the paper, I am not so certain that this unit was reached in all cases from any burner Mr. Dibdin used—whether with or without having a fair and even flame from gases of other qualities.

Then again, the consumptions of gases by different burners are given as registered by an experimental meter; but from Mr. Dibdin's remarks (published in the last "JOURNAL") I note he says it "was impossible to burn all the gas . . . required to get the same amount of light from the burner as with 16-candle gas," which leads one to think otherwise. What burner is he referring to?

Having experimented some time ago on very much the same lines as Mr. Dibdin has done, I shall be glad to have these points made clear to all those interested in how to burn gas.

Dec. 14, 1900.

H. GRAFTON.

## Retort Ascension-Pipes.

SIR,—In numbers of inclined settings I have inspected, where the retorts are 20 feet long they have only been fitted with one ascension-pipe; and it has accordingly been apparent that considerable economy, not only in ascension-pipes, but in hydraulic and foul mains, has been effected. All the settings of horizontal retorts I am familiar with of 20 feet in length are fitted with two ascension-pipes, one at each end, thus involving duplicate hydraulic mains, &c. The problem to be solved is therefore as follows: If only one ascension-pipe is required in the case of inclined retorts, and that nearly always placed at the lower end of the retort, why is it necessary to have two ascension-pipes to horizontal retorts of the same section and length?

It is well known that gas often passes up one of the ascension-pipes only; differences of seal, temperature, and other matters affecting this. That such is the case, has often been proved by placing a hand upon one of the ascension-pipes, when it will frequently be found cool, while the pipe at the opposite end is very hot, or *vice versa*. There is also the further consideration of stopped ascension-pipes. Where two pipes are used, it is necessary for both to be stopped before any obstruction is apparent in either; for as long as one remains clear, the gas will, of course, pass through it. This stopped-pipe nuisance presents a greater difficulty, therefore, where duplicate pipes are used. Moreover, it is open to question whether the trouble is not, indeed, actually augmented by the double system of pipes. Where stoking machinery is in vogue, it is undesirable to block the retorts in the centre, as sometimes a little overlapping takes place. Even, too, where overlapping is not permissible, the stopping of the retort in the centre reduces the available retort area in the most effective portion of it.

The argument respecting the decomposition of the gas in its long travel over the incandescent coke applies with equal force in both cases. In the inclined retort, where the ascension-pipe is placed at the lower end, the extra pressure exerted to convey the gas from the higher end down to the lower end is infinitesimal. Inasmuch as a 20-foot retort, set at an angle of 32°, only rises 10 ft. 7 in., this represents but one-tenth of an inch pressure, and can be disregarded. Irregular coal-charging in both systems would produce equally indifferent results. If a horizontal retort is charged heavily in the centre, the gas-passage is necessarily obstructed; whereas, on the other hand, any blockage in an inclined retort would also be disastrous to efficiency.

In my opinion, the few points roughly indicated in both systems cancel out, to say the least; and therefore it is difficult to conceive what advantage is to be derived from the duplicate-pipe arrangement. It remains for someone to be bold enough to arrange horizontal retorts 20 feet long fitted with a large ascension-pipe at one end only, and a single hydraulic main. I should certainly not have any hesitancy in adopting such an arrangement, should occasion require.

The question as to the reason why two pipes are necessary for horizontal retorts, and only one for inclineds, is constantly asked; but no satisfactory reply has, to my mind, been given.

Huddersfield, Dec. 14, 1900.

EDWARD A. HARMAN.

**The Gaslight and Coke Company's Proposed Additional Capital.**—At the Court of Common Council last Thursday, a letter was read from Sir Robert Giffin, K.C.B., giving notice, in accordance with section 18 of the Gaslight and Coke Company's Act, 1876, that he had been appointed by the Board of Trade to consider and report to them on a proposal of the Company to raise further new capital, and that it was his intention to consider the matter at the offices of the Company to-day (Tuesday). Mr. Morton said this was some roundabout way of raising capital; and he moved that the deputation of the Streets Committee who so successfully opposed the Bill of the Company last session should attend at the offices of the Company on behalf of the Corporation. This was unanimously agreed to.

## LEGAL INTELLIGENCE.

## PLYMOUTH COUNTY COURT.—Thursday, Dec. 13.

(Before His Honour Judge WOODFALL.)

Wharton v. Plymouth and Stonehouse Gas Company—Question of a Right to a Gratuity.

This was an action brought by Mr. Arthur Wharton, late Manager of the Plymouth and Stonehouse Gas Company, to recover £35 alleged to be owing to him by the Company.

Mr. J. P. DOBELL appeared for the plaintiff. Mr. JOHN SHELLY represented the defendants.

Mr. DOBELL said that early in 1895, Mr. John West, who was then Consulting Engineer to the defendants, saw the plaintiff, with a view to his taking the position of Manager of the works. After the interview, plaintiff wrote a letter in which he said he should be willing to commence at a salary of £250, with house, coal, and gas free, and a reasonable annual increase of salary. Mr. West told him it was the invariable rule of the Company to pay to every member of the staff at the end of each financial year 10 per cent. on his salary. Plaintiff took up the appointment on April 1, 1895. He duly received his salary, and for the years 1896, 1897, and 1898 he had in addition a gratuity of 10 per cent. In 1898, Mr. West resigned his position as Consulting Engineer, and plaintiff was made responsible for the works; his salary being increased to £350. On March 31, 1899, he again received the gratuity of 10 per cent. Early in the present year, his conduct was not satisfactory, and it was suggested that he should resign. This he did as from the 24th of June. On the 22nd of March, as appeared from the minute-book, a meeting of the Directors was held, at which it was resolved that the usual gratuity of 10 per cent. on the salaries should be carried into the accounts of the year ending the 31st of that month. Mr. Heath, the Secretary of the Company, wrote to the plaintiff on the 23rd of June that the Directors had voted him a gratuity as usual, to be paid in July, and the amount appeared in the list against Mr. Wharton's name; but it was afterwards erased in pencil by the Directors, and was not paid. The summons was served on the 19th of November. The next meeting of the Directors was on the 29th; and among the minutes passed was the following: "At a meeting of the Directors, it being reported that Mr. Wharton had brought an action against the Company for 10 per cent. commission on his salary, it was resolved that the action of Mr. Heath in withholding payment of the gratuity be approved, and that the action be defended." With regard to the legal claim, Mr. Dobell submitted that, although the Company might choose to call it a gratuity, or gift, or bonus, if it was part of the arrangement under which employees were engaged that they should be paid an extra 10 per cent., it was legally due, and plaintiff was entitled to recover it just as much as if it were wages.

Mr. SHELLY said his contention was that plaintiff was engaged on a salary of £250 with house, coal, and gas free. The engagement was in writing, and everything beyond it was a gift, and nothing more. Any offer made by Mr. West before plaintiff's engagement was inadmissible. If Mr. West mentioned that it was the custom to pay this gratuity, it was outside the engagement entered into afterwards between the plaintiff and the Company. Although the accounts were made up in March, and the usual allowance for the gratuities was included in a lump, the gratuities themselves were not voted until July; and in this case the Directors, in voting the gratuities, struck out Mr. Wharton's name because of his conduct. This was the only time that they had had occasion to withdraw a gratuity. Even assuming that it was an amount recoverable as salary, plaintiff's conduct was such that he had forfeited all right to it.

Mr. J. A. Bellamy, Chairman of the Company, was called, and said the Secretary had no authority to include Mr. Wharton in the list of those who were to receive gratuities, and when the list came before the Directors, they struck out his name. Early in the present year, plaintiff was drinking freely, and witness thought it necessary to warn him. Notwithstanding the warning, he found on visiting the works on the 9th of February, that plaintiff was in such a condition as to be unable to speak intelligibly. Witness at once suspended him, and on the 22nd of February, the Directors confirmed his action, and plaintiff was called upon to resign. Plaintiff was not allowed on the works from the time of his suspension; but, out of consideration for his wife and family, they paid his salary to Midsummer, and allowed him to live in the house.

Mr. H. B. Heath, Secretary to the Company, was also called, and gave evidence. In cross-examination, he said that in the balance-sheet the gratuities were charged under the head of salaries.

Mr. P. S. Hoyte, the present Manager, stated that he came to the works as Assistant Manager at the same time as plaintiff. In the autumn of 1895 he was told that his salary carried with it a 10 per cent. bonus, and he made plaintiff acquainted with the fact, as the latter was not before aware of it.

His Honour characterized the case as a painful one; but he had no hesitation in coming to the conclusion that the sum in question was a gratuity, and that plaintiff had no right to it. The account of the interview with Mr. West was hardly to be relied upon; and he had come to the conclusion that plaintiff had not heard of the 10 per cent. before he made the contract with the Company. There was, in fact, no agreement to pay the plaintiff 10 per cent. bonus, and there was no such gift that the money could be said to have been constructively in the plaintiff's possession. He must, therefore, give judgment for the Company.

Mr. SHELLY said he did not ask for costs.

## Claim for Damages for Personal Injuries.

In the Queen's Bench Division of the High Court of Justice last Friday, before the Lord Chief Justice and a Special Jury, an action was brought by a coffee-house keeper named Scott, carrying on business in Red Lion Street, Wandsworth, against the Wandsworth and Putney Gas Company, to recover damages for personal injuries. On the 19th of January last a gas-stove was being fixed by the defendants' workmen in the kitchen at the back of plaintiff's shop; and he, as alleged, tripped over a piece of iron pipe left on the floor, and fell with his arm through the glazed door leading to the shop, sustaining certain injuries, which



were deposed to by medical witnesses. He also alleged that he had suffered considerable loss of business in consequence. The defence was a complete denial of any negligence on the part of the Company or their workmen; the evidence given on their behalf being to the effect that there was no pipe on the floor at all, and that the plaintiff slipped in consequence of some grease under his foot. In the result, the Jury returned a verdict for the defendants, and his Lordship gave judgment accordingly.

#### Conviction for Stealing Gas.

At the County of London Sessions, at Newington, last Thursday, before Mr. McConnell, Q.C., Louis Muncey, a builder, pleaded guilty to a charge of stealing gas belonging to the South Metropolitan Gas Company, under circumstances fully recorded in the "JOURNAL" a fortnight ago (p. 1408). The Company were informed of the theft, and on an inspector going to the house to investigate the matter the prisoner made his escape by a window. He was arrested at Dover, and plated goods, the proceeds of a burglary, were found in his possession. A previous conviction against the prisoner having been proved, he was sentenced to twelve months' hard labour.

#### The Liability for the St. Helens Explosion.

Further evidence in this case, the opening proceedings in which were reported last week (p. 1463), was given on the 8th and 10th inst., it being chiefly concerned with the explosibility of chlorate of potash. Among the witnesses called were Mr. Horatio Ballantyne, Mr. W. Hepworth Dixon, and Dr. Dupré. The last-named gentleman, who is adviser on explosives to the Home Office, said the explosion had certainly added to the general knowledge in regard to chlorate; for prior to the accident he had neither known nor suspected that it could be exploded. There was little doubt that it was not the chlorate alone that exploded, but the wood and chlorate together. Professor Dewar was also called, and stated that up to the time of the accident he did not dream that chlorate was an explosive. Mr. Justice Bucknill put the following question to the Jury: "Is potassium chlorate of itself a dangerous substance? Was it before the date of the accident known to the defendants that it was an explosive when unmixed with other substances? If not, ought the defendants to have known that it was an explosive when unmixed with other substances? Did the defendants in the manufacture and storage of potassium chlorate take all reasonable care and precaution to prevent accident by fire and [or] explosion? If not, did such want of reasonable care and precaution in the manufacture or storage of potassium chlorate contribute to the explosion?" The Jury, after an absence of about an hour and three-quarters, delivered answers equivalent to a verdict for the plaintiffs. They found that chlorate of potassium was not of itself a dangerous substance; that before the date of the accident it was not known to the defendants that it was an explosive unmixed with other substances, but that the defendants ought to have known that it was an explosive; that the defendants, in the manufacture and storage of potassium chlorate, did not take all reasonable care and precaution to prevent accident by fire and explosion; that this want of care contributed to the accident; and that the fire was not one which happened by mere chance without negligence. His Lordship postponed judgment, awaiting a communication from defendants' Counsel as to their intention to oppose it.

#### Gas Supply on the Penny-in-the-Slot System.

The Bromley (Kent) Magistrates had before them on Monday last week a summons taken out by the Bromley Gas Company against William Taylor for 12s. 6d. for gas consumed by him. Defendant denied all liability. Mr. L. W. Gregory, who appeared for the Company, said the case was the first of the kind brought into Court; and his clients were very anxious to have the matter clearly laid before the Bench. The defendant had his supply of gas through a penny-in-the-slot meter, of which there were some 800 or 900 in the district. These automatic machines did not always work correctly. The consumer might get more or less gas than a pennyworth; and the question was whether he was bound by the registered quantity of gas consumed or by the pennies he put into the slot. The contention of the Company was that he was bound by the meter-index. Mr. Gregory then put in the agreement signed by the defendant, which contained the clause: "It is distinctly understood that the rate of payment is at per hundred cubic feet as registered on the meter-index; and any discrepancy between this index and the money in the meter-box shall be made good by the consumer." This, said Mr. Gregory, was the clause upon which he relied. The meter was fixed on the 4th of May, and between that time and the 4th of July, when an official attended to take the register, some 4900 cubic feet of gas had been consumed. This, at the charge of 3s. 8d., would have come to 18s., whereas there was only 4s. in the box. It was therefore perfectly clear that the fault was in the automatic part of the machine, which probably did not close when the pennyworth of gas had been burned. There was one point to which he desired to call special attention, which was that from the 4th to the 6th of July, when a man attended to remove the meter, the defendant had burned 200 cubic feet more gas, but had not put a single penny into the box. The meter had been removed and tested, and found to register correctly. A sum of 14s. 8d. was due to the Company; but according to the second meter, the gas burned up to Oct. 19 came to £1 1s. 9d., whereas £1 3s. 11d. was in the box—being 2s. 2d. in favour of the consumer. Amounts in excess were either returned to the consumers or credited to them; and this was kept on account of the balance of the 14s. 8d. then due. Evidence having been called to support the foregoing statements, the Bench decided to make an order for payment of the amount. The Chairman remarked that the defendant must clearly understand that if he signed a contract he would have to keep to it, whether it was right or wrong. The contract in the present case distinctly stated that the defendant would have to pay for any difference there might be; so that he could not complain if he was afterwards called upon to do so. These were the terms of the contract, and both parties must keep to them. Defendant had also to pay the Court fees, amounting to 13s.

## MISCELLANEOUS NEWS.

### THE GASLIGHT AND COKE COMPANY.

#### The End of the Capital Powers.

An Extraordinary General Meeting of the Company was held yesterday for the purpose of authorizing the Directors, in pursuance of the powers of the Company's (Capital Consolidation) Act, 1898, to raise additional capital by the creation and issue of a further sum of £125,000 of new ordinary stock, and to raise additional money by the creation and issue of a further sum of £100,000 of 3 per cent. consolidated debenture stock. The GOVERNOR (Colonel W. T. Makins) presided.

The SECRETARY and GENERAL MANAGER (Mr. J. W. Field) having read the notice convening the meeting,

The GOVERNOR said the meeting was called for the purpose of empowering the Directors to raise £125,000 of ordinary stock and £100,000 of debenture stock, which was necessary for the purpose of carrying on the Company's business in various directions. These two amounts were the balance of the Company's share and loan capital powers respectively authorized by the Act of 1876. So they now saw the Company had come right to the end of their tether. No part of this amount was required for new or additional works; but, first, it was needed to restore the working capital of the Company, which had been so unduly drawn upon as to necessitate their borrowing a larger sum from their bankers than the Directors thought desirable. Money was also required to pay balances due on sundry contracts for labour-saving appliances—mechanical stoking machines, coal and coke conveying or distributing plant, and sundry small items in connection therewith—all of which, as the proprietors were aware, were of vital importance to the economical working of carbonization. But the principal item of expenditure they had to provide for was the supply of meters, stoves, and fittings for the new and additional consumers of gas. During the current year, 12,500 new automatic meter consumers had been added to the figures at the close of 1899, and an additional 1500 consumers on the ordinary system had been supplied. To meet the requirements of new consumers, the Company must have money not only for the internal fittings, but also for additional mains and service-pipes. But there was another item, and a very important one. Should the iron market prove favourable—that was to say, if the price should become reduced, as he had every reason to hope and believe it would—they must also, upon the strong representation of their Distributing Engineer, provide an additional trunk main between the Beckton and Bromley stations. Part of the work in connection with this main had already been carried out; and they were now only waiting for the price of iron to reach reasonable limits before issuing their orders for the purchase of pipes. These several items would absorb the whole of the amount the Directors were now asking the proprietors to authorize them to raise; and so he did not propose to deal with the question of expenditure at all after the year 1901. In addition to the authority which they hoped to receive from the proprietors, the Directors would, before proceeding to raise the money, have to obtain a certificate from the Board of Trade that the amount was requisite for the purposes of the undertaking; so that the proprietors had not only the statement of the Directors that the money was necessary, but they also had a certificate from the Board of Trade that they, as a Public Department, were also satisfied the money was needed. He had nothing further to add. The matter was, as the proprietors would have seen, perfectly simple. He would therefore conclude by moving the formal resolution giving the necessary authority to raise the money in such amounts, at such times, and subject to such conditions as the Directors might determine.

The DEPUTY-GOVERNOR (Mr. Howard C. Ward) seconded the motion.

Mr. A. MORO asked in what districts the new automatic consumers were to be found.

The GOVERNOR replied that the general increase in the automatic consumers was all over the district; but, of course, the extension of the district must be in the north-west—Willesden and that part.

A SHAREHOLDER inquired what loss the Company made by giving the meters free.

The GOVERNOR said he did not think they made any loss. Giving the meters free was equivalent to a reduction in the price of gas. But the question had nothing to do with the motion before the meeting; it would only arise out of the general policy of the Company which must be discussed when the report was submitted in February next.

Mr. J. MITCHELL thought the question did arise out of this matter, seeing that had the Directors been a little more economical and careful in using the Company's money, they would not be in such straits as they were now, as to require to raise fresh capital. He asked had the Directors considered the position they would be in after having expended all this capital? No doubt they would want some extensions.

The GOVERNOR: Certainly; the Company will, of course, have to go to Parliament.

Mr. MITCHELL (continuing) said that, as to going to Parliament, there seemed to be a dead-set made against the Company from all quarters. He was afraid they had some traitors in the camp. (Laughter.) Whether this was so or not, it seemed they were in the awkward position, in the event of all the capital being expended, of having a dead-set made against them in the Committees of the House of Commons, and by the evidence of some of their friends, who ought to know better.

The GOVERNOR: I think we had better discuss that in February. The Bill has been deposited to-day.

Mr. MITCHELL: It will be too late to discuss it in February.

The GOVERNOR said he did not think it would be in order to pursue the matter, or he might produce plenty of reasons which had been given in that room before, and which had been accepted and adopted by the proprietary. Therefore, it would not be convenient or of any use to go into the matter at the present time.

The motion was unanimously carried; and the proceedings, which had only lasted a short time, terminated.



## CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. ARTHUR LUCAS in the chair.

The SECRETARY (Mr. F. W. Himing) read the notice convening the meeting, as well as the Directors' report and the accounts for the year ending June 30 last. The report was as follows:—

The Directors regret to have to record the death of M. Eugène Breittmayer, the late President of the Union des Gaz Company. M. Breittmayer had been connected with the Union des Gaz for 42 years, and for nine years had held the office of President.

Messina and Montargis, the two stations owned by the Continental Union Gas Company, show an increase in the number of consumers of about 6 per cent. The sale of gas also shows a slight increase on last year's total. The net sum spent on capital account during the year at these two stations amounts to £933 for new mains, lamps, and services.

The Union des Gaz have succeeded in renewing their concession for the town of Vienne until 1931. The average length of the concessions lighted by both Companies is now 27½ years.

The total debited by the Union des Gaz to capital account for work done during the year amounts to £65,204. This includes a new gasholder, new retort-house and settings at Beucaire, purchase of house and land at Milan, new gasholder, new benches, and a leading main at Rueil for lighting the Commune of Courbevoie (mentioned in the last report), new mains, service-pipes, &c., at the various stations, rendered necessary by the continued increase in the consumption of gas.

The working capital of the Union des Gaz continues to increase. A large part of this increase is caused by fitting new consumers' houses at the Company's expense.

The cost of coal employed at the French stations has increased considerably without any immediate prospect of reduction. In certain cases, English coal has been sent on account of the difficulty in obtaining an adequate supply of French coal, even at the increased prices.

The following information relates to the working of the Union des Gaz Stations:—

The fuel used for heating the retorts shows a further decrease at those stations where an opportunity has occurred of introducing the regenerative furnaces; and the wages per ton of coal carbonized also show a slight further decrease.

The average cost of coal has again increased. The higher value of the coke and other residuals has, however, more than compensated for this.

There has been a net increase of 517 in the number of public lamps. The number of private consumers on the books of the Union des Gaz on the 30th of June last, shows a further satisfactory increase of 15,333, being about 13 per cent.; making a total of 137,420 consumers supplied by that Company at their twelve stations. The quantity of gas sold has increased to the extent of a little over 8 per cent.

The rate of exchange on remittances from Italy has been somewhat less unfavourable than last year.

The Union des Gaz have this year been able to increase their dividend by 1 per cent.

Referring again to the accounts of the Continental Union Gas Company, the increase in the Union des Gaz dividend alluded to above, will enable the Continental Union Gas Company to maintain their dividend at 9 per cent., and to add £1397 to the balance of undivided profit carried forward.

During the year, your Directors decided to create a reserve fund, and for that purpose transferred from general revenue account the sum of £20,000, which has been invested in Local Loans Inscribed stock.

The net profit for the year ending the 30th of June last amounted to £81,472. The amount to the credit of general revenue is £92,642, out of which the Directors recommend a dividend at the rate of 9 per cent. per annum on the ordinary stock, free of tax, and of 7 per cent. on the preference stock, less tax. After deducting the interim dividends paid in July last, and paying the balance of 5 per cent. on the ordinary and 3½ per cent. on the preference stocks, the amount carried forward to the new account will be £12,567. It is proposed to pay the dividend as usual on the 4th of January next.

The Director who retires by rotation is R. Hesketh Jones, Esq., and the Auditors (A. T. Eastman, Esq., and I. A. Crookenden, Esq.) also retire; all of whom, being eligible, offer themselves for re-election.

The CHAIRMAN said for several years it had been his sad duty to refer to losses through death that had been sustained in the directorate of the Company. Although the late M. Breittmayer was not actually a Director of the Continental Union Gas Company, he was their colleague on the Board of the Union des Gaz, with which their own Company were affiliated. The Directors, therefore, wished to avail themselves of this opportunity of telling the proprietors how sincerely they deplored his untimely death, and of their appreciation of his valuable services. As President of the Union des Gaz, M. Breittmayer had, by his ability and energy, materially advanced its prosperity; and his ready tact and cordial manner had largely contributed to the good understanding which had always existed between the two Companies. It was therefore only fit that they should place on record their appreciation of the good work he had done, and their respect for his memory. M. Salanson, who had been elected President of the Union des Gaz, possessed much varied scientific knowledge. He had the full confidence of the Directors; and they felt assured he would discharge the duties of the office most efficiently. With regard to the year's work, he (the Chairman) thought they were justified in feeling satisfaction with the results. When the proprietors last met, the outlook was gloomy enough. Coal was continually rising in price; and a high figure had already been reached. Freights were, owing to the war, also increasing; and to give some idea of the increase, he said that where they had paid 7s. per ton for freights to the Mediterranean, they had been obliged to pay as much as 10s. 6d. or 11s. Coke, owing to a series of mild winters, was fetching low prices. There were then large stocks in hand, with little prospect of reducing them; and residuals generally had not realized the prices expected. In the meanwhile, things had changed, and for the better. It was true the cost of coal had not altered much; but there were signs that the maximum prices had been realized, and they might reasonably hope for a further diminution. Still, the coal bill was £45,000 more than it was last year. This was partly due to a larger quantity of coal having been carbonized. Coal had, moreover, not only been dearer, it had been very difficult to procure. Thanks, however, to the admirable arrangements made by their energetic Secretary (Mr. Himing), they had not only been able to supply the usual quantity to the

Italian stations, but they had been able to make up the deficiency in the supply of French coal, which had been, and was now, more difficult to procure than coal in England. Coke had, chiefly owing to the requirements of manufacturers, been continually rising in price. This had compensated for the smaller demand for domestic purposes on account of the mild winter; and other residuals had likewise increased in value. Last year, in order to maintain the dividend of 9 per cent., they had to take £4137 from the undivided profits. This year, the Directors not only recommended the same dividend, but they were able to add £1397 to the undivided profits. To sum up their financial position, they had earned this year £81,472, against £75,997 in 1899—that was to say, there had been an increase of £5475 in the profits. They had also, as the proprietors had heard, created a reserve fund; and for this purpose had transferred £20,000 from the general revenue account. The wisdom of this course was too obvious to require any explanation; and all he could hope for was that they would in future years be in a position to increase the fund. This improved state in their finances had, of course, been chiefly brought about by the larger dividend received from the Union des Gaz; and this led him to refer to the finances of that Company. As he mentioned last year, there was no doubt the capital of the Union des Gaz was far too small, owing to the ever-increasing amount of gas sold, and to the consequent necessity of extending the plant. It would not be out of place if he explained the position of the French Company. The capital was one million sterling; and the debentures, or (as they were called in France) bond-issue, amounted now to £842,331. The whole of this capital was sunk in the works; and the only funds that were available for extensions were the undivided profits and the amounts derived from the drawn bonds, which could be re-issued; and this year these sources would provide about £44,000—a sum far too small for their average requirements. The Directors did not, if they could help it, wish to increase the share capital; and if they could increase the bond-issue, they would do so, as this would be the cheapest way of raising money. Besides, the bonds could be paid off by annual drawings, while it was much more difficult to reduce the share capital when once created. For the present, they had sufficient money for the ordinary extensions; but should any extraordinary expenditure be necessary, and if the hopes of the Directors were fulfilled of enlarging the business in and about Rueil (which was one of the suburbs of Paris), it would be absolutely necessary to spend a considerable sum on the plant at the station. Then the Union des Gaz would have to take into serious consideration how to raise the needful capital. Last year he referred to a matter that had given the Directors much trouble, and that was their unfortunate lawsuit with the Municipality of Milan; and he had hoped to be able to tell the proprietors that this litigation had ended, and ended in favour of the Company. Although they were within sight of a settlement, no final judgment had been given; but the Directors had every reason for hoping that the Court of Cassation, which was the final Court of Appeal in Italy, would recognize the justice of the Company's claim to raise the price of gas as the quoted prices of coal were higher than the amount named in the contract. Even at this eleventh hour, the Board of the Union des Gaz would be willing to settle the matter amicably, consistent with their interests, with the Municipality of Milan; for no antagonistic feeling existed on their part, and they had always been anxious to meet the Municipality in a friendly spirit. Hitherto all efforts on the part of the Board in this direction had not met with success. Still, should overtures even now be made by the Municipality, they would be willing to discuss amicably any proposals that might be submitted to them. He had been obliged to often allude to Milan, because the management of their business in that city had been for some years very difficult. At the same time, it must be remembered that Milan was the most prosperous city in Italy, and that the population, which ten years ago was 406,000, had now increased to 495,000. Of course, their business had increased in proportion; but, owing to the very low price at which gas was sold, the profits had not been so large as they should have been, and the capital expenditure had been enormous. It was therefore only fair that they should benefit by the clause in the agreement, which gave the Company power to raise the price of gas in the event of the quoted price of coal rising above a fixed amount. The clause was perfectly clear; and the Board had always failed to understand how any Municipality, with a proper sense of justice, could dispute its application. The Board had been advised that they had a strong case, and that they had every right to expect a decision in the Company's favour. There was another matter connected with Milan which was causing some anxiety. Quite recently the men employed at this station made demands for an increase of wages, and for many other advantages. Some of these demands were reasonable, but others could not possibly be entertained. The Board had met these demands generously; and the concessions made were very liberal. They had always paid their men at the same, and in some cases above the, rate that prevailed in Milan and other cities of northern Italy; and, in addition, they had had for many years a scale of pensions by which the men had largely benefited. Therefore the men had, on the whole, every reason to be content, as they had been treated better than they would have been by many other companies. All he could now say was that, if the men were well advised, they would accept the liberal advances the Directors had made as a final settlement, and abandon their other impossible demands. In conclusion, the Chairman said, reviewing the results of the past twelve months, they had not been unsatisfactory. With regard to the coming year, it was, of course, impossible to speak with any certainty. But of one thing they might be moderately sure, and that was that the sale of gas would increase in the future as it had in the past; and they might fairly hope that next December they would have as good an account of the year's work to give the proprietors as they had had that day.

Mr. T. A. GREENE inquired whether the local loan stock in which the reserve fund was invested was in England or abroad.

The CHAIRMAN: English Local Loans Stock.

Mr. H. D. ELLIS, referring to the position of the capital account of the Union des Gaz, said he understood the Chairman to say that the capital stock was a million sterling, and that the amount they had borrowed was about £842,000. Might he ask if the borrowing powers of the Company were limited in any way on the Continent, or what were their powers with regard to the borrowing for capital. He agreed with the Chairman that it was not so judicious to issue further capital stock (which could not so easily be written off and cancelled) as to borrow temporarily. If



it would not be injudicious to state it in open meeting, he should like to know what were the Company's borrowing powers, and the figure which would meet the position in which they now stood. He had heard, with a great deal of pleasure, of the formation of a reserve fund, and also of the intention of the Board to maintain the policy, as opportunity and facilities might offer from time to time, of building up that reserve. He did not know what the opinion was on the proprietors' side of the table, but he thought most of those present would agree with him that this was an excellent policy, and they would always approve of it. It was a very judicious and prudent thing to do.

The CHAIRMAN, in reply, said he believed it was a moot point about the bond-issue of the Union des Gaz. Personally, he thought it could be extended by a general vote at a shareholders' meeting in Paris; but it would require a legal opinion. At present they had reached the limit.

Mr. G. A. ORME remarked that the Chairman had said they had now started a formal reserve fund; but he understood there was one in existence—£69,308, consisting of water-works shares and Union des Gaz bonds. This seemed to be on the face of it a kind of reserve.

The CHAIRMAN answered that there had never been in this Company a formal reserve fund. They had had this money in reserve, and had often lent it to the affiliated Company. He then moved the adoption of the report and accounts.

Mr. N. E. B. GAREY seconded the motion, which was adopted.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN (Mr. Frederick Tendron), the dividends mentioned in the report were declared.

The CHAIRMAN then moved the re-election as a Director of Mr. R. Hesketh Jones, to whom he said they had every reason to be grateful for his good work in the past.

Mr. J. HORSLEY PALMER seconded the motion, which was heartily agreed to.

On the proposal of Mr. R. F. BUTCHER, seconded by Mr. R. COOPER, the Auditors (Messrs. A. T. Eastman and I. A. Crookenden) were also re-appointed.

The CHAIRMAN next moved a vote of thanks to the Secretary, Managers, Engineers, and staff of the Company and of the Union des Gaz, both in London and abroad, for the able services rendered by them during the past year. He remarked that it was his duty this year to make an inspection of the stations in Italy; and he must say he found there a most devoted set of men, very able, and conducting their work exceedingly well. The same remarks applied to everybody connected with the undertakings with whom he had come in contact in Italy, Paris, France, Germany, and London.

Mr. R. S. GARDINER seconded the motion, which was agreed to.

A cordial vote of thanks was likewise passed to the Chairman and Directors, on the proposition of Mr. A. T. EASTMAN, seconded by Mr. M. N. ADLER.

This concluded the proceedings.

#### GRAND JUNCTION WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Offices, No. 65, South Molton Street, on Wednesday last—Mr. FREDERICK TENDRON, F.G.S., in the chair.

The SECRETARY (Mr. J. Goodwin) having read the notice convening the meeting,

The CHAIRMAN remarked that the shareholders had probably noticed in the Directors' report that the amount carried forward was £24,160. The Board would endeavour to increase this sum before the Staines works came into operation; for when once the Company were receiving water from Staines, they would come upon the sinking fund, and all the charges incidental to the supply, and they could not expect for a few years to derive the benefit which they otherwise would, because their powers of supply and delivery would be so much in excess of the consumption. As the years went on, however, that which would be a heavy charge would gradually diminish; and the Directors trusted that the day of profit would come. In addition to this £24,160, which belonged to the holders of the maximum 10 per cent. shares, the Company had paid on account of interest on debenture stock raised for the Staines works and provided in the accounts £13,046. Adding to these two amounts the dividends for the three years to Sept. 30 which the maximum 10 per cent. shareholders had received, it would be found that the net earning of the Company for those three years was as nearly as possible 9 per cent. per annum. The payments they were making on account of Staines had nothing to do with their normal earning power, which was 9 per cent.; but the Directors, supported by the shareholders, were wisely putting by the sum they considered necessary to enable them to maintain the dividend, and to increase it as the full powers of the supply from Staines came into operation. The Staines Act provided that if the Company were bought within seven years of the date of its passing—Aug. 14, 1896—no claim should be made for advantages accruing. This meant clearly that they were not to say that their actual property was enhanced in value by the additional powers they obtained from these reservoirs; but the Act did not preclude them from requiring the repayment of money they had paid on account of interest on debenture stock raised to pay for the reservoirs. He therefore contended that, not only whatever sum might have been reserved out of the earnings was the property of the maximum 10 per cent. shareholders, but also the whole of the payments the Company might have made on account of interest paid on debenture stock raised for the Staines reservoirs. The balance-sheet showed that £6456 was in suspense on account of these reservoirs. The reason of this was that the Directors contended that the Company ought not to be called upon to pay interest on account of the reservoirs until, according to the Act, the Joint Committee were in a position to supply the three Companies with stored water. The Directors had therefore taken the position that it was not right to ask the Company for these payments, as the Joint Committee were not in a position to deliver stored water at present. The West Middlesex Company took the same line; but the New River Company, on the other hand, wished the payments to be made. Therefore, in order to be perfectly clear as to the law of the case, a friendly suit had been instituted by the Staines Reservoirs Committee against the Companies. Good Counsel would be

engaged on both sides; and he hoped the decision would be in their favour, for it was extremely important to them, as it would largely increase the amount they would have available to meet all possible contingencies in connection with Staines when, as he had said, they would come under the operation not only of the full interest and the charges that properly belonged to the working of these reservoirs, but also of the sinking fund. The reason the New River Company preferred making the payments year by year to having them capitalized, was that the charge for sinking fund to that Company was almost incredible. He believed the Company paid something like 13 per cent.—that, he thought, was their ordinary dividend. But all that they were allowed was 4 per cent.; and therefore they would have 8 or 9 per cent. per annum to pay as sinking fund on the whole of their share of the Staines reservoirs. The entire capital would thus be recouped, with interest, in ten years. But did anyone ever hear of a sinking fund that involved payment under sixty or eighty years, when the advance was for public works? Whose conception it was originally that the Companies should be mulcted in such a sum called sinking fund, he could not say; but, in his opinion, it was worthy of the late Government of the Transvaal. With reference to the intercommunication scheme, the Company had spent for their share of these works and the expenses of issue some £70,000; and to meet this, an issue had been made of £75,250 of 3 per cent. debenture stock, at an average price of 93 per cent. The total cost of the intercommunication works would be about £650,000, which the Water Companies had willingly agreed to expend, in order to lessen the chance of an insufficient supply in any one particular district. He really thought that the Companies should have credit from the consumers all over the Metropolis for the readiness they had displayed in embarking on so large an enterprise, and in not grudging the heavy charge of something over £20,000 a year it would bring on them. It was like an insurance fund; and it was only right that the cost of the works should be divided among the eight Companies in the proportion, not of the value of their respective properties, but of their respective water-rentals. After expressing his readiness to reply to any remarks or questions, the Chairman concluded by moving a resolution approving the report and accounts, and adopting the recommendations contained therein.

Mr. HENRY MOTT seconded the motion.

Mr. BELLEWES, in supporting the motion, said he thought the shareholders might fairly congratulate themselves again on the position and prospects of the Company. There was nothing in the result of the late General Election to discourage those who were interested in the London Water Companies; but, on the contrary, there was much to encourage them. He did not think the present Parliament was at all likely to be impressed with the new argument put forward by the Progressive majority of the London County Council—that the Water Companies' undertakings should be bought by them because a Royal Commission had recommended that they should be bought by someone else. In the case of their Company, they were so favourably situated that they were prepared for either case—to be purchased or to remain as they were. Mr. Ritchie, at the dinner given by Mr. Dickinson, of the London County Council, on the 4th inst., said that "if the Council desired, as to the water supply and other matters, only what was right, some measure might be proposed to Parliament which would practically be unopposed." On reading these words, at first he thought that Mr. Ritchie was playing into the hands of the Progressive majority of the County Council; but on reading them again, he thought that the right hon. gentleman was administering a rebuff to that body—his remark being if the Council desired *only* what was right, &c. He therefore thought that Mr. Ritchie's utterance, although a little oracular, was another straw showing that the wind was blowing, and blowing strongly, in favour of the Water Companies and their efforts to fulfil their duties to the public.

Mr. REMNANT, M.P., thoroughly endorsed the remarks of Mr. Bellewes. He (the speaker) was at the dinner referred to, and, as Mr. Bellewes had stated, Mr. Ritchie said, "if the Council only desires what is right;" but the right hon. gentleman added the words "and reasonable." The Progressives certainly regarded Mr. Ritchie as one of their own party, and as one who would do all that he could in favour of their views; but he (the speaker) thought they would be mistaken. At all events, after the meeting that night, Mr. Ritchie was led pretty well to know that the London Members would not tolerate the handing over of the Water Companies to the County Council on the terms they wanted. He thought it an outrageous suggestion that the undertakings should be handed over without the 10 per cent. which was allowed on all property taken compulsorily; and he was convinced that this would not be permitted. He was sure the shareholders would agree with him that it was a matter of great satisfaction to them to see the position in which the Company stood owing to the efficient administration of their affairs by the Directors.

The CHAIRMAN, in reply, stated that he had read the remarks which Mr. Ritchie made on the occasion referred to. He (the Chairman) had inferred that the new Bill of the County Council would not contain a clause to take possession of the Water Companies' properties before the price had been fixed and the money had been paid. He had also concluded that the arbitration clause would be the usual one under the Lands Clauses Act; and that the properties would be bought on the same system on which all property had been bought and sold now for very many years. He had thought that Mr. Ritchie had been tipped with certain information. He considered it rather strange for the head of the Home Office to interfere in another man's department; and he did not think that Mr. Long would like such interference. He had been very pleased to hear Mr. Bellewes and Mr. Remnant speak so clearly of the views they took as to the action of the Progressive members of the County Council. He then put the motion, which was carried unanimously.

Resolutions were afterwards passed approving the dividends recommended and appointing Mr. C. P. Crookenden an Auditor in the place of the late Mr. James Best.

On the motion of Mr. SPICER, seconded by Mr. REMNANT, a cordial vote of thanks was passed to the Chairman and Directors for their efficient administration of the Company's affairs.

The CHAIRMAN briefly acknowledged the vote, and incidentally expressed regret at the absence from the meeting of Lord Knutsford, who had telegraphed that morning that he was confined to his room.

The proceedings then terminated.



## SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held at the Offices, Southwark Bridge Road, on Tuesday last, under the presidency of Alderman Sir H. E. KNIGHT.

The SECRETARY (Mr. Montague Watts) having read the notice calling the meeting, and other formal business having been disposed of, the report of the Directors and statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, stated that the Company had had a capital half year, and had shown a great advance, although they had not been able to earn quite as much profit as in the corresponding period of the previous year—a fact, however, of which he would presently give an explanation, which the proprietors would find perfectly satisfactory. The capital account showed an amount unexpended of £95,780; and they might well ask why the Directors wanted this capital in hand, when they could do without it, and had to pay interest on it. He could only reply, as he had said before, that it was a system of finance which had been forced upon the Company by the Government Auditor. If the Directors had been permitted to go on as business men, they would not have had this amount in hand; but the proprietors knew the differences which the Board had had with the Government Auditor on the point, and, for the sake of peace, they had fallen in with this method. It had some bearing on the earnings of the Company; and it was a bad system for them, and damaging as regarded the public, because by curtailing the Company's earnings the time was deferred for reducing the consumers' rates. He had always maintained that the Government Auditor was wrong; and he thought that his view had been proved to be correct. However, out of the £95,000 in question, £46,343 had been expended by the Company on intercommunication works; but this amount would be recovered when the Directors issued the debentures in connection with these works. They would then have the capital available for the Company's own purposes. Passing to the revenue account, he stated that under the head of maintenance the expenditure in the past half year had been £58,286, or £4502 more than in the corresponding period of 1899. Of this increase, £4000 represented the additional price of coal, and the balance was accounted for by the extra rates and taxes the Company had had to pay in the half year. Both these matters were entirely beyond the Directors' control. The expenses of management, on the other hand, had been £8400, or £1120 less than in the September half of 1899; and this saving had been effected entirely in law and Parliamentary expenses—the Company having been let alone. There had been no Royal Commission, and other matters, involving such outlay. The net increase in the expenses in the past half year had been £3218. The amount carried to dividend and interest account for transfer of profits was £74,440, or £12,509 less than in the corresponding period of the previous year; and he would presently explain the cause of this apparent falling off in the amount available for distribution. The credit side of the account was very satisfactory. It showed that the allowances for empty houses and over-charges were slightly less, as had been the case for some time past—a fact showing the strict supervision which was exercised in the conduct of the Company's affairs. The water-rents accrued to the date of the accounts amounted to £144,000, or £9602 less than in the same half of 1899. The explanation of this diminution was simply this—that in the corresponding period of last year the Company received from the East London Company about £13,000; whereas in the past half year they had not had a penny from this source. He was glad to say that the East London Company had been able to supply their own district with their own water; and this accounted for the deficiency of £13,000 mentioned. As, however, he had said, a decrease of only £9602 was shown in the income; and deducting this from the £13,000 referred to, £3343 was left. He congratulated the proprietors on this, because the latter amount represented the increase in the normal business of the Company for the past half year—a result which must be regarded as satisfactory. The loss of £9602, and the extra expenses of £3218, amounted together to £12,820; but after certain adjustments had been made, this total was reduced to £12,509, which was the amount less that carried to dividend and interest account. He had nothing further to say regarding the accounts; but he wished to impress on the proprietors that they were most satisfactory, for the reason stated, although they showed a falling off in revenue. The debenture interest required £29,391, or £4500 more than in the corresponding half of 1899; but if the Directors had been able to continue what he called a commercial system of finance, about £1500 out of the £4500 would have been saved, and would have been so much more profit. The interest on the preference stock was £12,230; and the balance applicable to dividend was £41,790, which was less by £12,258 than the amount available a year previously. This, as he had said, represented the loss of income sustained by the Company from one special customer. They ought not, however, to feel any regret on this score, because it was a desirable thing that no water company should ever fail in their supply; and therefore, although the Company lost a customer, they might all heartily congratulate themselves that their sister Company had been able to perform their obligations without assistance. The Directors recommended a dividend of 7 per cent., which would leave £5785 to be carried forward. The Board did not think that it would be wise to pay a larger dividend, because the high price of coal still continued, and the next half year was not the Company's best; but by carrying forward the amount mentioned, the Directors would be enabled next half year to pay fully the same dividend as that now recommended; and they thought that it was far better to do this than to pay a larger dividend now, and have to distribute a smaller one again next half year. The proprietors had the satisfaction of knowing that nothing would have prevented the maintenance of the dividend at 7½ per cent.—or the payment even of a higher rate—had it not been for the extraordinary rise in the price of coal; an advance amounting to £8000 in the year, or nearly 1 per cent. dividend. Passing to the report, he stated that the London County Council were again introducing a Bill into Parliament which would put the Companies to considerable expense in opposing it, as they must all do. No doubt, the proprietors had read in the newspapers, as he himself had, a statement which was recently made at the County Council respecting the object of this measure. He had read it carefully; and he unhesitatingly described it as nothing more or less than resorting to a series of dodges for evading the recommendations of the Royal Commissions, and to set

aside the decisions Parliament had already arrived at. The Directors, representing the shareholders, must endeavour to get the Bill thrown out; and he hoped that the proprietors would co-operate with the Board with this object. They did not think that the Bill had a chance of passing; it being diametrically opposed, as he had said, to the recommendations of the Royal Commission and the decisions of Parliament. Therefore it was all the greater shame that the Companies should be put to expense in opposing it, as they had to do year after year. The scheme in regard to intercommunication works had now been completed, and it had been generally approved by the Local Government Board. All the details in connection with the scheme had been sent in; and after these had been approved by the Local Government Board, the Companies would set to work and get their systems into intercommunication as speedily as possible. It was a matter which was forced upon them by the very dry summer in the year before last. This indicated that there was a possibility at that time—though he did not think that such a possibility would ever arise again—of a Company being deficient in their supply; and this being so, the Government and public opinion (and, he might add, common-sense as well) said it was a thing that must not be allowed. The intercommunication scheme had therefore been adopted; and it would enable any Company to be assisted to the extent of 20 million gallons a day, should they, from any cause, fail in being able to supply their own district. The prevention of waste was another very important matter affecting the Company. The consumption of water per head was much larger than the Directors thought it ought to be, and they had been endeavouring for years, by a system of inspection and supervision, to curtail waste and reduce the consumption to something like what they thought fair and reasonable. They could not do this, however, because, under the existing regulations for the inspection of fittings, the Company had not the power to make that strict survey which they ought. All the Companies had now agreed on a form of regulations; but their recommendations had to be approved by the Local Government Board. They only awaited the decision of that body, which he had every reason to believe would be quite favourable, the alterations suggested being founded on great experience. He therefore hoped that before long these regulations would be in use, and that they would result in the Company's Engineer being able to report in due course that a saving of so much per head had been effected in the consumption. If only 3 or 4 gallons a head per day were saved, it would represent an economy of some millions of gallons in the course of a year. The Company's magnificent range of filter-beds at Hampton had now been completed, and he did not think that there was another set to equal them anywhere. They were also backed by engine power more than ample for present requirements; and, further, they had large reservoirs in use, which would give them a good reserve. This would be of great advantage; and it would also save the cost of filtering. The Directors were busily engaged in getting ready to proceed with the works authorized by their Act of 1894. It had taken some years to mature the plans and to pave the way; but everything was now ready, and it was hoped that the Company would receive a tender in the course of the next week for the projected works. If so, they would be pushed on with all possible despatch, because when these and the other works in hand were completed, the Company would be in an admirable position to meet all their duties, as well as any difficulties that might possibly arise. He trusted the statement which he had made would be considered satisfactory, although they had been disappointed as regarded the amount of profit earned; but he thought he had shown that the Directors would have been in a position to pay a larger dividend had it not been for the increased price of coal.

Sir R. H. WYATT seconded the motion, which was carried.

Resolutions were afterwards passed declaring the dividends recommended on the preference and ordinary stocks and class "D" shares; re-electing the retiring Directors and Auditor; and authorizing certain donations towards the maintenance of schools at Sunbury, Hampton, Hampton Hill, Wimbledon, Merton, and Mortlake, with the object of keeping out Board Schools in these parishes, and of avoiding the payment by the Company of School Board rates in them.

A vote of thanks to the Chairman, Directors, and staff brought the meeting to a close.

**Complaints of the Steam Roller at Andover.**—At the last meeting of the Andover Town Council, the Clerk read some letters he had received from the Solicitor to the Gas Company, stating that the steam roller had broken their mains, and threatening that, if the rolling was not discontinued, or the Council would not give an undertaking to pay for all damage, an injunction would be applied for. The Council went into Committee to discuss the matter, and subsequently reported that they denied damage, but would give the Surveyor directions to use every precaution to avoid injury; reserving to themselves the right to use the roller in any street they chose.

**Gas v. Electricity for Workhouse Lighting.**—The Kingston Board of Guardians have had under consideration the question of generating electricity for lighting purposes; and at a recent meeting the Building Committee reported upon the matter. Allowing for the additional lights that would be required for new buildings in course of erection, the total cost of gas was estimated at £856 15s. 9d., while the cost of an electric installation would be £1315 5s. 6d., and if supplied by the Corporation of Kingston, at their quoted price of 43d. per unit, £1687 18s. 1d. The Committee unanimously advised the Board not to put down electric lighting plant; and their advice was followed.

**Aldeburgh Water-Works Purchase.**—A special meeting of the Aldeburgh Corporation was held on Friday to approve the Bill to enable the Corporation to acquire the undertaking of the Aldeburgh Water-Works Company, Limited, and to construct water-works and supply water, and for other purposes. The proposed Bill, under the advice of the Parliamentary Agents, was altered in a few particulars, after some discussion; the Mayor explaining that powers to raise the money on the security of the undertaking, otherwise than from the Local Government Board, was provided for. A formal resolution was then adopted, as was one—"That the common seal be affixed to the petition to Parliament for the Bill, and that the Parliamentary Committee be authorized to take all necessary steps to promote the Bill in Parliament, and to carry out and complete the purchase, and to do all such things as may be necessary or expedient to give effect to the resolutions of the Council."



## WAGES AND CONDITIONS OF LABOUR AT THE SHEFFIELD GAS-WORKS.

Some time since, an application was made by the men employed by the Sheffield United Gaslight Company for increased wages and other concessions; and the decision of the Directors has recently been communicated to the men's representatives.

The requirements of the workers were as follows:—

An advance of wages of 10 per cent. to be paid to all workmen outside the carbonizing department. Men in carbonizing department, 3d. per shift advance.

Workmen of ten months' service in carbonizing department to have seven days' holiday; eight months' service, three days' holiday; six months' service, two days' holiday; four months' service, one day's holiday. Yard men to have four days' holiday. These holidays to be paid as if at work.

The men in the carbonizing department at Grimethorpe to have same pay as the men at Neepsend.

Coal bank men at Neepsend to be paid 7d. per hour while engaged in coal stocking.

Exhaust enginemen at Neepsend and Effingham Street to be paid 5s. per shift.

Exhaust enginemen at Grimethorpe and machine enginemen employed at No. 3 retort-house at Neepsend to be paid same as stokers.

Boiler firers, valve men, elevator men, at all stations 5s. per shift.

Overtime: The first two hours to count as time-and-a-quarter, all time afterwards as time-and-half.

Sunday work: The whole twenty-four hours to count as time-and-half.

Each day to stand by itself, both as to ordinary and overtime.

Coke wheelers to be provided at Effingham Street same as are provided at Neepsend.

Checking to be abolished at breakfast half hour.

Better cabin accommodation to be provided; also better and further water-closet accommodation.

The decision of the Directors was communicated by Mr. Hanbury Thomas to Mr. C. Brain, the Branch Secretary of the Gas Workers' Union. It was dated the 10th inst., and was as follows:—

I am instructed by my Directors to inform you that, having regard to the fact that all classes of workmen in the Company's employ have received advances in their wages during the past twelve or fifteen months, they do not see their way to grant any further general increases; but after careful consideration of your application, dated the 2nd of October, and of the points put forward by the deputations which waited on the Board on Nov. 12, they have arrived at the following decisions:—

To pay time-and-a-half for all three shifts on Sundays, when at work.

To provide coke wheelers in No. 2 house at Effingham Street, who, when not fully occupied wheeling, will have to fill up their time in sweeping up, and other work.

The wages of oxide turners and blacksmiths' strikers to be advanced 1s. per week in each case.

The cannon coke wheelers to be paid 6s. 4½d. per shift on Sundays instead of 6s. per shift.

With regard to overtime, the following is to be the rule in future: A workman absent any time during the week, through illness or with leave, first obtained from his foreman, shall be paid for overtime at the extra rate of time-and-a-quarter. In all other cases, a full week's time must be made before overtime rate is paid.

I may inform you that the total cost to the Company of the above and previous recent advances amounts to over £4,000 per annum.

To consider the situation, a meeting of the men was held last Tuesday, at which a Mr. James Hammond presided. In opening the proceedings, he remarked that they had, after forwarding their petition to the Directors, been invited to send a deputation, and that deputation met the Directors and came away feeling that they were likely to get most of what they had asked for. Since then, however, some influence had been used, and it would seem as though this had overthrown the good feeling which had existed between their employers and themselves. There were only two things open to them. Either they should accept the concessions offered by the Directors—which was what he would recommend—or else place themselves in the hands of the officials of the Union to let them fight the case in their behalf.

In addressing the meeting, Mr. Brain said Mr. Hanbury Thomas's letter referred to the fact that increases of wages had been given. The boiler firers in Sheffield got 4s. 6d. per shift twenty years ago; and they were still paid the same. The Corporation paid their labourers 5½d. per hour; but the Gas Company paid only 5d. He thought that, when considering the men's application, the Board had used knives sharper than razors to cut the concessions down. In the Manchester carbonizing department, the men worked eight hours per day, and wheeled about 20 barrows less for 5s. per day than they did in Sheffield for 4s. 9d. The Manchester boiler firers got 5s. 3d. per shift; but in Sheffield they only received 4s. 6d. At Birmingham the men who wheeled the coke 20 yards, as compared with 40 yards in Sheffield, got 5s. per shift; but in Sheffield they received 4s. 9d. In Birmingham the men had to draw and charge 270 retorts, as compared with 288 retorts, at 5s. 9d. per shift in each place. In Sheffield they had to carbonize 12 tons of coal for 4s. 3d.; but in Manchester, for carbonizing 6 tons 6 cwt. 4s. 5d. was received. The coal fillers in Birmingham filled 14 tons 2 cwt. for 5s.; while in Sheffield they filled 16 tons for 4s. 6d. Other comparisons were given, including the fact that the workers of Birmingham obtained seven days' holiday in the year, and in Leicester six days' holiday, for which they were paid; while in Sheffield the men had none. In Leeds all general labour outside the carbonizing department was paid for at 27s. per week of 54 hours; but in Sheffield they only received 23s. Sir F. T. Mappin on Nov. 10 said that the corporations had got the rates to fall back upon to help to pay for their labour; but he did not agree with the corporations lavishing so much money on labourers. If, outside the corporation gas-works, he (Mr. Brain) could show where a higher rate than at Sheffield was paid, it would have some weight in the appeal. Fortunately for the workers, there were not many private companies; but instead of the large towns having to fall back on the rates to pay the cost of working, the corporation gas-works handed over considerable sums to relieve the rates, and to put the towns in a more satisfactory sanitary condition. The Company said that they were not in a position to pay more money; and all he could say was that they as men should use their best endeavours to get the concern under the Corporation for the benefit of the citizens and the

workers. He called attention to the large sum of money the Company were, after meeting all outgoings, able to add to their next half-year's accounts. The men at that meeting had to decide whether they would accept the Company's decision, whether they should ask them to reconsider the application, or whether they should place themselves in the hands of the officials of the Union.

The District Secretary (Mr. T. Hesketh) recommended that the men should appeal through their Committee to the Company to reconsider their decision. One of the workers proposed that the matter should be left in the hands of the London officials; but an amendment was introduced to the effect that the concessions should be accepted, and the Directors asked to reconsider their decision. This amendment, on being put, was carried almost unanimously.

[We give the foregoing report of the speeches to show the line of argument adopted by the men's representatives; but in regard to it, Mr. Hanbury Thomas has informed a local contemporary that "many mis-statements" were made, "which it is not necessary to notice." One, however, which was obviously a misunderstanding on the part of the reporter, and to which Mr. Hanbury Thomas properly took exception, we have deleted. Mr. Brain has since acknowledged that, in this particular instance, the reporter must have put down what he thought was meant rather than what was actually said. It is further remarked by Mr. Brain that the "men are so satisfied their position is just and reasonable, that they are quite willing to place their claims in the hands of an independent arbitrator, and will pledge themselves to abide by his decision."]

## CARLISLE ADOPTS CARBURETTED WATER GAS.

The proposed gas-works extensions again formed the principal topic of discussion at the meeting of the Carlisle City Council last Tuesday; and the debate ran into a considerable amount of time. It will be remembered that, at the previous meeting of the Council, the Gas Committee were asked to give further consideration to their proposals regarding the manner in which the necessities of the department should be met in respect of its producing power. This they have since done, and now came before the Council with a recommendation that Mr. Corbet Woodall's advice to erect plant for the manufacture of carburetted water gas as an auxiliary to the present coal gas supply be adopted, and that the Town Clerk be instructed to communicate with Mr. Woodall requesting him to submit detailed estimates of such plant as he would recommend to be erected upon the present site, to manufacture 600,000 cubic feet per diem. Mr. Coulthard proposed the adoption of the recommendation. He said the question of gas extensions had been before the Gas Committee for the last five years. When their Engineer (Mr. C. B. Newton) came among them, he told them they required an extension of the gas-works. The Committee had done their best to keep from the expenditure until this year, when they took the matter into serious consideration. Then the question of carburetted water gas was mentioned, and was the beginning of the friction which had arisen. In July the Committee (only by a majority of one) brought forward a scheme for the erection of works to manufacture 600,000 cubic feet of coal gas, at a cost of £13,200, or works for 300,000 cubic feet at a cost of £10,585. The question of water gas was also gone into; and it was found that plant could be introduced for the manufacture of 600,000 feet at a cost of £14,069. The figures were conflicting; and many of them could not agree with them, so they called in Mr. Corbet Woodall to advise them. Mr. Woodall did not approve of the extension of the gas plant on the present site; and the Committee by a small majority brought in a scheme to extend the works at Boustead's Grassing at a cost of £33,000 for 500,000 cubic feet per day. In the adoption of this scheme, the eventual expenditure of from £90,000 to £100,000 was contemplated. The Council very wisely declined to take their gas-works to Boustead's Grassing. The policy of the Committee had been to stave off large expenditure; and during the last five years, £27,000 of profits had been paid into the public exchequer for the reduction of the rates. He asked the Council to continue this policy of economy. The minority did not even now say that they wanted new works, and admitted that this was not the time to extend them. This year they had had an extra expenditure of £10,000 upon coal. What they wanted the Council to do was to go in for an installation of plant to manufacture 600,000 cubic feet of carburetted water gas; and by doing this they would renew the life of the gas-works for another fifteen years, which would be a right thing to do, as he did not think the present works should be thrown on to the scrap heap. They had sunk £122,000 in fixed plant at the present site; and they wanted to utilize this plant to the fullest extent. Mr. J. C. Dove seconded the motion. Several speeches were made in favour of the recommendation; and there was a little opposition. An amendment was moved; but it was withdrawn after an adjournment for luncheon, when everybody appeared to be in a conciliatory frame of mind. The recommendation—after a short speech by the Chairman of the Committee (Mr. Corbett), who, at the previous Council meeting, had objected to water gas, but now saw the matter in a new light—was unanimously adopted.

**Nuneaton Gas-Works Extensions.**—At last Thursday's meeting of the Nuneaton and Chilvers Coton District Council, the Clerk reported the deposit of plans, &c., for the extension of the Nuneaton Gas Company's undertaking. The ground it was intended to acquire forming part of the centre of the town, there was some opposition to the Company's proposals; and the consideration of the question was adjourned.

**Bangor (Ireland) Gas-Works Improvements.**—The Bangor District Council have adopted the scheme of gas-works improvement submitted to them by Mr. S. B. Langlands. The plan adopted is No. 1 (see ante, p. 1410), amplified by enlarging the proposed new retort-house to admit of seven benches of retorts being erected; but the new chimney stack is not to be built immediately. Mr. Langlands is to be asked to undertake the duties of Consulting Engineer, and superintend the work; and an application is to be made for a loan.



### MATLOCK BATH GAS UNDERTAKING.

Results of the Working under the District Council.

Figures were laid before the Matlock Bath District Council last Wednesday in reference to the working of the gas undertaking; and the Committee, the Manager, and the staff were congratulated upon the results they had achieved. It was stated that the works had a balance in hand of nearly £1000; and while this existed, the Council would never have to make a call on the general district rates to help the concern. It was also pointed out that 1s. 11½d. more profit per ton of coal was being made than in the time of the Gas Company; and the gas distributed amounted to 1,100,000 cubic feet more than before. There was still above £7000 left for borrowing powers on the works, with repayment in fifty years. The profit for the year ending March 31 last, amounted to £938, as compared with £814 in 1898-9, £817 in 1897-8, and £768 in the last year of the Company's management. This gratifying increase in profits had been made notwithstanding the fact that coal, materials, and wages are all higher. Last year the quantity of gas made was 18,919,000 cubic feet, which was the largest amount ever made in the history of the undertaking. It was also noteworthy that the leakage saved during the Council's management was equal to above 5 per cent. This in itself was equal to 2,250,000 cubic feet, which worked out at a cash value of £337, taking the average price realized at 3s. per 1000 cubic feet—the maximum of the Council's charges being 3s. 4d. per 1000 feet. Coke was also worthy of comment. In the days of the Company, 49·83 per cent. of fuel was used in the manufacture of gas. The Council during the past year had reduced this consumption of fuel to 38·04 per cent. The difference was 200 tons in weight, which the Council had sold and realized—a grand total of £125 saved to the Council and ratepayers. This had been accomplished with coal at 2s. 6d. per ton more than it was the last year of the Company's management, and yet the profit was shown as £170 more. Dealing with the financial side of the question, the loans on the works totalled to £20,500. This was allocated as follows: Purchase of undertaking, first award, £16,726 3s. 9d.; supplementary award, £807 11s.; costs allowed to Gas Company (per Act) to wind up Company, £250; costs of transfer of undertaking, £1457 19s. 1d.; expenses of borrowing loans, £305 5s. 3d.; expenditure on plant, £337 1s. 8d.; new mains and services, £456 6s. 3d.; new meters, £176 4s. 2d.; new cookers, £144 14s. 11d.—making a grand total of £20,661 6s. 1d., being £161 6s. 6d. overspent on capital account, and at present taken out of revenue. The balance to the credit of the Council on net revenue account up to March 31 last on the whole of the working since the Council took over the concern was £949. The Council were arranging a new loan of £2000 for the extensions of the works and distributing plant. This was being borrowed at the rate of 3½ per cent., and was repayable in equal instalments of principal and interest over fifty years; working out at an annual payment of £89 2s. 11d.

### GLASGOW STREET LIGHTING.

(From an Occasional Contributor.)

The Inspector of Lighting for Glasgow, Mr. Robert Hamilton, has for some time past been very busily occupied, chiefly with the adoption of incandescent gas-lamps. He has had his trials with electric arc lamps, which are generally distributed over the centre of the city, more especially where there are tramway lines. Up to now there have been installed in the city in this way between 200 and 300 of such lamps, and when the generating power shall have been developed to the requisite extent, there may be more of them. At present the question of terms does not bulk so largely as it was accustomed to do between the Electricity Committee, who provide and sell the current, and the Police Board, who, as being responsible for the lighting of the streets, purchase the lighting current. The electric arc lamps were charged at first £20 each for current; then, as the electric authority said they could not supply at the price, it was agreed to pay £26 per lamp. Now, however, the charge mutually agreed upon for the city to pay is £18 per lamp. The Inspector of Lighting is limited as to his annual expenditure, which at present amounts to upwards of £83,420, of which there falls to be recovered in the course of the year a sum of £24,000. The £83,420, it should be mentioned, includes both the gas and the electricity. It may safely be said that, even at £18 per lamp, "the game is not worth the candle."

In connection with the gas lighting of Glasgow—its streets, lanes, squares, courts, &c., and its common stairs—the city is divided into eight districts, each of which has a place of assembly for lamplighters, as also a foreman. The street lamplighters number 166, and there are installed upwards of 19,000 lights. Frequently, as at the corners of important streets, there are two or three, but not any more than three, gas-jets in each lantern; and not unfrequently there are four such lanterns at a street crossing where the tramway cars pass. Generally, these lamps are of the incandescent order, of which there are upwards of 1200 in use. They were first installed in St. Vincent Street, between Buchanan Street and Renfield Street, several years ago—to be exact, in 1894. This was the year in which the annual meeting of the North British Association of Gas Managers was held in Glasgow, with Mr. M'Gilchrist, of Dumbarton, as President, and when the strangers to the city and to the Welsbach burner had an opportunity of seeing it installed in a suitable thoroughfare. Since then it has been extended in many directions—Bath Street, West Regent Street, West George Street, and St. Vincent Street, all leading up the hill to Blythswood Square, where there is also an installation of the same light around the garden enclosure. It is long since Eglinton Street and Bridgeton Cross were fitted with the Welsbach system; and recently a resolution was passed to have these lights distributed generally over every district of the city. In this way Thistle Street, Rose Street, Muirhead Street, and other thoroughfares in the poorer districts of the South-east, were attended to by Mr. Hamilton. He has had Pollokshields and Hillhead in his "mind's eye;" and they are both well done. Other suburban districts of the city within the police bounds will subsequently be attended to. All the centre of the city has been done. It is long since George Street was attended to; but the thoroughfare is a portion of an important tramway route leading out east.

In course of time the Welsbach light has made an important impression

in Glasgow, more especially upon the Watching and Lighting Committee of the Corporation; and they are quite willing to vote money for its extension where the Lighting Inspector is satisfied that this can be done with advantage to the citizens. He has, from time to time, made or suggested improvements in constructional details; and they have been carried out as circumstances permitted. He takes credit for one of his St. Vincent Street lamp mantles doing a sort of record work, inasmuch as it was alight for upwards of 3000 hours before it "gave up the ghost." If he could get such mantles as this one, it would not be long before he had the whole city blazing with incandescent gaslight.

Mr. Hamilton has charge also of the lighting of the common stairs of the city, on or in which there are some 52,615 lights, and in which he has employed 455 lamplighters. The lighting of these lamps is a troublesome and laborious bit of work; but it is eventually got through, equally with the lighting of the street lamps. The question of the payment for the stair lamps is quite another matter, and will probably be settled by the Bill which will shortly be in Parliament. The stair-lighters receive at the rate of 13s. to 16s. per week in the shape of wages; and the total bill for wages on account of stair-lights is £13,300. But the wages for the lighting of the street-lamps during the year make up a total of £17,980. The wages amount to 23s. to 24s. per week, and the hands get certain considerations in the way of uniform and holidays—a week for each man. The gas for stairs and street lighting for the year 1900-1901 is estimated at 324,736,000 cubic feet, which is about one-third of the gas made in 1869, when the supply was taken over by the Corporation from the two Gas Companies which then existed.

### SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, on Monday last week, Mr. Alfred Richards offered for sale several new issues of gas and water stock. The first 30 lots put up consisted of 4 per cent. perpetual debenture stock of the South Essex Water Company, ten of which were sold at the rate of £110 per cent., and the remainder at £110 10s., compared with £105 and £106 realized for similar stock sold in July. The next lots consisted of £7500 of ordinary 5 per cent. "C" stock of the Ilford Gas Company (entitled to 6 per cent.); and it realized prices ranging from £108 to £110 10s. per £100 of stock—the bulk going at £110, against £105 to £106 early last month. Some 3 per cent. perpetual debenture stock of the Maidstone Gas Company was disposed of at from £76 to £80 per cent., as compared with £75 and £76 in July; and new ordinary 7 per cent. stock, entitled, at the present price of gas, to a dividend of 9½ per cent. per annum, at from £192 to £196, *cum div.* from the 1st prox. A small parcel of "C" stock of the Watford Gas Company fetched £170 per cent. A new issue of a few £10 "D" capital water shares in the Barnet District Gas and Water Company realized from £10 to £10 15s. each. Among other recent sales may be noted one by Mr. Harrie Stacey of some ordinary "B" stock in the Redhill Gas Company, which resulted in a little over £6000 of it being disposed of at prices ranging from £105 to £107 per cent. The amount offered was £7500; and 28 lots of £50 each did not find purchasers. At the offices of the Newcastle and Gateshead Water Company last Tuesday, Mr. Charles A. Joel offered for sale £50,000 of the Company's 5 per cent. preference stock. The prices obtained ranged from £152 to £156 per cent. On the same day, some £5 shares (7 per cent.) in the Brompton, Chatham, &c., Water Company were disposed of by Mr. W. E. R. Randall at £10 each.

### THE CARBIDE OF CALCIUM AND ACETYLENE INDUSTRIES IN GERMANY.

Her Majesty's Consul at Stuttgart (Dr. Frederick Rose) forwarded to the Foreign Office a short time ago an interesting, and at the same time valuable, report on the rise, progress, and present condition of the calcium carbide and acetylene industries in Germany. It was compiled, as is stated in the prefatory remarks, "in order to show the progress of scientific industrialism in Germany, and to enable the British acetylene industry to benefit by the experience which has been gained in Germany." Special attention is directed therein to the valuable work of the German Acetylene Society, to the attitude of the fire insurance companies and the State Authorities, to the lighting of small towns, and the adoption of acetylene oil-gas by the German railways. Dr. Rose points out that "in acetylene gas lighting the ordinary element of rivalry between the same industries in different countries is, to a great extent, absent, as the sphere of action of each is limited to its own country." He therefore concludes that "any advance made by one can only benefit others, and, by the interchange of experience and opinion, lead to the establishment of harmonious relations and mutual advantages." In view of the growing importance of acetylene as an illuminant, and of the fresh interest which will be imparted to it by the exhibition to be opened in a few days at the Royal Aquarium, we reproduce the report practically in its entirety.

One of the most remarkable instances of the creation and rapid growth of an entirely new industry has been seen in Germany during the last four years, in the manufacture of calcium carbide and the progress of acetylene lighting. Calcium carbide, the preparation of which, on a large and remunerative scale, now forms one of the triumphs of electro-chemistry, has long been known to the chemist since its discovery by Friedrich Wöhler, at Göttingen, in 1836, and the subsequent study of its qualities by Berthelot. The interest which it excited, however, was purely scientific, and confined to the chemical laboratory; and it was not until the year 1892, when Thomas Willson in America and Henri Moissan in France, working independently of one another, showed how calcium carbide could be produced in large quantities from limestone and coke in the great heat of the electric furnace, that the industrial possibilities of acetylene gas lighting began to be dimly recognized. Of all the countries which commenced to interest themselves in the new illuminant, Germany was foremost in the field, and secured an advantage which she has since easily maintained and considerably increased.

Thanks to chemical and engineering science, acetylene has entered into competition with petroleum, coal gas, and electricity; and it is at present impossible to predict with any measure of certainty what the ultimate



result will be. Probably petroleum will suffer most, coal gas will be superseded in some respects—especially with regard to the lighting of small towns—and electricity will not be appreciably affected.

Up to July, 1898, 62,000 jets of acetylene were installed in Germany. In the first months of 1899 this number had increased to 170,000, and was at the end of 1899, assuming that the rate of progress had been maintained, about 220,000. Taking the illuminating power of the acetylene flame at 40 normal candles, this would give a total of 8,800,000 candles, without taking into consideration the large number of jets of the acetylene oil-gas mixture used so extensively by the German railways. The records of the Imperial Patent Office reveal the extraordinary fertility of invention developed by the acetylene industry. In 1897, 617 patents were applied for; in 1898, 937. No other branch of industry in Germany is capable of showing such a large and steady increase in the number of patents. On the other hand, inventions for other illuminants have been gradually decreasing. In 1895, 304 were granted; in 1897, 288; and in 1898, 209.

It is difficult at the present moment to give an accurate estimate of the number of acetylene installations in Germany. According to Knappich, of Augsburg, it probably amounts to about 8000, including small, medium, and large apparatus and installations, and gas-works for the lighting of small towns. It is used for the lighting of towns, factories, public and private buildings, hospitals, barracks, castles, villas, mills, churches, squares, &c. In many instances it has been adopted by the German State Authorities. In Bavaria alone, six railway stations will shortly be lighted by acetylene. The Imperial Post Office has made a beginning by lighting two of its Berlin branch offices by acetylene, and has installed an apparatus with 60 jets in the Berlin head office. These latter instances are of some interest because acetylene was in competition with electricity, and was given the preference. The adoption of acetylene oil gas by the German railways will be dealt with in detail farther on.

The important questions of the construction of generators and the methods of generation have, after a period of experiment and uncertainty, at length resolved themselves into definite proportions. It is almost unanimously agreed that generators must be built of strong and durable materials, and that the method of generation must, above all things, exclude undue pressure and heating of the gas. For large installations of above 1000 jets, the system of generation, "carbide into water," is almost universally in use. The system of flooding carbide by water still holds its own in suitably constructed apparatus, especially when some cooling arrangement is provided; but the general trend of scientific opinion in Germany among acetylene chemists and engineers is all in favour of dropping the carbide into water. Generators in which the water drips upon the carbide are regarded with great suspicion; and the construction of self-feeding generators is still capable of further improvement. At present there is a distinct aversion to cheap, badly-finished, and unsafe generators, even when offered at low prices and under favourable conditions. Still, however, some few generators are to be seen, crude and inadequate in their conception and absolutely indifferent in their construction to the most elementary principles of safety and stability. The existence of such generators forms a standing menace to the acetylene industry, and has induced the German Acetylene Society to attempt the formulation of regulations for the construction and management of generators. The following questions are under consideration:—

- 1.—The highest permissible limit of temperature in generating chambers.
- 2.—The methods for the determination of the same.
- 3.—Prevention of the escape of acetylene in generating sheds.
- 4.—Quality and strength of materials used for the manufacture of generators, purifiers, and gasholders.
- 5.—The highest permissible pressure in any section of an acetylene installation.
- 6.—The presence of air in generators, and measures for the total prevention of the same.

The methods for the absorption of the impurities present in acetylene have been studied in Germany with great attention. The means adopted at first, mostly by inexperienced and ignorant persons, were defective in their action. For instance, wood shavings moistened with sulphuric acid, in conjunction with a mixture of nitric acid and lime, and, further, purification similar to that in use for coal gas, which had naturally no effect upon the principal impurities, the compounds of phosphorus. At present the following methods are extensively used: Chloride of lime, after Linge and Cederkreutz, modified by Wolff, who added salts of chromic acid for the purpose of binding free chlorine; Ulmann's method of a solution of chromic acid in acetic or sulphuric acid; Frank's purifier, consisting of an acid solution of certain metallic salts absorbed by infusorial earth; puratylene—a highly porous substance containing chloride of lime, slaked lime, and calcium chloride; and, finally, acagin. Although neglected at first, it is a significant fact that at present in Germany the thorough purification of acetylene is considered to be of equal importance to the suitable construction of the generators. The manufacture of steatite burners for acetylene is almost wholly in the hands of two Nuremberg firms—von Schwarz and Stadelmann—who have greatly increased the variety and improved the quality of these important articles. The advent of acetylene necessitated the manufacture of a totally new form of burner.

A new application of calcium carbide has been discovered which may become of great importance in the future. It consists in the production of pure metals from their ores by means of the carbide as a reducing agent. The process, which permits the great chemical energy inherent in the carbide to be completely utilized, is very simple; the ores being mixed with carbide and then subjected to a gentle heat. In this way pure copper and lead can be procured from their respective ores; while several alloys can be obtained directly from various ores containing the necessary metals. The economic aspects of the method are favourable; the metal requiring about 2 to 5 cwt. of carbide for its production. Lampblack is now manufactured from acetylene in Germany. Acetylene gives three to four times as much lampblack as good oil gas. It is of a deep black colour, with no tinge of brown, and of excellent covering power. It is well adapted for printing purposes, giving a deep, black, clear impression, and is entirely free from tar compounds. Gases relatively poor in carbon, from which it is desired to obtain lampblack, can be enriched by an addition of acetylene.

The relations between the iron and carbide industries are becoming

more intimate since the appearance of an invention which utilizes carbide for the production of converted steel as well as for the hardening of armour-plate after Harvey's process. The application of acetylene for driving gas-engines and motor cars, although at present in its infancy, has probably a great future before it, as 160 litres (5.65 cubic feet) of acetylene give 1-horse power, while 600 litres (21.2 cubic feet) of coal gas are necessary for the same purpose. Compared with benzene motors, it is claimed for acetylene motors that the combustion process is more complete, quicker, and odourless.

The invention of Professor Lewes, of Greenwich, who proposes to enrich the poor illuminating capacity of water gas by the addition of methane and acetylene, is likely to become of great importance in Germany, as it opens up the possibility of improving the lighting power of gas from inferior coal and water gas from coke without the complicated apparatus for carburization which has hitherto been necessary. Lieutenant von Kries has made experiments showing the advantage of the adoption of acetylene for the colonies, and for searching for wounded and dead on battle-fields at night. For this latter purpose, a portable generator with search-light is carried like a knapsack upon the back. For the colonies, he sees the great advantage in the lesser weight and consequent reduction in the freight of acetylene compared with coal. One kilogramme of carbide gives a flame of 50-candle power for nine hours; while the gas distilled from a like amount of coal burns for only a quarter-of-an-hour with the same light. Acetylene is also used for culinary purposes in Germany, and no complaints have been heard as to excessive cost and unpractical results.

As the temperature of the acetylene bunsen flame is very high—about 2700° C. compared with the 1700° C. of coal gas—it is largely used for soldering purposes in factories and workshops. Several mines are now lighted with acetylene in Germany; in some the workmen are provided with small portable lamps which burn from 8 to 10 hours. It is also extensively used for lighting tunnels while boring is proceeding. For photographic purposes and the lighting of picture galleries, it has proved to be most useful, as of all artificial illuminants it approaches most nearly to sunlight in its properties. In Alsace the dyeing and printing factories have adopted it largely, as it allows colours and tints to be as clearly distinguished from one another as in daylight. This resulted in a great saving, as with electric and Auer lighting the loss from defective colouring and tinting was noticeable. In some cases the saving effected was so considerable that the cost of the acetylene installation was covered during the first year. The lime sludge which is formed after the generation of the acetylene from carbide can be considered as the bye-product of acetylene gas lighting; it can be utilized for mortar for building purposes or as manure. Acetylene is, further, often used for search-lights, on account of the great facility in transporting the necessary apparatus; and the Berlin fire brigades are at present making experiments in this direction. Investigations carried out on the River Elbe in the presence of several officials of the German Lloyd and the Hamburg Observatory have proved that it is most suitable for lighthouses and signalling at sea. The lights, especially the green, were clearly visible at a distance of 8 miles. The tendency of acetylene to polymerize caused experiments to be made with a view of converting it into benzol and utilizing it as a raw material for the manufacture of aniline colours; the price of carbide, however, caused these experiments to be abandoned. Carbide is beginning to be used to destroy the parasites which infest vineyards, for which purpose it is manufactured with a high percentage of phosphorous compounds.

The four principal papers devoted to the interests of the acetylene industry in Germany are: "Das Acetylen," the official organ of the German Acetylene Society, edited by Professor Dieffenbach, Dr. Scheel, and Dr. Altschul, in Berlin. "Zeitschrift für Calciumcarbid-Fabrikation und Acetylen-Beleuchtung," edited by Dr. Ludwig, in Berlin. "Das Acetylen," edited by J. Gerlach and F. Liebetanz, in Düsseldorf. "Voran," edited by L. Henking, in Cannstatt.

The following list gives the names of some of the principal firms for acetylene lighting, with the amount of capital invested: Allgemeine Carbide- und Acetylen-Gesellschaft, Berlin, £80,000; Hera-Prometheus, Berlin, £60,000; Falbe and Co., £50,000; Butzke and Co., £17,000; Deutsche Acetylen Gesellschaft, £23,000; Keller and Knappich, Augsburg, £25,000; Bucher and Schrade, Mannheim, £12,500; Welkoborski, Giessen, £7500; and Thüringen'sche Gesellschaft, £15,000. The number of firms exclusively and partly engaged in acetylene gas lighting, manufacture of carbide, and all other necessary accessories is probably between 200 and 250.

The production of coal gas in Germany, according to Dr. Frank, amounted to the following figures (representing millions of cubic metres): 1859, 44; 1869, 151; 1877, 324; 1885, 479; 1896, 733; and 1899, 900, for which last amount no less than 3½ million tons of coal were necessary. This by no means, however, represents the principal supply of light in Germany, which is afforded by petroleum. The quantity of petroleum imported into Germany in 1870 was 70,000 tons, or 1.87 kilos. per head of the population. In 1896, it was 853,000 tons, or 16.26 kilos. per head; and in 1899, 911,000 tons, or 16.6 kilos. per head. The 911,000 tons are equal to 1100 million litres, and as 6 litres (1.32 gallons) of petroleum give the same light as 15 cubic metres (530 cubic feet) of coal gas burnt in ordinary burners, the above 1100 million litres of petroleum correspond to 2750 million cubic metres of coal gas, which is no less than three times the amount of this gas at present produced in Germany. This fact is of still more importance when it is considered that the consumers of petroleum are, as a rule, content with less light, as most petroleum lamps only give about 8 to 10 candle power, while gas in open burners gives 18 to 24, and the Auer mantle 50 to 60 candle power.

The illuminating power of acetylene is 15 times that of coal gas. As 15 cubic metres of coal gas give as much light as 6 litres of petroleum, 1 cubic metre of acetylene is equal to 6 litres of petroleum as regards lighting power; and with regard to price, it is now even somewhat cheaper than petroleum. What is still necessary is the invention and construction of a comparatively safe house-lamp. But even then the substitution of acetylene for petroleum could only take place gradually, and would for many years to come be only partial. A total immediate substitution would require a supply of 600,000 tons of carbide, for which electric plant with about 600,000-horse power would be necessary. For the present, however, a partial substitution of acetylene for petroleum would not only benefit a home industry, but would also render Germany



less liable to the violent and arbitrary fluctuations in the prices of imported American petroleum; for it must be remembered that the acetylene industry is a purely German one. The carbide is manufactured in Germany, and the large amount imported comes partly from works which have been built with German capital, and are now managed by German engineers and chemists. Further, the generators, purifiers, burners, piping, and all other necessary accessories, are solely manufactured in Germany.

When once the substitution of acetylene for petroleum has seriously commenced, there is little doubt that the industry, in addition to the great progress it has already made, would advance with rapid strides. Although the amount of water power available in Germany for the manufacture of carbide is limited, an immense source of power is being now opened up by the utilization of the waste gases of blast-furnaces, to which detailed reference will be made farther on. The preceding remarks on the competition of acetylene with petroleum, and the foundation of a home industry in the place of millions expended for an imported article, apply in the fullest sense to the United Kingdom. As regards the manufacture of carbide here, although water power is scarce, there is a great source of hitherto unused power in the waste gases of blast-furnaces.

Since acetylene gas lighting has now become an established fact in Germany, and its future possibilities recognized, the question of the production of the raw material—calcium carbide—has assumed great importance. At the present time the greater part of the carbide demand is met by importation, as the home production is not even sufficient to meet the requirements of the State railways, with their system of acetylene oil-gas lighting for the carriages. The Prussian railways alone will consume this year about 5000 tons; the Bavarian, about 600 tons; and the other German States (Württemberg, Saxony, Baden, Hesse, &c.) corresponding amounts. The total consumption for railway lighting alone will therefore probably exceed 8000 tons. When to this is added the amount necessary for the thousands of large and small acetylene installations in Germany, an approximate estimate of the import can be formed. This comes principally from Switzerland, Austria, Sweden, Italy, and France, and amounted last year to £110,000. The United States, which formerly held a monopoly of the import, has ceased sending carbide, as their production, although large, is scarcely able to keep pace with the progress of acetylene lighting. The statistics for the first quarter of 1900 show that the import of foreign carbide is beginning to decline; it amounted to 1800 tons.

Germany possesses at present the following carbide works (the figures representing horse power): Rheinfelden, 5000; Lechbruck, 2500; Hagen, 500; Phœnix, at Dortmund, 1000; and Lauffen, in Württemberg, 600. The first two are operated by water power; the third, by steam; and the fourth, by waste blast-furnace gases. The fifth has ceased working for the present. The capital of the Companies amounts to about £330,000, the total horse power to 9600. The Ruhr Carbide Works (water power), with 2500-horse power, are in process of erection. These works ought to produce theoretically about 9000 tons annually—an amount which is easily surpassed by the import. German capital has gone largely abroad for the production of carbide by means of electricity generated by water power. The principal inducements were, first, the low prices of the power; and, secondly, the facility of its utilization on account of the great fall, which renders the construction of long canals unnecessary. Later on it was found that these advantages were considerably reduced by the cost of the carriage of the necessary coke to the carbide works, and of the carbide to the consumers. At the present date it may be assumed, for the above reasons, that a carbide works in Germany paying from two to three times more for its water power than one abroad, is more likely to prove a financial success.

It is generally believed that the further successful development of the carbide industry is dependent upon two conditions—viz., favourably situated water or other power, and cheap raw materials. However cheaply carbide can be produced, if the cost of carriage to the consumer be too high, it will not be able to find a market. For this reason, therefore, a water power, however cheap it may be, is not always suitable for the erection of carbide works. It will always be noted that the majority of large acetylene installations are to be found either in the vicinity of carbide works or in places to which the carriage of carbide is not too expensive. These considerations were mainly instrumental in causing the erection of steam carbide works in Hagen (Westphalia) and Zomskowice (Russia), in addition, of course, to cheap available coal.

For some time past, efforts have been made in Germany to utilize the waste gases from blast-furnaces for various purposes; and the idea was at once conceived of turning this cheap and important source of power to account in the production of calcium carbide. Altogether, gas-engines with about 10,000-horse power are being at present worked by this hitherto neglected source of power; and in Germany alone an additional 5000-horse power will probably soon be utilized for the manufacture of carbide. Thus at Bochum, in Westphalia, an installation is at present in process of erection which, when completed, will work with several thousand horse power for the production of calcium carbide and other suitable electro-chemical products. The advance made in this direction is of especial interest and importance to the United Kingdom, as she shares with Germany, although in a much greater degree, the disadvantage of not possessing important water power. According to Liebefanz, of Düsseldorf, the cost of 1-horse power varies from £3 to £4 10s. This will probably be reduced in the future by improved methods of securing and conducting the gases, by a more simple system for their purification, and by improvements in the construction of the engines. The machine works at Deutz, on the Rhine, alone have already delivered 15 gas-engines for waste gases, with a total of 4100-horse power, and are constructing 15 more, with a total of 9000-horse power. Of these, no less than four possess a capacity of 1000-horse power each.

The present state of the carbide industry is not favourable for the owners and shareholders of carbide works. There seems to be in many cases an over-production of carbide, which has reduced prices to such an extent that some works have been compelled to limit or cease their output. At the Düsseldorf Congress in September last, the representatives of the carbide works held a consultation regarding the formation of a syndicate for the raising of prices. This crisis, which is probably only of a temporary nature, does not affect the acetylene industry, which can only be benefited by a fall in the price of carbide, and may even, in course of time, be of advantage to the carbide industry, by eliminating

those works which, whatever the reasons may be, possess no inherent vital strength. Two years ago the spread of acetylene had surpassed the production of carbide, and high prices reigned. Now the reverse is the case; the production of carbide is in excess of the capacity of consumption on the part of the present acetylene installations. It is seen that enough capital has been expended upon the flotation of carbide companies, and that it is time that more capital and attention were devoted to the spread of acetylene lighting.

If all those concerned in the financing and erection of carbide works had only considered that the period of high prices could be but of temporary duration, failures and partial closures of costly works would never have occurred. An advantage in favour of such works is that they can always devote their electric energy to the manufacture of other electro-chemical products. The carbide crisis is by no means of such gravity as is generally assumed; and it must always be taken into consideration that the carbide industry is only three years old. The foundation for a normal and remunerative production of carbide is now being slowly formed, and has already shown how erroneous the results obtained in experimental works were, and how hopeless are the prospects of certain works which were erected upon the strength of calculations based on these experiments. The present manufacture of carbide on a large scale has conclusively shown what conditions are necessary for its remunerative production, and how little reliance can be placed upon theoretical calculations.

The prices for carbide in 1898, 1899, and part of 1900 are shown by the following table. They are given in marks (1 mark equals about 1s.) per 1000 kilos. (1 kilo. equals about 2½ lbs.), each yielding about 300 litres of acetylene (1 litre equals about 1½ pints), and do not include cost of carriage to the place of consumption. Where it is not otherwise indicated, the prices are for quantities not below one waggon load (about 10 tons), and from Hamburg:—

Year and Month.	Description.	Price in Marks.
1898.		
Jan.	Granulated carbide in retail . . . . .	700 to 1000
Sept.	From Rotterdam or Hamburg . . . . .	390 „ 400
Oct.	From Hamburg or Berlin (including packing). . . . .	420 „ 480
Dec.	From Hamburg—	
	Beginning . . . . .	400 „ 500
	Middle . . . . .	550 „ 600
1899.		
Jan.*	Swiss, from works . . . . .	450 „ 500
	Swedish, from works . . . . .	450 „ 500
	French, from works . . . . .	440
	In Hamburg . . . . .	550
March	From Berlin . . . . .	530 „ 550
July	Do. . . . .	380 „ 420
Oct.	Do. . . . .	380 „ 420
	From Hamburg . . . . .	345
	From Basel . . . . .	325
Dec.	From Berlin . . . . .	340 „ 380
	From Basel . . . . .	320
1900.		
Feb.	Per waggon-load . . . . .	31
	Per 1000 kilos. . . . .	35
June	Including drums. . . . .	24 „ 29
	Per waggon-load (including packing, &c.) from	
	Hamburg, Bremen, and Stettin . . . . .	265
	From Amsterdam and Rotterdam . . . . .	271
July	One firm offered (including drums) . . . . .	21

\* There was a great demand this month. (a) Per 100 kilos; (b) per 1000 kilos.

A large amount of the carbide produced in Norway and Sweden goes to Hamburg, and thence direct to South America and Australia, as the Norwegian and Swedish harbours do not possess direct transport facilities to these countries.

(To be continued.)

ELECTRIC LIGHTING NOTES.

The Bury St. Edmund's Town Council are proposing to apply for the consent of the Local Government Board to a loan of about £6000 for public lighting by electricity.

Tonbridge has decided to go in for an installation of electric lighting on the lines of a scheme by Mr. Hammond. The Local Authority obtained their Provisional Order in 1897; and the Board of Trade have just stirred them up by asking what they have done in the matter.

The Swansea Corporation have secured for the inhabitants of the borough the blessings of "free" wiring, for which some acknowledgment will be made by users in the form of an additional payment per unit of electricity. After a time they, like many other people, will begin to doubt the applicability of the term "free."

Owing to "several vexatious delays," the Lowestoft Corporation electricity supply will not be ready, as it was hoped it would be, by Christmas. Disappointment must be borne and patience exercised by prospective users until the end of January—anyway they may be sure of getting the new illuminant by the time the light summer evenings arrive.

Complaint was made at last Tuesday's meeting of the Carlisle City Council that the electrical tramways were in very bad working order. Since the previous Thursday, the wires had broken down six times in different parts of the city. On the same occasion, the perverse tramways were handed over to the control of the Watch Committee. Perhaps they will now put on better behaviour.

A "Dissatisfied Consumer," writing to the "Rochdale Observer," asks whether it is true that only one member of the Corporation Electricity Committee "has been foolish enough to become a user of Rochdale electricity?" As a ratepayer, this consumer wishes to see the department in full work and paying its way; but he says "it never will while its product can only be regarded as a very expensive luxury, sold at prohibitive prices."

Favourable as are the terms upon which Paignton is offered the electric light, the scheme is not without its critics. The Chairman of the Ratepayers' Association drew the attention of that body the other day to the manner in which incandescent gas lighting is superseding electricity for public lighting purposes, and expressed considerable doubt as to the truth of the statement that electricity at 5d. per unit is equivalent to gas



at 2s. 6d. per 1000 cubic feet. Another member of the Association pointed to the experience of Torquay as a reason why Paignton should enter into the business; but, on the other hand, it was said that the cost of electricity was 50 per cent. more than gas, and many people in Torquay regretted using it.

The glory of electric lighting has faded tremendously at Whitehaven. Many of the principal thoroughfares in the town have been in darkness for several nights; and referring to the matter at the meeting of the Town Council last Wednesday, Alderman Musgrave stated that the cables had "decayed," and would have to be replaced at an estimated cost of £4000. He thought, and no doubt rightly, that the burgesses would be disappointed at the short life of their lighting installation; but he strongly recommended the Council to carry out the suggestions of the engineers and make a thoroughly good job of the work. The Council gave their sanction to a loan of £10,000.

The "Western Morning News" expresses the hope that there will be no attempt to put pressure on the Lighting Committee of the Corporation to extend the area of electric lighting in Plymouth. It is stated that, since the introduction of the incandescent gas system there has been nothing to complain of in the lighting of the roads at Mannamead, or in any other part of the town. Electric arc lighting would certainly give no advantage which would be commensurate with the heavier cost. Even if it were a much better light, the question of the expense could not be ignored. Our contemporary considers that, unless the expenditure is to increase enormously, electric lighting in the public streets must be treated as a luxury which can be only sparingly enjoyed.

About five o'clock on Monday evening last week, a large steam-pipe burst in the boiler-house of the Halifax Corporation Electricity Works, scalding three men (one of whom, we regret to say, has since died), and depriving the centre of the town of its electrical supply for about two hours. Tradesmen who were depending solely on the current for illumination scuttled about for other means of lighting; and then many of them no doubt devoted the remainder of that period of darkness to a little meditation on their misplaced confidence. Dark and motionless tramcars were also seen in all parts; and many a weary homeward-bound worker, we fear, uttered execrations on the day when the Corporation were led to exchange honest horseflesh for something which cannot be seen, handled, or whipped for the propelling of the tramcars.

Tenders were accepted by the Devonport Town Council last week for the erection and equipment of the generating station which is to be built in the Stonehouse district for the provision of electricity for lighting and tramway purposes. The lowest tender for the building was £5433; and this was accepted. The engines are to cost £3200; generators, £3659; switchboard, £2922; booster, £1015; boilers, £1950; and storage battery, £2600; plus an annual charge of £125 for maintenance. In addition to this, the chimney is to cost £3000, and £15,000 was paid for the site. It is, however, anticipated that the loan of £69,000 which the Local Government Board have sanctioned will be more than sufficient to cover the cost of providing the works. July is named as the period when electricity will be furnished for lighting. Temporary provision has been made for working the tramways at an earlier date.

The colossal troubles of the Electricity Department of the Manchester Corporation have been brought so prominently to the front of late that, in fairness to the retiring Engineer (Mr. C. H. Wordingham), he must be allowed space in these columns for removing from himself the suspicion that he is responsible for the present dire situation, and directing it to other quarters. His defence occurs in a report upon the present condition of the plans of the Stewart Street generating station; and it gives a beautiful insight into the kind of badgering and hampering to which some officials are exposed under municipal administration. Mr. Wordingham says that the actual development of events in the demand for, and supply of, electricity has been enormously greater than was anticipated when he entered into an agreement with the Corporation four years ago to act as their Resident Engineer at Dickenson Street chief station, and to advise on all electrical matters. Instead of being Resident Engineer for a station with 5000-horse power plant supplying about 1500 consumers, with some 143,000 lamps, he is now Resident Engineer for a station developing over 10,000-horse power and supplying energy to 3000 consumers with 360,000 lamps; and the entire management of the station has fallen upon him. The work that has devolved upon him includes the lighting of the whole of the city, supplying energy to an enormous outlying area, the responsibility of providing electrical equipment for the tramway system (this comprising the cars, overhead lines, and binding of the rails), advising on a large fire-alarm system, and the lighting of many public and semi-public institutions. He says he does not complain of these things. "But," he goes on to remark, "during the last two years a great change has come over the policy of the Committee. They have multiplied Sub-Committees. They have required me to attend endless meetings of such Sub-Committees, not only in the Electricity Department, but in the Tramways Department. I have been called upon to present voluminous reports upon the most trivial matters—matters which have no concern whatever with the development of the undertaking, and which could have been disposed of without any report from me." He further says: "Notwithstanding this, I have found time to design and to superintend everything in connection with the plant for an entirely new generating station of substantially greater capacity than the existing one, which has taken seven years to attain its present size. I have designed and superintended the laying of an immense system of high-pressure mains, a system with which there is nothing comparable in this country. The whole of the work has been carried out by the Corporation's own staff, and only within the last twelve months have I had any assistance in the matter, and then only with the actual superintendence of the execution of the work. With all this work on my hands, I have been expected to personally interview ordinary labourers; and it has been no uncommon thing for me to have to expend half-an-hour or more explaining my reasons for discharging a workman who had made groundless representations respecting his discharge." In concluding his report, Mr. Wordingham writes: "I say that the work as regards Stewart Street is as forward as it is possible for it to be, in view of the enormous amount of work which I have had to do. The scheme is worked out, the general arrangement of the station is settled, many of the details are complete, a considerable proportion of the specifications are prepared, and everything would have been ready in time had I not been hampered and fettered in the way which I have described."

## THE METROPOLITAN WATER QUESTION.

### The London County Council's Bills.

At the Meeting of the London County Council last Tuesday—Mr. W. H. DICKINSON in the chair—the reports of the Parliamentary Committee on the Council's Water Purchase and Amendment of Water Acts Bills already given in the "JOURNAL" (*ante*, p. 1467), were presented.

Mr. CORNWALL, in moving the adoption of the report on the Purchase Bill, stated that the measure was practically the same as the one introduced last session; but a few alterations had been made to bring the Bill into accord with the views of the Royal Commission. The constitution of the proposed Water Trust was, however, still objected to; and the Council were encouraged to persevere in the course they had taken by the remarks of Mr. Ritchie, the Home Secretary, at the gathering of Metropolitan Mayors a few evenings ago.

Mr. HARRIS characterized the alterations in the Bill as remarkable and most important; and he expressed his satisfaction at them for the reason that they had been brought about mainly by the action of the Moderate members of the Council.

Mr. COHEN, M.P., pointed out that the Bill still suggested that the Council should be the Water Authority; and this being so, he said he should continue to oppose any such proposition.

Mr. WHITMORE, M.P., declared that the Bill was substantially the same as that of last year, and would meet the same fate. There was no possible chance of its acceptance by the Government. He warned the Progressive members of the Council against basing their hopes on the after-dinner utterances of the new Home Secretary, whose department had nothing to do with the settlement of the water question.

Mr. STUART charged the Moderate party with being responsible for the present position of the London Water Question.

Dr. WHITE (Mayor of Lambeth) denied this, and suggested that the eventual settlement of the question might be brought about by the new Borough Councils.

After some further remarks, the Council divided, and the report was adopted by 64 votes to 17.

The report on the subject of the Metropolitan Water Companies (Amendment of Acts) Bill was then formally approved.

### The Government and the Water Question.

Last Thursday, the President of the Local Government Board (Mr. W. H. LONG) received the deputation from the County Council appointed at the meeting of that body on the 4th inst. to wait upon him on the subject of the water supply of London. The deputation included Mr. T. McKinnon Wood (Chairman of the Water Committee), Mr. Alderman W. H. Dickinson (Chairman of the Council), Mr. E. A. Cornwall (Chairman of the Parliamentary Committee), Sir Alexander Binnie (Chief Engineer), Mr. H. L. Cripps (Parliamentary Agent), Mr. H. E. Haward (Comptroller), and many members of the Council. Mr. Long was accompanied by Mr. J. Grant Lawson (Parliamentary Secretary), Mr. S. Montagu (Private Secretary), Mr. S. B. Provis (Permanent Secretary), Mr. J. Lithiby (Assistant Secretary), Mr. C. Perrin (Official Water Examiner), and Mr. A. B. Lowry.

Mr. McKINNON WOOD, in introducing the deputation, expressed his thanks to the President for receiving it, and then went on to explain that under the provisions of the Metropolitan Water Act of 1899 the Local Government Board were empowered to arrange with the Water Companies as to joining their mains. They had permitted the Council to attend the meetings, but not to know the decisions. In dealing with the applications of the Companies for new powers, Parliament had shown that they anticipated the possibility of the purchase of their undertakings, as proved by the sinking fund and "sterilization" clauses which had been inserted in all recent Acts. The question was, Should the purchase take place now? The Council considered it was in the interest of the public and of the Companies themselves that there should be no delay. The Government had appointed a Royal Commission, who did not recommend control, but proposed purchase by a public authority. Last year the Council promoted a Bill dealing with this question; and, following the example of all the large towns, they desired to obtain the control of the water supply. They tried to follow the views of the Commissioners as embodied in their report. They proposed that the Council should not be asked to give any sum for *solatium* to the Companies, and had introduced a clause into their Bill that there shall be paid by the Council for the undertakings such a sum of money as the arbitrators might determine to represent the fair value, together with such further sum as the arbitrators might award to meet the cost of re-investing such money (in the event of no arrangement being made by the Council under which the money could be re-invested without cost). The arbitrators, in order to ascertain this sum, were to inquire into all the circumstances of the case; but no allowance was to be made in respect of compulsory purchase. This was practically in harmony with the views of the Commission. But the Council could not accept the constitution of the proposed Water Board which the report recommended. Only ten of the 30 members were allotted to London, while London had 84 per cent. of the rateable value of the whole district, and three-fourths or four-fifths of the entire number of consumers. It was also necessary that the money should be obtained on the best possible terms, that it should be raised on the security of the rates of London, and that the body in control should be the body elected by the ratepayers. The objections of the Commission to the County Council were, first, that they were committed to a policy of severance; and, secondly, that they were projecting the Welsh water scheme. Both of these objections were now removed, and the only drawback was the unwillingness of the outside authorities to come under the power of the Council. But they contended that these authorities would be much more independent if they obtained their water in bulk from the Council, and then undertook its distribution. They submitted that the time had come when there should be no further delay; and they trusted they would be permitted to have the privilege of putting their case before Parliament.

Mr. LONG, in reply, alluded first to the reference to the administration of his Department. He said the suggestion was that, whereas before 1899 the Water Companies, if they wished to develop their undertakings, were compelled to go to Parliament and state their views in public, the



effect of the Act of that year was to cast upon the Local Government Board the duty of holding an inquiry, and that this had prejudiced the County Council, because they would no longer be able to obtain information on the subject. The matter was not so small as Mr. McKinnon Wood believed, because if the Department were to accede to the present request, and send to the County Council the result of their inquiries, they would have similar work to do throughout the country. While he was unable to hold out any hope that he would be in a position to meet the wishes of the deputation in this respect, he would give consideration to the matter. With regard to the Purchase Bill of which the Council had given notice, he said he should be perfectly frank; and he hoped nothing in his remarks would cause the deputation to say he was wanting either in courtesy or respect. As the Council had nothing to conceal with reference to their policy, so the Government had nothing to conceal in regard to the view they took on this most important question. He was somewhat surprised to hear that the Council had decided to bring in a Bill in the coming session. During the short time he had occupied his present office, he had been unable, in the examination he had given the subject, to find any change in the position from what it was when the Council's Bill was brought in and discussed in Parliament last session. If there was a change, it seemed to be rather in the direction of staying their hands; because the Council themselves, impressed as they must be with the immense gravity of the question, would be the last to desire that the new head of a Department, with but a few days intervening between his accession to office and the time when it was necessary for notices to be given if he decided to legislate, should arrive at a decision hurriedly or without careful examination of all the grounds for legislation, so that he might present a Bill well thought out in all its details. This was obviously impossible, owing to the shortness of his tenure of his present position. The decision of the Government on the last occasion was very plainly declared, and it appeared to be one not so much in respect of details as of matters of principle; and this was another reason why he was somewhat surprised that the Council had introduced another Bill. As he read the decision of his predecessor, it was made perfectly clear that the position the Government adopted was that they could not sanction the purchase of the London Water Companies' undertakings unless the purchasers were a statutory authority somewhat on the lines recommended by the Royal Commission, and not the Council. There were some other minor objections; but this, he took it, was the main and guiding principle of Mr. Chaplin, when he had to deal with this matter on behalf of the Government; and this, so far as he (Mr. Long) knew, was a conclusion which the Government to-day would have no justification whatever in departing from. There were other considerations which ought to weigh with the head of the Local Government Board in arriving at a conclusion on the question. Recent events had taken place in London which had not emphasized the view that the County Council should be the purchasing authority; and, further—though he did not know that the deputation would admit this—the coming into existence of the new municipal areas of London created a guiding factor which deserved consideration. He thought they ought to allow these municipal bodies, if they thought fit, to communicate their views to the Council or the Local Government Board, or both, so that the wishes of the people of London might be known. For these and other reasons, it would be impossible for the Government to assent to the passing of a Bill which proposed to ignore the recommendations of the Royal Commission in regard to the most important feature of their report. He gladly recognized that in the Council's Bill there was a great deal that was an improvement on previous measures. He was not prepared to commit himself now to the expression of opinion as to the compensation clause; but there was no doubt as to the importance of the view taken by the Council in regard to the operations of the Lands Clauses Act—viz., that some special sum should be allowed in regard to disposssession, apart from the actual value of the undertakings. The Bill in this respect was a great improvement. That improvement followed the recommendations of the Royal Commission; and it might very well receive the assent of all parties to the transaction, whether the Council, the statutory authority, or the Companies. So far as he knew, all that could be asked, and ought to be asked, was that full and fair value should be given to the owners of the property to be sold; and on this principle the price should be arrived at. Therefore, he saw no objection to the view of Mr. McKinnon Wood in regard to that clause. As to severance, he understood they accepted the decision of the Royal Commission, and had agreed to abandon the proposal they originally made. But there was the very important point of the view the authorities outside the area of the Council would take of the departure, and of any proposals made by the Council or the Government with respect to the purchase question. Upon this subject he hoped the Government might before long be favoured by some expression of their views. Mr. McKinnon Wood asked also what was to be the position of the Government. He very much regretted that it was necessary for the Government to deal with the question; but it was obviously impossible to go on, session after session, with Bills brought forward by the Council, costing, as they did, great sums of money. In the interests of London, the water consumers, the ratepayers, and the Water Companies, it was eminently desirable that this question should be settled in a satisfactory manner. As it would be his duty to advise the House of Commons, if he was appealed to, when the Council's Bill came on for second reading, to reject it—for reasons which he had given as well as for others—so it would be his duty to tell the House that he hoped to be in a position to deal with the question by legislation. It was his desire, if he was able to produce a measure which his colleagues approved of, to put it in the programme, not of the coming, but of the following session; and he had no reason to doubt, notwithstanding the difficulties and complications of the question, that this would be the course which he should advise his colleagues to follow, and which, so far as he knew, they would assent to. In any legislation for which the Government were to be responsible, they certainly would adopt the view of the Royal Commission in regard to the constitution of the authority. He was not pledging himself now to the representation to be given to the Council, or to any detail of that kind; but the Government would certainly accept the view of the Royal Commission that the future management of the water supply of London should be in the hands of a statutory authority representing the whole area, and not one part of the area, however important and overwhelming in its proportion of the area one authority might be. It would be a guiding principle

that the purchase clause should be based upon what the Government conceived to be fair and reasonable grounds; and they would endeavour to include in the Bill proposals which, while he should hope they would not cast upon the ratepayers and water consumers any extra burden, should certainly be conceived on just and fair lines towards those who were to be bought out. It was of the utmost importance that this question should be decided in such a way as to throw as little burden as possible upon either the ratepayer or the water consumer in the future. He confessed that the more he looked at it the more he was impressed with the difficulties of the question, and with the risks which must be run when any purchase took place. Though he would gladly sacrifice a great deal to protect the ratepayers and water consumers, and save them from any additional burden, yet he must have regard to the general rules which had guided the Government in dealing with such matters; and he did not think it would be possible for the Government to be responsible for any scheme of purchase which did not make the method of purchase, either through an arbitrator or by some definite scheme included in the Bill, fair, just, and reasonable to all who were bought out. In conclusion, he said the subject of the sterilization clauses must be dealt with; and therefore he would give careful consideration to the suggestions which had been made.

Mr. Alderman DICKINSON, in thanking the right honourable gentleman, expressed the hope that the Government Bill would treat London with the consideration which it deserved. The Council thought London should have a predominant voice in the settlement of the question.

The deputation then withdrew.

### PROPOSED WATER-WORKS TRANSFER AT DORKING.

Following up the particulars on this subject, given last week, it may be stated that, in accordance with the recent demand made for a poll of the parish in the matter of the steps now being taken by the Dorking District Council to acquire the undertaking of the Dorking Water Company, voting papers were delivered to all owners and ratepayers last Tuesday. The Council were successful in compelling the insertion of a clause in the Company's Act whereby they are bound not to oppose the sale to the Council; and a Committee of residents recently issued a circular giving certain reasons why the Council should be supported in their action. The circular points out that the Council's chief object would be to give a constant supply of pure water; and that if the undertaking is not purchased either this or next year, the town will not have a similar opportunity of compelling the Company to sell. It is further stated that in the neighbouring town of Guildford a profit of £3000 a year from the water-rate is now paid towards the reduction of the borough rate; and that in both Horsham and Deal nearly £200 a year profit is made. The Committee express the belief that, if the purchase is carried out, it will not cause any increase in the rates; but that, on the contrary, it would in the near future be a source of considerable income to the town. Other townspeople who are averse to the Council's action, have distributed a counter-circular, in which the case for the Company is stated. It is urged that the purchase of the undertaking, even taking the Council's own figures, would entail a heavy burden on the place for many years to come. Assuming the purchase price to be £50,000, and the repayment of principal and interest to be spread over 50 years, the annual repayment would be £2625. The present net earnings of the Company being about £1700, leaves £925 per annum to come out of the rates, which could only mean a serious increase in the rates. As to whether £50,000 is a fair basis for calculation, it is mentioned that the Godalming Council had to pay £77,500 for the water-works, with a capital of £40,500, as compared with £33,500, the capital of the Dorking Company. The highest dividend paid by the Godalming Company was 4½ per cent. per annum, and that only on one occasion; whereas the average dividend of the Dorking Company for the past ten years has exceeded 7 per cent. per annum. Instead of £50,000, therefore, it is quite possible that the purchase price would be at least £70,000. Incidentally, it might be mentioned that the result at Godalming had been an increase in the rates of 6½d. in the pound. The ratepayers have to judge between these comparative statements. The poll papers were collected on Saturday; and the counting was to take place yesterday.

### PROJECTED WATER COMPANY FOR THE HOWDEN DISTRICT.

The advisability of forming a Company for the purpose of supplying Howden, Eastrington, Gilberdike, Newport, Broomfleet, North Cave, Hotham, and Newbald with water was taken into consideration at a meeting held on Saturday, the 8th inst., at the Town Hall, Howden. Mr. Hutchinson (Chairman of the Howden District Council) presided, and stated that there was very little hope, if any, of obtaining water on the level country which surrounded Howden, and which covered most of the Howden area. The District Council had been advised that they were bound to look to the chalk hills which ran the length of Yorkshire, and which, with a little interruption to the Humber, were again continued right through Lincolnshire. In that district, they were told, there was an abundant and unlimited supply of water; and the question arose as to the best way of tapping it. Of course, it would be open, he supposed, to the Council to fix upon a place, elaborate a scheme, and then apply for an Act of Parliament or permission from the Local Government Board to go forward. While he did not pledge the Council to anything, he might say that they hailed with great satisfaction the proposal which was to be put before the meeting. It seemed to him that if a Company were formed—he was a believer in private enterprise—of competent people who had interests at stake, they would be better able to do the work than if it were taken up by a corporate body. Mr. A. M. Jackson said the scheme was one for taking water to the outside district. The site which had been obtained was a field 8½ acres in extent at North Newbald, from which an abundant and permanent supply of very good water could be procured from an underground source, one-half of which was running away into sandy gravel and limestone, and was thus lost so far as any useful purpose was concerned. It had been analyzed by Mr. J. Baynes, F.C.S., the County Analyst, who had reported it to be of great



purity, and admirably adapted for a public supply. Mr. G. W. B. Macturk, of Hull, the Engineer of the scheme, stated that a small covered reservoir would be made at such an elevation that the water would easily rise to the top of the houses in Howden; and it was suggested that a trunk main, with the necessary valves, should be laid by the side of the road to the town from the springs at Newbald, taking in the villages on the way. The maximum supply for all purposes equalled 40 gallons per head per day; and the total cost of the land, works, and legal and parliamentary charges, was estimated not to exceed £10,000. The population that could be supplied at present would be 7500. A long discussion ensued on the matter; a contingent from Newbald strongly protesting against the scheme. Mr. J. Glew moved that in the view of the meeting it was essential that a supply of pure water should be obtained for the Howden district. The motion was seconded by Mr. Anderton (who, however, considered Mr. Macturk's estimate erroneous, and said the cost of supplying water to the district would be three times more than he had indicated), and adopted.

### RATES AND GAS AND WATER CHARGES IN CERTAIN PROVINCIAL TOWNS.

Mr. James Carter, the Borough Treasurer of Preston, has sent a copy of his usual tabulated statistics of the rates levied and collected and the charges made for gas and water in a number of provincial towns for the year 1900-1901. There are 72 in all, the populations in which range from 668,645 (Liverpool) down to 22,140 (Stafford); the rateable values in these towns being the highest and the lowest—£3,991,665 and £76,110. The places which are most heavily rated are Norwich, 9s. 6d.; West Ham, 9s.; Dewsbury, 8s. 6d.; Rotherham, 8s. 4d.; East Ham and Southampton, 8s. 3d.; Brighouse, 8s. 2d.; and Wolverhampton, 8s. 1d. Those which have the lightest rates are Lancaster, 3s. 8d.; Southport, 4s. 2d.; Barrow-in-Furness and Blackpool, 4s. 8d.; St. Helens, 4s. 9d.; Chester, 4s. 10d.; Newcastle, 4s. 11d.; and Darlington, 5s. Out of the rents of property and profits transferred from municipal undertakings, Wigan relieves the rates to the extent of 1s. 9d. in the pound; Darlington following closely upon it with 1s. 9d.; Stafford coming next with 1s. 2½d.; Carlisle and Stockport, with 1s. 2d.; Lancaster, with 1s. 0½d.; and Rochdale, with 1s. Middlesbrough occupies the proud position of contributing ½d. in the pound in aid of the rates; while West Hartlepool gives 1d. The following is the complete list of towns: Accrington, 1½d.; Ashton-under-Lyne, 6½d.; Barrow-in-Furness, 10½d.; Bath, 8½d.; Belfast, 2d.; Birkenhead, 5½d.; Blackburn, 1½d.; Blackpool, 9½d.; Bradford, 4½d.; Burton-on-Trent, 6d.; Burnley, 7½d.; Bury, 3d.; Bristol, 3½d.; Carlisle, 1s. 2d.; Chester, 5d.; Coventry, 8½d.; Croydon, 2d.; Darlington, 1s. 9d.; Derby, 9d.; Dewsbury, 4½d.; Eastbourne, 1½d.; Halifax, 11d.; Huddersfield, 3d.; Kingston-upon-Hull, 10d.; Lancaster, 1s. 0½d.; Leicester, 5½d.; Liverpool, 8d.; Macclesfield, 8½d.; Manchester, 6½d.; Middlesbrough, ½d.; Northampton, 6d.; Norwich, 4½d.; Nottingham, 1½d.; Oldham, 10d.; Portsmouth, 1½d.; Plymouth, 3½d.; Reading, 4½d.; Rochdale, 1s.; Salford, 2½d.; Southampton, 4½d.; Stafford, 1s. 2½d.; Stockport, 1s. 2d.; Stockton, 10d.; Southport, 8d.; St. Helens, 3½d.; Warrington, 5½d.; West Bromwich, 3½d.; West Hartlepool, 1d.; Wigan, 1s. 9½d.; Wolverhampton, 4½d.; Widnes, 3½d.; York, 2d.; and Preston, 8d. The highest net charge per 1000 cubic feet for gas is at Norwich, 3s. 6d.; Kingston-upon-Hull coming next with 3s. 5d.; West Ham with 3s. 4d.; Chester, with 3s. 3d.; and Devonport, Reading, Southampton, and Tunbridge Wells, with 3s. The lowest-priced gas is supplied at Widnes—the average charge being given by Mr. Carter as 1s. 4d. per 1000 cubic feet; York following closely upon it with 1s. 11d. The charge for water for domestic purposes, on a house of £15 rateable value, is highest—2s. in the pound—at Rochdale, where the rates come to 6s. 10d. and the relief is to the extent of 1s. It is lowest in Liverpool—7½d.; Leamington and Manchester following closely with 8d.; Plymouth, with 9½d.; Birkenhead, with 10½d.; Bootle, with 10½d.; Reading, with 10½d.; Salford and Southampton, with 10d.; Widnes, with 11½d.; and Barrow, Bath, Belfast, Brighouse, Burnley, Carlisle, Cheltenham, Eastbourne, Kingston-upon-Hull, Leeds, Preston, Stafford, Sunderland, and York, with 1s.

### DANGERS OF UNVENTILATED BATH-ROOMS.

At the Hammersmith Coroner's Court last Thursday, Mr. Drew held an inquest on the body of Francis Auguste Colletta, a lad of 15, son of a French manufacturer, whose death occurred at No. 29, Warbeck Road, Shepherd's Bush, on the previous Monday. The evidence showed that the bath-room in the house was unventilated except for the window, and a geyser was in use there to heat the water. On the day in question, he went to take a bath. Some time after a noise was heard; and the landlady broke the stained glass of the door, and found the deceased on the floor insensible. Medical aid was summoned, but death took place the same afternoon. The gas was turned off at the geyser, which had been in use 2½ years, and was frequently cleaned. The window was closed, but there was no smell in the room. The geyser worked perfectly on the morning of the accident. The medical man who was called in deposed that death was due to poisoning by carbonic oxide, a product of coal gas. He added that the apartment was too small for a bath-room. The Coroner's officer said it measured 8 ft. by 8 ft. by 4 ft.—256 cubic feet. The doctor said the minimum should be 700 cubic feet. Mr. W. S. Wright, of Messrs. Sugg and Co.'s, said this kind of geyser did not want a flue. The flames were luminous, the same as ordinary gas-jets; and there would be no fumes. Severe tests had been applied, and the geyser was found satisfactory in every respect. This was the first accident that had ever happened with their geysers. The doctor, recalled, said, in reply to the Jury, that in a large room, if there was no ventilation, the burning gas would absorb all the oxygen, and cause death in the same way. If there had been ventilation in the room, death would not have occurred. The Jury returned a verdict of "Accidental death from carbonic oxide poisoning through an unventilated bath-room in which gas was burnt."

Writing in reference to the above case, Messrs. Ewart and Son point out that the majority of bath-rooms are, and must always be, of small dimensions, and that it is therefore absolutely necessary to insist that no geyser should be fixed therein without a separate pipe to convey the

fumes outside the apartment. They think it is not sufficient to insist that the room must be ventilated, because all ordinary ventilators can be easily closed; and any careless bather feeling a draught while bathing would take upon himself to close them. The public must, they urge, be brought to understand that a geyser can only be made safe in an ordinary bath-room by having a ventilating-pipe attached to it. Unless this is done, such accidents as the one reported will inevitably occur.

### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow on Thursday met specially to consider the terms of the Provisional Order of which they have given notice. The clauses in which it is proposed to take power to reduce the illuminating power of the gas, if need should arise, from 20 to 16 candles, and to borrow to an amount not exceeding £1,000,000 for gas and electricity purposes, were agreed to without opposition; it being intimated that the proportions of the money to be raised which are to be applied to gas and electricity purposes respectively had not yet been fixed by the Parliamentary Bills Committee. There was, however, a little discussion upon the clauses which provide for the establishment of a provident fund for those who are employed in the gas and electricity departments. Mr. Hugh Alexander asked if it was not possible to frame a clause under which they could extend their beneficence to all Corporation workers. They had a scheme in operation in the Tramway Department, without a Bill. They were therefore in the position of seeking a Bill to do legally something for the gas-workers while they continued to do illegally something for the tramway workers; and all the rest who were unfortunate enough not to belong to either of these departments must go to the poorhouse. He asked if he would be in order in proposing that a clause be drafted which would cover all the departments. The Town Clerk (Sir J. Marwick) said there would be no difficulty in framing such a clause as Mr. Anderson suggested; the matter was in the hands of the Corporation. Lord Provost Chisholm ruled that it would not be in order to move such a clause, as it would be distinctly new matter, and would require notice of motion. There was, however, plenty of time to give notice of motion, and have it discussed, before the Order was passed. Mr. Anderson did not give notice. Mr. Cronin, a labour representative, moved that compensation for accidents should be included within the scope of the fund; but the proposal was lost by a large majority. The clauses were amended so as to include "officers, servants, and workers," and were then unanimously adopted.

Sitting as Police Commissioners, the Corporation considered the clauses dealing with the consolidation of the charges for public lighting, which I have already described. The Interim Clerk (Mr. John Lindsay) read a letter from the Law Agents of the Glasgow Landlords' Association denouncing the proposal as amounting to sheer spoliation, and as an offence against the most elementary principles of municipal government—a violation of trust. The Association, it was said, would take the earliest opportunity, should the Order fail to receive the assent of Parliament, to challenge the right of the Corporation to defray the cost of its promotion, and would, if necessary, see that the right to do so was contested in Court. Mr. Gray said that, notwithstanding the threats of the letter, he would move the approval of the clause, which was in the trend of all recent legislation, both local and otherwise. The Interim Clerk said he knew of only two cases in which members of a statutory body were held personally liable for the costs of a measure which they promoted. One was in 1851, and was unimportant; the other was in 1872, when the Edinburgh and District Water Trustees, a statutory body with very limited powers, were held liable in connection with the St. Mary's Loch scheme. In that case, however, the Court of Session expressly stated that the judgment did not in the least apply to town councils or other bodies who held funds dedicated to general or public purposes. The clause was adopted.

These are three important departures in connection with the provisions for the lighting of the city. They are all in accordance with the spirit of the times. The benevolent fund may be expected to do more to consolidate the service than would any amount of Trades Union control; the security of the Corporation, apart from their contributions, being a powerful factor in the question. The proposal to equalize the charges for lighting is not right in principle, as it will make many people pay for the lighting of common stairs who do not own or use them. But there are sufficient examples of this evil existing in other municipal services to warrant the arrangement in regard to lighting. It is the substitution of a simple for a cumbrous method of charging for lighting; and it is a plan which has been found to work well elsewhere. I have no sympathy with the attitude of the landlords, who, under the present system, pay less than their share; but there are many occupants (say) of dwelling-houses which have not common stairs as access to them, and of highly-rented shops, upon whom the new assessment will fall as a heavy burden, unless there is provision made for protecting them—particularly the shopkeepers.

The "North British Daily Mail" of to-day says: "A cargo of cannel coal has just arrived in the harbour from Wigan for the Glasgow Gas Corporation. This is a most unusual business, if it has ever happened before; and the reason given by the Corporation is, we understand, that they are unable to obtain supplies at home. Coal merchants here, on the other hand, while admitting that supplies are scarce, say that the real reason is that the Corporation will not pay the price asked by Scotch producers." The latter, I imagine, is the correct view; for it is only the higher-priced cannels which can be bought just now, all the other classes having been contracted for. Indeed, the difficulty when contracts were being entered into was to get sufficient of the second and third class cannels.

On Thursday a discussion took place at the Coatbridge Town Council upon a proposal by the Lighting Committee to institute a prosecution against the Coatbridge Gas Company, on the ground that the Company had been found to be supplying gas of an illuminating power much below that required by statute, as ascertained by testing. The Council, however, agreed that in the first place a deputation should interview the Directors of the Company; and that, failing to get satisfaction, the matter should again be brought before the Council. Let not anyone







a Trades Council only look at a subject from the one point of view—that of the workers. They are not Trades Councils, but Tradesmen's Councils. It is not the good of the trades which they seek, but the good of the tradesmen. In this spirit, they criticized and condemned the action of the Town Council in refusing the demands of the gas workers. One of the speakers—the President of the Labourers' Union, with which, it was said, "the gas workers are affiliated," informed the Council that Mr. Kemp (the Convener of the Gas Committee) was making a mistake if he thought he was "strike-smashing" a weak or poor Union; he was trying it with the largest Union the world had at the present time, a Union that was admirably governed, and had plenty of funds, and had splendid men in Aberdeen to support its cause. This is just what I have been saying all along—that the cause in Aberdeen was not taken up because of its justice so much as because of the support it was likely to receive. After having had their say—which somehow gives these talkers in Trades Councils great relief—the subject was allowed to drop. Then on Thursday the Gas Committee met; and it was intimated by the Convener that he had received a communication from the Secretary of the Gas Workers' Union asking the Committee to reconsider their decision as to the application of the men. The Committee unanimously agreed to reply that, as the Town Council had settled the matter, it was impossible that the Committee could re-open negotiations. Any fresh proposals will require to come through the Town Council. If any such be made, there will, therefore, be a new chapter opened.

I see it stated that Mr. W. Blackwood, the Secretary in Scotland for the Gas Workers' Union, has been able to persuade the General Executive of the Union that he acted rightly in the matter of the strike in the Phoenix Tube Works, of Glasgow, and that there is now no question of his being asked to resign. Mr. Blackwood has been continued in his situation; but not a few misguided tube-workers who came out on strike have lost theirs.

Another Trades Council subject comes before me. This time it is Edinburgh; and the "enormity" which moves the soul of the Trades Councillors of the city to loathing is the provision, by the Gas Commissioners, of a residence at Granton for Mr. W. R. Herring, their Engineer. A motion was brought forward, spoken to, seconded, and carried without question, that the Secretary be instructed to write the Gas Commissioners asking on what terms Mr. Herring has been granted the use of Granton House, and how much money has been spent upon the house since the Commissioners took it over; and that a Special Committee be appointed to inquire into the matter. A Committee was accordingly appointed. One of the speakers said he regarded this as a most opportune time for raising the question, when the men are agitating for an increase of wages. Well, it is not a bad card to play, at a time when the Union are anxious to get workmen to adhere to them; but it need scarcely be pointed out that it leaves out of account altogether the merits of the subject, which are what the Gas Commissioners have to consider. When the merits are looked into, the Gas Commissioners, in any expenditure they may make upon Granton House, are not spending money upon Mr. Herring, but are investing capital in heritable property. The investment may bring more comfort to Mr. Herring; but so will the expenditure of

the vast amount upon the new gas-works at Granton bring more comfort to the gas workers. If Mr. Herring should leave Edinburgh, he could not take with him any improvements which may have been made upon Granton House; and his successor would then enjoy them. So that it is not a personal matter, but one of public policy; and the Trades Council will not add anything to the public estimate of their ability to look at a matter squarely—already not very high—by stirring up a question such as this.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 15.

**Sulphate of Ammonia.**—There has again been a firm market, and prices have slightly improved; the closing quotations being £10 15s. per ton f.o.b. Hull, £10 17s. 6d. f.o.b. Liverpool, and £10 18s. 9d. f.o.b. Leith. Scotland remains the seat of greatest activity, there being several steamers on the berth; but at other ports demand has been sufficient to absorb current production, which, owing to open weather, is scarcely up to its maximum. There is not much change in the forward position, makers being immovable, while consumers will not make up their minds to pay the premium required, though they would be buyers at 2s. 6d. to 5s. per ton advance on spot prices for delivery over the spring months.

**Nitrate of Soda** is unchanged; spot prices being 8s. 3d. to 8s. 6d. per cwt., according to quality.

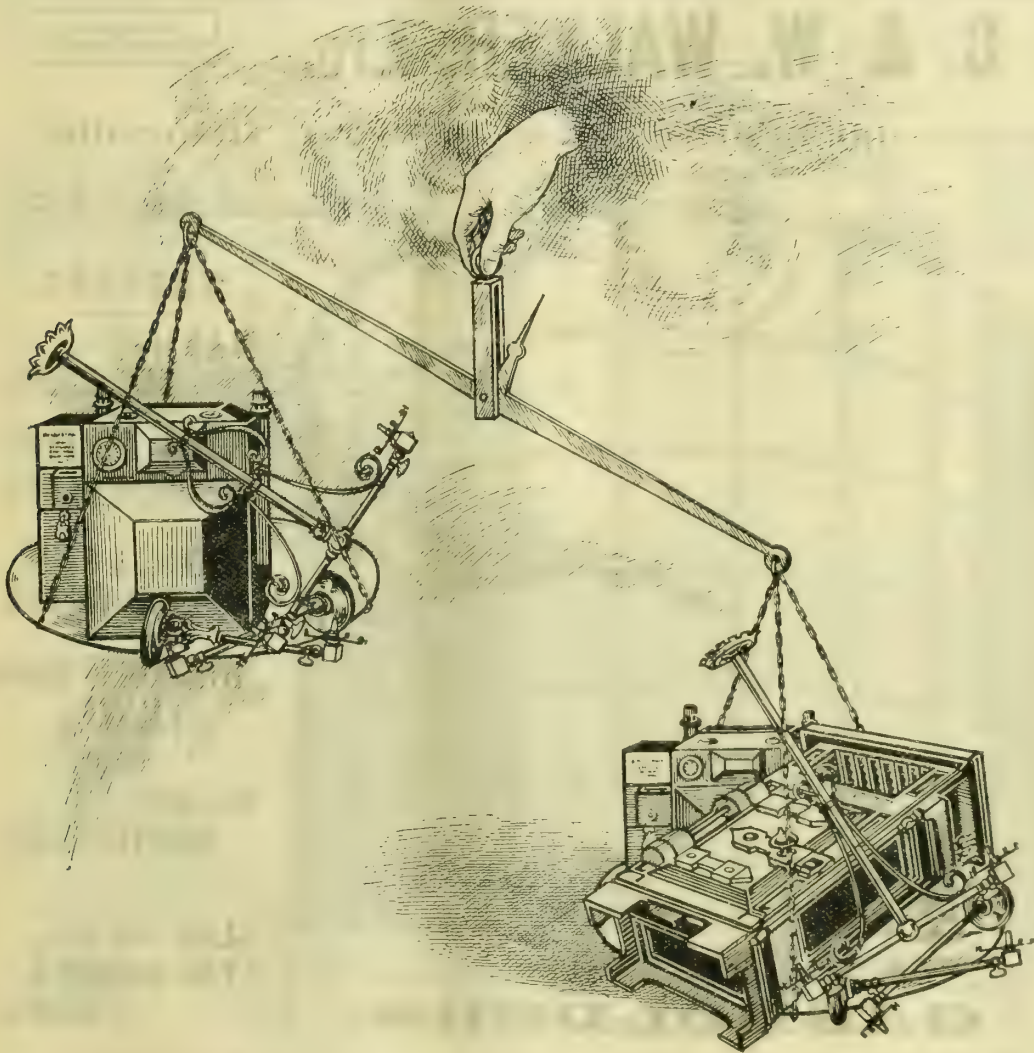
LONDON, Dec. 15.

**Tar Products.**—This market generally is in rather a bad way. Most products are either lower in value or shrinking in inquiry; the only exception probably being the demand that has sprung up for naphthalene salts. Benzol is somewhat weaker. Pitch is much lower, anthracene entirely neglected, and creosote oil (which for so long a time has been in excellent demand) is now difficult to sell, even at the very much lower prices mentioned below. Tar distillers are complaining of the high price of tar, which, on contracts made a few months ago, will leave a heavy loss at to-day's price of products.

To-day's value may be taken at: Tar, 14s. to 19s. Pitch, east coast, 32s.; west coast, 29s. Benzol, 90's, 10d. to 1s.; 50's, 1s. 1d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 1½d. Heavy oils, 2½d. Carbolic, 60's, 2s. 6d. Naphthalene, 90s.; salts, 50s. to 70s. Anthracene nominal, "A," 3½d.; "B," 2d.

**Sulphate of Ammonia** shows a little more strength, production is moving off, and stocks are disappearing. To-day's price may be taken at an average at all ports of about £10 17s. 6d. per ton, less 3½ per cent.

**Chelsea Water-Works Company.**—The Directors of this Company, in their report for the half year ending the 30th of September, recommend a dividend of 5 per cent., together with an additional distribution of ¼ per cent. on account of previous dividends which have fallen short of the statutory rate; carrying £2753 forward.



8000 cub. ft.

16,000 cub. ft.

COMPARATIVE  
CONSUMPTIONS.

Meter  
Makes No  
Money.

Brackets  
and  
Pendants  
help.

It is the  
Cooker  
that pays.

Richmond's  
give best  
value, as  
theirs cost  
less to  
maintain.



## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The situation generally throughout the coal trade of this district remains practically unchanged. House-fire requirements are small; while in other classes of fuel, for iron-making, steam, and general manufacturing purposes, buying is still mostly from hand to mouth, as consumers, under present conditions, scarcely care about contracting forward at current rates. Although indications are multiplying that lower prices will have to rule next year, collieries, with the absence of stocks of any moment, are as a rule still presenting a firm front, and are strong at their current quotations, with very little disposition to offer any material concession for forward delivery. The pit prices for best coals remain steady at 16s. 6d. to 17s. 6d. per ton, seconds 15s. to 15s. 6d., and common house coal 14s. to 14s. 6d. Steam and forge coals still average 12s. 6d. to 13s. per ton at the pit. Engine fuel, if anything, is perhaps a trifle stronger—good medium sorts not being quoted under about 10s. 6d. per ton; while for some special descriptions of slack, quotations are as high as 11s. 3d. to 11s. 6d. at the pit. The shipping trade is only moderate; and though 15s. 3d. to 15s. 6d. per ton represents about the average quotations of collieries for steam coal, delivered at the ports on the Mersey, there are in the open market sellers at much under these figures. Coke remains about steady at late rates; good foundry qualities averaging 28s. to 30s., and good furnace sorts about 15s. per ton at the ovens. A lessening demand is, however, the general report; and considering the depressed outlook in the iron trade, it is very questionable how much longer current rates can be maintained, as furnaces are being put out rather than renew contracts for coke at present quoted rates.

**Northern Coal Trade.**—A strike of some mineral guards has this week deranged a considerable part of the Durham coal trade. Coming out without notice, these guards have prevented part of the coal traffic arriving at the ports; and thus the shipments have been greatly reduced, though the Northumbrian trade has gone on unaltered. The prices of coal have not been materially varied; the fine weather limiting the consumption, while the quantity reaching the towns has been also less. Best Northumbrian steam coals are now quoted about 14s. 6d. per ton f.o.b., second-class steams 14s., and steam smalls from 7s. 9d. to 8s. In the gas coal trade, heavy shipments are being made by some collieries which have their own lines of railway; but other collieries are partly stopped. The prices have not varied much. Occasional cargoes will be in only a few instances obtainable until work is normal on the railways. With the stoppage, and the coming holidays, Durham gas coals may be scarcer. In the coke trade, prices show some ease; best Durham coke being about 21s. per ton f.o.b., and blast-furnace coke from 19s. to 20s. There is no alteration reported in the prices of gas coke. Up to the end of the week, the coal deliveries have slightly increased; but the railway men threaten to extend the area of the strike.

**Scotch Coal Trade.**—There has been a little better outlet for shipping; but the home demand continues to decline. As yet the temperature has been mild, and some are looking forward to a colder spell of weather

stiffening prices; but any such relief to coalowners would be merely as a drop in the bucket. The prices quoted are: Main 12s. 3d. to 12s. 6d. per ton f.o.b. Glasgow, ell 13s. to 14s., and splint 13s. 6d. to 14s. The shipments for the week amounted to 198,585 tons—an increase of 16,383 tons upon the previous week, and of 8153 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,471,156 tons—an increase of 951,011 tons upon the corresponding period of last year.

**Gas Affairs at Leigh.**—The Leigh Town Council have decided to apply to the Local Government Board for £4800 for the provision of gas stoves, meters, &c. A few weeks ago £40,000 was asked for in order to carry out extensions and improvements of the gas-works. At the meeting of the Council on Tuesday—the Town Clerk having reported that the Golborne Gas Company had issued a notice of their intention to promote a Bill in the next session of Parliament for the acquisition of statutory power to supply gas within the urban district of Golborne, and to amend or repeal so much of the Leigh Local Board (Gas) Act, 1874, as relates to the supply of gas within the district of Golborne—it was resolved to confirm a recommendation of the Gas Committee to take steps to oppose the Bill. The Committee also proposed that the Engineer be instructed to lay gas-mains into Golborne, that the charge for street lighting outside the borough be the same as the charge to ordinary consumers within the borough, and that the charge to ordinary consumers outside the borough be 3d. per 1000 cubic feet more than to ordinary consumers within the borough. The recommendations were approved.

**Payment of Income-Tax in Respect of English Undertakings Abroad.**—A complaint having been made in "The Times" against the Treasury with reference to their treatment of the bondholders of the Delagoa Bay Railway, Mr. D. Evans, a Director of the Antwerp Water Company, sent to that paper the following facts, which he submitted constitute a grievance on the part of the shareholders in the Company: "An English Company were granted by the city of Antwerp a concession to construct water-works. They were entitled to receive the whole of the revenue for a term of 50 years, during which they were to put aside sufficient to repay themselves the money invested and to pay a dividend on the capital employed—£350,000. The British Treasury claims income-tax on the whole revenue; thus practically (if the income-tax be 1s. in the pound) appropriating £17,500 of the capital of the Company. Formerly the Belgian Government made a similar claim; but, recognizing the injustice of it, now make no demand. We are told that we are in exactly the same position as any party building upon a ground lease in England. We differ in this respect—that the English Government can have no right to tax any income which a Belgian derives from a Belgian source. It is true that Antwerp's income is a deferred income. All the same, they become possessed at the end of 50 years of £350,000 to £400,000 gradually earned by the Company for them. The English Treasury makes the Company pay income-tax on the profits which belong to the Belgians. Is this fair? I think not. What do the public think?"

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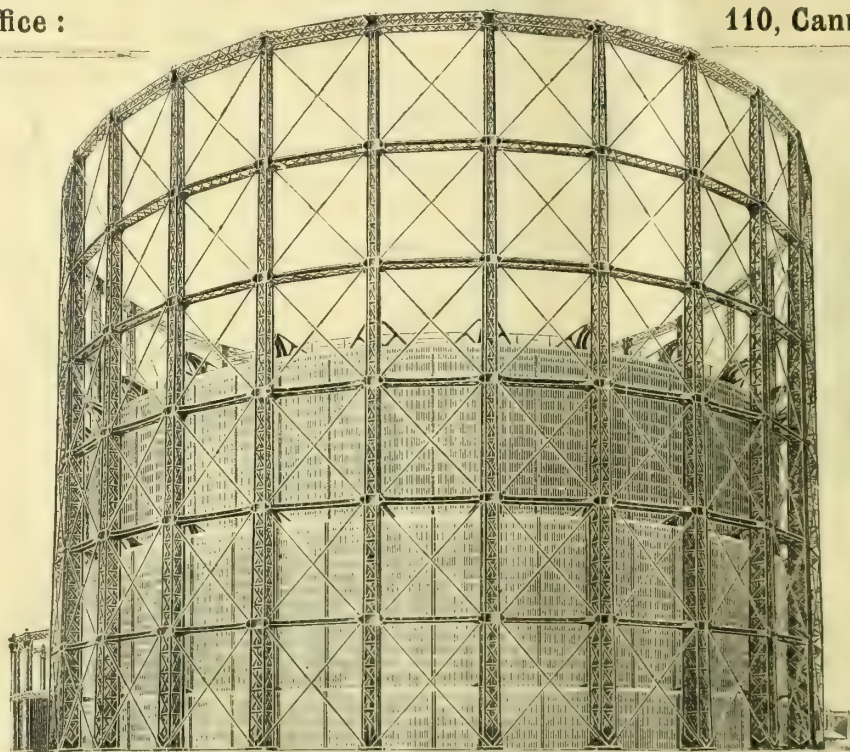
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**Stockport Water Scheme.**—On Tuesday last, the adjourned meeting of the ratepayers of Stockport was held to further discuss a resolution authorizing the Corporation to promote a Bill in Parliament acquiring powers for a new watershed at Kinder at a cost of £820,000; this being in addition to the recent purchase of the existing water-works at over three-quarters of a million. The meeting, consisting largely of property owners, was full of excitement from beginning to end; the Mayor, who presided, having a difficulty in keeping order—chiefly owing to his ruling that no one should speak twice while he himself ignored the rule. The greatest bone of contention was the probable effect of the scheme on the rates. The meeting voted for the scheme; but a poll was demanded.

**New Joint-Stock Companies.**—The Dawlish Gas and Coke Company has been registered with a capital of £6000, in £5 shares, to take over the business carried on by the Dawlish Gas and Coke Company at Dawlish, Devon. The Gas and Mechanical Speciality Company, Limited, formed with a capital of £5000, in £1 shares (500 deferred), will carry on the business of gas engineers, manufacturers of gas, electric, and other lighting appliances, and other machinery, &c. The Diesel Engine Company, Limited, with a capital of £500,000, in £1 shares (50,000 preference), has been formed to acquire patents, concessions, licences, and the like, adopt an agreement with G. Oppenheimer, and carry on the businesses of engine and motor manufacturers (whether for oil, gas, solid fuel, or other power), gas manufacturers, makers of machinery for producing gas, &c.

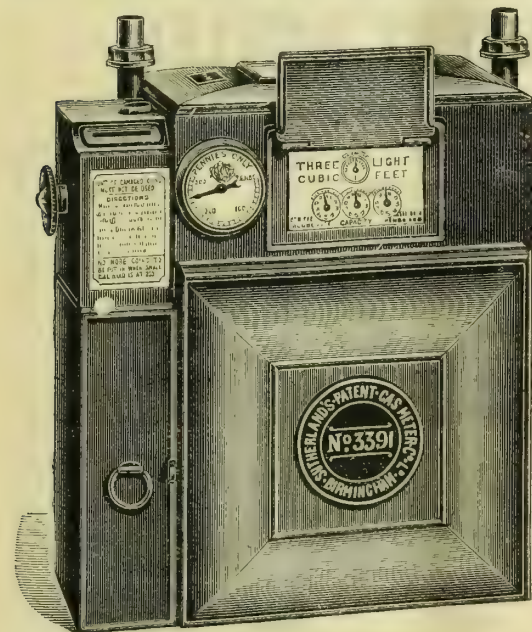
**Intensified Gas Lighting.**—News reaches us from far and near of a growing appreciation of high-pressure gas lighting. On Saturday, the 8th inst., the Bath Gas Company and Messrs. James Colmer, Limited, of that city, gave the inhabitants an example of its capabilities. The premises of the firm are situated on both sides of Union Street; and it appears that the Corporation approached the proprietors with the view of substituting electric lighting for the old gas-burners used in the outside lanterns. An arc lamp was tried; but it was found to be insufficient. The Gas Company thereupon stepped in with an offer of Sugg's intensified gas lighting; and the installation was started on the above-named day. There are twelve large lamps, each containing three 10 feet per hour gas-burners, furnishing combined a light of from 900 to 1000 candles, as compared with the old 8-burner clusters, consuming 78 cubic feet of gas per hour, and giving only 300 candles. The compressing plant is located under the pavement, and occupies a space, including pipes, &c., measuring only 4 feet by 2 feet and 5 feet high. It uses 210 gallons of water per hour, which, at 8d. per 1000 gallons, comes to 1-68d. The saving of gas (570 cubic feet per hour) leaves ample margin for interest on the outlay. Intensified gas lighting is also making its way in the Colonies. A New Zealand correspondent, writing from Auckland, states that the Gas Company in that city have created a very good impression in favour of gas as compared with electricity by their successfully completed contract for the lighting of the new Strand Arcade. They have installed plant for the intensified gas system, using Keith's compressor, which is operated by the city water supply. The light obtained from about 300 incandescent Welsbach burners and 43 high-pressure gas-lights in clusters of twos and fours in the main arcade is equal to 28,000 candles.

**Extensions at the Conway Gas-Works.**—At an adjourned meeting of the Conway Town Council last week, it was decided to spend £5500 upon the improvement and extension of the gas-works. It was also decided to advertise for reports from experts as to the possibility and advisability of adopting the electric light for the borough.

**A Water Crisis at Epsom.**—Epsom has been singularly unfortunate in the matter of the water supply of the district. On Oct. 1 last, for the first time in the history of the town, the consumers had the benefit of a constant service; and under the new régime the prospects were most favourable. This boon had hardly been given long enough to be fully appreciated when the old order of things had to be reverted to, owing to the breakdown of a horizontal engine. But something worse followed. The necessary repairs were being carried out to this engine, when the remaining engine also gave out. Luckily the mains of the Sutton Water Company are contiguous to those of Epsom; and by arrangement connections were made between the two systems by means of lengths of hose, and a water famine was thus averted. It was explained at the District Council meeting last Wednesday that no foresight could have prevented what has occurred. But in July last the Consulting Engineer reported that there was not sufficient stand-by in case of an accident. It is not astonishing to learn that the matter is now receiving the serious consideration of the Water Committee.

**South Barracas (Buenos Ayres) Gas Company, Limited.**—The ordinary meeting of this Company was held last Tuesday, at the London Offices, No. 1, East India Avenue. Mr. F. J. Heseltine occupied the chair; and in moving the adoption of the report and accounts, remarked that the property of the Company was leased to the Buenos Ayres (New) Gas Company for a period of fourteen years, which had not yet expired. The income last year amounted to £12,016, against £9240 in 1898. The expenses were £6917, as compared with £5098. The cause of this increase had been that their Lomas extension had been completed, and taken over officially in May. During that time it had been worked, as in the case of the Barracas Company, by the Buenos Ayres Company. The balance in hand had been disposed of by paying the interest (£136) on the debenture stock held by the Buenos Ayres Company for advances; and the half share of the surplus due to that Company was £1371. The balance of £3591 had been transferred to the credit of the guaranteed dividend account and retained by the Buenos Ayres Company in reduction of the debt to them. The private consumption of gas had been gradually increasing; and the dividend which had been guaranteed by the Buenos Ayres Company was now more than covered by the earnings of the South Barracas Company. In 1898 the number of meters was only 449; while at present they had 932. The guaranteed dividend was paid to the shareholders last June, and would be paid again this month. He made regretful reference to the retirement, through failing health, of the Chairman (Sir Wilford Brett), whose position on the Board had been filled by the election of Mr. F. C. im Thurn. It was further his painful duty to announce the death of Mr. E. W. Layton, the Secretary, who had been connected with the Company since its inception, and was a loyal representative. Mr. R. Nesham seconded the motion, which was unanimously carried. Other formal business concluded the proceedings.

# SUTHERLAND'S PATENT PREPAYMENT GAS-METERS



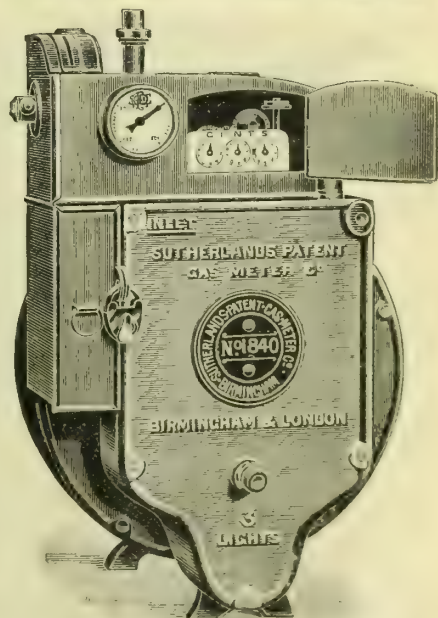
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**Devonport Town Council and the Gas-Works.**—A report has been prepared by the Gas Committee of the Devonport Town Council on the steps they have taken to further the promotion of the Bill for the purchase of the undertaking of the Devonport Gas Company. Mr. T. Newbigging has been retained to assist the Committee with engineering advice; and the services of Messrs. Lass, Wood, and Drew have been engaged to deal with the accounts.

**Walsall and the "Mond" Gas Scheme.**—Advised by the Gas Committee, the Walsall Corporation have resolved to take steps to oppose the application in Parliament for a Bill to incorporate a Company to supply "Mond" gas for other than lighting purposes. In reply to a question, the Chairman of the Gas Committee (Mr. Brownhill) stated that, if there were any demand for this gas, the Corporation could supply it, seeing that they had expended £250,000 in laying down their gas plant.

**The Water Scare at Chester.**—At a meeting of the Public Health Committee of the Chester Town Council, yesterday week, Professor Boyce attended, and stated that a further analysis of the water supply of the city made by him showed that it had greatly improved since his previous examination. He informed the Committee that he would have no hesitation in drinking the water himself. The Committee thereupon resolved that it be intimated to the public that there was no longer any necessity to boil the water before drinking it.

**The Lighting of Wakefield Streets.**—At the meeting of the Wakefield City Council last Tuesday, Mr. W. Ramsden, the Chairman of the Lighting Committee, made a lengthy statement to the effect that it was proposed to light the streets with Welsbach incandescent burners, and terms had been arranged with the Gas Company. Mr. Wigham, the Chairman of the Electric Lighting Committee, thought his department ought to have been asked their terms to light the streets with electricity, as the electric light works were the property of the Corporation, and it was desirable that they should make the undertaking as remunerative as possible. A heated discussion followed, after which the recommendation was referred back for further consideration, and to give an opportunity of obtaining terms from the Electricity Committee.

**Tees Valley Water Board Accounts.**—The financial statement of the Tees Valley Water Board for the half year ending Aug. 13 shows that the capital expenditure was £10,459, bringing up the total cost of the undertaking to £1,906,013. The principal items of fresh expenditure were: On Lartington tank and filter-beds, £4002; engineer's commission, £4000; extension of supply mains, £1389; and parliamentary costs, 1899, £506. The receipts on capital account for the half year were £11,887; the total amount received now being £1,901,082, or £4932 less than the amount expended. The revenue account shows an increase of £770 compared with the preceding half year, and the balance carried to the net revenue account is £38,326. This account is debited with several payments for interest, and credited with interest by the Bank; and, after being dealt with in this manner, there remains a balance of £56,424. Of this amount £36,000 was paid to the Corporations during the half year; leaving £20,424 5s. to be carried forward, £15,000 of which has since been paid to the Corporations.

**Incandescent Gas Lighting of a Cheshire Village.**—On Saturday, the 8th inst., a public lighting scheme was officially inaugurated at Barnton (Northwich), which is one of the most progressive villages in Cheshire. The Lighting and Watching Act has been adopted, and several miles of mains have been laid by the Northwich Gas Company. The installation, on the Welsbach system, is most successful; and the village is now regarded as one of the best lighted in the kingdom.

**Liverpool and the Water Supply of Wallasey.**—At the meeting of the Liverpool City Council last Wednesday, the Water Committee asked approval to an application to the Local Government Board to borrow £146,000 to supply the Wallasey district with Vyrnwy water in accordance with the recent agreement made between the Corporation and the Wallasey District Council. Alderman Burgess (Chairman of the Water Committee) explained that the money would be provided entirely by the Wallasey Council by means of a sinking fund. In connection with this matter, the financial position of the Corporation was assailed by one member; and, after some little discussion, Alderman Burgess said the £146,000 was a liberal estimate, and would cover, as far as the Committee knew, the whole expenditure in the supply of Vyrnwy water to Wallasey. As security, the Wallasey Council were bound under the agreement to provide for it by a sinking fund, extending over a period of thirty years; and it was guaranteed and secured to the Corporation on the rates of the Wallasey district. Supplying water to Wallasey would be a wise thing for Liverpool and for Wallasey, who were badly in need of good water. Whether or not Liverpool supplied Wallasey with water they did not require themselves, another pipe-line would soon have to be laid from Lake Vyrnwy, and, in view of this undertaking, the arrangement with Wallasey might be advantageous. The Committee's proposal was confirmed.

**Effect of Checking Waste of Water in Salisbury.**—At the last monthly meeting of the Salisbury Town Council, the Water Committee reported the receipt by them of a statement from their Waste Inspector (Mr. Carter) to the effect that on the 28th ult. the total quantity of water supplied for all purposes was equal to 33 gallons daily per head of the population; the amount taken by private meter consumption being 13.6 gallons. The supply for sewer flushing and all other purposes not registered by meter would thus be 19.4 gallons. The figures for the corresponding date last year were 37.15 and 22 gallons per head per day respectively. Mr. Harris remarked that these figures were the lowest they had had. Mr. Haskins thought the Council might congratulate themselves, and acknowledge that both the Surveyor and the Waste Inspector had carried out their duties in a most efficient manner. After the new works were completed, they started with a consumption of 68 gallons in July, and in August it had risen to 70 gallons per head of the population daily. In the next year, after Mr. Carter and the Surveyor had half the water-closets in the city fitted with cisterns, the consumption dropped to 60 gallons; in 1896, it was 52 gallons; in 1897, 50 gallons; in 1898, 41½ gallons; in 1899, 37 gallons; and this year, 33 gallons. They had therefore made a steady reduction; and he thought it was in great measure owing to the very efficient manner in which the Surveyor and Mr. Carter carried out their duties.

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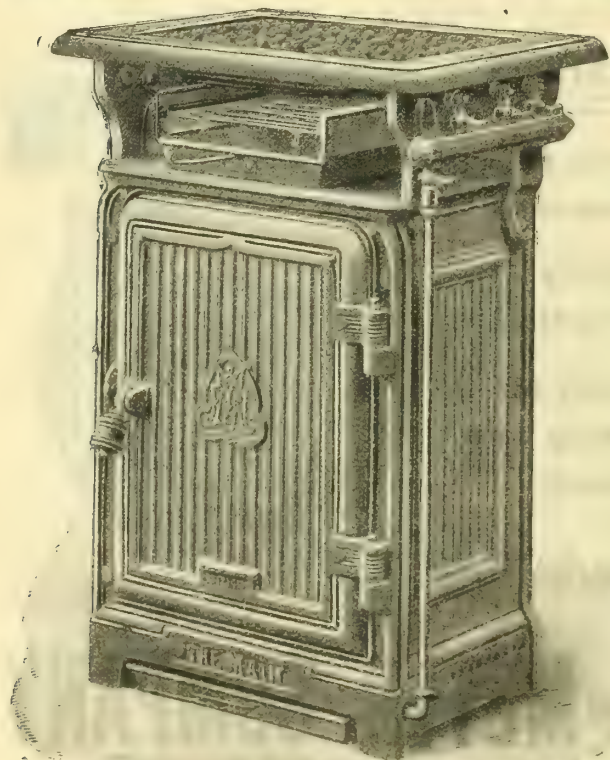
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**Singapore Municipality and the Gas-Works.**—The Municipality of Singapore, who, as our readers are aware, have been advised by Mr. Corbet Woodall on the subject of the acquisition of the gas-works (*ante*, p. 1465), have decided to purchase as and from the 31st of March. The shareholders will be called together shortly to consider the matter.

**Aberavon Gas Supply.**—The gas-works at Aberavon, South Wales, have become too small to cope, adequately, with the demands of the consumers—the make of gas having increased during the last two years to the extent of 5 million cubic feet. The Gas Committee of the Town Council have therefore instructed the Manager (Mr. W. Lister) to prepare a report as to the removal of the works to a new site selected some few years since, and upon which a new gasholder already stands.

**Wells Water Supply.**—Last week a few further particulars transpired as to the rival schemes of the Wells Town Council and the Water Company, both of whom, as our readers are aware, will have Bills in Parliament. The Council's scheme is founded upon a plan submitted by Mr. Newton, of Manchester, which may be briefly described as follows: The existing spring at Hole's Ash, the Company's present source, is combined with the supply from two other springs in the vicinity, all rising in the limestone shales adjacent to the old red sandstone. A dam is to be thrown across the valley immediately below the springs; and the reservoir thus formed will have a capacity of about 6 million gallons, with a surface of 2½ acres. It will supply the two service reservoirs at present in existence, having a combined capacity of 350,000 gallons, and one or two smaller reservoirs for special districts. The Company's scheme utilizes the three springs and the present works, but omits the large reservoir. This scheme has been prepared by Mr. Taylor, of the firm of Taylor, Sons, and Santo Crimp. Feeling in the city runs high on the question, and a poll upon the Council's proposition is in progress at the present time.

**Death Accelerated by Inhaling Coal Gas.**—An inquiry was held at Taunton last Tuesday, before the Deputy-Coroner (Mr. C. E. Hagon), respecting the death of Mrs. Tarrant, 85 years of age, residing with her son in St. James's Street in the above-named town. Mr. John Yeo, son-in-law of the deceased, deposed to breaking into her house and finding the occupants lying in bed in an unconscious state. Medical assistance was called and the son recovered, but his mother did not. Dr. Charles Farrant, who had previously attended the old lady for bronchitis, said he found her suffering from inhalation of coal gas, of which there was a strong smell, though none was used in the house. The cause of death was the development of acute bronchitis and heart failure brought about thereby. He did not attribute her death to the poison of the gas, because she had thrown off a good deal of it. Mr. A. J. Edwards, Manager of the Taunton Gas Company, said he was called to the spot the previous Wednesday evening, and found a small leakage of gas near the residence of the deceased, and investigation revealed the fact that a length of main had sunk 2½ inches, so that a joint had opened, and caused a leakage of between 15 and 20 cubic feet of gas per hour. This gas had made its way into the house through the foundations; the point where the leakage occurred being close to the building. No complaint had been pre-

viously made to him of a leakage there, though the Company's men had been working within 250 yards of the place for some weeks past. He could not account for the dropping of the main; but the workmen had been cautioned to watch this particular street closely, and he had himself, for more than four months, made it a personal duty to do so. The Company's Solicitor (Mr. T. Broomhead) pointed out that there could not have been an immense quantity of gas in the house, as on entering the premises Mr. Yeo had taken a light upstairs, and no explosion had followed. The Deputy-Coroner, in summing up, alluded to the straightforward evidence given by Mr. Edwards. The Jury found that the deceased had died from bronchitis, accelerated by the inhalation of gas, and that death was due to misadventure. The Deputy-Coroner remarked that the case was a very regrettable one; but there was no negligence on the part of the Gas Company or any of their officials.

**Salford's Proposal for Improving the Water Supply.**—At Salford last Wednesday, a meeting of owners and ratepayers was held to assent or otherwise to the promotion of a Bill in the ensuing session of Parliament with reference to the water supply. The Mayor (Alderman S. Rudman) presided, and said they were driven to seek the help of Parliament in getting a proper water supply. He hoped they would obtain what they wanted without any hostility from the other side of the river, and that the proceedings would be wound up in a friendly manner. He moved a resolution in favour of going on with the matter. Alderman Snape, the Chairman of the Water Committee, seconded the resolution. He regretted they were taking a step that might appear hostile to the Manchester Water Committee. As Chairman of the Salford Committee, and a member of it for the last twenty years, it had been a matter of great rejoicing to him that hitherto they had got on very nicely with Manchester. Manchester had always been willing to listen to any proposition they had to present, and had always met their views in a very reasonable way, until trouble arose some two or three years ago about the amounts of water and the pressure in certain parts of Salford. He afterwards went into the details of the scheme, and said they were obliged to seek parliamentary powers because Manchester practically refused to have anything to do with them, and had as good as refused to receive the special deputation to confer with them on the subject. He considered this very bad form. The resolution was carried unanimously. Previous to the present stage being reached, there has been considerable correspondence between the Manchester and Salford authorities on this question. Salford, it is stated, requires a supply of water additional to the 2 million gallons daily which the city is under statutory obligation to furnish, and asks that the price should be fixed by an independent authority. But the city has not agreed to these terms. Manchester refers to the advantageous terms on which Salford has received its water supply. In support of this assertion, it is stated that, under the arrangement made in 1862, Salford is supplied with water at a less price than large consumers in the city, and that the borough is able to make a profit under the existing terms. Manchester, on the other hand, it is contended, is prevented from making a profit by statute, which directs that when a surplus is shown, a reduction in the charges for water must be made.

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SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
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MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000

	Cubic Feet Daily.
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
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LEICESTER	2,000,000
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ACCRINGTON	500,000
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STRET福德	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.



**Gas-Works Scalding Fatality.**—Arnold William Soanes, aged 26, coal wheeler, has been scalded to death at the Gaslight and Coke Company's works. At the inquest on Thursday, Patrick Murray, a fireman, said that he and his mate were clearing the fire of clinkers. Witness had to pull out a second bar to get a large clinker away, when a quantity of coke fell into a pan of water. Soanes was scalded by the rush of steam. The inquiry was adjourned for the attendance of the Factory Inspector of the district.

Messrs. R. & A. Main, Limited, have been holding an exhibition of their gas cooking and heating stoves at Nottingham.

On the recommendation of the Gas Committee, the Walsall Corporation have decided to spend £1000 in laying new mains and doing other work necessary to improve the supply of gas at Bloxwich.

The Harrogate Corporation have received a communication from the Public Works Loan Board stating that the Commissioners have resolved to grant a loan for not exceeding £40,000 on the water undertaking, at  $3\frac{1}{4}$  per cent., to be repaid in thirty years. It was resolved to negotiate for the completion of the loan.

The artesian bore has been working wonders in Australia of late years. In many places, when the rain does fall, it escapes underground. Now, however, by the aid of the artesian system, a practical method has been found of retrieving it. In the Kyoona district of Queensland lately, a bore was worked down as far as 2500 feet before the water was struck; but when once the tap was opened, a steady flow of more than a million gallons a day was obtained.

The Board of the "Era" Incandescent Oil-Lamp Company express regret that the good prospect held out to the shareholders at the last general meeting by a representative of the vendors has not been fulfilled. Royalties on sale of lamps only amount to £23; and this failure has led the Board to give the most anxious consideration to the position of the Company with regard to the vendors. The whole matter has been laid before Counsel; and, acting on their advice, the Board have instituted legal proceedings against the vendors to, and promoters of, the Company. With regard to calls in arrear (£1634), a sum of £562 has been paid since the balance-sheet was made up; and the Board have confidence that most of the unpaid balance will shortly be collected. The net expenditure for the past financial year was £2157; the balance from last account being £4088.

The report of the Directors of the Nernst Electric Light Company, Limited, covering the period from Feb. 23, 1899, to Sept. 30 last, states that the expenditure on capital account during this period was £9696, while the disbursements on other accounts amount to £6757. Acting on the advice of the Auditors, the Directors, after deducting from the latter amount £846, received on account of interest, and transfer fees, have placed the balance of £5911 to a development suspense account, to be dealt with in future years. Apart from the purchase consideration for the patent rights, the only prominent item of expenditure on capital account is £5000 contributed towards the purchase for this Company of Professor Nernst's British royalties; the balance of the consideration having been provided by the vendors. The Directors have found that the practical difficulties to be overcome in the wholesale reproduction of the Nernst lamp to the best advantage have been greater than they anticipated.

## CHRISTMAS HOLIDAYS.

In consequence of the CHRISTMAS HOLIDAYS, the next issue of the "JOURNAL" will be sent to press on SATURDAY. Correspondents and Advertisers will therefore oblige by forwarding their Communications as early as possible.

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## EDITORIAL NOTES.

## 1900.

## A Retrospect of the Year.

IF the end of an ordinary year is a chronological event which always touches the imaginative and reflective faculties of civilized mankind, and arouses the human mind to a sense of the flight of Time which is only paralleled in individual experience by the recurrence of a man's own birthday, the close of a century naturally deepens this ordinary impression in a degree as exceptional as the event itself. In a sense, of course, every moment that passes is the termination of all phenomenal duration; and centuries are of no more account than moments in the unbroken series of sensations which we call the course of Time. Yet our imagination refuses to regard the passing of a century of our Era as an insignificant circumstance. One feels, vaguely, that it means something more than the succession of one year's date by another; but the sentiment is elusive, and one cannot separate it clearly from the throng of more familiar thoughts which crowd in upon the occasion of those accustomed anniversaries when the peculiarly human faculty of looking before and after finds its fullest scope. We do not, therefore, aim at making our Retrospect of the year 1900 to any great extent an exercise in Centennial reviewing. Some few important landmarks must, of course, be noted; but the general history of the past hundred years of gas manufacture and supply cannot be given here, even in the baldest synopsis. It is enough to remark that when the century which now closes opened before the eyes of the generation then living, not only was there no gas lighting industry, but scarcely one object of political, civil, or industrial origin on the whole planet which the present generation takes as a matter of course was then in existence. The British Empire itself was not in being; and the chief link uniting Englishmen of to-day with their ancestors of that period is the Blood and Spirit of the Race, which, under God's Providence, has made the Old World a New World in all essentials since that painful time. It is not overstating the case for the gas lighting industry to claim that among the most potent of the material aids to the development and fruitful application of the human understanding during the closing century has been that organized artificial illumination which gas was the first manufactured product to render universally available, and the humanizing and educational value of which cannot be expressed in words. The assembly-room, the theatre, the lecture-hall, the school, the learned society, the technical association, the club and institute for the people—all these agencies of civilization, and more that might be catalogued, owe their very existence, for popular purposes, to gaslight. It is no mean service for any industry to have rendered to an Age and a state of Civilization.

And now, at the end of its first century, the gas industry, like its great contemporaries steam transport by land and sea, and electricity, stands firmly upon the up-grade of its prosperity, powers, and prospects. The past year has been a time of trial and stress—what year is not, to a living thing?—but they have been surmounted and withstood; and the New Year breaks fair, with promise of comparatively calm weather. The country, as a whole, has experienced almost unexampled financial prosperity and mercantile expansion. Prices have ruled high; and labour has been well paid and much in demand. The ugly wail of the unemployed has not been heard for a long time in our land. Men have earned good money; and, generally speaking, they have borne their fortune vastly better than was the case in the last "flush times," a quarter of a century ago. It is really marvellous to reflect that this satisfactory condition of the home population has been coincident with the active prosecution in South Africa of the greatest war in which this country has been engaged since the struggle for the suppression of Napoleon Bonaparte. It is only necessary to read the history of the home conditions under which that conflict was carried on, and compare the facts with actualities, to realize that the difference between 1800 and 1900 is in other respects besides time. The British populace of 1800 burnt ricks of corn, in order that the wealthy should not enjoy that of which they were themselves deprived. In 1900 men of the same class tax themselves willingly for the support of the dependants of their fellows



fighting for the Flag across the sea. This is more than a Revolution. It is a Re-birth of the Nation.

The year's financial history of British Gas Companies is so bound up with that of legislative changes, that it is difficult to recount one without bringing in the other. Thus, the fashion of converting and consolidating original and additional share capital upon a basis more nearly approximating to the level of the actual returns on the current value of the investment has been pursued, usually without opposition, because the operation is found to redound to the advantage of the undertaking, and indirectly to the public, without cost to the community. The possibility of employing money to advantage in many ways led to a general cheapening of gas stocks, much to the gratification of the best judges of such matters, who deplored the exaggerated valuation of what is after all but industrial property. When people have bought gas stocks too dearly, the fact is apt to weigh too much in the counsels of the administration, and cause the maintenance of the corresponding rate of dividend to be a consideration overpowering policy of greater prudence. Another cause of depreciation of the market price of gas stocks was the general sacrifice of dividend necessitated by increased prices of gas, in the case of sliding-scale companies accustomed to pay dividends to the full statutory limit. Where it is the practice to keep a margin of the sliding-scale dividend in hand, this influence has not shown itself so strongly. The year was, indeed, rendered memorable by the circumstance that for the first time since the introduction of the sliding-scale of gas prices and dividends, this means of adjustment came largely into operation against both consumers and shareholders. Owing to a rise in the cost of coal averaging 8s. per ton all over the country—an advance unprecedented since the coal famine year 1873—the selling prices of gas had almost everywhere to be raised from 6d. to 9d. per 1000 cubic feet. On the whole, the public took this enforced increase in the cost of one of the necessities of town life very patiently, for the reason that householders were at the same time compelled to pay at least 10s. per ton more for their coal supplies of all grades. Where popular discontent with the dearness of gas was fanned into overt agitation by local busybodies, the chief complaint to find utterance related to the detail question of whether an alteration in the price of gas can legally be made retrospective. Contrary to the expectation of many, the circumstance of the existence of a sliding-scale, whereby the shareholders suffered in dividend rateably with the increased price of gas, did not act as a solace to the public. Of far greater importance was the knowledge that gas supplied by municipalities throughout the country was also advanced in price. And this was done in many places, be it noted, specially to keep up the deplorable practice of indirectly taxing gas consumers for the benefit of the ratepayers.

The question of coal was that which chiefly occupied the minds of gas-works administrators during the year. All through the season of Christmas and the New Year—until the lengthening of the days, indeed, brought relief to the gas manufacturing plant—the greatest difficulty was experienced in getting deliveries of coal. The contractors everywhere fell hopelessly behindhand with their consignments. Neither ships nor railway trucks were to be had for money; and some gas-works situated within cartage distance from collieries could hardly get enough coal to keep the holders off the ground. Important gas undertakings in the South of England were reduced to stocks measurable by days—sometimes by hours. Chance cargoes were bought at any price the owners chose to ask; considerable sums of money being necessarily sacrificed in this way. As usual, all manner of theories were put forward to account for this abnormal state of affairs, occurring moreover in a mild winter; but of greater practical moment were the two clear issues that it would become imperative to raise the price of gas as soon as possible, and that penalty clauses of coal contracts are not of the slightest use when they might be of the greatest value.

Gas prices were, as a matter of fact, increased as already stated, at the Lady-day or Midsummer (in Scotland, Whitsuntide) index-takings. The position of most gas companies having annual coal contracts was at the beginning of the year that of depending upon their contractors for the completion, as they were able, of the old contracts which were made at prices greatly below the open market rates. It was inevitable that the fresh contracts to succeed these would not be settled except at a serious advance. The

great question was whether this advance, which might be taken as marking the high-water level of coal values, would last. It proved, as we have mentioned, to amount to 8s. per ton for Newcastle coal in the home market. This source of supply was particularly intractable, in consequence of the readiness of foreign buyers of gas coal to strike bargains at top prices, just at the season when the big home contracts should have been sealed. The supply of Midland coal, fortunately, was not so seriously influenced in the same way. After a sudden advance at the pit's mouth of just as much as the Newcastle coal, during the first two months of the year, it as suddenly declined to a price at which it could be purchased to an advantage as compared with the North Country article. Inspired by this circumstance, some large buyers of gas coal held off, and ventured upon the unprecedented course of making a six months' contract only. They trusted to the market weakening towards the end of the year; and this anticipation has been fulfilled.

The coal situation this winter is, so far as British gas-works are concerned, the complete opposite of the state of affairs a year ago. There never was so much coal on the works at this season of the year as there is now. The coal cost a high price, and freights were high; but these conditions have produced the natural effect. Coal and freights have been turned into money as fast as possible; and now, as a general thing, gas companies have more coal than they really know what to do with. Their turn is, therefore, coming. Scarcely anywhere, irrespective of the sliding-scale, has the retail price of gas been advanced to the figure that would be necessary to completely meet the bare increase in the cost of coal, to say nothing of the accompanying advance in other raw materials, gas-works supplies, and labour. Full credit has everywhere been allowed for the improved return from coke, the only residual of gas manufacture that has responded sensibly to the influence of dear coal; and there has generally been something taken out of the undivided balance to square the revenue account. Coke has paid well this year; but tar and sulphate of ammonia appear to be immovable, probably in consequence of the growing supply from sources other than gas-works.

A curious feature of the gas manufacture of the year was exhibited by the carburetted water-gas branch of the industry. The popularity of this accessory of many British gas-works continued unabated on technical grounds; and there are more of these auxiliary plants in use than there were a year ago. Unfortunately, however, for those British gas managers who put their trust in carburetted water gas, of the American kind, the market price of gas oil was advanced in sympathy with the dearness of gas coal. It was published in the last accounts of the Crystal Palace District Gas Company, that, owing to the dearness of coke and oil, the works' costs of the carburetted water gas made by the Company had risen to 1s. 7d. per 1000 cubic feet. The lack of a native supply of suitable oil for gas making is a grave objection to the limitless extension of the manufacture; although fresh foreign sources of this material are continually being exploited, the newest being the distant island of Borneo. A good deal was said in advanced technical circles about the capabilities of Dellwik water gas, carburetted with benzol, as an addition to the resources of a coal-gas works; but the plant was not established on a working scale anywhere in the United Kingdom. Arrangements have been made for the installation of a Dellwik-Fleischer plant at West Bromwich. The position of ordinary coal gas, as the staple product of British gas-works, remains yet as firm as ever. It was, indeed, considerably strengthened during the year by certain parliamentary proceedings to be mentioned later.

Before quitting the subject of gas-works finances and profit and loss, we desire to lay stress on the great success, signalized on several distinct occasions during the year, of the practice of issuing new gas capital in small lots at a fixed price, to suit the small and the local investor. The rights and wrongs of this matter of fresh issues were exhibited at the autumn meeting of the Gas Companies' Protection Association. There it was plainly shown that the best way for a gas company to make friends is to parcel out new stock at a reasonable fixed price among the consumers and the public from whom its income is drawn. On the contrary, the most unpopular gas companies are those whose capital is obtained from the general Money



Market. There is nothing new in this exposure. It is only the moral of the old Consumers' Gas Companies repeated in a modernized shape. Yet it is marvellous how sluggish British Gas Companies are to follow good examples, old or new. Popular stock issues; profit-sharing; adoption of the business methods of ordinary competitive traders—anything and everything of this kind of progress may be exhibited by one company for long years before their next neighbours will do likewise.

Great interest centres in the legislative record of the year. No general statutes of any great importance, as regards the gas industry, became law during the Parliamentary Session of 1900; but the Private Gas Bill business was of the first order of magnitude and far-reaching influence. This was due to the nature of the Bills relating to the Metropolis Gas Supply, and to the dealings of Parliament with these measures. It seemed good to the London County Council to promote a Bill to legalize penalty gas testing by scouts armed with a portable photometer; and to bring under statutory control the efforts of the London Gas Companies to popularize gas by means of prepayment meters and hired fittings. They had far better have left the latter design alone; but the infatuation of a democratic authority for tying up every public enterprise in red tape, proved irresistible, and Parliament yielded to it once more. The portable photometer project was, however, defeated. At the same time, and through the same Committee, the House of Commons had to consider a Money Bill of the Gaslight and Coke Company, and a Bill of the South Metropolitan Gas Company for reducing the initial price of gas under the sliding-scale enacted in 1876, and for lowering the standard illuminating power of the Company's gas. The former Bill was rejected; the latter was passed. Later, in the Upper House, the South Metropolitan Bill was shorn of the provision it had contained for enabling the Company to acquire from the Gaslight and Coke Company the portion of their undertaking lying on the south side of the River Thames. The illuminating-power clauses of the South Metropolitan Act constitute a precedent of vast economical and industrial importance, which is already being followed, and may be widely utilized as time goes on. The Wandsworth and Putney Company, one of the cheap-gas Companies of the London suburban ring, secured a fresh Act on the old basis. In connection with two Acts of the year for converting horse tramways to electric traction, the London Gas Companies obtained a valuable concession of the principle that their mains and pipes should be protected from electrolytic injury. Parliament was engaged upon an interesting inquiry into the merits of Municipal Trading, and took evidence from Mr. George Livesey on municipalized gas supply. It became the rule to disallow powers to manufacture gas-fittings, &c., by Gas Companies, as well as Municipal Gas Committees, in connection with the usual hiring-out clause of Gas Acts.

Gas Companies have not troubled the Superior Courts much in regard to the settlement of disputed cases of gas law. The law of steam road-rolling was further elucidated, by a judgment obtained by the Alliance and Dublin Consumers' Gas Company. The Hull gasholder case finally flickered out, not without leaving a lesson in regard to the law of underground water. An important question arising out of the Building Acts was decided by the Divisional Court against the Wandsworth and Putney Gas Company. Several notable decisions were given by the Appeal Court under the Workmen's Compensation Act. One of the most generally important of these was in *Pearce v. The London and South-Western Railway Company*, which settles the liability of undertakers for their sub-contractors. Much interest was taken in the Kern patent litigation between the Welsbach and the New Sunlight Incandescent burner interests, which ended in a compromise. The expiry in March of the 1886 patent of the Welsbach Company leaves this proprietary with the untied (in the High Court) patent of 1893 as their sole remaining mantle patent.

Gas engineering opinion continued to be exercised throughout the past year respecting the comparative merits of carbonizing coal in inclined retorts and in horizontal retorts with mechanical stoking appliances. All that seems to be decided as yet in this important department of a gas-works is the necessity of efficient coal and coke transporting machinery. This mechanical equipment of retort-houses is independent of the retorting arrangements, which are still unsettled. Gaseous firing has become universal, and large external gas-generators for supplying a battery

of settings have come into favour in some big works. Gas washing with oils, by Young and Glover's process, for the removal of naphthalene, has entered upon the commercial stage; and the dry-sealing of gas-purifiers came into wider favour. Carburetting by benzol also became an industrial practice. Outside the works, gas engineers had to consider the expediency of distribution at higher pressures than were customary in old-established practice; and at the works of the South Metropolitan Gas Company, the usual distribution by the force of gravity was supplemented by trunk-main blowers, driven by Westinghouse gas-engine power. A notable improvement in high-power gas lighting for wide streets, open spaces, and works yards was perfected, in the shape of high-pressure incandescent lamps; and a brisk beginning was made in the introduction of these brilliant lamps. In a general way, the incandescent method of gas lighting made enormous progress in public favour. Notwithstanding the saving of gas incidental to this system of illumination, the public demand for gas increased in almost embarrassing volume; rendering it difficult to keep the manufacturing plant abreast of the needs of the time. The use of coal gas for cooking, heating, and driving engines is still growing fast; and some gas undertakings have to make provision for a 20 per cent. increase for the year. Increases of about 10 per cent. are fairly common, which is a happy circumstance for the firms whose business consists in supplying the necessary plant and materials for this swelling trade. Acetylene gas lighting has advanced in some respects, and fallen back in others. The industrial use of large gas-engines received a marked impulse. A fuel gas scheme, using the Mond process, was projected for South Staffordshire.

A memorable incident of the year was the recognition by the most progressive gas engineering opinion of the radical change that has been wrought in the commercial and technical ideals of the industry of coal gas manufacture and supply by the domination of the system of lighting by incandescence. This system, being independent of the normal illuminating power of the gas, as tested by photometry of the luminous flame, supersedes the old standards of quality based on this photometry. The measure of the usefulness of any gas is thus changed from the luminous value of the open flame to the heating power of the gas; its lighting service being performed exactly upon the same principle as its heating and power-generating work. The partial application of this discovery by the South Metropolitan Gas Company, as already chronicled, was resisted by the County Council; but the forces of obscurantism had to suffer defeat. In Germany, gas of 8 to 10 candle power is being distributed by municipal undertakings, to the great relief of the market for the best gas coals. A beginning upon the same lines has now been made in England; but it still remains for the British gas industry to shake off the incubus of the luminous-flame photometric standard, in order to ascertain the cheapest way of working in accordance with the new conditions. Until the incandescent system of gas lighting actually becomes the most generally used, and luminous flames are reduced to an insignificant minority, it will be expedient to continue the production of unenriched coal gas of not less than 14-candle power. But where this obligation no longer holds good, as in the case of Germany, it has been already proposed by Dr. Bunte to distribute a mixture of the commonest coal gas, carbonized in bulk in retort-ovens, with 20 per cent. of uncarburetted water gas. This mixture would have a normal illuminating power of from 4 to 5 candles, and a calorific value of about 550 British thermal units per cubic foot. Irrespective of the merits of any particular prescription for its manufacture, which can only be determined by experience, the "note" of cheap "light" gas predominates in the technical ideals of the time.

There have been some few accidents and casualties to vex and distress the followers of the gas industry; but nothing, happily, of a very terrible character. Indeed, the year was remarkably free from disasters in or in connection with gas-works. A regrettable suffocation case, resulting in the death of two persons, occurred in the Tottenham district, which was chiefly memorable for the proof it supplied that a mixture of gas and air may be fatal to breathe, while not attaining to explosive proportions. A gasholder collapsed in an unexplained manner at Barking.

The political and official side of the cause of Labour suffered several sharp rebuffs in the course of the year, especially at the General Parliamentary Election which



took place in October, and resulted in the discomfiture of the greater number of the professional Labour candidates. Employment generally was plentiful, and wages, especially in the coal and iron industries, ruled high. On the other hand, the building and brick-making trades were in a poor way, which had the effect of easing the market in which the less skilled grades of gas-works labour is chiefly recruited. There were strikes of Thames coal-trimmers in the early spring, and of lightermen in the autumn. The latter is still dragging on. Mischief was made among railway men by the Railway Servants' Union; and a vexatious revolt on the Taff Vale railway system was quelled. This affair gave rise to an interesting point of law which remains unsettled, as to whether a Trade Union can be made answerable for injuries caused by its officials acting in its name. There was another outbreak at the Bethesda slate quarries of Lord Penrhyn, over the familiar question of "recognition" of the Union, which, in this as in other cases, means abject submission to Union domination. The memory of Thomas Shelton, of Leicester, remains to testify to the character of recognized Trade Unionism.

This year having been distinguished by the holding of the latest, and possibly the last, of the French series of International Exhibitions, the opportunity was taken for the convening in Paris, in September, of an International Congress of Gas Engineers, under the presidency of M. Th. Vautier. The congress was well attended, and proved to be an agency for the collection of a valuable set of technical papers. In England, the Incorporated Gas Institute and the Institution of Gas Engineers held successful meetings under the respective Presidents, Mr. E. H. Stevenson and Mr. J. W. Helps. At these meetings, measures were initiated for bringing about a fusion of the two organizations into one truly national and representative Society; but the matter still remains in suspense. The North British and the various District Associations of Managers continued in activity, and justified their existence by their transactions. Besides the doings of the technical societies, gas engineers desirous of being "in the movement" have many calls upon their perceptive and critical powers. The output of technical literature, which nobody who does not desire to be reputed a "fogey" dare neglect, is becoming almost overpowering. To lose touch of it for a week or two, is to be stranded in uncomfortable ignorance of what is going on. Yet however penible is the task of obtaining it, an adequate acquaintance with current technical topics is as his very breath to a professional man. There is only one real Long Vacation in the strenuous career of a modern specialist who aims at mastery of his craft.

Several of our whilom fellow-workers have entered into their rest during the year that is almost past. Mr. J. Blacket Gill, who came of a good gas stock, presided for the last time over the annual meetings of the Commercial Gas Company in October. A highly respected member of the gas profession—Mr. Peter Simpson, of Rugby, who of late years occupied the position of Trustee of the Gas Institute—died in the early Spring. Mr. T. W. R. White, of Sherborne, was a familiar figure at Gas Institute and Southern District meetings. Mr. W. Barratt, late of Grantham, was a founder of the Eastern Counties Association. Mr. J. W. Buckley, of Formby; and Mr. J. Robb, late of Haddington, were representatives of the older order of gas managers. Mr. R. A. Gandon was taken almost before his career had opened. Mr. Richard Clark, of Devonport, was one of the seniors of the profession in the West of England. Mr. William Livesey needs no qualifying description here. Mr. W. S. Randall, taken in the prime of life, was a great loss to the Gaslight and Coke Company.

There have been many changes of professional appointments in consequence of death and retirement. It is the first complete year of Mr. C. C. Carpenter's work as Chief Engineer of the South Metropolitan Gas Company. Mr. G. C. Trewby retired from the position of Chief Constructing Engineer of the Gaslight and Coke Company, and has for the present no successor. Mr. J. F. Bell has gone to Derby in succession to Mr. C. Taylor, retired—Mr. Pooley taking Mr. Bell's position at Stafford. Mr. J. G. Newbigging has the chief engineering charge of the works of the Manchester Corporation Gas Department. Mr. Harold Woodall succeeds to Bournemouth. Mr. T. H. Duxbury was appointed to South Shields, in succession to Mr. W. J. Warner. Mr. S. Stewart retired from Greenock; and his place was taken by Mr. W. Ewing, of Hamilton.

Much more might be written of the events of the year,

and still leave a great deal unsaid. The record of the time has been kept, as faithfully as possible, and as completely as circumstances permitted, in the two bulky volumes of the "JOURNAL" for 1900. To this chronicle we must perforce refer for anything that has been omitted in this necessarily imperfect review of the doings of an exceptionally busy year. It is not the object of these Retrospects to be encyclopædic, but only to give in one sweeping glance a presentment of the salient events and the most decided tendencies of the period. As Galileo said of the earth, so it may be repeated of the gas industry of the United Kingdom, "Still it moves!" And that is the great thing. Whether in some respects the organisms within the gas industry, and the personality thereof, move quickly enough, is another question. So far as the work of the "JOURNAL" goes, we can claim that no technician into whose hands the weekly numbers come can fairly complain that he has no indication of the way in which the technical world is moving from time to time. In pointing the way, and recording progress, the "JOURNAL" finds an ever increasing, always a more and more pressing task, because the gas industry itself grows in bulk and in complexity of developments daily.

## WATER AND SANITARY AFFAIRS.

### The Principal Events of 1900.

THE historian of the year now fast drawing to its close does not find himself able to record the occurrence of any event of such significance, in the field of water supply or sanitation, as to bring 1900 into unusual prominence as a period of exceptional progress. The century, however, of which it is the last fraction, has witnessed great advances in each of the above-named important factors in the health and well-being of the community. To go no farther back than about fifty years, it may be pointed out that water supply has been brought under legislative enactments, that the public health has come under control, and that endeavours have been put forth to prevent the pollution of soil and rivers. The labours of Dr. Parkes caused greater attention to be devoted to sanitary science and hygiene; while those of Hawksley, Bateman, Bazalgette, and Rawlinson resulted in the provision of vastly improved water supply and sewerage systems. With the constitution of the Metropolitan Board of Works in 1855 came the inauguration of a more adequate drainage scheme for the Metropolis. The Board have passed out of existence and given place to the London County Council; the old Board of Health, to the Local Government Board; the Vestries—erstwhile the paradise of Bumble and of his peers—to the Borough Councils. As the result of these changes, we are surely justified in looking for more efficient administration. At all events, we may enter the new century inspired by the hope that the lessons of the past—they have in many cases been hard to learn—will be productive of much good in the future. But before passing into 1901, we may well review what has been done in 1900.

The year opened with the Metropolitan Water Question, which had been more or less before the public during the latter half of the century, still hanging, so to speak, in the balance. The last of the four Royal Commissions appointed to investigate the subject—that presided over by Lord Llandaff—had nine months previously concluded their two years' labours; but their report had not appeared. In the meantime, two of the members of it—Major-General Scott (the Official Water Examiner) and Mr. H. W. Cripps, Q.C.—had been removed by death. The London County Council, without waiting for an expression of the views of the Commission, had given notice of Bills to sanction the purchase of the Water Companies' undertakings and the carrying out of their Welsh supply scheme. That the Council would not be alone before Parliament on the water question was evidenced by the fact that three of the Companies—the Chelsea, East London, and Lambeth—had notified their intention of introducing Bills to enable them to improve their positions financially or structurally, and the eight Companies collectively had intimated their desire that the Local Government Board should be armed with power to require them to submit schemes for additional storage reservoirs in the Thames Valley, and to draw more water from the river and its tributaries. This was the position at the birth of the New Year. The year



was not many days old, however, before we were able to give a forecast of the long-awaited report of the Royal Commission. In the "JOURNAL" for the 16th of January we stated that it was adverse to the Welsh scheme—the existing sources of supply being considered sufficient for the next forty years; and that it favoured purchase and control of the Companies' undertakings by a specially constituted Water Board composed of representatives of the Local Authorities within the existing limits of supply, with a Chairman and Vice-Chairman chosen by the Local Government Board. That these predictions were not far wrong was shown by the appearance of the report on the following Monday. The document was fully dealt with in our columns at the time, and therefore it is unnecessary now to go over the old ground. Suffice it to say that the Water Companies came well out of the inquiry, as they had done in that conducted by Lord Balfour of Burleigh only a few years previously. In fact, the associated Companies, by their Bill already referred to, had anticipated one of the principal recommendations of the report—viz., that further powers should be conferred upon the Local Government Board. The Commission had already specially reported upon the advisability of connecting the Companies' distribution systems; and their suggestions on this matter had received legislative sanction.

The report was well received, on the whole, by the Press; but, of course, the Progressives on the London County Council and their supporters outside objected to it. Consequently, after the lapse of a few weeks, a deputation from the Council, headed by the new Chairman, Mr. W. H. Dickinson, formerly Chairman of the Water Committee, waited upon Mr. Chaplin, at the offices of the Local Government Board, to represent their views on the water question, and to suggest that the Council should be authorized to take over the property of the Water Companies, and subsequently promote a Bill to settle the constitution of the authority to control the supply. In other words, they wished to get possession of the supply, even if they had to give it up afterwards. The idea, as we pointed out at the time, was preposterous. Mr. Dickinson thought that, if the Council had only the Government to deal with, the matter would be settled without any difficulty. But Mr. Chaplin quoted the very emphatic expression of opinion by the Royal Commission, that the Council should not be the public body to whom they advised the water undertakings to be transferred; and he told Mr. Dickinson plainly that the Government could scarcely be expected to support a Bill the object of which was diametrically opposed to that view, while, as far as he personally was concerned, the arguments adduced appeared as in "distinct conflict" with the recommendations of the Commission. This was not very encouraging to Spring Gardens; but worse was to follow. After three weeks of suspense, their hopes were dashed altogether. Their Bills were down for second reading "by order" on the 22nd of March; but, owing to some misunderstanding, the night had been promised to the Irish members. After a disorderly scene, the debate was adjourned for a week; and then the Purchase Bill was thrown out by a majority of 83, and the Welsh Bill withdrawn. Undaunted, however, and apparently impressed with the belief in the value of "pegging away," they have decided to re-introduce their Purchase Bill, accompanied by one to continue the operation of the "sterilization" clause; but, judging from the rebuff they received a few days ago from Mr. Walter Long—Mr. Chaplin's successor, consequent upon Ministerial changes, at the Local Government Board—they cannot expect it to pass, especially in view of the decision of the Government to introduce a Water Bill in the session of 1902. They have very prudently dropped their Welsh scheme. After the Council's Bills were disposed of, the Speaker advised the House that the Bill of the associated Water Companies, which was also down for second reading, could not be entertained as a private measure; and it, too, was withdrawn. With regard to the other Bills, the Chelsea Company did not proceed with theirs; but the East London and Lambeth Companies carried their measures successfully through both Houses. The result has been to give each Company additional storage.

The general water legislation of the past session has been so recently dealt with in detail, that it scarcely calls for mention here, except to make the retrospect of the year complete. A Bill was passed to reconstitute the Lea Conservancy Board, on which the New River and East London

Water Companies will have only one representative each, while their contributions to the revenues of the Board will be increased, without apparently any commensurate benefit. But the proposals of the promoters were not allowed to pass without protest from the Companies. A scheme was brought forward for the constitution of a Water Board for South Essex; and it encountered a great deal of opposition. Hertfordshire was alarmed at the possible effect upon the county of the sinking of the proposed wells; Cambridgeshire contemplated the draining of the Cam to the point of exhaustion; the Water Company immediately concerned characterized the scheme as the worst which had ever been presented to Parliament; and the East London Company condemned it as unnecessary, and likely to result in financial failure. In the face of so many formidable objections, the House of Lords declined to sanction the project. Nor were they more considerate to the Bill of the South Essex Water Company for the construction of new works, though it had the able support of Mr. E. K. Burstal and Mr. Baldwin Latham. Better fortune awaited other companies. Incorporation was conferred upon those at Great Berkhamsted, Higham Ferrers, and Woodbridge; and additional powers and extended limits were granted to a number of others. An Act obtained by the Southport Water Company contemplated the transfer of the undertaking to a Joint Water Board, for the formation of which permission will be sought next session by the Local Authorities of Southport, Birkdale, and West Lancashire. A similar Board was sanctioned for Bury and the district, as well as a Water Trust for Airdrie and Coatbridge. Acts to transfer the undertakings at Exmouth, Hemel Hempstead, Menstone, and Spalding were passed; powers were conferred in various cases to acquire lands for the protection of the sources of water; and the Corporation of London obtained authority to construct subways for the accommodation of pipes and wires belonging to parties having the right to lay them in the streets of the City.

Schemes in hand for affording additional supplies of water have made steady progress during the year. The visit of inspection paid to the works towards the end of June by the members of the Staines Reservoirs Joint Committee, left a very favourable impression upon their minds. Operations were not formally started till April, 1898, yet the smaller of the two reservoirs now in course of construction, the combined capacity of which will be 3300 million gallons, was in a very advanced state, while considerable progress had been made with the larger one. In addition to this, a good deal of pipe laying, bridge building, and syphoning had been carried out. The Contractors (Messrs. John Aird and Sons) had nearly 2000 men upon the works; and it was hoped that by next summer the smaller reservoir, estimated to hold 1400 million gallons, would be ready to receive water. Mr. Shaw Lefevre attempted early in the year to create a scare by questioning, in letters to "The Times," the stability of the puddle wall in the embankments of the reservoirs; but he found a formidable opponent in Sir Frederick Bramwell, who demolished his alarmist statements. The Engineers of the scheme (Messrs. Hunter and Middleton) are perfectly satisfied as to the adequacy of their embankments to sustain the pressure of water upon them. An important addition was commenced in October to the great works by which Manchester is supplied with water from Lake Thirlmere. In the presence of a numerous company, the Lord Mayor (Mr. T. Briggs) laid there the first length of a second pipe-line, consisting of 50 miles of tunnels and "cut and cover" work, and 45 miles of pipes, the greater portion of which will be 44 inches in diameter. The cost of the work, which is being executed under the supervision of Mr. G. H. Hill, will be between £400,000 and £500,000. The gigantic scheme which Mr. James Mansergh is carrying out for the supply of Birmingham with water from Wales has been advanced at all points, the weather during the summer having been favourable for the execution of the works. One aqueduct—that from Elan to Dolau—which was in the hands of Messrs. John Aird and Sons, is practically complete; and good progress is being made with the others. At the end of July, the Oldham Corporation witnessed the completion of a scheme for the provision of additional works, for which powers were obtained some years ago, by the formal opening of the Rooden reservoir, the first turf of which was cut on July 30, 1894. It has a capacity of 265 million gallons. Early in the year, some initial steps were taken in the



direction of carrying out the scheme entrusted to the Derwent Valley Water Board by instructions being given for the survey of the sites for the Ronsley and Howden reservoirs. The engineering of this important work has been placed in the hands of Mr. E. Sandeman, who displayed such conspicuous ability in connection with the construction of the Burrator reservoir of the Plymouth Corporation. In September, a commencement was made by the Halifax Corporation with the Walshaw Dean reservoirs, which will add  $2\frac{1}{2}$  million gallons of water to the daily supply of the town. Among the smaller works undertaken during the year may be mentioned additional filter-beds and pumping plant by the Bristol Water Company, and the commencement of a new station at Melling by the St. Helens Corporation.

Fortunately there have not been any very serious accidents or unusual meteorological conditions to interfere materially with the supply of water over the country. First to be noticed is the serious leakage—to the extent of about a million gallons a day—from the Thirlmere water-main, which was brought to the notice of the Water Committee of the Manchester Corporation in January. Shortly afterwards, Guildford was visited by heavy floods which inundated the water-works, disorganized the service, and caused great leakage. Fortunately, former connections with the Woking Company's mains allowed of assistance being rendered by that Company, and testified to the utility of intercommunication. Owing to an accident to a main, a portion of the district of the Lambeth Company had to be put on a restricted supply during August; and a breakdown in the pumping plant at St. Ives (Hunts) deprived the town of water. The large main from Vyrnwy to Liverpool has revealed a weak point at Colebrook, a few miles from Northwich, for a serious burst occurred in August, making the third in the course of twelve months. Other accidents, such as are incidental to undertakings of the character of those connected with water supply, do not call for notice.

Though there has not been any case of great magnitude before the Courts this year, several noteworthy legal points have arisen during its progress. First in importance, probably, was the action taken in August by the Corporation of Harwich to compel the Tendring Hundred Water Company to furnish a constant supply of water under pressure in the borough, which it was alleged they had failed to do owing to their selling largely in bulk. The defence was that the inefficient supply complained of was due to defective fittings in the houses; moreover, it was contended that the parties aggrieved should seek a remedy otherwise than by *mandamus*. The Court, however, declined to support the contention, and the writ was issued. Another case in which proceedings against a Water Company were successful arose at Oystermouth, where the occupant of a house on very high ground complained that he could not get a supply. The Company contended that they were not bound to furnish water to the highest house in the neighbourhood, which the one in question certainly was; but they were fined £10, with a continuing penalty of £2 a day. A rather singular case occurred at Brymbo, where a colliery proprietor sought to recover from the Water Company money alleged to have been paid as water-rate under legal duress, with the view of inducing the Company to give him a supply of water, which had been cut off; but he failed to establish his contention. Curiously enough, in some subsequent proceedings, which arose on the Company wishing to compel him to take his water by meter, owing to the great waste going on upon his premises, they failed, and were fined £18. This dispute had been going on since 1893; and it had a melancholy termination, inasmuch as the plaintiff died during a week's adjournment of the final proceedings. This gave rise to the contention by the Company's representative that the action should abate; but the Bench were advised to the contrary. The East London Water Company scored a good point against the London County Council on a special case stated with the view of having a declaration by the Court as to the use of water from hydrants or fire-plugs for other purposes than the extinction of fire. It was decided that the Company had a perfect right to use their own water as they pleased. The Oldham Corporation were made aware that they could not with impunity cause the pollution of water, even though it was only to be used for compensation purposes; and the Stroud Water Company were restrained from taking water from a stream so as to detrimentally affect the working of

a mill. The Denbigh Corporation learnt to their cost, as others have done, that the steam-roller must not be used to the injury of mains, whether they convey water or gas; and Mr. Timms Ludgate, an oil merchant of Brighouse, had the fact impressed upon him by the Halifax Justices that when the owners of a water undertaking decline to supply, he must not give instructions to a plumber to tap their mains on his own account. Various wasters of water have been very properly fined during the year. Although not strictly a legal subject, the movement initiated to obtain an alteration in the law in regard to the rating of reservoirs may well be noticed here.

Several interesting questions bearing upon water supply and sanitation have come before the technical societies during the year. The control of water undertakings and the sources of water supply was brought under the notice of the British Association of Water-Works Engineers by Mr. C. E. Jones; but, though the subject was referred to a strong Committee, the only result has been the presentation of the somewhat inconclusive report which appeared in our columns last week. The Association had a good summer meeting at Cardiff, when useful and profitable discussions took place on the subjects of the rating of water undertakings and the detection and prevention of waste; and at their recent meeting in London they spent some time usefully in considering the subject of the protection of underground water. This young Society may well take credit to itself for having accomplished an excellent year's work. The session of the Institution of Civil Engineers opened in November with a very able address by the new President, Mr. James Mansergh, who made some weighty remarks on the Metropolitan Water Question which cannot fail to help forward the ultimate solution of that difficult problem. Mr. Mansergh holds with the transfer of the undertakings to a public body, but on fair arbitration terms; and the settlement of who is to be the body and what are to be the terms will, there is good reason for believing, if we may judge from recent utterances, be one of the early events in the new century. Mr. Reginald E. Middleton did some good service in reading before the Surveyors' Institution the valuable paper given in the "JOURNAL" this week. As a member of Lord Balfour's Commission, he spoke with authority, and made out a good case for utilizing to the utmost the water that lies at our feet before incurring enormous expense in going for it to Wales. At the same Institution, early in the year, Mr. J. Shiress Will, Q.C., dealt in a very able manner with the law of underground water—a subject to which Mr. Mansergh also referred in his Presidential Address. At the Society of Engineers, Dr. G. Sims Woodhead and Mr. W. J. Ware gave the members an account, in a joint paper, of the disinfection of the water-mains at Maidstone after the typhoid epidemic of 1897. Interesting questions on sanitary matters were discussed at the meeting of the British Medical Association at Ipswich, and also at the Health Congresses in Paris and in Aberdeen. At the last-named place, Dr. Percy F. Frankland suggested the creation of an Imperial Board of Health, having at its head a Minister of Cabinet rank, to undertake scientific investigations into such questions as the treatment and disposal of sewage—a matter which had been dealt with by Dr. A. C. Houston, the colleague of Dr. Frank Clowes in the bacterial experiments now being carried out by the London County Council, an interesting account of which was given by the last-named gentleman at the Society of Arts on the 12th inst. While on the subject of sewage treatment, mention must be made of the large scheme carried out at Manchester, under the advice of Dr. Frankland. Before the same Society, quite early in the year, Mr. W. O. E. Meade-King, one of the Inspectors of the Local Government Board, read a suggestive paper on "Parish Water Supply and Sewerage;" and at the Institution of Mechanical Engineers, about the same time, Mr. W. Schönherr brought before the members the important subject of the use of water-meters in checking waste. The holding in London of the annual convention of the American Society of Civil Engineers afforded Mr. Rudolph Hering, of New York, an opportunity of laying before his English professional brethren the results of his researches in connection with the filtration of water.

Among the general subjects relating to water supply and sanitation to which attention has been directed during the year is that of divination. A Commission in Paris and the Society for Psychical Research in London have been



investigating the matter; and it was deemed of sufficient importance by Mr. Mansergh to be dealt with at some length in his Inaugural Address to the Institution of Civil Engineers. But we do not know that their labours have advanced matters very much, beyond leading to the rather indefinite conclusion that there is "something in it." A good practical test of the "dowser's" power would be to start him on the work of ascertaining the extent of the "lake" which is said to exist under London; and he might also be of assistance in defining the course of underground water when the County Councils and other bodies unite their forces to endeavour to obtain some alteration in the law in regard thereto. An increase in the water-rates at Guiseley led to an outbreak of hostilities between the consumers and the suppliers when the accounts were presented. At Portsmouth, on the other hand, a voluntary reduction by the Water Company of about 15 per cent. in the water-rate, by a change in the basis of charge, averted litigation and promoted good feeling. The proximity of electric cables to water-mains has added one more to the anxieties of conductors of water undertakings, who have had to give serious attention to the effect of electrolysis on their distribution systems. Prevalence of enteric fever at Falmouth, and a somewhat sharp rebuke from a Local Government Board Inspector led to essential improvements being effected in the sewerage and water supply, and subsequently to another abortive attempt being made by the Corporation to acquire the Water Company's undertaking. The insanitary condition of Windsor evoked some strong condemnation of the Corporation and their responsible officials by another of the Board's Inspectors. A noteworthy event of the year was the outbreak of bubonic plague in Glasgow towards the end of August, especially on account of the promptitude with which the disease was grappled with, localized, and eventually stamped out.

The financial position of the London Water Companies has rather improved during the year. However, an entire share in the Adventurers' moiety of the New River Company only fetched £120,000 a few weeks ago, as compared with £122,500 at the last preceding sale.

It will have been gathered from this retrospect of the year that, while it has not been an *annus mirabilis*, it has, at all events, marked progress in several matters of interest in connection with both water supply and sanitation. We therefore enter the new century better equipped, by the experiences of the past, for attacking any obstacles standing in the way of improvement in these two important branches of the public service, on the efficiency of which depend in so large a measure the health and well-being of mankind.

Mr. W. WHYTE, of Renton, Dumbartonshire, has been appointed Manager of the Rothesay Corporation Gas-Works, in succession to Mr. J. Ballantyne, transferred to Hamilton. The only other name proposed was that of Mr. G. Keillor, jun., of Peterhead, and Mr. Whyte was elected by a majority of one.

Referring to a notice which appeared in our issue of Dec. 4, we learn that the working of the Gas-Meter Company, Limited, is now in the hands of Mr. F. W. Church, the Secretary, with Mr. Thomas Wilkins as Manager. Both gentlemen have been in the service of the Company for many years.

"Practical Lessons in Metal Turning" is the title of a little work just issued by Messrs. Dawbarn and Ward, Limited, of Farringdon Avenue, E.C. It is a handbook prepared for young engineers and amateur mechanics by Mr. Percival Marshall, who has illustrated the text with 193 original illustrations.

In a recent number of the "Comptes Rendus," the results are given of some further comparative researches by M. Gréhan on the products of combustion from incandescent gas-burners, candles, and petroleum lamps, with special reference to the quantity of carbon monoxide produced. The following are the ratios of the volumes of carbonic oxide and carbonic acid produced: Auer burners, 1:655; oil-lamps, 1:1025; and candles, 1:1610.

We learn from the current number of the "Journal of the Franklin Institute" that, in consideration of the enormous advance in the art of artificial lighting made possible by the invention of the Welsbach mantle, the Institute have awarded the Elliott Cresson Medal to Dr. Carl Auer von Welsbach, "for his discoveries regarding the metallic oxides which may become incandescent when heated, and for the invention of a mantle by the use of which these metallic oxides are commercially available as sources of artificial light." Further that, in view of the many details worked out by the Welsbach Light Company of Gloucester (N.J.), in putting a thoroughly practical mantle on the market, the Institute have awarded them the Edward Longstreth Medal of Merit.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

THE week before Christmas, generally a rather colourless period in the Stock Exchange, has this year mustered up sufficient animation to produce some changeable phases, and to render it more interesting than is often the case. It began very quietly; and attention scarcely strayed beyond the American and the Foreign Markets. This was followed by decided flatness, owing to the disagreeable news from South Africa, and apprehensions regarding money. Then suddenly the tide turned; and everything became brisk and buoyant until realizations and profit-snatching administered a sharp check, and so the week died out. The condition of the Money Market was again a dominant factor; and the question whether a rise in the Bank of England rate could be avoided on Thursday was anxiously discussed, and some relief was felt when it was found there was to be no change. But it is to be devoutly hoped that this does not merely amount to a postponement of the rise until next Thursday. Business in the Gas Market was very fairly active, all things considered; and the general tendency was decidedly good. Several issues of importance had a material improvement; but the chief of them was an exception to the rule. Good, sound Gas Stocks continue to gain in public favour, and are no doubt well worth buying at present prices. The extraordinary mildness of the season is not conducive to heavy sales of gas, and is bound to check the normal rate of increase. But a change may come at any moment, and, with sharp weather, Companies may be hard put to it to meet the demand for gas. In Gaslight issues, the ordinary was rather weaker, possibly in connection with the extraordinary general meeting; and the quotation had to give way. But the secured issues kept up. South Metropolitan was steady, without any sign of a disposition to advance. Commercial were firm at an advanced figure for the old stock. The Suburban and Provincial group showed out favourably; and Brentford old and new and Brighton ordinary had further advances. The Continental Companies were quiet but firm; and Imperial advanced. There was nothing to note among the remoter undertakings, except a small gain in Buenos Ayres debentures. The Water Companies were more than usually quiet, and with little change.

The daily operations were moderate throughout. On Monday, Imperial rose 1, Brighton ordinary  $2\frac{1}{2}$ , and Buenos Ayres debenture  $\frac{1}{2}$ . On Tuesday, Brentford old gained 5, ditto new 2, and Commercial old 2; but Gaslight ordinary fell 1. On Thursday, Brentford new advanced 3 more. In Water on Wednesday, West Middlesex rose 5, and Lambeth  $7\frac{1}{2}$  per cents. 1.

### BRITISH ELECTRICITY SUPPLY IN 1900—A RETROSPECT.

THE year's record of matters and things electrical is a very full one. It does not need the conventional electricians' trick of enumerating and multiplying lamp connections, reduced to the 8-candle unit, to show that there has been during the past year a substantial growth of the electric lighting industry. This is a fact with which the gas industry must reckon, with constantly increasing seriousness, year by year. There are few important centres of population throughout the United Kingdom at the present time in which the whilom speciality of the provision of organized artificial lighting for public and private purposes, once enjoyed by gas, has not been broken into by electricity. Outside the Metropolis, this competition in lighting has usually been entered upon by local authorities, who have, obviously, many advantages in carrying on such a business over those enjoyed by private traders. Rarely as yet have the owners of statutory gas undertakings adequately realized the revolution thus wrought in their *status* and prospects, so as to adjust their commercial methods to the altered circumstances.

Competition has not only been restored in the artificial lighting business generally, by the admission of electricity supply undertakings into gas supply areas; but the principle of competition in electricity supply itself has been confirmed in several prominent instances, according to the intentions of the Electric Lighting Acts. This policy was most conspicuously exhibited by the passing of the first English Acts for the establishment of electricity-in-bulk generating and supply undertakings. Authorities engaged in electricity supply for their own local government areas endeavoured vainly to procure the conversion of their statutory rights in this regard into an absolute monopoly. If this attempt on the part of the municipalities had succeeded, the result would have been that any petty local authority's electric lighting undertaking might have barred the way to the development over the same region of comprehensive electricity supply schemes otherwise capable of serving and linking together the centres of population of the country-side. Parliament, however, limited the privileges of isolated municipalities in this respect, and defined the conditions under which local statutory rights must give way or be adjusted to the greater interest of a larger community.

In the technics of electric lighting, the year does not mark any important advance. No new arc or incandescent lamp came into general use; and accidental extinctions, breakdowns, and fires due to defective wires and connections, were as plentiful as



ever. The rapid extension of the system of distributing lighting currents at the maximum voltage sanctioned by the Board of Trade was attended by a regrettable number of injuries to the person—sometimes fatal. Electric lighting undertakings suffered, with all manufacturing industries, from the dearth of coal and other supplies and materials; and no new mechanical means appeared to reduce the cost of generation or distribution. The most notable technical advance of the year was the growth in favour of polyphase currents. The economical side of electric lighting remains unaltered. Although demonstrably many times dearer than modern gas light, the demand for electric light increases where other considerations besides that of cost serve to recommend it. But the business of supplying it is not yet a paying one in the great majority of cases. The local authorities who thought to cheapen the cost of the lighting current by combining dust destruction with electricity generation, have been disappointed; and few electric lighting undertakings, public or private, outside the largest cities, are yet able to make ends meet, including the necessary allowance for depreciation.

It cannot be said that the supplementary employment of electric lighting currents for heating, cooking, or the generation of motive power for any important purpose has substantially grown. For many years now, electric lighting undertakings have endeavoured to improve the day load on their plant by offering current for the above-named applications at almost nominal charges—usually considerably under works' cost. The amount of business attracted in this way has hitherto been insignificant. It is reported that, in localities where the service can be fairly trusted for regularity, electric lifts are in some demand; but it cannot be truly said as yet that electric power has won its position in British mechanical engineering practice, especially where gas or hydraulic power is an available alternative. Electric house heating and cooking appliances are toys. That no apparatus of the kind has a strong economic reason for existence appears by the witness of the electrical fitting of ships. The rights of this matter can only be distinguished in cases where, as in big ship fitting, electricity gets its due appreciation, and no more for the sake of advertisement. Such an example is that afforded by the Hamburg-American Atlantic liner "Deutschland," the crack ship of the year on the Transatlantic service. The electric plant of the vessel is as big as that of a good-sized town; being capable of supplying some 2550 incandescent lamps. There are besides 70 connections for small ventilators, and 375 connections for curling-irons. The power circuits feed 23 motors, aggregating 50-horse power; and also eight electric stoves with a current consumption of 128 amperes, two water-heaters for 16 amperes, and two egg-boilers for 16 amperes. This is scarcely an extensive list of power and heating applications of electricity under exceptionally favourable conditions.

It seems to be understood that, while electric power transmission and electric driving are making fair headway in British factories—especially, as might be expected, in the newer establishments that a prosperous national trade causes to spring up on every side—in these examples the electricity is specially generated on the spot. The problem that actually awaits solution, by the several electricity-in-bulk generation schemes which were sanctioned by Parliament this year, is whether the product of these new concerns will find a better demand among power users than even the largest electric lighting undertakings, as that of the Manchester Corporation, have been able to create for their power branch. Much has been said about the prospects of the new undertakings, in the matter of distributing power among an industrial population in their homes, and to this extent superseding the factory system; but all this, and a good deal more of the same order of speculation, is "in the air."

The year is chiefly remarkable for the opening of the longest underground electric tramway in England, between the Bank of England, in the centre of the City of London, and Shepherd's Bush, on the extreme west. This line is an improvement on the older City and South London, and City and Waterloo lines, and forms an important link in the new chain of similar lines which is being projected to establish electric transit all round and across the Metropolis. These proposals will require to be systematized in the coming session of Parliament. Meanwhile, an experiment has been successfully completed at Kensington for testing the capabilities of electric traction for working the ordinary passenger trains of the Metropolitan and District Railways; and positive progress seems to have been made in settling the data by which the pending question of the application of electric traction to the complete working of a main line of railway must be determined. The early adaptation of the existing Metropolitan street tramways to electric traction was taken into the range of practical politics; and in Glasgow and other important centres of population electric tramways grew and multiplied.

To all this dazzling electric traction business, there appeared a distinct shadow—the question of the electrolysis of street gas and water mains by wandering currents. This new trouble of gas and water works engineers certainly grew nearer and more defined. Although the standard of efficient and adequate preventive measures in regard to this consequence of working tramways electrically has been set by the Board of Trade in the pioneer example of Bristol, and has been observed elsewhere, a disturbing number of shocks have been felt by men and animals in different localities served by electric tramways. These shocks ought not to occur. Where they do, they are a proof that the electricity concerned is acting *ultra vires*. It may

as easily reduce the metal of iron mains as knock down wayfarers. Parliamentary action has been taken in respect of this impending danger by the South Metropolitan Gas Company, whose interests were directly threatened by the electric tramway legislation of the year; and it is scarcely possible to formulate what further defensive measures may yet be found necessary in view of the threatened general extension of such legislation.

In view of the danger of electrolysis, which attaches peculiarly to the single overhead trolley-wire system of electric tramway working—in which the current returns through the tramway metals—it is not reassuring to reflect that no tangible progress was made during the year in the direction of superseding this dangerous system of working by something free from such risk. The surface-contact principle of electric tramway propulsion remains where it was a year ago. The underground conduit system, expensive as it is, seems to be the only means of working an electric tramway innocuously and without creating an eyesore; and even this method still wants a good deal of careful working out. The overhead trolley driving wire, with a second similar wire to convey the return current, is not a favourite with anybody. Independent electric road carriages, and especially the electric cabs put upon the London streets, driven by accumulators, have failed to keep the roads.

No noteworthy addition to the manufacturing processes depending upon electrolytic actions has to be chronicled. Carbide of calcium, for use in acetylene gas lighting, has proved to be one of the most expansive of these new electrolytic manufacturing processes—which is one of the ironies of modern industrial enterprise, seeing that every acetylene flame probably displaces an electric lamp, if it supersedes anything.

### THE USES OF TOWN HIGHWAYS AND BYE-WAYS.

FOR several months past, a considerable portion of the main thoroughfares of the City of London, and more particularly of the streets forming the ancient highway between the Cities of London and Westminster, along the northern bank of the River Thames, passing through the "village" of Charing, has been in the condition shortly and expressively designated as "up." The public using these streets in every sense have been much inconvenienced by this condition of the roadway; and naturally the references to the matter in the London newspapers have been, in Bret Harte's phrase, "frequent and painful and free." The London County Council have taken cognizance of the circumstance; and the newly-born Metropolitan Borough Councils have cried out against the Fate which reserved this trial, and sprung it upon them on the very threshold of their existence. Finally, of course, a Member of Parliament must give himself the trouble of asking the Home Secretary whether the attention of his Department has been drawn to the circumstance of the streets of London being torn up; and, if so, whether he would consider the desirability of putting such operations under the control of the Commissioner of Police. In due official phraseology, the Minister promised not to lose sight of the subject; and there the "incident" closed, so far as any Parliamentary or Government action is in question. The London County Council cannot say anything, being themselves one of the chief offenders against the amenity of the streets in respect of the beginning of their great Strand widening scheme. The time taken to make up the new part of the street does not support the presumption that the unrestricted municipal control of the roadways for all purposes would tend to minimize the amount of public inconvenience caused by operations on the subsoil.

The protests and comments of the general public and of the newspapers in regard to these street engineering works, are like the complaints of angry children when they discover that there is a nasty powder in the blandly-offered spoonful of jam. The newspaper people and the other speakers for the great dumb public incessantly clamour for "jam," in the shape of competitive supplies of electricity, Government telephones, and similar luxuries; and they never fail to be intensely amazed and angry when they learn that the provision of every additional service of the kind involves the tearing up of the streets. Then they appeal to the London County Council to "do something." There follows much talk as to the imperative necessity for the construction of subways for accommodating all the necessary pipes and wires; and the public, soothed by the talking, turn away with the aspiration that these subways might be made "at once." Such was, in sober truth, the comment of a leading London newspaper upon the last subway discussion at the County Council. Just as though a structure of the kind could be had for the asking—made "while you wait," so to speak. To read rubbish of this kind, makes one despair of the intelligence of our lay instructors on the Press. Apart altogether from every other consideration—cost, practicability, and expediency—to construct a subway in any old street would involve such a tearing-up of everything, that the way would be blocked for months. And then the British Public would write to the papers demanding to know what all this pother was about, seeing that every requisite pipe and cable was already comfortably reposing in its allotted place under the pavement.

There is not the smallest good in pointing, as is invariably done, to the success of the subways made in connection with the construction of new streets, as furnishing any reason why



the same works should be undertaken for old thoroughfares which it is practically impossible to remake from end to end. As usual in crying out for subways, the public are on the wrong scent. Not if all the main thoroughfares of London and Westminster, or of many a busy English town, were accommodated with these public service works, would the inconvenience attending their use for over-ground traffic be removed. The streets are not commodious enough, "there's the rub!" Of course, it is bad for traffic when the ubiquitous navy arrives on the busy scene, and having calmly staked out his claim in the midst of the highway, proceeds to make his occupation effective by barricading himself in and sinking a hole in the expensive paving. But this is no worse than the stopping of a parcels van outside a warehouse, or the breakdown of a cab in the middle of the road. There are always stopping vans, and carriage breakdowns, at every few yards of a busy street; whereas the accidental navy only occurs at comparatively rare intervals. All the popular vilification is reserved for the navy; whereas for one such invader of the thoroughfare in a mile, there will perhaps be half-a-dozen new shop frontages in course of construction, every one involving a procession of rubbish or materials carts, and constituting an encroachment on the already too narrow sidewalks in most streets.

In hardly an instance has the work of street widening, which is a municipal responsibility of the first order of magnitude, kept pace with the increase of population and traffic. This is one reason why, when we are asked to extend the scope of municipal activity in all sorts of directions, we object that this means of doing necessary public service has not brought itself credit in discharging the elementary duties of its position in the community. In London, especially, street accommodation has been allowed to fall sadly behind the requirements of the day. As the "Engineer" recently remarked, an increase of population of the capital from under one million to six millions in a century, is a notable fact. Sir John Wolfe Barry, in his address to the Society of Arts last year, said everything that it is necessary to say on this matter. The pity is that all the Lord Mayors of London, and other important people in the local self-government of the Metropolis, including the National Government, should have left it for an independent Engineer to say. The streets and sidewalks are not half wide enough for the traffic they have to accommodate. It is difficult, and frightfully costly, to make the structural alterations necessary to correct this shortcoming, which, as we have already remarked, is not peculiar to London. Far otherwise, indeed; for it is the necessary and natural condition of all the really ancient, notable streets in the world.

The problem thus presented by Old London, Old Paris, Old Vienna, Old Berlin, and even Old Birmingham, is open to attack in different ways which will be suggested by the names of these world-towns. A new thoroughfare altogether can be made by clearing away all the buildings along a chosen line, with the double object of creating an additional business street, and of relieving the undue pressure on the old ones; or the latter can be widened, heroically at a blow, or piecemeal. There is great variety of procedure; but essentially street widening and additions can only be effected in one of these ways. Of them, the second—the stretching of old arteries of traffic to accommodate the fuller stream of life—is at once the most desirable and the most costly and difficult. Pleasure, fashion, and trade have a tendency, too strong to be controlled, for continuing to flow in the historic and accustomed channels. Sir J. Wolfe Barry has acutely pointed out that the enormous modern development of travelling facilities between town and suburb, so far from relieving the congestion of the central region, materially increases it; for at some time or other everybody "comes to town," and always to the ancient centres of street life. Unfortunately, the Metropolitan Local Authorities did not perceive this in time; or, if they did, they sat still and made no attempt to provide for the increased volume of central street traffic circulation which has actually come about their ears.

It is of the essence of a suburb not to be self-contained; if it were, it would be a town of itself, not a suburb. Now, there are large Metropolitan areas which are fairly self-sufficing; and in many localities the main arteries of traffic happen to be of ample dimensions. Consequently, nobody feels the want of subways there. The cry for subways is only raised in regard to thoroughfares which are far too small for the ordinary traffic. This point leads to another, of very great and pressing importance. It is disappointing to find even the "Engineer" a little foggy on the subway question, and falling into the vulgar error of confusing the admitted benefit of subways made with, and for, new streets, with the problematical advantage of tunnelling (say) Fleet Street expressly for this purpose. What we claim is that, instead of charging all the expense of the tearing up of the roads for the laying of pipes and cables against the hypothetical credit of a subway, it would be fairer to charge it to the organic cause of all traffic congestion, accidental and continuous—the insufficiency of the highway itself. After the present disturbance of the Strand-Fleet Street road is at an end, the blocking of the traffic will be almost as bad. It is a mere question of degree. Six stationary hand-barrows in a mile are at least as obstructive as one navy, where there is no room for either.

We find ourselves in cordial agreement with the "Engineer," however, on the point—which has already been advanced in these columns—that it does not always follow that every new and additional service, whether in the shape of main pipes,

cables, or fast tramways, must find accommodation in the principal thoroughfares. Naturally enough, as our contemporary remarks, those who wish to run wires, or anything else, from one point to another go the shortest way, which is usually the ancient line of communication—in other words, along the principal thoroughfares. The point sought to be made in this regard is, that in future any such disturbance of a main thoroughfare should be specially justified. Otherwise, use should be made of a convenient bye-street. It is rather curious that our esteemed contemporary should have been led to join in the general praise of subways, and to propose the bye-street route for trunk mains, by what is happening in Fleet Street, because this ancient highway has no parallels north or south; and to propose making a subway under it is confessedly impossible. Although few ancient thoroughfares are paralleled by equally direct bye-ways, in London or elsewhere, unquestionably this condition often prevails in relation to the more modern town areas which are laid out more or less on the "gridiron" plan. Here, at least, the requirement to use the less busy side streets for through mains and express tramway traffic might reasonably be laid down as being compulsory.

This expedient has been recommended in the "JOURNAL" as a possible device for providing some English towns, including London, with fast-running electric tramcars, without interfering with the main thoroughfares. It has several noteworthy recommendations—assuming, of course, that the prime essential of parallel streets exists. Anyone who will take a tram-ride through one or all of the great South or North London main roads, will perceive that the slow-moving horses have often to be pulled up on account of the still slower-moving general traffic. In order to do justice to itself, an electric tramway needs a clear course; and this it cannot have on the main roads within miles of the Elephant and Castle, or any similar centre. Every timber waggon or coal cart will dispute the right of way with it. There is no such press of miscellaneous, and very heavy, traffic in other places where electric tramway traction answers best. In these conditions, therefore, the fast electric tramway ought to be an addition to the ordinary main-road service, running from one fixed stopping-place to another, through the side streets. There is another consideration favouring the adoption of the same plan—the avoidance of electrolytic injury to the mains in the principal road. Generally speaking, the leading gas and water mains are in the high roads—not invariably, because of late years quieter thoroughfares, less expensively paved, have been made use of for their accommodation, where possible. Still, there are, at any rate, very important mains in all the chief arteries of traffic, and they have been there for many years—since a period when electric tramway working was never dreamt of. It will be a hazardous thing to risk the scattering of electrolytic currents unnecessarily in these old thoroughfares. Who knows how materially the natural dissolution of these old public servants may be hastened by this means? No such risk ought to be run, save under the strongest compulsion of necessity.

We know better than to ask impossible things in this respect. What we do protest is against the heedless assumption that electric surface, or deep-level transit facilities, must necessarily follow the lines of the main thoroughfares where another course is available. It has already been remarked that exact parallels with ancient thoroughfares are not often found. This is because the original makers of these roads naturally took the nearest route, and had no occasion to duplicate the track. They were, however, very prone to make short-cuts, diagonally, "across country," from one central point to another. Sometimes these short-cuts became leading thoroughfares; but very often they remained undeveloped and in bad repute, for various reasons. Their existence, however, can often be traced on a map of any ancient town. London is burrowed through and through with them; and at the present day a man who knows his London well enough, will get from one end of the City to the other, through quiet bye-ways, with a saving of time and of buffetings as compared with the transit by the high-roads. The American "gridiron" plan of city building would never have commended itself to the early town dweller. He would have missed his diagonals sadly. Where these ancient short-cuts exist, it might be possible to restore them to their original time-saving use.

One sees by all these considerations, which are not by any means exhaustive, that the subway cannot be the panacea for all the woes of the wayfarer when the streets he favours are "up." A great deal more might be advanced, on the same side of the question; but enough has perhaps been said for once. Meanwhile, it should hardly be necessary to observe that those who have a statutory right to the use of the subsoil of the streets owe it to the public to exercise these rights in the most considerate and least objectionable manner open to them in their various circumstances, and especially to be quick over it.

The manufacture of sulphate of ammonia from gas liquor was at one time suspected of being the cause of what are called the odours of Paris. As the Paris Gas Company's (La Villette) works are close to the Aubervilliers sewage farm, there was some reason for doubting this. However, investigations made in the neighbourhood of isolated gas-works have entirely dispelled the idea. At the coke-ovens of Lens, for example, the output of which is about 10 metric tons of sulphate day, no odour resembling that of Paris is perceived.



## THE WORKMEN'S COMPENSATION ACT AND CASUAL LABOURERS.

IN its recent decisions on appeals under the Workmen's Compensation Act (which were referred to in our "Editorial Notes" last week), the House of Lords has once more justified its position as the final Court of Appeal; and the Law Lords have furnished another proof of their capacity to give a common-sense interpretation of the statute law. The judgments in the cases of *Lysons v. Andrew Knowles and Sons, Limited*, and *Stuart v. Nixon and Bruce*, will be welcomed by all who desire to see the Workmen's Compensation Act construed on the lines of its obvious intentions and meaning, rather than in that spirit of super-subtle literalness which seems at times to obscure the intelligence of our lawyers. The comments made in these columns last March on the judgment of the Court of Appeal in the first of the two cases named, showed clearly enough our dissatisfaction therewith. The facts of the case are probably within the recollection of our readers.

The plaintiff was a miner in the employ of the defendants, and was incapacitated from work by accidental injury on the second day he was on duty in their colliery. The County Court Judge awarded him compensation under the Act; but the Court of Appeal held that, the plaintiff not having been in the service of the defendants for two weeks, it was impossible to ascertain the amount of his "average weekly earnings," as provided in the first schedule of the Act. On this ground, therefore, the Court held that no workman could be granted compensation in respect of an injury received during the first two weeks of his employment. They subsequently (and consequently) held, in the case of *Stuart v. Nixon and Bruce*, that the dependants of a workman accidentally killed in the course of his employment, who had only been continuously employed by the defendants for four days prior to the accident, were not entitled to compensation under the Act.

These decisions, as we pointed out at the time, excluded from the benefits of the law of 1897 the very numerous body of casual labourers who, especially at the Docks, are rarely in the service of the same masters for more than a few days together. We also remarked that they would have the effect of denying to the winter hands taken on every year by gas companies the legal right to compensation for accidents occurring within the first fortnight of their engagement. That any companies would avail themselves of such a strict, and, as it then appeared, and has now been held to be, an inaccurate interpretation of the law, we refused to believe; but it is to be regretted that one at least of the leading gas undertakings has adopted the narrower-minded view. There are some people who can never appreciate the wisdom—to put it on the lowest ground—of preferring justice to law, where the legal obligation does not, according to their view, equal the moral.

Fortunately, however, the House of Lords have now decided that, in the cases in point, the legal and the moral obligations coincide. Their judgment is to the effect that the substantive intention and meaning of the Act is "that compensation should be given to every workman in certain places when the injury happened to him in the course of his employment," unless his incapacity for work did not last beyond fourteen days. Lord Halsbury made short work of the point that the compensation is to be in accordance with the provisions of the first schedule of the Act; that the schedule provides for payments based on "average weekly earnings;" and that if the workman were not employed for at least two weeks, his weekly earnings could not be averaged. He took the view that the obvious intention of the Act was to establish a relation between the compensation to be granted and the man's earnings; and that the words "average weekly earnings" were inserted in the schedule solely for the purpose of establishing this relation, and not in the least for the purpose of limiting or cutting down the right to compensation contained in the sections of the Act. He was of opinion that there was in the schedule no repeal of a right which had first been granted; and that, if it were impossible to ascertain a man's "average weekly earnings," arbitration or some other means of determining the amount to be paid might be taken. This is obviously justice; and it will be admitted by everyone to be a more worthy interpretation of the law than that given by the Court of Appeal.

The remarks made by Lords Halsbury and Davey in delivering their judgments have been hailed with delight by those whose political partisanship leads them to decry the merits of the Workmen's Compensation Act. The assertion of the Lord Chancellor that it was impossible not to recognize that the Act presents difficulties of language and construction, and that words have been used which perhaps are not the best chosen for the solution of the problem which lay before the Legislature, is acclaimed by the critics as final proof that the authors of the Act were incompetents. Why, what Act is there upon the Statute-Book dealing with infinitely variable circumstances affecting some millions of people, of which the same might not be said? Are there, for instance, no difficulties of language and construction in the Companies Acts? It is absurd to single out from all the statutes that, in the process of their interpretation, give so much employment to the legal profession, one measure in particular, simply because the statesman chiefly associated with its enactment is one round whose personality party conflict

rages with unusual acrimony. The Workmen's Compensation Act, like many others, needs amendment in some details; but this neither proves its failure nor does it counterbalance its far-reaching benefits.

## SIR LOWTHIAN BELL AND OTHERS ON FOREIGN COMPETITION—THE DANGERS OF SELF-SATISFACTION.

EXPERTS and journalists—terms, unfortunately, rarely synonymous—still differ widely as to the possibilities and probabilities of American iron and steel goods to any material extent displacing English in our home and foreign markets; as to whether there are any grounds for the charges brought against manufacturers in this country of being behind their rivals in methods of production and distribution; and as to whether England or the States possesses the greater natural advantages. The reviews are full of interesting and mutually contradictory articles. The journals of the engineering profession and of the iron trade take, some the optimistic—all's for the best in the best of all possible business communities—view, others the pessimistic; while still others take the intermediate line that we have probably got something to learn from our fellow competitors, but that we may be depended upon to learn it sooner or later.

Earlier in the year, we commented at some length upon a series of articles that appeared in "The Times," from the pen of a special correspondent who had made a personal inspection of the principal engineering works in the States. That correspondent avowedly laid the most stress upon those points in which he considered that the Yankee manufacturer excelled, or had the advantage of, his English competitor. The articles in which he embodied the results of his observations have been bitterly resented in some quarters, because the correspondent did not catalogue nor emphasize the points in favour of, and creditable to, the manufacturers in this country. The resentment is quite unjustified; for the purpose of the articles was to draw the attention of English manufacturers, not to those particulars in which their methods are beyond question the best, but to the advantages which they might add to those they already possess, and to the nature of the competition they must expect to encounter in the future. In our opinion, a debt of gratitude is due from the engineers of this country to "The Times" for their enterprise in obtaining so excellent a first-hand account of what is being done on the other side of the Atlantic.

Sir Isaac Lowthian Bell, whose long and distinguished connection with the iron trade claims respect for his opinion, has taken up the cudgels on behalf of his English brethren, both in the columns of "The Times" and, more recently, in his address to the Institution of Junior Engineers; but we cannot say he has altogether succeeded in making good his contention that the competition of American manufactures need not really be taken seriously by the producers in this country. Sir Lowthian stated in the address to which we have referred that he had not been in America himself since 1890; and that fact does not strengthen his position in combating the statements of one who has made exhaustive inquiries and investigations there as recently as last year. Events have, moreover, certainly justified the contention of "The Times" correspondent that we should witness a very considerable influx of American iron and steel into this country so soon as production in the States exceeded the demand. That such an influx has commenced is shown by the fact that, while the total imports of unwrought steel into this country in 1899 equalled 77,290 tons—a figure nearly double the previous highest, and twelve times the tonnage imported in 1892—for the first ten months of this year, the quantity of unwrought steel imported from the United States alone equalled 96,011 tons; and by the end of the year it will probably exceed 140,000 tons. These figures are worth a good deal of surmise; and they speak of the English market only. The growth of the imports of American goods into the Australasian Colonies is far more remarkable. We shall not easily displace those goods with others of our own manufacture.

Sir Lowthian Bell's address has served to demonstrate the differing opinions and attitudes of the engineering journals very strikingly; the "Engineer" and "Engineering" both devoting editorial articles to the subject on Friday week—the one expressing satisfaction with the address and with the position of the English manufacturer as complete as the dissatisfaction expressed by the other. The "Engineer" takes the line of argument so favoured by all criticized persons—namely, that of denying what was never alleged. Our contemporary evidently has in mind the articles of "The Times" correspondent when it speaks of "men who have permitted themselves to be carried away and overpowered by American effusiveness of talk, of hospitality, and of size—there is something very telling in a big works, and our friends across the water are quite aware of the fact"—yet it says that "nothing has been too bad" for such men to say of "those whose skill, industry, and enterprise have made Great Britain the wonder and envy of the world. Their machinery is bad; their methods antiquated; their enterprise lacking; their skill a thing of the past." So far, at any rate as "The Times" correspondent is concerned, these remarks are quite unjustified. He distinctly refrained from condemning English engineers root and branch. He merely pointed out where they appeared to be surpassed in ingenuity or methods by their



competitors. Some people appear to resent any criticism or suggestion as something in the nature of an insult.

This attitude is always a very unfortunate one to adopt, and never more so than at the present time; and that Sir Lowthian Bell should preach self-sufficiency to the rising generation of engineers is equally regrettable. As our contemporary "Engineering" says, "it is not wholesome food for junior engineers. It is a national vice—to which we of Great Britain have always been prone—to undervalue our foes. We have suffered bitterly for it in the past, time and again, by sacrifice of blood and treasure in the field of battle; and now it is endangering our commercial supremacy. We comfort ourselves with belated official returns and statistics which record only the past; blind to the gigantic engines of competition abroad that have only of late been called into existence, and which are already casting their long shadows forward on our manufacturing industry. He is on friend to the coming generation of English engineers—the juniors of the profession—who blinds their eyes to these portents of future industrial strife. That the uneducated leaders of working men should, for their own purposes, describe 'foreign competition' as a 'bogy' is to be understood; but for educated masters of industry to do so should be hardly conceivable, though unfortunately we have evidence to the contrary."

Surely this is quite the right line to take. What would have become of the gas industry if, when the competition of electric light first threatened its supremacy, and many cried aloud for gas makers to bestir themselves to see where economies could be introduced, where better methods could be adopted, and where fresh processes could be brought into use, the leaders of the profession had counselled its members (and they had agreed to treat with contempt those suggestions, and to dwell self-complacently upon their past achievements? The present position of the gas industry is due to those who recognized and faced the danger, and has been reached in spite of those who affected for long to ignore it; and the manufacturers of this country will maintain their rank in the commercial world only by obtaining a clear perception of the difficulties of their task, and by manfully tackling them. We have never expressed any doubt as to the ultimate result of the contest; what is needed is that it should be early recognized as inevitable.

Happily, Sir Lowthian Bell's contempt for the competition of other countries is not shared by the leading members of the engineering profession. Mr. W. H. Panton, of the firm of Messrs. Dorman, Long, and Co. (who have the contracts for the enormous amount of structural steelwork required by the Westinghouse Company for their new works), took a very different view of the situation in his presidential address to the Cleveland Institution of Engineers. He remarked—

Whereas thirty or forty years ago England was the workshop of the world, now we have fallen back in the race; and, unless we mend our ways, we shall be out of it altogether. Both on the Continent and in America they have gone far ahead of us. I have, during the last few years, visited all the important Continental and American works, and I have witnessed this for myself with no little regret. We English are far too easily satisfied. I am inclined to think that if some of the self-satisfied ones saw what is being done abroad, a good deal of their self-esteem would disappear. I am afraid it goes from top to bottom. When the average English manufacturer has made what he thinks a fortune, he buys an estate and becomes a country gentleman. The manager, as soon as he has put 25 per cent. on the output of his works, slaps his sides and thinks he has done very well, and will leave well alone. The workman, when he gets more money than he did before, does not try to do as much as he can, because he is frightened he will "spoil the job." The American ironmaster, on the other hand, puts his millions into new works; and his ambition is to be a greater "prince of industry" than he is. The managers vie with one another in "breaking records," and are very openhanded in helping each other, and laugh at "trade secrets." The workmen do their best to turn out as much as possible. They know that the more they turn out, the more money they will get; and the more prosperous the undertaking with which they are connected, the better it is for themselves. It is a good thing for us that the broad Atlantic Ocean is between us and America, or we should be having a sorry time of it. Even as it is, American steel is coming to all parts of Great Britain.

We have made this long quotation from Mr. Panton's address because there is a good deal therein which gas engineers, managers, and men, might well ponder. "We are too easily satisfied." Over how many works' gates and managers' offices might that not be written! As we said the other day, there are some gas engineers, so called, who are satisfied so long as their works never come to grief; but all too many of those of far higher ability are much too easily satisfied. Who is the most successful gas manager of the present day? A man who is never satisfied. The same answer will be found to apply to the question of who is the most successful man in any profession or walk in life. A ceaseless striving after improvement is absolutely vital to any industry subject to competition. That is the lesson that Sir Lowthian Bell should strive to instil into the minds of junior engineers—his own career is a proof of its truth. Self-satisfaction is only too easily acquired, and needs no apostle.

It remains to be seen whether British manufacturers will be satisfied to lag behind their competitors; we doubt it. But there is a good deal of leeway to make up, and a good deal of labour trouble to face; for our workmen are far from grasping the fact that "the more prosperous the undertaking with which they are connected, the better it is for themselves." It is, however, a good thing for all concerned, both producers as well as consumers, that the competition, not only of America but of Germany, has to be encountered; for it will stimulate enterprise, inventiveness, and business capacity in the future, and will tend to the moderation of prices.

## MOTIVE POWER FROM BLAST-FURNACE GASES.

Of the various problems which will present themselves to the mechanical engineer for solution in the early years of the new century, two of the most important will be how to employ to the greatest advantage the sources of power now in his possession, and find others which will be available as auxiliaries. It is acknowledged that at the present time there is much latent force still undeveloped; and its discovery and profitable utilization unquestionably present a promising field for the labours of the investigator. Much has been done in the past, but more remains to be accomplished. Let us take the source of power with which readers of the "JOURNAL" are chiefly interested—viz., coal gas. Five-and-thirty years ago, this fuel was employed in driving about 150 engines of the Lenoir type in Paris. At the close of last year, there were 2989 gas-motors in use in the city and the surrounding communes, furnishing about 12,600-horse power; and by this time the number is doubtless well over 3000. In other cities, the extended use of this convenient form of motive power has been equally, if not even more striking. Gas having established itself as a rival to steam, attention was turned to its more economical production. One of the earliest workers in this direction was Mr. J. Emerson Dowson, who successfully manufactured from anthracite or coke a gas which was found to be a good substitute for the coal gas generally employed. The recognition of the fact that producer gas could be used for driving engines led to consideration being given to the utilization for this purpose of the gases generated on so large a scale by blast-furnaces—their quality being only slightly lower than that of producer gas. The idea was first turned to practical account about six years ago; and the great progress already made justifies the belief, according to no less an authority than Mr. Bryan Donkin, that in these gases we have a "new, cheap, and most valuable power agent." This opinion is enunciated in the opening paragraph of an article in the current number of the "Engineering Magazine," extracts from which will doubtless interest readers, in view of the project for supplying power gas in the Midlands, to which reference has been made in our columns.

Mr. Donkin begins by summarizing as follows the successive steps taken in utilizing what he prefers to call "high-furnace" gases: "Thirty years ago they were considered of no value, and were often burnt off at the mouth of the furnaces. They were next partially used, by retaining a portion to heat the air for the blast and burning a larger proportion under boilers to generate steam for driving the blowing-engines. No attempt was made to burn the gases economically, and a considerable quantity was wasted. In 1894, attempts were made at Wishaw (near Glasgow), at Seraing in Belgium, and at Hörde in Germany, to explode them in an engine cylinder, in the same way as producer gas, instead of under boilers." These several pioneer efforts were attended, he tells us, with complete success. It was found that, when thus utilized, the quantity required was only a fifth of that needed when burnt under the old system.

At the outset, the difficulties to be overcome appeared almost insuperable. First of all, complaint was made that the gases were too poor to be ignited in an engine cylinder; then it was said that they were too variable in composition and pressure, that their temperature was too high, and that they were so dust-laden that they would clog the working parts of an engine. All these objections have been met, removed, and turned to account by modern science and intelligent engineers. The low heating value of these gases is due to the small proportion—26 or 27 per cent.—of combustible gases, chiefly carbonic oxide, the rest being inert nitrogen. The calorific values of these gases range from 102 to 112 British thermal units per cubic foot, as compared with 140 to 150 units in ordinary producer gas, and 500 to 600 units in illuminating gas. Nevertheless, Mr. Donkin tells us that, "singular as it may appear, high-furnace gases give, in the few trials yet published, a higher thermal efficiency than either of the other two kinds; as much as 31 per cent. of the heat given to the engine having been converted at Seraing into work." This satisfactory result is, he says, obtained in two ways: "In the first place, the proportion of air admitted to mix with the gases and form an explosive charge is much reduced. . . . For lighting gas the ratio is about 8 to 1; for power gas, 1.4 to 1; while with high-furnace gases the size of the air and gas valves must be so adjusted that about equal quantities of both are admitted to the cylinder." The low heating value of the gases can be remedied by more highly compressing the charge prior to ignition.

Possibly the most important objection to the use of blast-furnace gases is the amount of dust they contain. Mr. Donkin acknowledges that this is still a difficulty, and it requires to be met in different ways for each furnace treated; for in no two iron-works are the gases exactly the same. According to an estimate of Professor Witz, when they leave the furnace, they contain 125 grammes, or 187.5 grains, per cubic metre (35.3 cubic feet). Of this quantity about 100 grammes are heavy metallic dust, which is deposited automatically in the pipes and passages, and usually returned to the furnaces. Nearly all the remaining 25 grammes are got rid of in the purifiers and scrubbers; and from 2 to 3 grammes per cubic metre remain in the gas when it reaches the engine cylinder, and are blown out with the exhaust. At Seraing, Mr. Donkin collected some of the dust, which he found fine and soft to the touch, like flour—not gritty,



like sand. It is this residuum which has been considered so deleterious, and likely to attack the working parts of the engine. But we are assured by the author that this difficulty can be overcome by the high compression that is exerted and the high speed attained by the motor piston.

In connection with blast-furnace operations, Mr. Donkin clearly shows that there are two sources of power which are at present more or less wasted—viz., the surplus store of gases going to waste in the atmosphere, after the needs of the furnaces have been supplied, and the imperfect utilization of those now burnt under boilers, when power might be generated from them by direct combustion in a gas-engine. The usual standard of working blast-furnaces is about one ton of coke burnt per ton of iron made. From 160,000 to 180,000 cubic feet of furnace gases are produced per ton of iron smelted or per ton of fuel burnt. This quantity may be divided as follows: Waste, 16,000 cubic feet, or 10 per cent.; to heat the air-blast, 44,800 cubic feet, or 28 per cent.; burnt under boilers, 64,000 cubic feet, or 40 per cent.; available surplus, 35,200 cubic feet, or 22 per cent. Assuming that 10,000,000 tons of fuel are burnt annually in blast-furnaces in Great Britain, this gives about 2,000,000-horse power wasted, which might be converted into useful work. From a furnace in regular work, about 10-horse power may be obtained weekly per ton of fuel burnt.

The quantity of gases generated in blast-furnaces is so great that the largest engines are required to utilize them. But most of the important German and Belgian firms now make them up to 1000 or 1500 horse power for working with these gases. Mr. Donkin says England is still much behind in this respect. It was, however, in this country that the first attempts were made to usefully employ blast-furnace gases—Mr. B. H. Thwaite having, in 1894, proposed to utilize them in a gas-engine; and he took out a patent for their treatment. The first engine driven with these gases was a four-cycle "Acme," started in February, 1895, at the Wishaw Iron-Works; its consumption being about 84 cubic feet per indicated horse power per hour. There are only a few other installations in England. Abroad, however, the subject has been more carefully and thoroughly studied, and nowhere more successfully than at the important Cockerill Iron-Works at Seraing. On their labours, Mr. Donkin makes the following remarks:—

This enterprising firm worked independently of the English makers, and in December, 1895, applied some of the gases from their great furnaces, of which they have six, to drive an 8-horse power "Simplex" engine. The discovery that high-furnace gases could be thus utilized was made almost accidentally, while testing the motor with power gas; and it was the first engine driven with gases generated from coke. It is a four-cycle engine resembling the Otto, but with electric ignition, and made with only a single cylinder. The gas had a heating value (taking the water as condensed), of 110 British thermal units per cubic foot, and the consumption at half load was 187 cubic feet per horse-power-hour. Encouraged by this success, the Society in 1898 started a larger "Simplex" engine, indicating from 150 to 200 horse power, and driving an air compressor, which was tested by Professor Witz in July of the same year. This motor, which has now been running successfully for more than two years, and which I saw at work, has a cylinder of a diameter of 31½ inches, with a 39½-inch stroke. The speed during the trial was 105 revolutions per minute. The work shown on the brake was 181-horse power; mechanical efficiency, 85 per cent.; thermal efficiency, taking the brake horse power, 20 per cent.; consumption of high-furnace gases, about 116½ cubic feet per brake horse power. The result was considered so satisfactory that engines on a much larger scale were planned, and have now been started and tested. Upon this fine power plant—the largest on which trials have yet been made—experiments were carried out at the Seraing works in the spring of this year (1900). The engine is connected direct to the blowing cylinder. Diameter of the engine cylinder, 4 ft. 3 in.; stroke, 4 ft. 7 in.; diameter of the air cylinder, 5 ft. 7 in.; stroke, 4 ft. 7 in.; length of the connecting-rod joining the two cylinders, 14 ft. 5 in.; diameter, 11½ inches. The experiments were carried out on two consecutive days. In the first day's trial, the engine was tested with a brake, without the blowing cylinder, and gave 573 brake horse power, with a consumption of 123½ cubic feet of gas per brake horse-power-hour. Mechanical efficiency, 72 per cent.; thermal efficiency, taking the brake horse power, 20 per cent. On the second day the engine was coupled to the blower, and gave 886 indicated horse power and 725 brake horse power, with a gas consumption of 101 cubic feet per brake horse-power-hour. The thermal efficiency, taking the indicated horse power, was 31½ per cent.

The Hörde Iron-Works, in Westphalia, were the first in Germany to start a gas-engine driven with blast-furnace gases. In 1895, they began experiments on a 12-horse power Otto engine, in which the consumption was 141 cubic feet of gas per brake horse-power-hour. Then they proceeded to motors of larger size, and selected one of a new type—viz., a two-cycle Oechelhäuser—for their work. This engine seems, the author says, to be especially well adapted for use with blast-furnace gases, with which alone it has hitherto been worked; and several large plants have been ordered. It is, however, on an engine of the ordinary Otto type that one of the best trials yet published has been made—viz., those carried out by Professor Meyer, at Differdingen, in Luxemburg, in 1898. The heating value of the gas was 105 British thermal units per cubic foot; the diameter of the cylinder, 17 inches; the stroke, 27½ inches; and the average speed, 161 revolutions per minute. The engine indicated 79½-horse power, with a consumption of 79½ cubic feet per indicated horse-power-hour. As it was coupled direct to a dynamo, the brake horse power was determined from the electrical instruments and taken at 65½, and the consumption of gas per electrical horse power per hour, 96½ cubic feet. The thermal efficiency, taking the indicated horse power, was 30½ per cent.; taking the electrical horse power, 25 per cent. Mr. Donkin stated that this is one of the most complete trials made with these gases; and the results with so comparatively small an engine are, he considers,

very satisfactory. The utilization of blast-furnace gases in gas-engines has been fairly started in Germany and Belgium on what can scarcely fail, he thinks, to be a prosperous course. He has seen many plants running, and is of opinion that there is a great future for this work, especially for gas-engines of large power.

### PERSONAL.

#### THE NEW SECRETARY OF THE BIRMINGHAM CORPORATION GAS DEPARTMENT.

The successor of Mr. Edwin Smith in the important office of Secretary to the Birmingham Corporation Gas Department was appointed by the Gas Committee last Wednesday; the candidate who secured their preference being Mr. G. HAMPTON BARBER, of Birmingham, to whom we express our congratulations and best wishes for success in his new sphere of labour. The Committee have had a difficult, delicate, and unenviable task in fixing their choice. There was the responsibility of the office on the one hand, and, on the other, so many of the gentlemen who applied possessed qualifications which demanded respectful and grave consideration. Altogether there were 120 applicants, and from these a Special Sub-Committee made a selection of nine gentlemen; and these were further reduced to three—Mr. Andresen, of the Imperial Continental Gas Association; Mr. Hampton Barber; and Mr. George Clarry, of Cardiff. These gentlemen were interviewed last Wednesday by the Committee, who unanimously resolved to appoint Mr. Barber. The office carries a present salary of £1000 per annum.

Mr. Barber, who is 41 years of age, is well known in Birmingham. In his application for the position, he set forth the fact that as a young man he spent four years in the shops of an engineer, and there acquired some knowledge of mechanical construction. But when nineteen years of age—in 1878—he forsook engineering and entered the Treasurer's office of the Liverpool United Gaslight Company. He remained in the service of the Company for nearly twelve years, and during this time passed through the departments having to do with mains, service-pipes, stores, orders for supplies, gas-rentals, public lighting, residuals, and accountancy. He thus gained an extensive knowledge of the Company's business with 60,000 consumers. For the Accountant's Department he was specially selected by the Treasurer; and he prepared the accounts in accordance with the requirements of the Board of Trade, and also the statistics for the Treasurer's guidance in the control of the finances, involving a capital of nearly two millions sterling. As book-keeper he scrutinized and dissected all accounts, and supervised the work of the clerical staff of over one hundred. His position also gave him knowledge of the coal, coke, and chemical markets, and experience in dealing with consumers of gas and coke and other residuals, specifically ammoniacal liquor on sliding-scale contracts. Having achieved this position at thirty-one years of age, and believing that his future advancement with the Company would be slow, there being only one position which he regarded as superior to his own in the Treasurer's Department, he decided to engage in insurance work, and he was ultimately selected by the Mutual Life Assurance Company of New York to organize and superintend their agencies in the Provinces. In his new occupation he made a study of insurance; and three years ago he established in Birmingham the Midland Employers Mutual Assurance Association, Limited, which is a special local combination called into existence owing to the passing of the Workmen's Compensation Act and the high rates for insurance which were at first demanded by the ordinary offices. Since then, a fire insurance scheme, also on the mutual system, has been carried to success; Mr. Barber managing both businesses. His testimonials included letters from the Directors of these concerns, and from Colonel Robinson, the Treasurer, and Mr. William King, the Engineer, of the Liverpool United Gas Company. The recommendations of the latter gentlemen doubtless had great influence with the Committee.

After more than thirty years' successful management of the Kirkburton Gas-Works, Mr. DAVID STOTT SHAW has felt compelled to send in his resignation; and Mr. W. BREARLEY, who has been in the service of the Elland-cum-Greetland Gas Company for about nine years, has been selected out of a large number of applicants, as his successor.

Mr. J. M'CUBBIN, Engineer and Manager of the Chorley Corporation Gas-Works, has been appointed Resident Engineer to the Hong Kong and China Gas Company; and he will leave England to take up his new duties about the middle of February. Applications for the position were invited in the "JOURNAL" for the 13th ult. Mr. M'Cubbin went to Chorley in 1896, in succession to Mr. R. Fearnley, who had resigned. Prior to that he was Assistant-Manager at the Greenock Gas-Works.

In connection with the Paris Exhibition, M. EUGENE LEBON, a Past-President of the Société Technique du Gaz en France, President of the Organizing Committee for the collective gas exhibit at the Exhibition, and Managing-Director of the Compagnie Centrale du Gaz, has been promoted to the grade of officer of the Legion of Honour; and M. JOAQUIM-ARMAND BENGEL, manufacturer of gas and electrical appliances, the President of the Jury in Class 75 (gas-fittings and other lighting apparatus), to the grade of Chevalier.



## NOTES.

## The Proper Fuel Rating for Gas-Engines.

Writing in the current number of "Cassier's Magazine," Mr. A. D. Adams points out that, in generalizing upon the subject of the relative claims of steam and gas engines for industrial purposes, the champions of each type of motor are sometimes content to centre the issue upon the question of their thermodynamic efficiency alone. It is, in fact, the only common ground upon which they can meet, for the prices of fuel, upon which the commercial efficiency depends, are inseparable from purely local conditions. He goes on to show that, in making comparisons of this kind, we must take a unit weight of coal or fuel, and ascertain how much of its thermal energy is actually delivered in the form of mechanical energy at the shaft of the motor, as measured by a brake applied at that point. By so doing, we embrace all possible losses occurring during the transformation from one form of energy to another. However interesting it may be to be able to assign certain fractions of the total loss to special parts of the transforming apparatus, it is quite irrelevant to our purpose; for when the commercial economy of the plant, as a whole, is under consideration, we are concerned only with the total loss of energy in the system. The gas-engine is generally placed at a disadvantage unless the foregoing considerations are regarded. It is quite customary to state the performance of a steam plant in so many pounds of coal per horse power per hour. One often hears of gas-engine power being expressed in cubic feet of gas, which would be valuable if the calorific value of the gas were always known. It would be equally indefinite to express the work of a steam-engine in so many horse power for a given number of cubic feet of steam, without stating the pressure in pounds per square inch and the percentage of moisture in the steam. Even if the work of both forms of motor were expressed in so many horse power per pound of coal, it would not necessarily mean that they were placed upon the same basis for comparison. Some kinds of coal are better for making steam than others, and there is also a difference in the amount and quality of the gas to be obtained from coal of different kinds and price.

## The Position of Ventilation Outlets.

Writing to the "Engineer" on the subject of the ventilation of occupied rooms and public halls, Mr. Wheeler remarks that all men in this business find out sooner or later that it is the movement of the air in the room or building that is the chief thing to study; while the means to produce and sustain the air movement have to be chosen and arranged to suit the user. He broadly divides all ventilation into two classes—warming combined with ventilation in winter, and ventilation for cooling in summer. The first class must have an apparatus for warming the fresh air; but no special cooling plant is required for summer use, as an induced briskness of movement is sufficient to produce the desired effect. In both classes, the position of the air-outlet affects the result far and away more than that of the inlet. For winter use, the outlet should be near the floor, in an ordinary room; while for summer ventilation, it should be above the people's heads, but not necessarily at the ceiling-level. It should not be more than 5 feet above them, because it is the air at breathing-level that must be removed and renewed. That far overhead does not matter. The reason for the alteration of the position of the outlet lies in the temperature of the outside walls. In summer these walls are warm, often hot; and they warm by contact the already warm air in the room, causing it to ascend. If it cannot escape by some outlet aloft, it will travel along the ceiling until it finds some wall not so hot as the others, by which it is cooled enough to descend; and a continuous circulation of the air inside a room is thus set up and kept going. In winter, the conditions are exactly reversed. The cold outer walls now chill the air inside, and there is a down current at the walls and the windows. Consequently, the outlet must be at the skirting, so that it draws off the chilled air. An upper outlet requires in winter 30 per cent. more fuel to keep the interior warm; while the distribution of the air is not equal to that with the low outlet. In public buildings, floor-outlets are not convenient, and a horizontal current over the people's heads from inlet to outlet will be found to give the best results.

## Governing the Speed of Gas-Engines.

It is pretty generally acknowledged that the requirements to which a motor must conform at the present time are more exacting than they were formerly, both in regard to economy of fuel and regulation of speed. The introduction of the dynamo, and the rapidly increasing demand for motors adapted to the driving of alternators in parallel, have been met by a high degree of excellence in the governing attachments on gas-engines. This is recognized by Mr. Robert S. Ball, jun., in an article on the above subject in the current number of "Cassier's Magazine." He points out that difficulties of a very serious nature had to be overcome to give the gas-engine good speed regulation. The force of the explosion occurring once during every two or more revolutions of the crank in single-cylinder engines was smoothed by extra heavy fly-wheels. The governing mechanism has not been changed to any extent from the well-known centrifugal principle used in governing steam-engines; but the methods by which the centrifugal action of the governor balls or weights

operates to alter the speed of the engine somewhat different from the cut-off or throttling mechanism used with steam-valves. One method consists of allowing the engine to miss an explosion by the simple expedient of cutting off the supply of explosive mixture. This is attended with all the disadvantages of coarse governing; for small fluctuations in speed exercise through the governor a somewhat violent change in the amount of energy imparted to the motor. Another system which has found practical acceptance is to alter the quality of the mixture by the regulation of the air and gas valves. It is difficult by such a method to ensure that the impulse given to the engine by the varying quality of the explosive mixture shall be of the desired intensity. A heavy fly-wheel will allay, to some extent, the results of gauging the mixture inaccurately; but extra weight thus added is a poor expedient to adopt for the purpose of covering up the defects of regulating the admission. It is less a matter of uncertainty to vary the amount of mixed gases entering the cylinder than to tamper with the quality of the mixture through the movement of the governor. In engines worked on this principle, the valve under control of the governor varies the supply of gases in the same manner as the throttle-valve of a steam-engine regulates the supply of steam. The result is a varied compression or density at the time of ignition, and a proportionate impulse after explosion. These methods explain in a general way the up-to-date practice of gas-engine regulation; and the results obtained answer the exacting specifications of electrical engineers and others to whom close regulation is an essential requirement.

## COMMUNICATED ARTICLE.

## THE FUTURE OF THE GAS PROFESSION.

BY ONE OF THE PAST.

(Concluded from p. 1509.)

Another question that crops up at intervals is one which, in the interests of the gas industry, should be well thrashed out, and that is the position as regards outside or opposing interests. Is it right or desirable that a director or committeeman should be a substantial shareholder or hold a responsible appointment in connection with firms whose tenders come before him for consideration? Or for the principal salaried officials to be interested in a similar manner, or by way of royalties on patents? But few directors or officials could claim to be absolutely free from some connection of this sort; and if we look further afield, we find that it is the general business practice to make one thing help another. If a clean sweep was to be made of our gas-works board-rooms and offices in respect to everyone who could not say that he held no shares in a trading company doing business with gas-works undertakings, or had no interest in any patent exploited by such companies, the residue that remained would not be sufficient, either in quality or quantity, to effectively carry on operations. And with the continual increase of joint-stock enterprise, the conversion of individual businesses into companies, and the amalgamation of large firms, the inducements to remain immaculate do not increase. Scarcely a week elapses without every director or principal officer receiving prospectuses, allotment forms, &c., offering him the opportunity of securing debentures or shares in some joint-stock concern for the supply of ironwork, stoves, meters, fittings, burners, and so on. In this connection, I have often been surprised that the coal trade—who, according to their account, get their living by losing heavily for nine years out of ten—do not exhibit a disposition to share their losses by a similar process. But the prospectus of a colliery company is as rare as a dead donkey. Another peculiarity is that this kind of document is frequently delivered by the postman on the Sabbath day; and I am told this is not always a matter of accident, but that the senders believe themselves, by this means, more likely to receive careful consideration, which would seem to show that Sabbath-breaking is not confined to Sunday leaguers or cyclists, and points to the need of an association which would agree to destroy unread on Monday morning any prospectus or circular that came to hand on the previous day.

I should be sorry to say a word against those who advocate strict honour and probity in business methods, and have great sympathy with their intentions. But most reformers manage to get the character for being impractical; and in this case they are apt to forget that it is impossible to make men honest by Act of Parliament, and that if every interested director or officer was displaced to-morrow, there is no guarantee that their successors would show an improvement in the matter of clean-handedness or honesty. The handing over of the management of a gas company to a committee of bakers and shoemakers, would not of itself be a guarantee for strict plain dealing in the future. It would be more a question of personal character than of business connection. It is just the man who makes an efficient gas director that is likely to be in demand in regard to other undertakings; and the engineer who exhibits tact in the construction of one gas-works, is sure to be consulted about others. More than this, the director will increase his experience by his connection with other similar undertakings, and in many ways become the more



valuable. An engineer, too, who goes to advise another concern, will return with freshened and broadened views which will greatly assist him in the matter of future extensions at home; and he will have gathered useful ideas for the improvement of his own present practice. The industry would lose more than it would gain by the introduction of any stringent measures in this connection. There are instances of dishonest practices and of feathering one's own nest to be quoted, and possibly of influencing contracts in a reprehensible manner; and there always will be, while human nature remains what it is. But for every case of this sort, there are two or three on the other side. For example, a member of a firm of gas engineers and contractors has a steady, well-established business, and but little temptation—to say nothing of inclination—to enter upon underhand practices. He is requested, as a favour, to accept a seat on the board of a gas company, and in this capacity repeatedly acts as consulting engineer, and saves the cost of fees. His co-directors look upon his wide professional experience as of great value in regard to all matters that come before them. When a question of extensions arises, the board think themselves quite justified in putting a little in the way of their colleague. They say, with some reason, that he, being always on the spot to answer for the quality of the work, will do as well for them as anyone else would. All this is very unparliamentary, and certainly *might* lead to awful abuses. But it is ordinary business practice, and in nine cases out of ten is really the best course in the interest of the concern. The engineer-director accepts the work in the spirit in which it is offered, and carries it out in a fair, straightforward way; seeing that his firm do not lose, but also avoiding unnecessary expense to the company, and saving them money by substituting second-hand apparatus for new where this can be done with advantage, as in the case of rough castings. Or the engineer of a large undertaking may be asked to accept the appointment of consulting engineer to a small one in the neighbourhood. The engineer-director *might*, of course, plunder the company, and the engineer-manager *might* consider the interests of his outside practice to the detriment of his permanent one; but the cases where this occurs are the exception, and not the rule.

The days of slavery and serfdom are past; and every individual is entitled to a reasonable amount of leisure and to freedom in the use of it. He is also entitled to absolute freedom as regards investment of his property. Any attempt to encroach upon these rights without offering a fair equivalent, is of the nature of tyranny, and will not tend to the development of the industry at large, or to the real prosperity of the particular concern. It may be smart practice, when there are a hundred candidates or so for a vacancy, not only to cut down the salary, but to put in stringent clauses about not engaging in other work, not leaving the district without permission, or not having shares in trading companies. But the "lucky" man who secures the appointment will not feel inclined to respect his employers, to take a great interest in the concern, or to put more power into his work than is absolutely dragged out of him. Nor are such limitations likely to recommend the gas industry to the attention of the superior orders in intellect and ability.

Any examination with a view of giving a certificate of fitness for the management of a gas undertaking is but a one-sided affair, if it does not take into consideration the physical condition of the candidate. The man of science may go into his laboratory and deal as he likes with his bottles and glasses, retorts and crucibles; but the manager of a gas undertaking must be prepared to consider the peculiarities of his directors, his employees, and his customers. In the present rush for education, there is a tendency to forget that, although a young man may emerge triumphantly so far as book knowledge is concerned from a course of (say) ten years' study at fifteen hours a day, he may also be a physical wreck—muscles soft and flabby, nervous system hyper-sensitive, with appetite and digestion poor. How can we expect a pallid, slope-shouldered, knock-kneed sort of man to deal with a strike among the stokers, the collapse of a holder, the failure of a principal main, or with less important matters that turn up every day? No amount of success at an examination will give him muscle, nerves, or digestive powers; and he wants a good allowance of all three in order to successfully control the numerous departments of a gas undertaking. One reason why an intelligent workman, in spite of educational disadvantages, may, and does, rise to the control of a gas-works, is his sound physical health. He can stand about for hours at a time, watching the progress of operations; and, if need be, take a hand with the tools himself. His old experiences as a workman stand him in good stead, on the same principle as that a retired criminal makes the best detective. But the great point is that his physical condition is not disturbed by worries and casualties that would send his intellectual superior home to bed, temporarily incapacitated by nervous headache or such like ailment.

So far I have touched upon the weak places in the gas industry, and some of the causes which have hindered its advancement. We boast sometimes of the increase in the consumption of gas; but really—looking at the degree of refinement arrived at by the manufacturers of gas fires and cookers, at the great economy of gas for lighting that is rendered possible by the introduction of the incandescent burner, and the innumerable applications for technical purposes—we should be examining into the reasons why it is not greater. Gas is by far the cheapest agent for lighting and cooking; and also for warming when its convenience and saving of labour is considered. But its use is not so general as

these advantages would lead one to expect. In every town there are not only single houses, but whole rows, into which the service-pipe has not yet penetrated. It is a standing disgrace to the industry that the first organization of a body of canvassers should have been left to a manufacturer. Whoever heard of a gas company in England undertaking a house-to-house canvass—a proceeding which American gas managers, who do not neglect this department as usual in England, have pronounced to be indispensable? Under a more energetic and enlightened directorate and adequate staff, the sales of gas might be at least 50 per cent. more than they really are.

We are drawing close up to the end of a century—a season which renders us inclined to review the past, and make resolutions for the future. We look back with regret over the lost opportunities of the years gone by, and forward with hope as to the possibilities afforded by those that are coming. And in this connection, I can readily imagine a time when the duties of the directorate should be defined and limited to such matters as the capabilities of an influential experienced man of business, having a good general (but no special technical) knowledge, can efficiently deal with; and when the whole of the operations, commercial, technical, and general, shall be under the control of an experienced manager, with the aid of efficient clerical and technical assistance in the various departments. There should be general responsible supervision over the whole, in preference to dividing up the operations between two or three heads. In regard to establishments of the first magnitude especially, there has always seemed to me to be too great a *hiatus* between the manager at about £2000 a year and his assistant at £200; and between the secretary at £1000 and the chief clerk at £150. There is room for a good class of second-grade officials, receiving perhaps one-half of the salaries considered sufficient for the chief, and possessing in their own departments a certain amount of responsibility, but subject to head control. According to theory, there is wisdom in the multitude of councillors; but in practice the real work is done by the few. Out of a board of six or seven, one or two really guide the decisions; and the rest simply say "Ditto to Mr. Blank." Nor is there any particular objection to this, provided the right kind of men get the upper hand. For successful working, there is nothing like a vigorous personality. There is also need for a larger staff—one able, not merely to keep the thing moving, but to develop all possible resources, either commercial or technical, and to keep well up with all that is being done elsewhere. There is room for more investigation in respect to materials purchased and the results obtained from them, to say nothing of pure research. The same as regards the sales department, in respect to new appliances that are continually being put forward.

So much for the particular. As regards the general state of the gas industry, I could imagine our "Institute" supported by all branches of the gas industry, but in which the income from gas undertakings would be at least five times that of the members' subscriptions; having not only an adequate income, but a strong position, and able to deal, not only with technical, but also with commercial matters; and having good educational facilities, in addition to an Examining Board whose certificates would be generally recognized, and of graded orders of merit, so as to avoid the glaring inconsistency of stamping a young man of 21 years of age as a full-blown experienced gas manager. There would be a good reference library, with accommodation for reading abstractors; and it would be a usual thing to send a junior from the provincial gas-works to get particular information. There would also be committee-rooms, where the various orders of certificate holders could meet and discuss matters peculiar to their own particular branch, and the members would be encouraged to attend by their employers, and have their expenses paid. A suite of laboratories, testing-rooms, and workshops, and even an experimental gas-works at some place within easy reach would be available; and, if required, tests, examinations, and reports would be undertaken at fixed fees. Are these practical suggestions, or Utopian dreams?

**A Gas-Stove Does not Make a Kitchen.**—A Police Court summons was recently made the means of ascertaining whether the introduction of a gas cooking-stove into a conservatory building constituted it a structural addition to a dwelling-house, within the meaning of the London Building Act. The case occurred in the South Metropolitan district. It appeared that a householder employed a builder to make a conservatory at the back of the house, across the casement window of the kitchen. After this was finished, the occupier put in it a gas-stove and a slop-sink, with other articles of portable kitchen furniture. Practically, the place was used as, and for the ordinary purposes of, a back-kitchen; and there was even evidence that it was built with this object. The District Surveyor saw the building in this condition; and he claimed that it was substantially a kitchen addition to the premises, and as such ought to come under the provisions of the Building Act. Against this, the Police Magistrate elicited the fact from the District Surveyor himself that if the gas-stove and other things in the place were cleared away, it would be a conservatory. Practically, therefore, the case amounted to a complaint by the Surveyor of the purpose for which the conservatory was used, which was not held to be sufficient ground for the issue of an order on the summons.



## TECHNICAL RECORD.

### PROTECTION OF UNDERGROUND WATER SUPPLIES.

The paper which occupied the concluding portion of the sitting at the recent winter meeting of the British Association of Water-Works Engineers was by Mr. W. MATTHEWS, M.Inst.C.E., of Southampton. It was as follows:—

The protection of public water supplies is a matter of such vital importance that, although so much has already been written upon the subject, I feel it should be persistently pushed to the front until legislation having this object in view is generally recognized as being quite as necessary as the Acts providing for the sanitary inspection of dwelling-houses, the notification of infectious diseases, the erection of isolation hospitals, the cleansing of verminous persons, and the inspection of foods and drugs. For all these purposes the general law is sufficient; but to protect a water supply from possible pollution, the costly process of obtaining a Special Act must, in each case, be faced.

The law relating to pollution has been fairly clearly defined by the judgment delivered on the case *Ballard v. Tomlinson*, and is, in general terms, to the effect that no one has a right to deal with the water flowing to, under, and past him in such a manner that it reaches his neighbour in a worse condition than it otherwise would did he not intervene to alter its character; and, further, a person can only be held to be dealing with such water if it can be shown that he either must have known for a certainty, or that there existed strong presumptive evidence, without the necessity of resorting to highly scientific methods of reasoning or to making excavations, that the water is passing from under his land to that of his neighbour (*Ewart v. Belfast Poor Law Guardians*, 1881). By sinking a well or cesspool deep enough to reach the subsoil water, he clearly deals with such water, because its inflow to him demonstrates the fact that the soil is permeable; and there is good ground for inferring that any objectionable matter introduced into the well or cesspool will flow away through the soil, and be carried into the general water system which he has tapped. If, however, a cesspool be sunk of insufficient depth to reach the water, the owner may claim that he is not dealing with the subsoil water at all, and that in the absence of any knowledge of its depth beneath the surface, or of the direction of its flow, he cannot be held responsible for the effect produced by the use of the cesspool. Again, where several houses are adjacent, and each has its own cesspool, sunk to water-level in perhaps only some cases, who can prove which particular cesspit is causing pollution? One or the other may be imperfectly bricked and cemented, and be leaking into the subsoil in such a manner that detection would be impossible, except a detailed examination be made of each pit. Such examination, I need hardly point out, no water company or even local authority, obtaining water outside its own area of jurisdiction, has any power to make, or to insist upon being made by the local sanitary authority. In such a case, the pollution cannot even be traced to the individual, after which it must further be proved that he was dealing with the water in the sense previously explained.

So far as I am aware, there is no law to prevent the deposition of manure or nightsoil upon cultivated land unless it be there placed in such a manner and quantity that, owing to heavy rainfall, it gets washed into the ditches so as to form a veritable stream of sewage; nor is it possible to prevent the deposition of faecal matter in ditches and such-like places by farm labourers, tramps, gipsies, and others. The pollution of the Maidstone supply was attributable to such a cause; and although the water was in that case fouled after it had left the soil, the same result would probably have arisen had the polluting matter been washed down some crack or fissure in the soil, and so been led into communication with the subsoil water before it reached a spring or well. At Horsforth, the water supply was shown to have been polluted by nightsoil which had been deposited on land in the vicinity of the source of supply.

The inmates of the Hants County Asylum were, some years ago, subject to serious and recurring outbreaks of typhoid or enteric fever, the cause of which was clearly traced to the water supply. The well, sunk with a watertight lining through the upper gravel, took its supply from the chalk beneath; but it was found that, owing to the existence of fissures, there was direct communication between the well and the gravel some distance away, and that pollution which took place there, owing to the presence of sewage disposal works and a burial ground, was conveyed to the well. A new supply was found at another site; and I have not since heard of any such epidemics as were previously so frequent at this establishment. The outbreak of fever at New Herrington (Durham) was proved to be due to the pollution of a well by sewage matter brought through fissures from a farm  $\frac{1}{4}$  mile away.

The most instructive case which can be cited is that which gave rise to an epidemic of typhoid at Lausen, in Switzerland. The water, having become polluted in one valley, flowed underground for over a mile, and was then taken, where it issued as a spring, for drinking purposes in Lausen. Fine flour mixed with the water at the upper station did not reappear at the lower station, whence it was very reasonably assumed that the water percolated through the rocks or very fine fissures rather than

flowed in anything like open fissures or well-defined channels. When, however, salt was mixed with the water at the upper station, the spring at the lower station soon yielded saline water. This is most important when we consider what has happened at Eastbourne and other places adjacent to the sea, because we shall be forced to the conclusion that strata which permit of the passage of saline matter are exceedingly likely to permit of the passage of the germs of typhoid and other infectious diseases, as was the case at Lausen.

Other epidemics of similar character have taken place at Bangor, Swansea, Paisley, Chester-le-Street, Caterham, Worthing, and King's Lynn, which were in each case traced to pollution of the water supply before it reached the wells or reservoirs. With but one exception, so far as I can find out, there was no previous warning of danger in any of the above-quoted cases, the exception being at King's Lynn, where the ratepayers themselves had overridden alike the repeated representations of expert advisers and the consequent proposals of the Corporation to seek a purer source of supply. Needless to say, the epidemic was followed by repentance.

As a striking contrast to such a culpable and almost criminal exhibition of ignorance and disregard of warning, it is refreshing to note that the Portsmouth Water Company, not waiting for any outbreak, but acting simply upon the advice of experts who suggested the bare possibility of danger from pollution, have, at great cost, taken steps to safeguard their sources of supply in a manner which deserves the highest recognition. I am glad to know that at least two municipalities are depositing Bills in the ensuing session of Parliament, having as their object the acquisition of land around their sources of underground supply as a means of protection from possible pollution.

In the course of a somewhat extended study of the chalk districts of Hampshire, I have come across a number of places where the deposition of polluting matter might be attended with serious results as affecting the supplies of water drawn from the vicinity, and will venture to set three of them before you as typical cases. In the first case, a swallow-hole in the chalk receives and engulfs the washings from a large track of cultivated land as well as the probable overflow from a number of cesspools, and the scouring of over a mile of public highway and side ditches, the flood being at times so great that considerable protection works have had to be carried out to prevent the roads from being washed away. The water, after entering the swallow-hole, goes to augment the main body of water in the chalk, which, after an underground passage of over half-a-mile farther, partially emerges in a set of springs which, after such floods, become very turbid. Obviously the chalk water is, at such times and up to this point, distinctly polluted, and who can say how far it must yet travel through the chalk before it becomes free from such pollution. The effect of heavy and continuous pumping from a well in the neighbourhood will tend to increase the speed at which this water will travel, and render the time necessary for purification by natural agencies too short, and then the impurities will appear in that well.

In the next case, a group of cottages are situated upon a detached patch of clay, overlying, and surrounded, by the chalk, at the edge of a steep slope, which ends in a rather deep dell close by a pumping-station where water is raised from wells and headings. The cottages have shallow, and in some cases open, cesspools, which, owing to the clayey character of the soil and their general environments, obviously overflow in times of heavy rainfall. There is but one direction in which such overflow can go, and that is down the slope in the direction of the chalk dell, which does not retain water, and is just of that character which is so often associated with swallow-holes of more or less pronounced type; and therefore a ready means of communication with the underground water system is in this case so extremely probable that I consider the existence of these cesspits a menace to the purity of the supply.

The last case is that of some wells and headings made entirely in the chalk, most of them at a depth of 60 to 80 feet below the surface, and cutting numerous fissures at nearly right angles. Some of these fissures have been proved to be in communication with the surface, so that thick chalky water will traverse them, and appear in the headings still in a thick, turbid state. It is obvious that polluting matter might easily, in this case, be transferred from the surface, or from cesspits in the neighbourhood, directly to the water which is derived from this source; and it furnishes a typical example of a case where an area of protection around the works should be acquired, and any possible sources of pollution removed.

It is to be assumed that no proposed site for a pumping-station would have received the sanction of either Parliament or the Local Government Board had it not, when proposed, been considered a good site, and free from probable pollution; but building and other operations have in many cases so altered the surroundings, that sites once perfectly safe are now no longer so. It seems to me only reasonable that a general enactment should be passed to empower any company or water authority to purchase, with the consent of the Local Government Board, and for this sole and express purpose, such land around their sources of supply as may be shown to be desirable for protecting the water from pollution. In the case of Croydon, the Local Government Board appeared to be so impressed with the danger which it was alleged would arise from pollution from agricultural lands that they refused to sanction the proposal to make a



well at Waddon in the bare chalk; and this, together with other cases of refusal, may be taken as indicating fairly well the attitude of that Board in connection with protection.

I do not think that compulsory measures should yet be asked for, but rather that the way to voluntary efforts to protect supplies should be made easier and cheaper than can possibly be the case while each one has to be made the subject of a Special Act. If, later on, the pressure of public opinion, and opposition before Parliament, fails to induce many water undertakings to give adequate protection to their sources of supply, I would suggest that the Local Government Board should, upon proper requisition and after due inquiry, be given the power to insist upon the necessary protection being furnished.

It has been suggested to me that adequate protection would be afforded by the creation, around sources of supply, of special drainage districts to be formed under the powers of the Public Health Act, 1875; but I have, after careful consideration, come to the conclusion that, in at least the majority of instances, this course would not meet the needs of the case. In my opinion, any works having for their object the protection from pollution of water supply must be constructed, controlled, and managed for all time by the body who are relying upon such works as their safeguard. This power cannot be exercised by them under the special drainage provisions of the Public Health Act; and they must go to Parliament to acquire them until the law is amended and general powers are given.

I trust that I have made out a sufficiently strong case to convince you that the acquisition of areas of protection around many underground sources of water supply is a necessity, and that Parliament ought to give greater facilities for the accomplishment of this object.

#### Discussion.

The PRESIDENT (Mr. C. H. Priestley, of Cardiff) emphasized the remarks of the author as to the inadvisability of works being constructed in an area over which the water authority had no control. Personally, he had had nothing to do with underground supplies; but the same thing as had been described by Mr. Matthews sometimes arose in watershed areas—viz., pollution subsequent to the Act being obtained. In his own town many years ago, water was not taken from the present source, but from another some four or five miles outside the town, and then he believed it was quite pure. Subsequently building operations had gone on largely; and it was not now considered that the water was so good as it was when the Act for the district was obtained.

Professor HENRY ROBINSON (London) sent a communication on the paper, in which he said that he thoroughly sympathized with all endeavours to bring about the protection of water supplies, and prevent pollution. At the same time, it was not unlikely that opponents of proposed legislation in this direction would suggest that private interest had already suffered by water authorities abstracting underground water to the detriment of surface owners.

Professor HULL commented on the importance of protecting underground water. The pot-holes and the fissures so prevalent in the chalk were very dangerous in the matter of water supply; and the same thing occurred in the new red sandstone, with which his experience was more expressly connected. He gave particulars of contaminations some years ago at Liverpool and Nottingham in the new red sandstone area. He was of opinion that the large towns were now beginning to look after themselves very well in this respect. What was wanted was the appointment of persons whose duty it should be to go round from farm to farm in country districts, and poke their noses into every possible source of contamination; particularly over porous material, such as chalk or the new red sandstone. He considered the proper system of disposing of sewage in country districts was to put it on the land; and he ventured to say that where there was a sufficient thickness of soil (from 12 inches upwards), and where there was vegetation of various kinds—either pasturage or arable—the deposition of the sewage on the land as manure would not injure the underground supply. He had great faith in Nature's mode of purification.

Mr. W. A. RICHARDSON (Birkenhead) observed that one of the evils of underground pollution was that frequently a long time elapsed before it was found out, and what generally led to its detection was the outbreak of disease. He considered there was at the present time great necessity for the protection of underground water.

Mr. JOHN SHAW (Boston) remarked that he was glad to say he had little to do with underground waters at the present time; but some 35 years ago up to 20 years ago, he took a great deal of interest in measuring various wells, particularly in chalk districts; and the tremendous distance that he found water would travel, and the various ways it would come into the wells, was very astonishing to him then. He gave a number of examples from his experience at that time in and around Croydon; some wells in the same district showing, by the rapidity with which the water-level was raised after rainfall, that they had a more direct connection with the surface than others. He thought the instances quoted showed that no general rule could be laid down as to the amount of protection that was required by underground water; and he looked forward with some hope to such gentlemen as Mr. Whitaker, Dr. Thresh, and the Council of the Association assisting the members in recording the water-levels in their districts, so as to

allow them to come to some conclusion in the matter. Regarding the underground stream flow (which most people recognized there was from the higher part of the chalk to the lower), there were considerable variations. He believed that he was concerned in the first application of lithia to trace this underground flow some 23 years ago. Water was drawn from wells in the lower part of a valley, in order to try to trace the flow from the higher part of the chalk to the lower; and some very curious results were found. Some wells directly in the road did not show a trace of lithia at all; others miles away showed it after two or three days; while others in the road between the upper and lower wells did not show the same results for nearly six weeks. Of course, this result greatly depended upon the fissures in the chalk and some other considerations. But whether water could be polluted from the surface or not, there could be no question that the greatest care should be taken of underground water. It was all very well to say there could be no pollution from this or that source; but if there was a dangerous source or any suspicious place within a mile of a pumping station, the place ought to be watched and closed, if possible, by Act of Parliament.

Mr. WHITAKER, F.R.S., F.G.S., was glad the author had given the Portsmouth Water Company the credit due to them. It was a big Company, and even a big Company could and should protect themselves. The Company were not to blame for any of the evils which had occurred around them. It was the neighbouring authorities who were to blame; and they could not be forced to do anything. He (Mr. Whitaker) had been all over the town of Havant; and a more delightful state of things for fouling a water supply could not exist. The Company a great many years before had offered to take upon themselves half the expense of a sewage scheme; but the people would not take the other half. He believed, however, the Company had now fully protected themselves against pollution; but it was a cruel thing a company should be put in such a position—that a company upon whom a large town depended for its water supply should be troubled by the gross negligence of a small town of 5000 population close at their doors. The Company had acquired springs and land, and had pulled down all the cottages they could to make things safe; and they deserved credit. He hoped that what Mr. Shaw had said with reference to recording water-levels would be taken to heart. There was no more valuable information in districts where the supply was obtained from wells than the constant recording of water-levels a long way round the works. Mr. Matthews did it at Southampton; it was done at Croydon; and it ought to be done everywhere. It was true that no general rule could be laid down in regard to protection; each case must be investigated and dealt with individually. If it was not, the unexpected would surely happen.

Mr. G. GREENSLADE (South Hants Water Company), being interested in underground supplies, had followed the paper with considerable interest. He only wished that some of the members of the Southampton Corporation had been present to have heard the paper and the discussion; and he was sure they would not then have hesitated in giving Mr. Matthews several acres of land round about his works, instead of allowing houses to be built just alongside the headings. The Corporation did not see the value of protecting their area as advocated by Mr. Matthews; and so they had let the matter go on. In his own case, they hoped to have before long the neighbourhood of their works thoroughly protected.

Mr. J. LEES (Tonbridge) remarked that, in the next session of Parliament, some 40 or 50 water schemes (either Bills or Provisional Orders) would come under consideration; and much of what the author had suggested might be very profitably dealt with in connection with them. His (Mr. Lees') Directors last year very wisely, in order to prevent pollution, secured some 53 acres of land immediately adjoining the works; and they felt sure, now that the matter was completed and the land paid for, they had done the right thing.

Mr. MATTHEWS, in reply, said what he was anxious for was that all water companies and local authorities should have facilities given them for safeguarding their supply without having to go to an enormous and totally unnecessary expense. Mr. Shaw had shown them how difficult it was to discriminate between what was and what was not safe. He had shown them that the rate at which water flowed and got into wells was far different in one case to what it might be in another; and therefore in such circumstances the time element was a most important one. No matter what the strata might be, or its physical construction, there was no doubt in the question of filtration, whether it be through strata *in situ* or through material placed for the purpose of filtration, it was not sufficient that the material should be good, but the time element must apply. If the water got through the chalk at a great rate, they had no guarantee that the chalk strata would be effectual as a filtering material. In this session of Parliament, Margate and Hull were seeking powers for the protection of their areas; and he hoped there were a great many more doing the same thing. The Corporation of Southampton deposited a Bill for the purpose last year; but, unfortunately, after a good deal of expense had been incurred, they began to repent of it. They said it was a precedent, nobody else had done it; and they did not see why they should be in the van, and do things ahead of others. He (Mr. Matthews) did not see why they should not. However, he thought that it would only take a year or two for him to persuade them that it was certainly the right thing to do.



## THE FUTURE OF THE LONDON WATER SUPPLY.

By R. E. MIDDLETON, M.Inst.C.E.

[A Paper read at the Surveyors' Institution, Dec. 10, 1900.]

The future of the water supply of London is of so much importance to the inhabitants of the Metropolis, that a short statement setting forth the estimated population to be provided for, the amount of water to be afforded, the sources from which it is to be obtained, and the effect of taking water from one district for the supply of another, cannot, it is thought, fail to be of interest to the members of this Institution. I am very fully aware that the task I have undertaken is difficult, and that the number and complexity of the questions to be considered are great; but I trust I may be able to put a plain story into plain words, and to brush away some, if not all, of the cobwebs which have been woven round this important subject, and show it to you as it is.

The eight Water Companies—the Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—supplied water to a population of 5,232,155 persons in the year 1891; while the population of Greater London, including the outlying portions of Water London, was at the same date 5,732,950, or 500,795 in excess of that included in the area supplied by the Water Companies. The population of 500,000 odd not supplied by the eight Companies is located partly within and partly without the areas of supply of these Companies, but entirely within the area of 845 square miles comprised in Greater London and the portions of Water London lying outside of Greater London, which, for the sake of simplicity, we will call "Metropolitan London," and obtains water from the following nineteen Companies, or Corporations: The East Surrey, the West Surrey, the Sutton, and the Limsfield and Oxted Companies, the Croydon and Richmond Corporations, and the Epsom Local Board, to the south of the Thames. The South-West Suburban Company supply both in Surrey and Middlesex, and the Barnet District Gas and Water Company, the Central Middlesex, the Colne Valley, the Rickmansworth, and Hoddesdon Companies, and the Uxbridge, Cheshunt, Enfield, Tottenham, and Ware Local Boards supply in the counties of Middlesex and Hertford; while the South Essex Company supply part of Essex.

The population of Greater London (701 miles in area) was 5,659,909 in 1891, increasing at the rate of 18.2 per cent. per decennium; and that of the outlying portions of Water London (with an area of 144 square miles) was at the same period 76,041, increasing at the rate of 19.7 per cent. per decennium. The population of Metropolitan London will therefore be, following the same rate of progression, at the end of each decade—

Year.	Greater London Increasing at a Rate of 18.2 per Cent. per Decennium.	Outlying Portions of Water London Increasing at a Rate of 19.7 per Cent. per Decennium.	Metropolitan London.
1891 .	5,659,909	76,041	5,735,950
1901 .	6,685,445	91,407	6,776,852
1911 .	7,900,987	109,385	8,010,372
1921 .	9,337,542	130,899	9,468,441
1931 .	11,035,289	156,645	11,191,934
1941 .	13,043,712	187,504	13,231,216
1951 .	15,417,667	224,442	15,642,109
1961 .	18,223,682	268,657	18,492,339

The density of population in the county of London, with an area of 118 square miles, was in 1891 56.1 per acre. A population of 18,223,682 in 701 square miles would be at the rate of 40.6 per acre. With a density of 56.1 per acre, 845 square miles would contain a population of 30,338,800.

That the population of London—a city or aggregation of cities standing for the most part on an area circumscribed by a line drawn with a radius of 15 miles having Charing Cross as a centre—will ever reach a figure of 18,500,000, not to speak of 30,000,000 persons, is, to say the least of it, improbable; but prophecy on this subject would be improper, even if it were possible. If, however, it can be shown that the same sources of supply which have been sufficient in the past can, if adequately guarded and under proper treatment, be made sufficient for the future requirements of this vast population, it will be agreed that no anxiety need be felt for the immediate future; that each succeeding census will tend to prove or disprove the assumptions on which the estimate of the future population is based; and that it will be sufficient, when the population of London has reached a total of 15,000,000 persons (should that time ever arrive), to inquire whether London does or does not require any addition to its water supply which cannot be afforded by an extension of the system already adopted.

Besides the population of the Metropolis, there were in 1891, in the valley of the Thames above the intakes of the Metropolitan Water Companies near Hampton, 1,056,415 persons, increasing at the rate of 9.88 per cent. per decennium; and in the valley of the Lea above the intake of the East London Company, 189,287 persons, increasing at the rate of 14.17 per cent. Following out these figures, the population in the valleys of the Thames and Lea would in 1961 be: In the Thames Valley, 2,042,985; in the Lea Valley, 478,614—total, 2,521,599.

In the chalk area of Kent, to the eastward of the Kent Company's district, and to the north of a line drawn from Sevenoaks to Dover, but excluding the Isles of Thanet and Sheppey, which could not do more than supply their own population, there was

in 1891 a population of about 379,819 persons, increasing at the rate of 11.7 per cent., which, following the same rate of increase, would make the population in 1961 in this area 824,041. In the county of Essex, the district which is increasing in population with the greatest rapidity lies within the area of 845 square miles, which we have called Metropolitan London. It is improbable that the rest of the county will be supplied to any great extent from the valleys of the Lea or the Thames, or from any district which will be called upon to contribute to the supply of the Metropolis; and it will suffice if 100,000 be added to the population in 1961, already referred to, to meet any calls in this direction.

The total population to be provided for in the future up to the year 1961, taking the rate of increase to continue as it was from 1881 to 1891, will be—

Population to be Supplied with Water.	Year.	Metropolitan London.	Valleys of Thames (a) and Lea (b).	Kent (a) and Essex (b).	Total.
6,149,551	1891	5,735,950	(a) 1,056,415 (b) 189,287	(a) 379,819 (b) 33,782	7,395,253
7,240,547	1901	6,776,852	(a) 1,160,789 (b) 216,109	(a) 424,258 (b) 39,417	8,617,445
8,530,330	1911	8,010,372	(a) 1,275,475 (b) 246,732	(a) 473,896 (b) 46,062	10,052,537
10,051,570	1921	9,468,441	(a) 1,401,492 (b) 281,694	(a) 529,342 (b) 53,787	11,734,756
11,846,016	1931	11,191,934	(a) 1,539,959 (b) 321,610	(a) 591,275 (b) 62,807	13,707,585
13,965,009	1941	13,231,216	(a) 1,692,109 (b) 367,182	(a) 660,454 (b) 73,339	16,024,300
16,465,474	1951	15,642,109	(a) 1,859,289 (b) 419,212	(a) 737,727 (b) 85,638	18,743,975
19,416,380	1961	18,492,339	(a) 2,042,985 (b) 478,614	(a) 824,041 (b) 100,000	21,937,979

Of the water supply for this estimated population of 22,000,000 in round numbers, that for the Metropolitan area in the county of Kent and in Essex passes away, after being used, into tidal waters; while that drawn from the valleys of the Thames and the Lea, for the use of the population living above Hampton and Chingford, is returned to the land and eventually to the rivers, and is therefore available for the supply of the population below. The total population to be supplied may, therefore, be reduced by 2,521,599 to 19,416,380, or (say) 19,500,000. There are breweries and manufactories, both in the valley of the Thames and the Lea, which use large quantities of water; but practically the whole of it is returned to the rivers, as the small quantity which is carried away in steam and in beer, &c., forms such an infinitesimal proportion of the whole, that it may be ignored. So far as the writer is aware, the only water which is carried away is that drawn by the London and North-Western Railway Company from their chalk wells at Bushey; and even this goes in reduction of the water used for trade purposes in London, as does the water pumped from wells in London for similar and other trade purposes.

That the requirements of the population of the valleys of the Thames and Lea above the intakes of the Metropolitan Companies can be affected by the water drawn from these rivers at Bell Weir, Sunbury, Hampton, Ware, or Chingford, or from wells sunk in the chalk at Streatham and from Ware to Barking, is not possible. Were it not that they return the water to the land or to the rivers after using it, the inhabitants of the upper reaches of the valleys of the Thames and Lea, having the first pull, could deprive those below them of water; but they themselves cannot be deprived, nor can their supply be reduced, and, as things are, neither suffers. It is the interests of those situated below the intakes and below the pumping-stations, not those above, which have to be considered; and the requirements of the former are fully safeguarded in the scheme propounded by the writer by their inclusion in the population to be supplied.

When reservoirs are formed in natural valleys for the supply of water to a particular town or district, it is usual for the promoters, who have to pay for the necessary works, to obtain powers over the drainage area down to the position of the dam, to impound all the water flowing off the drainage area, and to give back to the river as compensation for the right to abstract a certain amount of water from it about one-fifth to one-third of the available water running into the reservoir on the average of three dry years. The remainder of the water, except so much as may run away over the bye-wash of the reservoir, becomes the absolute property of the promoters. Under these circumstances, no large quantity of water can be abstracted from the river above the dam; while below the dam the flow of the river is reduced to something less than one-third of its average volume, and it is unlikely that Parliament would allow anything further to be taken from the main river, though that body might perhaps permit other reservoirs to be constructed by the same or another authority, and on similar conditions as to compensation, on one or other of its tributaries. Under the conditions referred to, neither those above nor those below the water-works can hope to be able to draw any considerable quantity of water from the river.

The reservoirs already constructed in the basins of the Thames those in course of construction, and such as may be built in the future, are designed to be used under totally different conditions. The promoters are not empowered to take the whole of the waters



of the river, but may only pump the water into the reservoirs when it exceeds a given quantity. They can only take such surplus water as flows down to their intakes, and cannot prevent those above them from drawing water from the river for their own purposes, though no doubt they would successfully oppose the abstraction of water if it were the intention to divert it to the use of a district outside the drainage area of the Thames, and to prevent its return to that river or to land within the drainage area. The intakes to the reservoirs are situated so far from the source, and so near to tidal waters and to the Metropolis, that the population below the intakes will be provided with water drawn from the several intakes, and cannot suffer from any abstraction of water from the river, even if it were greater than is proposed; while it has been shown that the inhabitants living above the intakes would not be interfered with in any way.

In the case of impounding reservoirs—as, for instance, those proposed by the London County Council to be constructed in Wales—a given very large quantity of water would be abstracted from the area of supply for the use of London, and would be entirely lost to inhabitants of the area from which it was drawn and to those living geographically below the reservoirs.

It is calculated, on the assumption that the rate of increase existing between 1881 and 1891 is maintained, that the effective population within the area of supply—the population to be supplied with water from the sources to be enumerated hereafter—will number 19,500,000 in 1961; but the calculation is based on the merest assumption. In calculating the probable population at any given date in any of the large provincial towns, it is generally assumed that there will be a decremental rate of increase—that is to say, the rate will be less than compound and greater than simple—but whatever assumption be made, it is based on knowledge derived from the past, and is, at best, only assumption. For the present purpose, the percentage of the rate of increase will be taken as constant.

The Royal Commission presided over by Lord Balfour of Burleigh decided, after hearing a very large amount of evidence on the subject, that a supply at the rate of 35 gallons per head per diem for all purposes is ample. It has been maintained that advanced and advancing sanitation, the increased use of public and private baths, the demands for street watering, flushing of sewers, &c., necessitate a much larger use of water, and that a supply at the rate of 35 gallons per head is inadequate. The gross misuse of water which is allowed to exist in the cities of America, and the lavish supply afforded in Glasgow, and at times in Paris, have been adduced as arguments in favour of this contention; but the experience of provincial towns disproves it. It is notorious that the waste of water in America is unparalleled, that Glasgow will have to curtail its supply, and that Paris is in great straits for water at the present time; while it has been repeatedly shown that the legitimate use of water for domestic purposes in large towns does not exceed 17 gallons per head, and in country districts from 10 to 12 gallons.

The supply afforded by the Metropolitan Water Companies has, during the last three very dry years, exceeded 35 gallons per head. There can be no doubt, however, that this quantity could be very materially reduced—probably to 27 gallons per head—if the Companies enforced with the utmost stringency the powers they have, and obtained such further powers for the prevention of useless and unnecessary waste as are possessed by many provincial companies and corporations. Should the undertakings be transferred to a Trust, as recommended by Lord Llandaff's Commission, it is certain that waste would be put down with a strong hand, and that the water consumer would be brought under much more strict supervision than he is accustomed to at present. Taking the rate of supply to be that provided for by Lord Balfour's Commission, or 35 gallons per head, including that required for the rural districts—a very ample provision indeed—the average quantity of water to be supplied daily at the end of each decade will be—

	Gallons.		Gallons.
1891 . . . . .	215,234,285	1931 . . . . .	414,610,560
1901 . . . . .	253,419,145	1941 . . . . .	488,775,315
1911 . . . . .	298,561,550	1951 . . . . .	576,291,590
1921 . . . . .	351,804,950	1961 . . . . .	679,573,300

The actual increase in supply does not proceed by regular increments, but depends to a considerable extent on the conditions of each year—whether the general temperature is high or low, whether there is much or little rain, and whether the winter period is open or frosty. It is necessary, therefore, to provide for something more than the calculated requirements, to the extent of probably about 5 per cent. The greatest possible provision necessary to be made for the year 1961, supposing the population at that date to number 19,500,000 persons, would therefore be 717,500,000 gallons a day.

Before proceeding to examine into the question of how this quantity of water (more than three times the average supply at the present date) can be provided, it is necessary to clear the way by the removal of erroneous interpretations of the findings of the two Royal Commissions of 1893 and 1899, and other stumbling blocks which interfere with a true solution of the problem under consideration. It has been repeatedly stated that the report of Lord Balfour's Commission gave a verdict to the effect that only 300 million gallons a day were available from the Thames. The report of Lord Balfour's Commission contains not one word to this effect; nor does the later report of Lord

Llandaff's Commission confirm the statement erroneously said to be made by Lord Balfour's Commission. On the other hand, the report says: "We do not understand Lord Balfour's Commission to have expressed any opinion as to 300 million gallons a day being the limit." We are asked to believe that Lord Balfour's Commission, on which the engineering profession was represented by Sir George Bruce (who was also a member of Lord Llandaff's Commission), Mr. Hill, and Mr. Mansergh, was deceived in its estimate of the capabilities of the Thames to supply 300 million gallons a day, or 22 per cent. of the average flow of the river. On the other hand, we are required to accept as a conclusion with which there can be no cavil, that an area of 488 square miles in Wales—only one-eighth of the drainage area of the Thames basin—can supply 415 million gallons a day without injury to the rivers; or, in other words, be nearly eleven times as productive as an equal area in the Thames basin.

It is desirable at this stage to consider what is the real value of the Thames for purposes of supply, and to compare it with the Welsh drainage area, and with impounded supplies generally. The drainage area of the Thames down to Teddington Weir is 3766 square miles, or to the Companies' intakes 3548 square miles; and the average rainfall on this area is 28.50 inches. The actual average run-off from the larger area is about 1450 million gallons a day, or 9.7 inches of rain; the average of three dry years, 1016 million gallons, or about 6.8 inches of rain; and the flow of the driest year was 644 million gallons a day, or 4.3 inches of rain. In order that the same run-off should be obtained from 488 square miles in Wales, the average rainfall would have to be approximately 90 inches; whereas it is doubtful if it is so much as 55 inches. The value of the Thames basin as an area of supply is therefore greater, not less, than that of the Welsh rivers.

The run-off from a considerable area of this district was not, on the average of two years, more than 37 inches. If the value of the whole district be taken at 40 inches of rain, its value as compared with that of the Thames is as  $488 \times 40$  to  $3548 \times 9.7$  inches, or as 1 to 1.76 nearly; all the advantage being with the Thames.

I wish it to be understood that I do not pin my faith on these figures as representing the average run-off from the Welsh district; they may or may not do so. The probabilities are that, on the average of a number of years, the run-off is more than 40 inches, but not to such an extent as to materially affect the comparison with the Thames.

The least natural flow of the Thames during any month was at the rate of 212 million gallons a day. At such a time, supposing the average supply to be afforded to be 415 million gallons a day, the draft on the Thames Valley reservoirs would be 495 million gallons a day. The least natural flow in the Welsh area would be not more than 35 million gallons a day; and the draft on the reservoirs, under like conditions with those already instanced for the Thames, would be 677 million gallons a day or thereabouts, and it is again shown that the advantage rests with the Thames.

Experience has proved that impounded supplies have, when worked to their full capacity, failed to afford the quantities of water expected from them; and there is no reason to suppose that the Welsh area would be an exception to this rule. Indeed, the gaugings of one of the rivers show that, in order that the estimated supply should be afforded, the reservoir capacity would have to be largely increased. On the other hand, the Thames has been gauged for more than 16 years, during which period the rainfall has been 2 inches, or 7 per cent. below the average. The rainfall of the last 2½ years was 23.3 inches, which is 18.3 per cent. below the average. These figures agree very closely with the rules which are accepted as governing the flow of rivers; and so far from disproving the findings of Lord Balfour's Commission, they confirm them.

In another respect the Thames has the advantage over Wales—in that, while the storage capacity requisite for a supply of 415 million gallons a day from Wales is estimated by the promoters to be 104,600 million gallons, on the terms set forth in the report of Lord Llandaff's Commission (namely, that storage may be calculated on the basis of the year 1893), the requisite storage in the Thames Valley would be only 45,000 million gallons, or 43 per cent. of that necessary to supply the same quantity of water from Wales. The flow of certain Welsh rivers has fluctuated, on the average of a month, from something like 35 million gallons a day at the lowest to 2500 million gallons at the highest, or in the proportion of 1 to 72; while the flow of the Thames varies from 212 million gallons a day at the lowest to 6400 million gallons at the highest, or in the proportion of 1 to 30. The lowest flow of the Thames is six times that of the Welsh rivers, while the highest is two-and-a-half times that in Wales.

Storage must be made use of, whether in the Thames, in Wales, or elsewhere, if the water is to be employed to the best advantage; and it is obvious that the more regular the rate of flow and the less the quantity of water to be used in comparison with the average flow off the drainage area, the more certain is the supply and the smaller the reservoir capacity to be constructed for a given supply. The advantage is with the Thames in both respects, as it is not proposed to use, for purposes of supply, more than 30 per cent. of the average flow of that river; while something like 60 per cent. of the average flow of the Welsh rivers would be abstracted for a like purpose. In the Thames, the flow is so well maintained that it is unnecessary to give compensation water to the river; while in Wales at the



time of minimum flow compensation to the extent of from 100 to 175 million gallons a day would have to be afforded, and the requisite storage increased by from 20,000 to 35,000 million gallons for that reason.

As regards cost, the comparison is again largely in favour of the Thames. In the items which are strictly comparative, Lord Llandaff's Commission found that the cost of reservoirs and appliances in the Thames Valley would be as 1 to 2·3 when compared with the like provision from Wales. I am of opinion that this is an under-estimate, and that the comparative figures should be as 1 to 2·8. The above comparisons refer to works other than those for filtration, for service reservoirs, and distribution, which must be incurred whether the supply be drawn from the Thames, the Lea, and from wells, from Wales, or elsewhere.

To return to the arguments which have been raised against the continued use of the Thames and the Lea. It has been suggested that the water derived from these rivers is polluted, and is liable to increased pollution in the future, due to a larger population. The report of Lord Balfour's Commission refutes this contention, and the freedom of London from zymotic disease nullifies it. Since the Thames Conservancy obtained their Act in 1894, there has been a reduction, not an increase, in the organic impurities contained in the water; and the knowledge obtained during recent years of the biological treatment of sewage, points to a time, not far distant, when, even in populous districts, our rivers may be freed from impurities, and be kept nearly as pure as those which run through barren tracts.

In this connection, Mr. James Mansergh, the President of the Institution of Civil Engineers, in his Presidential Address delivered on the 6th ult., called attention to the danger which may be apprehended from water derived from sources hitherto considered pure. He said: "A word of warning may be spoken with regard to water obtained from elevated and sparsely populated moorlands, for the danger is, in my opinion, greater if such water became infected, especially if not passed through impounding reservoirs, than if the supply were taken from a large river."

In order to attain the most desirable result of freeing our rivers from impurities, it would be of the utmost advantage if the existing divisions of the country into counties, unions, and parishes were, for water supply and sewage purposes, replaced by drainage areas, which could be conserved on a system similar to that of the Thames basin, but somewhat more extended in its application. Although Thames water contains more impurities of animal origin than does that flowing from the Welsh rivers, it must not be supposed that the latter is free from organic matter, or that it is invariably clear and bright.

Among many other questions which appear to be misunderstood, there is one error which requires correction. It has been stated in the Press that the area of reservoirs in the Thames Valley, to afford a supply of 300 million gallons a day, will be 10 square miles. According to the report of Lord Llandaff's Commission, the capacity of the reservoirs yet to be constructed to afford this supply should be 17,500 million gallons. The area of the Staines reservoirs to contain 3300 million gallons is 421 acres, or two-thirds of a mile; therefore, with the same depth of water, reservoirs to hold 17,500 million gallons will have an area, not of 10 square miles, but of 2233 acres, or 3½ square miles. The above calculation is based on the supposition that the reservoirs to be constructed in the future will be of similar capacity to those in course of construction at Staines; but should the reservoir capacity be increased, more water is stored on a given area, and it also becomes economical to increase the depth of water. Therefore the total future area of land to be employed for reservoir purposes up to a supply of 300 million gallons a day, is likely to be less, rather than more, than 3½ square miles. The maximum area to be occupied by reservoirs, including those already constructed or in course of construction, according to the conditions set forth in the report of Lord Llandaff's Commission, is, for a supply of 400 million gallons a day, 7½ square miles.

Having estimated that, at some date or another (which for the sake of argument, has been called the year 1961), the population to be supplied will number 19,500,000; that the rate of supply, which, supposing waste be prevented, may provide for much cleansing of streets and for public fountains, will be 35 gallons per head; and that the quantity of water to be supplied, including a reserve of 5 per cent., will be 717,500,000 gallons a day—it is required to show from what sources this enormous quantity of water, which is nevertheless half of the average flow of the Thames, can be drawn.

The area of the Thames basin down to the intakes of the Water Companies at Hampton is 3548 square miles; and the water run-off from this area during the last sixteen years has measured 8·22 inches of rain, or 1166 million gallons a day. The average rainfall during the same period has been 26·36 inches, or 2·14 inches less than the 28·5 inches which the late Professor Symons determined to be the general average rainfall in the drainage area of the Thames above London. It is not easy to determine what proportion of the 2·14 inches deficiency of rainfall during the last sixteen years would, on the general average of years, find its way into the river; but it is not likely to be less than two-thirds, which would make the general average run-off over a long period of years 9·64 inches—say, 9·70 inches. If the average run-off be 9·70 inches of rain, the average flow is 1376 million gallons a day. The report of Lord Balfour's

Commission puts this figure at 1350 million gallons daily. The run-off of the Thames measured at the same point has been, on the average of three dry years, 970 million gallons a day, and during the driest year 616 million gallons daily.

Speaking generally, the amount of water drawn from the Thames during any year will approximate to the average supply. The proportion of the flow of the river taken for this purpose will therefore be, on the average of years, 30 per cent., and on the average of three dry years 40 per cent. nearly. During the driest year, the quantity of water drawn from store is so large in comparison with that drawn direct from the river as to amount probably to some 90 million gallons daily; and the average quantity drawn from the river during such a year will not exceed 310 million gallons a day, or 48·17 per cent. of the river's flow. In the Welsh rivers, supposing the proposed reservoirs to be of sufficient capacity, and a quarter of the average available flow of three dry years to be given as compensation, the proportion drawn for purposes of supply would be, on the average of years, approximately 55 per cent., on the average of three dry years 72 per cent., and during the driest year 98 per cent. It does not require any very elaborate calculation to show that the supply which is only 48 per cent. of the flow of a river, during the driest year for more than 80 years, is better secured than when 98 per cent. of the whole flow of the drainage area has to be taken to satisfy an almost identical supply.

Although it is herein accepted that, under the conditions of storage recommended by the Royal Commissions presided over by Lords Balfour of Burleigh and Llandaff, the maximum supply to be drawn from the Thames is 400 million gallons a day on the average of a year, it must not be concluded that the capabilities of the river for purposes of supply are thereby exhausted; but it becomes a serious question whether it is economically desirable to further increase the supply drawn from this source.

Lord Balfour's Commission decided that, with the introduction of adequate storage, which is in course of construction, 52,500,000 gallons a day can be obtained from the River Lea. Some 22,500,000 gallons daily are taken by the New River Company, without storage; 5,400,000 gallons daily must be provided for the use of the Lea navigation; and 30,000,000 gallons per diem are, under the above conditions, available for the East London Company. The average flow of the River Lea, as measured at Feilde's Weir, is about 120 million gallons daily, or 7·11 inches of rain run-off from an area of 422 square miles.

The average rainfall in the Lea Valley is 26·50 inches (Sir John Evans says 26·24 inches); while the average for the last sixteen years has been 23·91 inches, or a deficiency of 2·59 inches. The average run-off for the same period has been 6·31 inches of rain, equal to 106,500,000 gallons a day. The average flow of the Lea during the three dry years 1897-8-9 was 78·4 million gallons daily, and during the driest year 42·3 millions. The rainfall for the years 1862-3-4 was 21·86 inches; and the run-off was at the rate of 4·79 inches, or 80·8 million gallons a day. For the years 1863-4-5 the rainfall was 22·88 inches, and the run-off 4·48 inches, or 75·6 million gallons daily. The average ratio of the run-off to rainfall is 20·7 per cent. For the years 1893-4-5 the rainfall was 23·28 inches; and the run-off was 4·89 inches, or 82·5 million gallons a day. The rainfall for the years 1897-8-9 was 23·56 inches, and the run-off 5·23 inches, or 88·2 million gallons per diem. The average ratio of the run-off to rainfall is 21·2 per cent. These figures are corroborative one of the other; and it is shown that there is no falling off during the later period in the proportion of the rainfall which finds its way into the river.

In the report of Lord Balfour's Commission, it is stated that, on the average of three dry years, 56 million gallons of water may be pumped daily from the chalk basin of the Lea Valley without injury to any material interests, and that during the driest of three dry years 47 million gallons a day may be pumped. In corroboration of these figures, if the average rainfall be 26·5 inches, and the loss by evaporation so high as 16 inches, the available rain will be 10·5 inches, or 177,240,000 gallons a day; but the average run-off of the river is 120,000,000 gallons daily. There is, therefore, a quantity of 57,240,000 gallons a day which passes down through the chalk basin, and does not find its way into the visible river. Should the loss by evaporation be 15 inches instead of 16 inches per annum, as seems probable, the available rainfall will be 11·5 inches, or 194,120,000 gallons daily, and the quantity passing down through the chalk basin 74,120,000 gallons per diem. Having shown that the available water in the chalk basin is certainly as much as 57 million gallons daily, and may be 74 million, it is unnecessary to follow the argument further—especially as these figures confirm the conclusions arrived at by Lord Balfour's Commission.

Even supposing the pumping during the driest year to exceed the available supply due to the rainfall of that year—a contention negatived in the report of Lord Balfour's Commission—the reduction in the level of the water in the area below the pumping-station due to pumping would be very small, and in the area above the pumping-stations it would be non-existent. It is not possible to estimate with any degree of accuracy either the area of the chalk basin below the pumping-stations which might be affected by excessive pumping or the capacity of the chalk for parting with the water contained in its pores and fissures; but it is not unreasonable to calculate that a reduction of level of 1 foot over the whole area would mean the removal of some 50 million gallons of water daily. Thus excessive pumping to the extent of 10 million gallons a day, continued for a year,



would mean a reduction in level of one-fifth of a foot, or 2'4 inches. Obviously the level is not reduced, if it be reduced at all, regularly over the whole area, but is at its maximum in the line of the wells, decreasing to *nil* at a short distance above the highest pumping-station and laterally from the same station, and widening out lower down in the area. The depression may therefore reach many inches at the well, although when extended over the whole area it is very trifling. Whatever the reduction of level might be in one year of great drought, in the next year of excessive rainfall it would be made up again, and something over.

As regards the area above the pumping-station, a little consideration will, it is thought, show conclusively that the effect of pumping cannot extend beyond a limited distance. What that distance is, must depend on the nature of the material in which the well is sunk, on the depth of the well, and the level to which the water is reduced in it when pumping. In a purely chalk formation, it is believed that the effect of pumping is seldom felt at a greater distance from the well than a quarter-of-a-mile, calculated on the level. When the well is situated at the foot of a steep escarpment, this distance is likely to be exceeded. The same holds true of a chalk area covered with gravel charged with water; and it is known that the effect of pumping has been felt at a distance of a mile.

Given a well sunk to the bottom of the chalk on to the impermeable stratum below it, given engine power sufficient to pump the well to the bottom, and to continue pumping without intermission from year's end to year's end, not always at the same rate, but so as to keep the pumping level of the water in the well as near the bottom as is practicable, continuance in pumping will not extend the area of absorption, which will only vary from season to season with the level of the water in the surrounding strata. If the level of the water in the district rises, so will it rise in the well. If the level of the water in the district sinks, the water in the well cannot sink lower, for it is already at the bottom; the diameter of the cone of absorption will therefore be reduced, and the quantity of water pumped from the well will be decreased.

The same principle may be applied to a visible and uncanalized river; and an illustration drawn from such a source may appeal more readily to the mind than where underground and invisible sources are to be considered. Let a well be sunk in the middle of an uncanalized river; and let pumping machinery be provided of sufficient capacity to lift the whole of the water running down to the pumping-station at any time, and to transfer it in some other direction. Below the pumping-station, the bed of the river will be dry for some distance, until enough water accretes from the banks, from the bed, and from tributary streams to renew the flow to some limited extent. At the pumping-station the depth of the water will be reduced from what it was when the river flowed naturally down its bed. Above and near to the pumping-station, the velocity of the stream will be increased and its depth reduced; but at some distance, varying with the volume of the water and the depth of the river, the original conditions will be restored. The quantity of water to be pumped may be at the greatest 20,000 million gallons in a day, and at the least 200 million gallons; but this quantity will not be affected by the presence of the pumping-station, nor will the flow of the river be altered even fractionally by the pumping, how ever so long it may be continued, but will depend, as heretofore, on the rainfall in the drainage area.

What is true of pumping from a visible river, is true also of pumping from wells sunk into the chalk. In the river, the depth of the water is limited; but its flow being only resisted by surface friction, the gradient of approach is flat. In the chalk, the depth of the well may be great—400 feet or more—but the water having to pass through innumerable small fissures, the resistance to its approach to the well is great, and the gradient of approach is steep, probably 1 in 10 or thereabouts. But whatever the gradient may be, it remains constant so long as the vertical distance from the surface to water near the bottom of the well remains the same.

There is an undoubted popular belief (which is not, however, founded on any scientific data) that the flow of the rivers and streams in Hertfordshire is being gradually reduced in volume; the loss being ascribed to the pumping of the New River and East London Companies. When, however, it is found that a supposed falling off in the flow of the River Ver is mentioned in monastic times, that Mr. Homersham speaks of the same thing in 1852, and it is again referred to in or about 1864, all being dates antecedent to the pumping of any considerable quantity of water from the chalk basin, some other explanation of the phenomenon, if there be any to explain, must be looked for; and is to be found in the meteorological conditions of the later period referred to. Mr. Homersham probably had in his mind some former period of drought, as the year 1852 was near the termination of a period of wet seasons. But the year 1865 came at the end of twelve years of less than average rainfall; and the year 1899 terminated a similar period extending over sixteen years. As the River Ver, for instance, fluctuates in the position of its source by 5 miles, and other rivers fluctuate in a similar manner, though to a less degree, between high and low water periods, it is not perhaps to be wondered at that what happened in 1883, and again in 1897, when these rivers rose at their highest points, is lost sight of; and when some years later the source is miles lower, a fear is aroused that what happened in 1883 and in 1897 will never happen again. Exactly the same fear was felt and

given expression to in 1891-2-3, yet its falsity was set forth so soon after as 1897. Nevertheless, so wedded have the people become to an unfounded belief, that the same story is produced in 1898 and 1899.

Some words of apology are necessary for the length to which this argument has been followed; but as it is desired to show conclusively that the districts from which the water supply of the Metropolis is to be drawn will not be injuriously affected by its abstraction, it is necessary to go into the matter in some detail.

The chalk area in the Thames basin above the intakes of the Water Companies is 1005 square miles, which may probably be increased to 1400 square miles by areas which drain on to the chalk. Following the figures of the basin of the Lea, where the area contributing to the chalk is 352 square miles, if this area can afford 47 million gallons a day during the driest year, 1400 square miles will supply 187 million gallons a day. But the rainfall in the Thames Valley is 28'5 inches, or 2 inches greater than that of the Lea, and the yield of the chalk area must be raised in the same proportion to 201 million gallons a day. The report of Lord Balfour's Commission says that any such abstraction will probably be at the expense of the springs and streams feeding the Thames. Against this contention, it may reasonably be argued that the conditions in the two valleys are identical; and on this basis it can be shown that this or a larger quantity is available.

The area of the Thames basin is 3766 square miles, the average rainfall 28'50 inches, and if the loss by evaporation be taken on the average at 16 inches, the run-off should be 12'5 inches. The actual run-off is, however, 9'7 inches. Therefore there are 2'8 inches of rain on an area of 3766 square miles—equivalent to a quantity of 422 million gallons a day—absorbed into the ground, but which does not find its way into the river, and is available for supply without injury to the river.

On the average of three dry years, the rainfall will be 24'5 inches; and taking evaporation at 14'8 inches, the run-off should be 9'7 inches. It is, however, about 6'8 inches. Therefore 2'9 inches, or 437 million gallons a day, are available. During the driest year, the rainfall is about 21 inches; and taking evaporation at 14 inches, the run-off should be 7 inches. It is, however, 4'3 inches. Therefore 2'7 inches, or 407 million gallons a day, are available for supply; and it is shown that the estimate of 200 million gallons daily, derived from a comparison of the Lea Valley with that of the Thames, is a conservative one.

From the Kent Company's district, Lord Balfour's Commission estimated that 27½ million gallons a day may be pumped; and from the chalk area of Kent outside the Kent Company's district, 123 million gallons daily. Besides the areas referred to, there are others in Sussex, Surrey, Hampshire, and Wiltshire, from which an additional supply might be procured, which would considerably augment the available sources to which special reference has been made, and which are—

	Million Gallons a Day.
From the River Thames. . . . .	400
From the River Lea . . . . .	52½
From wells in the Lea Valley . . . . .	47
From wells in the Kent Company's district . . . . .	27½
From wells in Kent outside the Kent Company's district, say . . . . .	110
From wells in the Thames Valley . . . . .	200
Total . . . . .	837

The sources of supply tabulated above, without consideration of those which exist in Sussex, Surrey, Hampshire, and Wiltshire, are therefore sufficient for the supply of a population of nearly 24 million persons with 35 gallons of water per head per diem, and are much more than enough to supply the population which, on the basis of calculation adopted by Lord Balfour's Commission, might possibly have to be provided for in the year 1961, or more than 60 years hence.

It is hoped that sufficient has been said to prove that the sources of supply within a moderate distance from London are more than enough to provide water for any population which may reasonably be expected to be congregated within the Metropolis, while providing amply for the requirements of the areas, other than those above the intakes of the Companies, from which the supply will be drawn. When the population to be supplied numbers, say, 15 million persons, and is still growing, it will be time enough to consider whether an additional quantity of water should be looked for from Sussex, Surrey, Hampshire, and Wiltshire, from Wales, or elsewhere.

It has been shown that the population above the intakes of the Water Companies will not be injuriously affected by the requirements of the Metropolis, however large they may become; while the interests of the inhabitants within the area of supply and to the eastward of the intakes are safeguarded, along with those of Metropolitan London itself.

It can be proved conclusively that the bringing of water from Wales of different quality, but no better than that which can be provided from the neighbourhood of London, would be very much more costly than to extend the sources already brought under contribution; while it seems more reasonable to use up the nearer supplies first, rather than to go for a limited quantity to Wales, and then be obliged to supplement it from the Thames and from wells afterwards. I have been obliged to omit much



of the proof from my arguments. I believe, however, that the more this momentous question is investigated in a spirit of pure research, the more fully will the conclusions which I have submitted be confirmed in all their bearings.

### GAS-ENGINES IN ITALY.

According to some particulars recently published in the "Bollettino delle Finanze, &c.," there were a short time since about 3000 gas-engines in use in Italy; representing a total of 16,470-horse power. Of this number there were only 174 motors using poor gas; their total horse power being 5474. All the others were driven by illuminating gas. These motors were found in 220 communes (about 2.66 per cent. of the total number of communes in the kingdom). There are gas-engines in nearly all the provinces, of which there are more than a hundred. In Milan, there are 691; in Turin, 469; in Rome, 200; in Genoa, 182; in Naples, 160; in Firenze, 143; and in Bologna, 116. The provinces occupying the first rank for horse power are: Milan, 2572; Turin, 2100; Genoa, 1368; Bari, 1322; Rome, 1266; Naples, 828; Firenze, 795; and Palermo, 769. The total horse power for all the other provinces is a maximum of 500. With regard to the industries which make the most use of gas-engines, the food-stuff factories take the lead with 248 per 1000 of all the motors, and more than 226 per 1000 of all the power. In this class are particularly conspicuous the factories of alimentary pastes and those of gaseous and mineral waters, bakeries, flour mills, and tinned and salt meat works. The services connected with public works follow with 129 per 1000 of the total power; the drinking water service being remarkable for the number of motors employed, and also that for the production and transport of power for electric lighting. The printing and cognate industries employ 114 per 1000 of the total power of Italian gas-engines. Next come the mechanical industries, especially foundries, machine building or repairing works, &c., with 101 per 1000; then the physical industries, with 74 per 1000; and the timber industry, with 46 per 1000. A less important, though not uninteresting classification—viz., that by numbers—gives the following order for the various industries: Foodstuffs, printing, &c., mechanical engineering, public services, timber industry, &c. As regards motors operated with producer gas only, more than one-half of them are employed by the foodstuffs industries and public works—viz., 96 out of 174, with 3397-horse power out of 5473.

### REGISTER OF PATENTS.

**Preparing Carbide of Calcium.**—Toby, F. L., of Euston Square, and Borch, O. S., of Upper Bedford Place. No. 23,874; Nov. 30, 1899.

The inventors claim a process by which preparations of carbide of calcium are produced, containing "particles," which conduct the water to the carbide, and "thereby assure a constant access of water to the carbide when desired;" also a process by which different carbide of calcium mixtures can be produced having different degrees of quickness in generating gas, to suit different apparatus. It is asserted that these mixtures of carbide of calcium, on being decomposed, do not produce after-generation, and no incrustation takes place at any time during generation.

This is brought about by a thorough intermixing of the carbide of calcium with a strongly hygroscopic substance—chloride of calcium ( $\text{CaCl}_2$ ) or chloride of zinc or magnesia. The proportions are about 7 lbs. of chloride of calcium to 90 lbs. of carbide of calcium, for mixtures to be used in ordinary acetylene lamps. The proportion of chloride of calcium can be reduced, if a mixture with a slower generation is desired, and increased if mixtures generating gas more rapidly are required. As soon as the supply of water is discontinued, the water contained in the lime-sludge is retained by the strongly hygroscopic chloride of calcium. Moreover, the undissolved carbide of calcium is coated with moist chloride of calcium sludge; but when water is again supplied, it is quickly conducted to the carbide, and the lamp can be relighted at once.

To make the mixture, chloride of calcium is heated until it assumes a liquid form. It is then transformed into an absolutely dry mass, by evaporation. A quantity of the chloride of calcium so obtained, and a quantity of carbide of calcium (in the proportion of 7 lbs. of the former to 90 lbs. of the latter), are put together into a grinding machine having air-tight receptacles, and ground into fine powder. It is advisable to pour (say) 1 lb. of oil over the above quantity of carbide of calcium before grinding it, so as to prevent any ignition of gas during the grinding process by friction. To the powder so obtained is added tar—say, 2 lbs. for 90 lbs. of carbide of calcium; and the whole is thoroughly mixed, and heated to (say)  $120^\circ\text{C}$ ., and then passed through a sieve. The mixture is then left to cool down—preferably for a few days in closed receptacles. It is then passed into a briquette machine, and compressed into cakes of any required size.

If it is desired to make mixtures which generate gas less quickly, the proportion of chloride of calcium is reduced to (say) 5 lbs. or less; and an increase in the proportion of chloride of calcium to (say) 15 lbs. will produce very rapid generation.

**Production of Carburetted Air Gas.**—Boult, A. J.; a communication from A. Perrier, of Marseilles. No. 25,009; Dec. 16, 1899.

This apparatus (for the production of petroleum or like gas suitable for lighting, heating, or as a motor-driving means) consists of three main parts—i.e., an air-vessel or compressor, a saturator, and a gasholder; the two first-mentioned apparatus alone forming the main object of the invention.

The air to be carburetted is supplied through a bell placed in a water

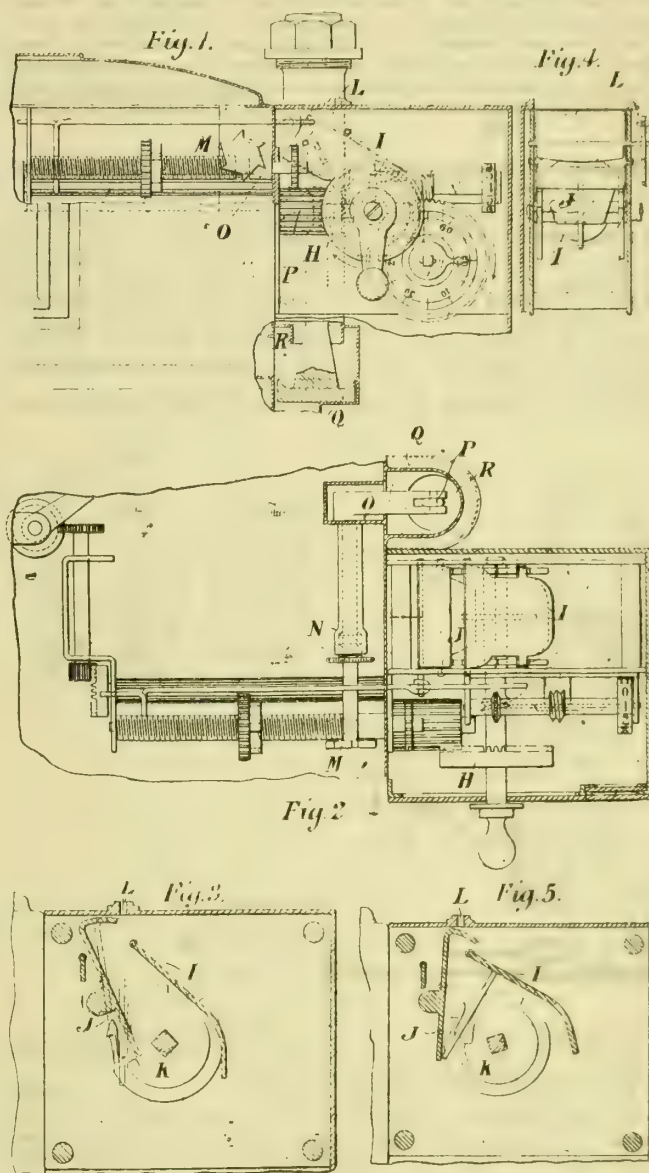
receptacle, and capable of moving up and down in it; the bell being caused to descend in order to drive the air under pressure through saturators preferably formed of several chambers, arranged one above the other, and each supplied separately from a petroleum reservoir arranged above. The air flows through the charge in these chambers, takes up vapours therefrom, and thus saturated passes to the gasholder ready for use.

**Prepayment Gas-Meters.**—Paterson, B., of Clerkenwell Green, E.C. No. 1086; Jan. 17, 1900.

This invention relates to coin-freed gas-meters of the kind wherein, by the aid of a coin, a normally locked handle is freed to enable the purchaser to turn it through a predetermined distance; the rotation of the handle revolving a screw, and setting forward a toothed wheel upon it through a predetermined distance, and opening the gas outlet or inlet valve so as to allow gas to pass through the meter—the passage of the gas effecting the return of the toothed wheel by means of an elongated pinion placed parallel with the screw.

Fig. 1 is a sectional elevation of a portion of a meter with the present improvements applied to it. Fig. 2 is a sectional plan. Figs. 3 and 4 are cross sections. Fig. 5 is a view similar to fig. 3, but showing the parts in different relative positions.

The prepayment mechanism comprises the carrier for receiving the coin



introduced, consisting of two end-plates, formed with slots to receive the coin, and mounted upon a spindle which is supported in bearings in the frame-plates, and has an external handle or crank whereby it can be turned in the usual way. The spindle is provided with a crown-wheel H, which gears with an elongated pinion adapted to effect the rotation of the feed-screw either directly or indirectly. In the arrangement shown, it actuates the screw through the medium of a toothed wheel mounted upon one end of the feed-screw externally to the meter-casing and inside the casing of the prepayment mechanism. The wheel H also serves as a price-changer—to enable the apparatus to be adapted to deliver different quantities of gas for each coin inserted according to the price of gas. The coin-carrier is normally held against rotation by means of a pawl I having two pins, which engage peripheral notches or slots in the end-plates of the carrier by means of a second or gravity-pawl J, which normally engages a depression or tooth K upon a cam-disc extended upwards to form a shutter for closing the coin-slot L, when a coin is in the carrier. It will also be seen that the pawl forms a guide for the coins inserted.

With this arrangement, when a coin is inserted in the apparatus, it drops into the slots in the end-plates, and in its travel releases the gravity-pawl J from engagement with the cam-disc, moving it into the position shown in broken lines in fig. 3, so that the shutter is brought underneath the coin-slot L and closes it. The cam-disc being thus released,



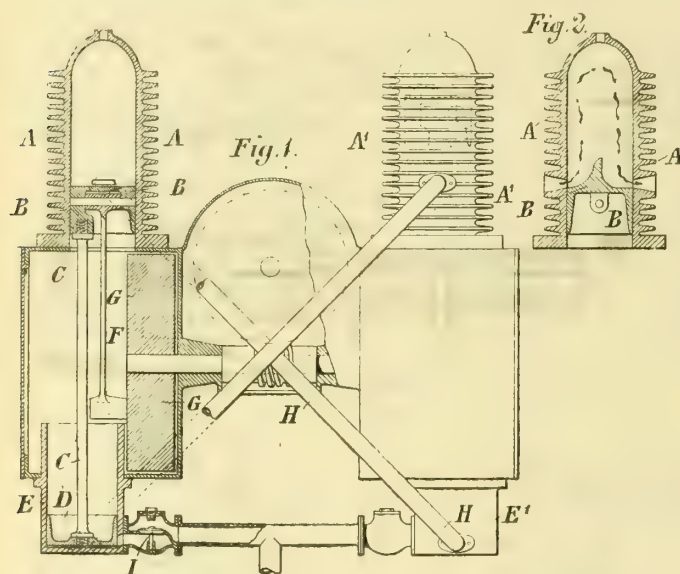
the carrier can be rotated slightly. This initial movement of the carrier, however, causes the coin to lift the pawl I from the peripheral notches, as shown in fig. 5, thereby completely releasing the carrier, and allowing it to be turned further until the coin falls from the carrier and the latter resumes its normal position. The gravity-pawl (which, during the latter portion of the movement, has ridden upon the periphery of the cam-disc, and thereby kept the money-slot closed) then again drops into engagement with the tooth K, and locks the carrier, upon which the shutter is withdrawn and the money-slot L reopened to receive another coin, and so on. The rotation of the spindle has turned the crown-wheel H, which, through the medium of the toothed gear, has set forward the toothed wheel upon the screw to an extent corresponding to one coin's equivalent of gas.

The toothed wheel in the attic of the meter is of special construction—that is to say, it is formed upon one face with a number of projections or teeth (preferably somewhat radial); the grooves forming the teeth upon the wheel extending on to the peripheries of the projections. These teeth have for their object to engage with a star-wheel M, when the toothed wheel has been returned by the action of gas passing through the meter to the initial position; the engagement of the teeth at any point with the star-wheel effecting the closing of the gas outlet or inlet valve. To this end, the wheel is mounted upon a spindle supported at one end in a stuffing-box N on a closed chamber containing a crank-arm O, keyed to the spindle and connected to the valve spindle or stem P, and at the other end in a recess in the feed-screw. To enable the gas to be gradually and not suddenly cut off, the valve-stem is formed with a cone-shaped lower end having a dish-shaped or recessed disc or valve proper Q. With this arrangement, the gradual closing of the valve decreases the area of the gas-outlet passage R until the disc Q completely shuts the passage.

**Gas-Engine.**—Melhuish, A. G., of East Dulwich, S.E. No. 1358; Jan. 22, 1900.

This invention consists primarily in arranging a duplex gas-engine in such a manner that two ignitions and explosions occur at each revolution, there being no valves in (preferably) the working cylinder, the exhaust being sucked out by a suction-cylinder of the adjoining engine of each pair. The new charge enters the cylinder at the extreme outstroke, and is deflected inwards and sweeps out the remainder of the combustion products. The return-stroke of the suction-piston discharges the products through a valve either in the piston or cylinder side; and the working piston compresses the charge, and fires it.

Fig. 1 is a side sectional elevation, showing the pipes communicating



with the respective cylinders. Fig. 2 is a sectional elevation of the working cylinder; the piston having a projection for deflecting inward and sweeping out the remainder of the combustion.

A A' are the working cylinders, the pistons B of which are connected by rods C to the exhausting-pistons D working in the cylinders E E'. The piston B, by the connecting-rod F, imparts rotary motion to the fly-wheel and crank-disc G, which can be utilized in doing work in any convenient manner. The pistons of each engine are connected to the crank-disc at an angle of 180° to each other; so that when the one has completed its instroke, the other has completed its outstroke. Therefore, the lower or exhausting cylinder of the right-hand engine is connected by a pipe H to the top cylinder of the left-hand engine, and *vice versa*; and the lower cylinders are either each fitted with non-return valves I, or else the pistons may be made of such a length that the valves are dispensed with.

Upon the upstroke of either engine, a vacuum is formed in the lower cylinder E E' respectively; and when the top piston B has uncovered the communicating-port, the products of combustion are withdrawn, and a new charge enters at the opposite port, and is deflected as shown in fig. 2.

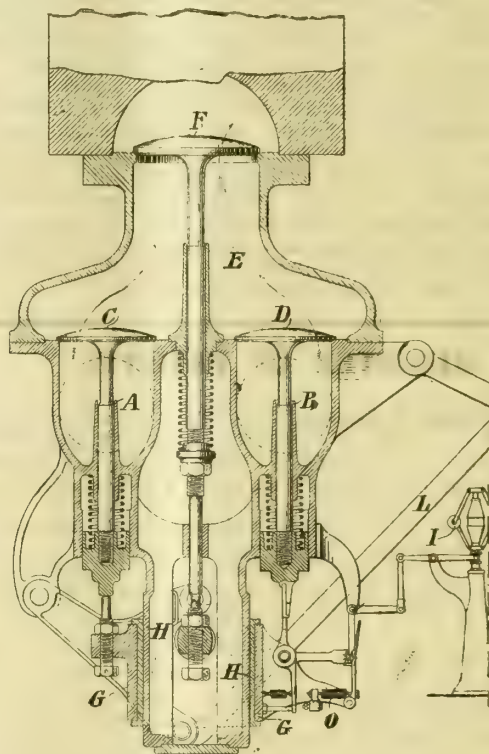
**Producing a Homogeneous Explosive Mixture of Gas and Air in Gas-Engines.**—Dudgeon, A. J.; a communication from La Société Anonyme John Cockerill and H. Savage, of Seraing, Belgium. No. 14,343; Aug. 10, 1900.

One of the causes which is most frequently prejudicial to the working of engines operated by the explosion of a mixture of air and gas is—the putrefaction point out—the want of homogeneity of the mixture. It is generally believed that the diffusion is, in itself, sufficient to assure an intimate and homogeneous mixing of the separate volumes of air and gas which are admitted into the combustion-chamber at each fixed period of the cycle of the engine. With the usual arrangements, in which air is directly admitted from the atmosphere independently of any mechanical

regulation, the homogeneity of the gaseous mixture cannot be obtained, they seek to demonstrate.

They say: On what cycle soever the motor works, let us assume the position of the piston at the start to correspond with the back dead-centre, and the displacement to take place in front thereof. The admission of gas to the combustion-chamber is regulated by the distributing valve or valves, which open to the gas a certain area of the port for a given time. The volume of gas admitted depends upon these two conditions, and upon the pressure existing in the pipes—modified, perhaps, within certain limits, by the governor of the engine. The admission of the air required for the combustion of the gas is, on the contrary, not subject to any regulation. For all possible speeds and conditions of running, it depends only upon the area of the orifice establishing communication with the atmosphere, and on the displacement of the piston, which always sucks practically the same quantity of air into the cylinder. Therefore, one cause of irregularity in the composition of the mixture lies chiefly in the different modes of admission of the air and gas. Also, a further cause of loss of homogeneity is due to the variable speed of the piston. In all machines where the rectilinear movement of the piston is converted into rotary movement of the shaft or crank, the piston speed is *nil* at the dead-points, and attains its maximum at half-stroke.

Starting from this postulate, let us consider first what takes place in admitting gas to the cylinder. The admission-valve presents at the commencement of the stroke a very small opening for the admission of gas, which opening gradually increases in area correspondingly with the advance of the piston. The engine being at full speed, the quick start of the piston from the beginning of the stroke, combined with the small area of the admission-port, throttles more or less the admission of the gas. This throttling disappears with the gradual opening of the valve; and at its greatest opening (*i.e.*, at mid-stroke), the piston, having attained its maximum velocity, sucks in the gas in great volume. Towards the end of the stroke, the valve closes; the piston speed diminishes; and the gas supply is gradually cut off.





cylindrical guide H cast in one piece with the valve-casing and adapted to act upon the valves C and F through the medium of adjustable studs. The valve D is worked by means of a detent controlled by a centrifugal governor I or other such appliance. The governor acts on the bell-crank lever K, and by means of a cam or inclined plane or other suitable connection on the latter, it raises one end of the horizontal arm, and in so doing tilts backwards the detent, which is thus thrown out of gear with the projection on the valve. By the same motion, the outer end of the arm is lifted on to a catch on the vertical curved lever, and is there maintained by the tension of the spring O. The detent is thus held in its out-of-gear position until the curved prolongation of the lever, following the ascending motion of the sleeve G, is brought into contact with a roller or button on the pivot. This releases the catch at the end of the horizontal arm, and a second spiral spring draws the tail-piece hard up against a fixed stop, so bringing the detent back to its vertical or gear position, when the gas-valve D is at once raised as the sleeve G rises. The lever L transmits its motion to the sleeve G, and therefore regulates the distribution of the charge to the motor.

When an air-regulator is employed, the action of the detent gearing is practically identical with that above described, but adapts itself better to hand regulation.

The opening of the gas-valve D is regulated according to the speed of the machine by the reciprocating movement of the sleeve G, and by the position imparted to it by the governor and the detent; the mechanism being, in fact, analogous to that employed in steam-engines with automatic gear.

The mixing of the air and gas takes place in the chamber E; and on opening the valve F, the gaseous charge rushes into the combustion-chamber in proportions which do not alter throughout the whole piston stroke. By regulating (as required, by means of the screw and nut) the opening of the valve C, air will be admitted "with certainty and constancy" during the whole stroke, in just the volume necessary for perfect combustion; and consequently "the maximum useful effect with a minimum consumption of gas will be assured."

**Burners for Gas used in Furnaces.**—Fletcher, T., Neil, A., and Fletcher, Russell, and Co., Limited, of Warrington. No. 15,501; Aug. 31, 1900.

This invention relates to the bunsen or similar burners used in small blast-furnaces—especially those fitted with crucibles, and employed for experimental purposes; the object being to protect the wire gauze of such burners from damage caused by the excessive radiation of heat from the interior of the furnace, when the blast is shut off, and also to remove the flame from the surface of the gauze.

For this purpose, to the inner end of the burner there is fitted over the wire gauze (on the side next to the furnace) a protecting hollow cone of cast metal, either plain, stepped, or corrugated; the larger end of the base of the cone resting with its edges against the back of the wire gauze, and the smaller end thereof projecting into the furnace.

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22,470.—BEREND, O. A., "Gas lighting." A communication from J. R. Schauer. Dec. 10.

22,491-2.—CARPENTER, C., "Incandescent gas-burners." Dec. 10.

22,507.—NEW, A. G., "Internal combustion engines." Dec. 11.

22,520.—HAMMOND, J., "Gas cooking-stoves." Dec. 11.

22,546.—BERGMANN, T., "Gas-engines." Dec. 11.

22,551.—PURPLETT, S., "Exhausting and compressing gases." Dec. 11.

22,587.—THOMPSON, W. P., "Self-igniting gas-lighters." A communication from Wolff and Co. Dec. 11.

22,595.—FILLET, J., "Carburetted air." Dec. 11.

22,598.—WISE, W. L., "Gas-meters." A communication from the Aktien-Gesellschaft für Automatische Zünd und Lösch-apparate. Dec. 11.

22,601.—WISE, W. L., "Lighting and extinguishing jets of combustible fluid." A communication from the Aktien-Gesellschaft für Automatische Zünd und Lösch-apparate. Dec. 11.

22,618.—HARRIS, W., "Shock-proof fitting for use with incandescent gas lighting." Dec. 12.

22,643.—HUMFREY, C., "Producer gas-burners." Dec. 12.

22,644.—HUMFREY, C., "Washers for use with producer or other gases." Dec. 12.

22,645.—HUMFREY, C., "Grates, stoves, and ranges heated by gas." Dec. 12.

22,693.—ROWBOTHAM, W. & K. A., "Gas and oil engines." Dec. 12.

22,694.—LERY, J. B. DE, "Incandescent gas lighting." Dec. 12.

22,720.—BLAKEY, J. W., "An improved lighting apparatus for gas and other purposes." Dec. 13.

22,721.—BLAKEY, J. W., "Anti-vibrator for incandescent gas lighting." Dec. 13.

22,724.—WARWICK, R., "Incandescent gas-lamp chimneys." Dec. 13.

22,738.—CHANDLER, S. S. & S. B., "Gas washers and scrubbers." Dec. 13.

22,782.—CLARK, W. W., and BONE, G., "Generating acetylene gas." Dec. 13.

22,784.—BLACKSTONE, E. C., CARTER, F. & E., "Cooling the cylinders of explosion engines." Dec. 13.

22,786.—WILSON, J., "Incandescent gas lighting." Dec. 14.

22,790.—ROWBOTHAM, W. & K. A., "Explosion engines." Dec. 14.

22,810.—MARCHANT, G. M. & W., "Valves for steam, water, gas, or other purposes." Dec. 14.

22,831.—KENNEDY, R., "Coin-prepayment mechanism for meters." Dec. 14.

22,858.—CROSS, F. W., "Combined coal-screen and coal-breaker for inclined retorts." Dec. 14.

22,894.—LANE, H., "Air and gas and like engines." Dec. 14.

22,903.—COWAN, W., "Prepayment gas-meters." Dec. 14.

22,943.—CROSSLEY, W. J., and ATKINSON, J., "Treating the gas given off from gas-producers, and the air before passing it into the producer." Dec. 15.

22,960.—SHACKLETON, J., and ROSS, A., "Acetylene generators." Dec. 15.

## LEGAL INTELLIGENCE.

### HOUSE OF LORDS.—Monday, Dec. 17.

(Before the LORD CHANCELLOR, and LORDS SHAND, DAVEY, BRAMPTON, JAMES, and ROBERTSON.)

**J. E. H. Andrew and Co., Limited, v. British Motor Company, Limited, and Others—Question as to a Gas-Engine Starter Patent.**

This was an appeal by the plaintiffs against a judgment of the Court of Appeal reversing a decision of Mr. Justice Kekewich given in a case which came before him on Jan. 24, 1899.\* The action was brought in the first instance for the purpose of obtaining an injunction restraining the present appellants from infringing letters patent granted to Frederick W. Lanchester. The validity of the patent had been certified by Mr. Justice Wright in an action in which Mr. Lanchester and the respondents were the plaintiffs and Messrs. Richards and Green the defendants. The appellants denied infringement, and alleged that the patent was invalid for various reasons. It related to an improved means of starting gas-engines—an operation which, prior to the invention, was, in the case of engines of great power, a work of difficulty and danger. Mr. Justice Kekewich did not express any opinion as to the validity of the patent, but held that the appellants had not infringed it, and dismissed the action. The Court of Appeal decided that the patent was valid, and that the appellants had infringed it; and they discharged the judgment of the learned Judge, and granted an injunction. Hence the present appeal. Their Lordships now delivered a reserved judgment.

LORD DAVEY said the case resolved itself into a question of the right construction of the first claim in Lanchester's patent of 1890. On the one hand, the respondents admitted that if the construction was that approved by Mr. Justice Kekewich, there was no infringement of their patent by the appellants; and, on the other, the appellants admitted that if the larger construction which found favour in the Court of Appeal was adopted, their machine was an infringement, subject to any question which might then arise as to the validity of the patent. The question thus presented was one of some difficulty and nicety; but he had ultimately come to a clear conclusion that the judgment of Mr. Justice Kekewich was right, and ought to be restored. The learned Judge had discussed the question very fully, and, speaking generally, he (Lord Davey) agreed with the reasons given for his opinion. The question was whether the words "causing the velocity of outflow to fall short of the velocity of the propagation of flame" would, having regard to the context, cover and include a device suggested in the body of the specification whereby the same result—viz., the striking-back of the flame—was secured automatically. First, he observed that, in the general description of the invention, as well in the provisional and in the complete specification, the patentee said it consisted substantially (so far as was material for the present purpose) "in providing means whereby, on cutting off or reducing the supply of inflammable gas or vapour, the said mixture is exploded to start the engine;" and he described a cock to be used for the purpose, "when the explosive mixture burns with a characteristic roar in the expanding nozzle." Secondly, he described an alternative method in these words: "The relative areas of the nozzles may be such that the flame, instead of being caused to strike back by reduction of the rate of flow, strikes back on the mixture becoming sufficiently rich." In the Court of Appeal, Lord Justice Romer said the patentee intended the subsidiary methods to come within the scope of his invention and the wording of his first claim. With the greatest respect to the learned Lord Justice, this assumed the very point to be decided. On the construction of the claim, he (Lord Davey) came to the conclusion that the patentee thought it more prudent not to claim, or, at any rate, had not claimed, as part of his invention for which he sought protection, the alternative means adumbrated in one sentence of his specification. It was therefore necessary to discuss the other questions argued at the Bar. He thought the judgment of the Court of Appeal should be reversed and that of Mr. Justice Kekewich restored, with costs in the Court of Appeal and this House.

The LORD CHANCELLOR and the other learned Lords concurred.

### HORSHAM PETTY SESSIONS.—Saturday, Dec. 15.

(Before Mr. R. H. HURST, Chairman, Sir W. STIRLING-HAMILTON, Bart., and Mr. J. WARREN.)

**The Complaints of Nuisance from the Horsham Gas-Works.**

The summons taken out by the Horsham District Council against the Gas Company for permitting noxious odours to escape from their works, which was before the Bench on the 28th of July last (*ante*, p. 294), came on again for hearing.

Mr. C. J. B. HURST represented the Council; Mr. G. F. HOHLER appeared for the Company.

The CHAIRMAN explained that, as left at the previous hearing, the case stood as follows: The Bench found that there was evidence of a nuisance arising from the Company's new works; and they postponed their final determination for three months—the Company in the meantime to raise the chimney-shaft to such an extent as would be sufficient to abate the nuisance.

Mr. HOHLER gave a brief outline of the proceedings at the July sitting, and said that since then the Company had adopted the best practicable means to remedy the nuisance. Mr. Corbet Woodall, who gave evidence on the previous occasion, had suggested the raising of the shaft to a further height of 20 feet, and had also recommended that if the system of cutting off the oil supply was adopted, the nuisance would be abated, and there would be no reasonable cause for complaint.

Mr. Corbet Woodall was then called, and said his suggestion had been carried out in its entirety. The interval allowed in cutting off the oil was two minutes. He recommended this, but found that it was exactly what had been done. He had inspected the works, and found great care

\* See "JOURNAL," Vol. LXXIII., p. 248.



and attention paid to cleanliness and order. They were the best of the kind he had seen, for their size. He was quite sure that with the apparatus as it was now it could only be by carelessness or accident that a nuisance could be caused to the neighbourhood. He then explained the system of gas-making to the two Justices who were not on the Bench at the previous hearing.

In cross-examination, witness said 20 feet was just about as considerable an addition as could be made to the shaft with safety; and it was now high enough to prevent the probability—and almost the possibility—of nuisance to the neighbourhood. In addition to raising the shaft, he had had a wind-guard placed facing the south-west on the leeward side, so that when a south-west wind blew the gas coming out would be still further distributed in the air—not driven straight in front of the wind.

In re-examination, witness said the actual height of the shaft from the ground was now 72 feet, and its diameter 18 inches. There had been no suggestion that the diameter should be greater. If it were, they might get a down-draught, and the fumes would escape into the generator-room. A brick shaft would induce risks greater than any at present existing, for there would be liability to explosions.

Mr. HURST admitted that, since the chimney had been raised, there had been less nuisance, but said it had not been proved that this was due to increasing the height, or to the fact that the works had not been used so much. The shaft was not, he contended, sufficiently raised to carry the fumes right away over the houses; but if it were taken up still farther, it would do so.

Dr. Kenneir, who gave evidence on the previous occasion, said that his house was about 70 yards from the new works, and since the shaft had been raised he had not been subjected to the nuisance so often; but when the works had been going, and the wind had been from the west, it was just as bad as before. He had made notes of the nuisance, one being to the effect that on the 19th ult. the gas-works were smelling badly, and that dense yellow fumes were coming out of the top of the shaft.

In cross-examination, witness said that when the works had been going there had been no improvement whatever. However high they raised the chimney, there would always be a stench. To get rid of the nuisance they must get rid of the works. Reading further from his diary, witness said that the 4th of December was "a horrible day; abominable smells from gas-works; children made sick and bad." On the 29th of October he entered: "Gas smelling badly. Blue fumes coming out of roof."

Mr. G. W. Flint, Managing Clerk to a local solicitor, said his room was close to the works, and he had not smelt fumes from the shaft since it had been raised.

Mr. HURST said the shaft had been carried sufficiently high to take the fumes over witness's employer's place, but not over Dr. Kenneir's.

Mr. Woodall, recalled, said he had no hesitation in stating that the same quantity of gas made by the ordinary process, with coal, must necessarily produce far more smell than would arise in the production of carburetted water gas. From this gas there was no smell except that caused by the combustion of the coke.

In reply to the Bench, witness explained that the fumes coming out of the roof were caused by the removal of clinkers from the boiler in the process of cleaning. This would occur about three times a day.

Mr. E. T. D. Sapcey, Manager of the works, said the boiler was cleared about three, and occasionally four times a day.

The Magistrates then retired. After a brief consultation, they returned and gave the following decision: "The Court finds that the Company have complied with the terms of the previous order, and therefore makes no further order against the Company."

#### The Liability for the St. Helens Explosion.

In the Queen's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Bucknill had before him for further consideration and judgment the case of *The St. Helens Corporation v. The United Alkali Company, Limited*, recently tried by him at the Liverpool Assizes (see ante, pp. 1463, 1525), in which the plaintiffs sought to recover for damage done to their gas-works and other property by an explosion of chlorate of potassium at the defendants' works at St. Helens, on May 12, 1899. Mr. Danckwerts, Q.C., Mr. Clarke Hall, Mr. Rigby Swift, and Mr. Hutchinson appeared for the plaintiffs; Mr. Joseph Walton, Q.C., and Mr. Horridge represented the defendants. Mr. Walton addressed his Lordship, and claimed that, as the experts, as was proved in the case, were not aware that chlorate of potassium in a pure and unmixed condition was explosive, the defendants could not be held to be liable for the damage done. Without calling on the other side, Mr. Justice Bucknill said that it was well known that potassium chlorate was dangerous when it came into contact with other substances—notably burnt or charred wood; and in the event of a fire it was highly inflammable. The Jury at the trial had found that, in view of this fact, the defendants had not taken proper precautions against an outbreak of fire. He must, therefore, hold that they were liable; and he would give judgment for the plaintiffs, with costs—the damages to be assessed as agreed to between the parties. A stay of proceedings was granted, after some discussion, with a view to an appeal.

#### Damages for Personal Injuries.

At the Marylebone County Court, on Monday last week, before his Honour Judge Stonor and a Jury, John Blackman, of Warrington Road, Notting Hill, brought an action, under the Employers' Liability Act, against the Gaslight and Coke Company, for compensation for personal injuries alleged to have been caused through negligence for which the defendants were responsible. The amount of the claim was set down at £195. Mr. A. Hutton appeared for the plaintiff; Mr. Alexander Neilson represented the Company. In opening the case, Mr. Hutton explained that the plaintiff had been employed by the defendant Company as a labourer for some five years at their Kensal Green station. At these works there were twelve purifiers; and on the 13th of October the plaintiff was assisting in cleaning one of them, which was 30 feet long, 20 feet wide, and 6 feet deep. The gas was supposed to have been drawn off, and ordinary air passed through the box with a view to clearing out as much of the impurities as possible. While Blackman was working at the bottom of the box, an explosion occurred, and he was badly burnt about the face and arms. It was contended on his behalf that the defendants or their servants were guilty of negligence in consequence of the

impurities not having been drawn from the purifier before the men were sent to work in it, and also that the pipes were not properly sealed so as to prevent leakage of the gas. The plaintiff bore out his Counsel's opening statement. He added that his wages, while in the employ of the Company, averaged 25s. a week. He was taken to St. Mary's Hospital, Paddington, where he was detained until the 15th of November. He had been unable to do any work since, and still suffered from the shock. Mr. A. C. M'Minn, Assoc. M. Inst. C.E., the Resident Engineer at the works, stated that the process of cleaning the purifiers by forcing air through them had been approved by the Metropolitan Gas Referees; and it was only after the air had been pumped through for an hour that the cover was taken off in order that the men might enter. He acknowledged that a slight leakage had been found; but it was of no importance. The whole of the mains and the valves were new in 1879, and the purifiers themselves were new in 1883. Alfred Wells, the deputy-foreman in the purifying department, said he was present when the accident occurred, but could not account for it. His Honour remarked that it seemed to him like a miracle. Mr. Neilson said his suggestion was that it was a strange combination of causes, for which no explanation could be given. Witness went on to state that at the time of the accident the valves of the purifier were perfectly sound. The Jury found: (1) That there was defect in the works, or in the use of the works, which arose from negligence on the part of the defendants or of persons entrusted by them with the supervision of the works; (2) that this defect had not been discovered or remedied owing to such negligence; and (3) that it was in consequence of the defect that the accident occurred. This was a verdict for the plaintiff, in whose favour the Jury assessed the damages at £50. His Honour gave judgment accordingly, and allowed costs.

#### Sequel to the Accident at the Stoke Gas-Works.

At the Stoke County Court, his Honour Judge Mulholland, Q.C., recently had before him the matter of an arbitration between William Lamb, a bricklayer and retort setter, and Messrs. R. Dempster and Sons, Limited, of Elland; and he arranged an order for £1 a week compensation, deducting the total amount paid to him since the date of his accident. Applicant sustained a compound fracture of the right arm, a bruised back and hip-bone, and a scalp wound while employed by the respondents on the 10th of January last at the Corporation gas-works, Stoke; the accident being due, as reported in the "JOURNAL" at the time, to the principals supporting the roof of the building falling down. With reference to the fracture of the arm, part of the bone had had to be taken out, and consequently the arm was useless, rendering applicant totally incapable of following his trade.

#### Responsibility for Giving Notice to Discontinue a Supply of Gas.

At Marylebone Police Court on the 11th inst., Mr. Plowden had before him a case in which the Gaslight and Coke Company sued Mr. Healing for a sum of about £20 for gas supplied. Defendant carried on business in Pinduck Mews, Marylebone, as a cab and carriage builder, in 1891, and entered into a contract to use the Company's gas. He converted his business into a limited liability Company, and a contract was entered into by them to pay for the gas. In 1892 the Company failed, and the defendant again signed a contract for the supply of gas. A fresh Company was formed at the end of 1892, and the defendant was appointed Manager. From about that time until 1899 the accounts for gas were paid by the Company's cheques; but in this year the debenture-holders obtained an order to appoint a receiver and manager. The question now arose as to whether, owing to there not being sufficient notice in writing by the defendant, he or these parties were liable for the gas consumed. It was contended for the defendant that, as the Gas Company had received cheques of the limited Company for a number of years, there was sufficient notice of the defendant's intention to discontinue the use of gas, and that therefore the limited Company were liable. Mr. G. Merry, one of the Gas Company's collectors, proved the contracts signed, and said he had not received any written notice to stop the supply of gas. He also mentioned that the accounts were usually paid at the Company's chief office towards the end of the quarter, under pressure. Defendant was called to speak as to certain conversations which had taken place, and formally prove some documents relating to the formation of the Company. His Worship, after going through the evidence, said that his judgment must be for the plaintiffs, and with costs, as they were entitled to stand upon their strict right because of the failure of the defendant to give proper notice in writing as was required.

#### A Gas Company Fined for Polluting a Stream.

The Guildford Borough Magistrates recently had before them a summons taken out by the Conservators of the Thames against the Guildford Gas Company for having polluted the River Wey on the 22nd of October. It was stated by the representative of the Conservators (Mr. W. S. Bunting) that so long ago as 1897 the Conservators were in communication with the Company on the subject of the pollution then going on; and the following year proceedings were commenced with the view of stopping it. An undertaking was given that certain works should be carried out, which it was quite believed by all parties would put an end to the nuisance complained of; and consequently only a small penalty was imposed. The promised works were duly executed, and the trouble ceased. In the course of the present year, the Conservators had been again in communication with the Company on the subject; and they explained that the pollution arose in consequence of the very heavy rains having broken down a portion of their embankment. They undertook to carry out some repairs—in fact, they had started them before the complaint was made—and this pollution was stopped. The Conservators, however, in July, served a notice on the Company, calling upon them to obviate all sources of pollution. On the 22nd of October a sample of the effluent was taken, and it proved to be so bad that the Conservators had no alternative but to again institute proceedings. Assuming that there was something wrong, the Company opened up the works they had carried out two years previously, and discovered that, owing to the character of the ground, the pipes had sunk and caused a break, through



which the gas liquor found its way and caused the pollution. The Company had had this remedied; and since then there had been no pollution. Mr. Sparkes, who appeared for the Company, said he entirely endorsed what Mr. Bunting had stated, and would leave the matter in the hands of the Bench. The Company intended to exercise every precaution, as they had done in the past, to guard against a recurrence of the pollution. They took samples almost daily, and they did not at all anticipate that there would be any pollution in the future. The Mayor, Mr. G. Tayler, said the Bench understood that in this case the pollution was quite accidental, and arose from a matter of which the Company were not aware. Under these circumstances, although there had been a complaint before, they thought it would be sufficient if they inflicted a fine of £1, with £5 18s. costs.

#### Question as to the Appointment of an Umpire in the Ossett Gas-Works Arbitration.

In the Chancery Division of the High Court of Justice last Thursday, Mr. Justice Cozens-Hardy had before him a motion on behalf of the Ossett Gas Company, for an injunction to restrain the Mayor and Corporation of Ossett from summoning a jury for the purpose of determining the value of the Company's undertaking, which the Corporation were seeking to purchase. Mr. Vernon Smith, Q.C. (Mr. Beaumont with him), who made the application, said the short point to be decided was whether or not the Corporation were right in the view that the value to be paid by them to the Company could be ascertained by a jury. The plaintiffs contended that it could only be done by arbitration under the Lands Clauses Act. The Company was an old-established one; but on the 10th of July last an Act was passed authorizing the purchase of the undertaking by the Corporation. It was provided by section 5 that the Company should sell and the Corporation purchase the concern for such price and on such terms as should be agreed, or as, failing agreement, "shall be determined by arbitration, in accordance with the provisions of the Lands Clauses Act with reference to the purchase of land otherwise than by agreement." It also went on to provide that the Corporation should pay compensation to the Manager and Secretary of the Company, to be determined, in default of agreement, by arbitration. The Lands Clauses Act was not incorporated; the only reference to it being in the section named. On the 10th of August a notice to treat was given by the Corporation; and on the 27th, the Company gave notice of a request to concur in the appointment of a single arbitrator, or, failing this, to nominate an arbitrator to act on their behalf. On the 3rd of September, the Corporation appointed Mr. Monkhouse as their Arbitrator; and on the 6th, the Company nominated Mr. Corbet Woodall as theirs. A long correspondence (partly conducted by Mr. Henry Woodall, in his father's absence abroad) ensued between these gentlemen as to the selection of an umpire. In this correspondence, Mr. Monkhouse was pressing for the concurrence of Mr. Woodall in the appointment of certain gentlemen named by him, to which Mr. Woodall did not agree; and he, on his part, was pressing for an extension of time, which the defendants declined to agree to until the umpire had been appointed. Ultimately, on the 6th inst., when the three months limited by the Act had expired, the Company applied to the Board of Trade to nominate an umpire. But they had not yet notified whether or not they were prepared to do so; and on the 15th the defendants served the plaintiffs with notice of their intention to summon a jury. On this notice the motion was launched. He submitted that the defendants had no power to do as they proposed, and pointed out how inconvenient it would be for a jury to attempt to assess the value of such an undertaking as that of the plaintiffs, which the defendants themselves had estimated at £86,500. He also pointed out that if there was any difficulty about appointing an umpire, in consequence of the time having expired, the Arbitration Act of 1889 gave power to the Court to extend the time and make the appointment. Mr. Blennerhassett, Q.C., for the defendants, contended that whatever inconvenience might arise would have been caused by the plaintiffs themselves, and that under the Lands Clauses Act, when a matter was referred to arbitration, and the time was allowed to expire without any award being made, it was within the right of either party to summon a jury. Dr. Davies Williams, who was on the same side, further urged that, in any case, the plaintiffs were not entitled to an injunction, because, on their own contention, the inquiry before the jury would be futile and ineffective, and it was not the practice of the Court to interfere by injunction to prevent people making fools of themselves if they pleased, so long as, by so doing, they did not injure other people. Mr. Vernon Smith had commenced his reply, when Mr. Blennerhassett said he believed all trouble would be saved, as the parties were willing to agree to Mr. Punchard being appointed umpire. It was arranged that this should be done, and that the time for making the award should be extended to the 31st prox. There only remained the question of the costs of the motion; and his Lordship, in a short judgment, gave his reasons for holding that the defendants were wrong in the construction they put upon the 5th section of the Act, and must therefore pay the costs.

#### The Felixstowe Gas Company Fined for Defective Illuminating Power.

At the Woodbridge Petty Sessions last Thursday, a summons was heard against the Felixstowe Gas Company, Limited, for having, on Nov. 22, supplied gas to the District Council of Felixstowe and Walton, of less illuminating power than provided by the Gas-Works Clauses Act, 1871. Mr. F. B. Jennings (Clerk to the Council) said the Company were incorporated under an Order of 1895, which provided that the minimum illuminating power should be equal to 15 candles. On Nov. 22, however, Mr. E. C. Sayer, the Gas Examiner, tested the gas, and found the mean lighting power was 14.5 candles. This certificate was forwarded to the Company; and on Nov. 24 the Secretary wrote acknowledging its receipt. Nothing more was heard until Dec. 5, when the Council received a letter, stating that the cause of the deficiency on the day named was an unavoidable accident—one of the retorts having broken down. The Secretary further called attention to the fact that in previous tests the illuminating power had ranged from 15 to 18 candles, with no impurities. The Order provided that no penalty should be incurred by the undertakers in respect of

defect of illuminating power if it was proved that it was produced by an unavoidable cause or accident. Mr. Jennings contended that the defence now set up was an after-thought, and was no answer to the Council's allegations. Mr. A. J. Haward, for the Company, did not impugn the correctness of Mr. Sayer's certificate; but he did contend that the insufficiency of illuminating power was caused by an unavoidable accident, over which the Company had no control. They were, on Nov. 22, working with nineteen retorts; and one of them, through some unexplainable reason, collapsed. The retorts were charged every six hours. In the present instance, they were charged at ten in the morning, so it was not until four in the afternoon that the retort was discovered to possess a large hole. In consequence of this, the retort had drawn in a certain amount of air, which, on mixing with the gas, caused a reduction of the illuminating power. Everything possible was done to overcome the difficulty; and by seven in the evening, the gas had assumed its normal condition. Mr. William V. Watson, the Secretary and Manager of the Company, gave evidence, and in reply to the Bench, said the retorts were examined daily; and if one was found faulty, a report was immediately made. In cross-examination, witness added that each retort produced about 2800 or 3000 cubic feet of gas per 24 hours. The Company possessed two gasholders; and on the occasion in question, the smaller of the two, with a capacity of about 17,000 cubic feet, was at work. He believed it was nearly full. At that time they were consuming as much gas as they could possibly make. Mr. J. Watson, foreman, stated that at about seven or eight p.m. the gas was of 17 or 18 candle power. The holder was not full in the morning; it contained, he should say, at the least, 10,000 feet. Mr. Sayer was then called for the prosecution; and he stated that he was not informed, when he made his examination, that there had been a breakdown at the works. If the Manager had told him that a retort had collapsed, he would certainly have made a note of it on his certificate. Dr. Samuel Rideal expressed the opinion that the Company were to blame in the matter. It had been shown that the amount of gas consumed between ten a.m. and four p.m. was about 11,000 cubic feet—a quantity which, he pointed out, corresponded with the amount estimated to have been in the holder in the morning. He, therefore, held that the gas tested at the Company's office between five and six o'clock was manufactured before the breakdown of the retort had occurred. He was certain that the gas was manufactured in the state shown by the Inspector's examination, and was not due to the breakdown of the retort. Even assuming that the leakage in the retort did affect the quality of the gas, he considered the accident was one that might have been avoided, with due care. The Bench imposed a fine of £2, with costs £4 4s. 6d.

#### Embezzlement by a Collector.

At the Westminster Police Court last Wednesday, William George Straffon, a young man who had been in the service of the Gaslight and Coke Company as an automatic meter collector, was, on remand, charged before Mr. Horace Smith with embezzling the moneys of the Company. Mr. R. H. Humphreys prosecuted, and Mr. P. Conway appeared for the prisoner. The excuse made by Straffon for not paying in some £12 collected from gas consumers was that the money had dropped through a hole in his pocket. It appeared that he had falsified his account-book, and had given customers wrongly dated receipts. Mr. Conway said the accused deeply regretted that he had tried to deceive the Court, and he now made the only reparation in his power by telling the truth. He had not lost the money from his pocket, but he had foolishly spent it. A clergyman who had known the accused for seven years said that up till this time he had borne an irreproachable character, and had been associated with Church work. Mr. Horace Smith: Persons who embezzle are generally those who are presumed to be of good character. They get situations of trust because of this. Here is a young man who has carried out his defalcations with much forethought, skill, and premeditation. Then he falsifies his accounts and persists in a fabrication about losing the money from his pocket until the story is disproved by evidence. After that he appeals for consideration on the ground of character. He must have three months' hard labour.

**Water-Gas Plant at Chorley.**—The formal inauguration of the installation of water-gas plant which Messrs. Humphreys and Glasgow have put up at the Chorley Gas-Works, at a cost of about £5000, took place on the 13th inst.

**Aldershot Gas and Water Works Purchase Question.**—A meeting of the ratepayers of Aldershot, convened by the Chairman of the District Council (Mr. J. May), in his private capacity, in response to a memorial presented to him, was held a few days ago to consider the advisability of the purchase of the undertaking of the Aldershot Gas and Water Company. Mr. C. Calvert, who has taken the initiative in the matter, and has laboured very earnestly to attain his object, submitted a motion to the effect that the undertaking should be bought and worked by, and on behalf of, the town. He said he estimated that it could be acquired on the basis of 25 years' purchase of the net earnings *plus* 10 per cent. for compulsory sale, which came to £245,000. Adding £10,000 for parliamentary expenses, he reached a total of £255,000. To repay this sum in 50 years would require £9610 annually. The Company's profits came to £9000, and the Directors' fees to £1000—together, £10,000—which would leave the ratepayers a profit of £200 or £300. The proposal was not very cordially received by the ratepayers, one of whom suggested that its further consideration should be adjourned for a month; while another expressed his willingness to support the suggestion, if the period were extended to six months. Mr. Calvert thought they ought to "fight it out" then and there. The "fighting" accordingly commenced, and the proceedings at times became boisterous. An opinion seemed to prevail that the undertaking should be left in the present hands. At all events, more time was needed for consideration. Mr. Huntley moved, as an amendment, that the meeting stand adjourned for three months. Mr. Watts seconded the amendment; but nothing came of it. In the end, Mr. Calvert's motion was carried by 43 votes to 33. Of course, this vote does not pledge the ratepayers in any way. If the Council decide to go on, a statutory meeting of the inhabitants will have to be called to authorize the step.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Mr. Dibdin's Chemical Industry Society Paper.

SIR,—There are some figures in Mr. Dibdin's interesting paper, given in your issue of the 11th inst., which seem to require elucidation.

In Tables I., III., and V., giving the tests respectively of Widnes, Gaslight and Coke, and South Metropolitan gases, with the various burners, as stated, I note that with 13·5-candle power gases, Mr. Dibdin found that a No. 4. Sugg table-top burner required 9·4 cubic feet of Gaslight and Coke Company's gas to give the same result as 7·7 cubic feet of the same illuminating power gas at Widnes; the No. 5 burner requiring only 6·2 cubic feet of the latter gas, and 8 cubic feet of the Gaslight and Coke Company's, while the Welsbach "C" burner required 4 cubic feet of the former, and only 2·9 cubic feet of the latter. Again, under "14·5 illuminating power," we have 9 cubic feet of Gaslight and Coke Company's gas required, but only 5·9 feet of the same illuminating power gas of the South Metropolitan Company; while Bray's fishtail No. 4 required 10·1 cubic feet of the former, and only 5·3 feet of the latter. The No. 5 Bray, again, only required 5·9 cubic feet of South Metropolitan gas, but 10·3 feet of the Gaslight and Coke Company's.

It will thus be seen that the difference in the results with the same illuminating power gases, as shown in the tables, vary as much as 90 per cent.—i.e., Bray's fishtail No. 4, South Metropolitan 14·5-candle gas 5·3 cubic feet, and Gaslight and Coke 14·5-candle gas 10·1 cubic feet. I also note that Widnes gas shows 4·9 cubic feet of 16·2-candle power gas "to produce the normal intensity of 16 candles," but 5 feet of 17·2-candle gas to produce the same result.

Perhaps Mr. Dibdin can explain why 90 per cent. more of the same illuminating power gas is necessary on the north side of the Thames than on the south of the river, to give the same "normal intensity," from the same burner. To an ordinary reader, these discrepancies are somewhat startling, more especially coming from a gentleman with the recognized scientific attainments of Mr. Dibdin.

East Grinstead, Dec. 19, 1900.

D. T. LIVESEY.

## Retort Ascension-Pipes.

SIR,—Mr. Harman, in last week's "JOURNAL," raised the question, Why use two ascension-pipes for horizontal retorts, when one pipe only is required for the inclined retort?

For several months now, I have had three centre retorts (those immediately over the combustion-chamber) working with one 8-inch pipe; and so satisfactory has been the working of these pipes, that I have decided to adopt the one 8-inch pipe instead of the usual two 6-inch ones on all the new work I am erecting here next year. The advantages to be gained, so far as my experiments show, are as follows.

A considerable reduction in the temperature of the gas entering the hydraulic main. I do not suppose this would have been so, if equal volumes of gas would pass up the two 6-inch ascension-pipes during the charge. But from a number of temperatures I have taken from time to time, I have never found this to be so. With one ascension-pipe, there is no doubt which way the gas is going.

The reduction of temperature in the pipe should to a great extent do away with the nuisance of stopped pipes, especially where the hydraulic main is used and high heats worked.

The adoption of one 8-inch pipe will simplify, and save cost in, construction, reduce by one-half the number of pipes for the men to keep clear, and where machinery is used the men would get through the work quicker.

From the experience I have had with the working of these pipes, my own opinion is that two ascension-pipes are not required.

Bury, Dec. 20, 1900.

HY. SIMMONDS.

SIR,—I notice in the last issue of the "JOURNAL" a letter from Mr. Edward A. Harman, on the above subject. His reasoning and facts are no doubt quite correct, but were, however, fully known to the generality of gas engineers—particularly to those who have had experience with inclined retorts and stoking machinery with 20-feet through retorts. It hardly remains "for someone to be bold enough to arrange horizontal retorts 20 feet long fitted with a large ascension-pipe at one end only," because, as is pretty well known, this was done many years ago at the Nine Elms works; the sufficiently "bold" man being the late Mr. John Methven. As Mr. C. C. Carpenter recently mentioned, Mr. Methven's "make and quantity of gas per ton were among the highest in his Company."

Dec. 20, 1900.

MERLE BLANC.

**Port Erin and Port St. Mary Gas Company.**—The Chairman of this Company at the annual meeting last Tuesday was able to congratulate the shareholders that, in the second year of working, they had earned a dividend of 2½ per cent. He also announced that the consumption of gas had increased threefold during the year.

**Smethwick to Oppose the Mond Scheme.**—There is a strong agitation in Smethwick against the proposal of the promoters of the Mond gas scheme to erect their works there. At the meeting of the Town Council last Tuesday, the Town Clerk explained that it was intended to purchase 30 acres of land near Brasshouse Lane, at present occupied as allotments. He understood that the Mond gas would be supplied for all purposes except illumination; the charge to be 6d. per 1000 cubic feet. Mr. Stones (Chairman of the Gas Committee) said the Council had a monopoly at the present time; and it would be unfair, after spending such a large sum of money in mains for the supply of engines, to allow the Mond Company to come in. Mr. Pinkney said this was no wild goose scheme, and the only way they could keep the Company out was to manufacture cheap gas themselves. The Town Clerk was instructed to take the necessary steps to oppose the Bill.

## MISCELLANEOUS NEWS.

## MANCHESTER CORPORATION GAS SUPPLY.

## Alderman Gibson and the Gas Profits—Discussion Adjourned.

At the Meeting of the Manchester City Council last Wednesday, Mr. Alderman R. Gibson, Chairman of the Gas Committee, and ex-Lord Mayor, brought up his motion on the subject of gas profits, the consideration of which had been adjourned from previous meetings. His proposal was to the following effect: "That, in the opinion of this Council, the present system of subsidizing the rates out of the profits of the gas undertaking is wrong in principle, unjust in practice, inimical to the best interests of the ratepayers, and ought to be discontinued."

Alderman Gimson, in moving the resolution, remarked that for some years he had held the opinion that it was wrong in principle to subsidize the rates out of the profits of the gas undertaking; and when, a few months ago, the Council took £40,000 out of the pockets of the gas consumers, openly and avowedly for the sole purpose of lessening the general rates, he felt that a great injustice was being done to a class of people whom it was his duty to protect, and that a blow was being aimed at the prosperity of an undertaking in which he was deeply interested, and for the success of which he should, in the main, be held responsible. In the first place, he wished to urge that it was wrong in principle to subsidize the rates out of the profits made on the gas. Why? The proper principle, as he took it, was to make every department of the Corporation responsible for its own acts and its own expenditure. Every tub should stand on its own bottom; and it was wrong to make any one portion of the community bear more than its fair share of the public burden. When they, in effect, said, as they had done, that £10,000 was not enough for them, that they wanted £50,000, and that if the Gas Department did not make this amount, they must charge the gas consumers 3d. per 1000 cubic feet more for their gas, he submitted that they were making the gas consumers bear more than their fair share of the public burden. They were taking a large sum of money out of their pockets, and putting it into those of people who did not burn gas at all. This policy was also unjust in practice. As he had previously pointed out, when 1d. per 1000 cubic feet was equal to 1d. in the pound on the rates, and all were gas consumers, although the principle was unsound, he took no exception; but now the case was quite different. There were upwards of 3000 ratepayers who had given up burning gas, and were using electricity for their lighting purposes. Besides this, there were in use 500 motors worked by electricity; and they had no right to put an extra tax upon the gas consumer and offer a premium to the electric light consumer. Taking the names of 21 large ratepayers, all of whom now used electricity, their total assessment was £66,855. Fourpence in the pound came to £1114; and this sum they were deliberately taking out of the pockets of the gas consumers—who, be it remembered, were ratepayers—and putting it into the pockets of large ratepayers who were not gas consumers, but who used electricity. This was both unfair and unjust. But it might be said that they were relieving the ratepayers. Indeed! He had taken the cases of a number of small shopkeepers—men who began to burn gas early in the day, and kept on burning it until ten or eleven o'clock at night, and who had in many instances a hard struggle for existence. How had these people been relieved? Their total assessment was £830; and 4d. in the pound on their rates came to £13 16s. 8d. They therefore had their rates relieved to the extent of £13 16s. 8d.; but by having 3d. per 1000 cubic feet put on the price of their gas, they had to pay £26 15s. more for it than they used to do. They would consequently have been £13 better off if they had been left to pay the increased rate, and allowed to have gas at the old price. These were only 30 out of 102,000 gas consumers. Again, he had taken twenty ratepayers who used gas-engines—20 out of some 1600. These were assessed at £777 a year. Now 4d. in the pound on this sum was equal to £12 19s. Their total gas-rental was £383, 3d. per 1000 cubic feet on which was £42 11s. So that while they were relieving the rates of these people by £12 19s., they were actually getting £42 11s. out of the same people's pockets wherewith to do it. Take one other instance. There were 45,000 gas consumers in Manchester having 2 and 3 light meters. Reckoning the gas they consumed as 20s. worth a year each—which was certainly far less than they did burn—this would mean 8000 cubic feet each. Therefore 3d. per 1000 cubic feet would mean that they had to pay 2s. each more for their gas, which for the total number would come to a net sum of £4500. What became of this £4500 which they were taking out of the pockets of their very poorest consumers and ratepayers? They were putting it into the hands of their landlords, who did not burn any gas. Even these cases, however, were few in comparison with the large number of ratepayers whom they compelled to pay more than they should do, under the delusion that they were benefiting the ratepayers. They might relieve the rates, but they were not relieving the ratepayers, of whom there were 120,000 on the register; and in the city, excluding the out-townships, there were 102,000 gas consumers. If they liked, he would give them 22,000 of these consumers who might benefit by having 4d. in the pound taken off their rates. What about the remaining 80,000? Were they legislating for the benefit of the many or of the few? If for the many, then he said without hesitation that, under the idea of relieving, they were actually penalizing the great bulk of the ratepayers to the extent of 10s. for every 5s. they took off their rates. Taking his own case, his rates were relieved to the extent of £1 13s., but he was charged £5 12s. more for gas; and no doubt this was fairly typical of the whole 80,000 ratepayers who were gas consumers, and who were penalized to relieve the rates of the remaining 22,000, many of whom were users of electricity. The policy which had been pursued had been inimical to the best interests of the ratepayers. The Corporation had had the gas-works under their entire control for 57 years, during which time they had made a gross profit of £5,345,194. What had they done with it? Well, for ten years they handed over a moiety of it each year to the Water Committee, to relieve the Committee from the necessity of raising the price of water. This was a perfectly legitimate and proper thing to do; it really relieved the ratepayers. The £166,000 which they gave out of the gas profits relieved every ratepayer in the city without distinction. They had, however, given away



out of gas profits ten times this sum, which had not benefited a single citizen, but had been an injury to all. They had paid £1,058,616 for interest on borrowed money which there had been no necessity to borrow. In June, 1843, when they took over the gas undertaking, the mortgage debt was £83,750. From this time to June, 1845, they made a profit of £83,233; so that during this period they could have paid off the whole of the mortgage debt and left the works free. Between 1843 and 1850 the capital expenditure was £83,376, and the profit £297,136, or £200,000 more than they had spent. Consequently, if the Gas Committee had used the profits for the extension of their own works, as the conductors of any private concern would have done, they would at all events not have had any necessity to borrow money during the seven years. From 1850 to 1860 they spent on the works £289,668; but they made a profit of £553,614—nearly twice as much. From 1860 to 1870 they spent £399,773, and made a profit of £672,377. From 1870 to 1880 they spent £687,540, and made a profit of £1,172,256. Yet they borrowed money. From 1880 to 1890 they spent on the works £562,863, and made a profit of £1,462,519. From 1890 to 1900, they spent on the works £803,904, and made a profit of £1,187,292. And yet, with all this excess of profit over expenditure, they still went on borrowing money. He thought these figures fully justified him in saying that the £1,058,616 which had been taken out of the pockets of the gas consumers to pay interest for borrowed money need never have been taken; and no one was the better off for it except those who lent the money, who were not Manchester people at all, while the citizens were distinctly worse off by this amount. The principle of using their own profits for the development of their business was much broader and wider and more far reaching than he had time to indicate; and he should be glad to hear any reason why a municipal undertaking should be carried on by other than well understood and well recognized sound commercial principles. He honestly believed that if the Gas Committee could have utilized their profits during the whole of the last fifty years, gas could have been sold at 6d. per 1000 cubic feet less than it had been, the whole of the works (probably of much greater magnitude than they were now) rendered free from debt, and the citizens of Manchester made £2,085,072 better off than they were to-day. They would not have owed £1,026,456 on the works as they now did, and would not have had to pay £1,058,616 in interest on borrowed capital. They had always made nearly twice as much profit as they could possibly spend in plant to feed their increasing business; and he therefore held that it was altogether unsound policy to borrow money. He believed that, if they were now to begin *de novo*, they could enrich the citizens of Manchester by £50,000 a year, and not require to raise another penny for their gas undertaking, and so save the necessity of taking any more money out of the pockets of the gas consumers, who were ratepayers, to pay for interest on borrowed money. Having thus explained his main reasons for moving the resolution, he would only briefly allude to what might be called the side-issues of the question, although they were of great importance to a large community. Who could tell what cheap light and cheap gas meant to the citizens of a large city? When they reduced the price 3d. per 1000 cubic feet, the number of gas-cookers on hire increased in four years from 3781 to 9560, and the gas-engines from 962 to 1662. Besides giving encouragement to small manufacturers, and creating a demand for labour, did they not think it also had something to do with purifying the atmosphere? Not only did cheap gas mean an increasing use of small engines, but he did not see why they should not have gas-engines of 100, 500, or even 1000 horse power, in this country, as he believed they had in some places on the Continent. Cheap gas meant large manufacturers doing away with their steam-boilers, saving the dirt and trouble of getting in their coal, and the worse dirt and greater turmoil of getting rid of their ashes, and preventing their black smoke polluting the atmosphere, with consequent fines and costs. Besides all this, he felt that the Gas Committee should not rest satisfied until a gas-stove was in every office in the city, and a gas-fire and a gas-cooker in every house. Then indeed they would have greater cleanliness, less work, better cooking, and more comfort all round. Smoky chimneys would become a thing of the past, and Manchester would be brighter and healthier. In conclusion, he might say that he did not expect to carry the resolution by what could be called a large majority, nor, perhaps, could he hope to uproot an old custom and long-standing prejudices by one stroke of the axe; but he fully believed that the considerations he had urged would, sooner or later, permeate into the minds of the ratepayers and gas consumers themselves, and become impressed upon the consciences of the great majority of the members of the Council.

Mr. LAMBERT formally seconded the motion, and observed that, after trying to bring it forward at several meetings, Alderman Gibson had at last succeeded in putting before the Council his views on the matter. They could scarcely hope to discuss it at any length that afternoon; but he was quite sure, from a perusal of some of Alderman Gibson's notes which he had had the opportunity of making, that the figures he had given and some of the statements he had made were really deserving of serious consideration. His statistics put the matter in a very different light from what some of the Council had expected. He (Mr. Lambert) would therefore suggest that the discussion of the question might be adjourned, and that, meantime, Alderman Gibson should be asked to send a copy of his notes to members of the Council, so that they might have the figures before them to enable them to come to a decision.

Alderman GIBSON agreed with Mr. Lambert's suggestion, and said he should be glad to send copies of his notes to the members.

Mr. PLUMMER remarked that, if the matter were taken then, he was quite prepared to traverse some of the arguments which had been adduced, and try to convince the Council that the view Alderman Gibson had taken was erroneous. But he thought it best to adjourn the discussion.

Sir JOHN HARWOOD said that, if Alderman Gibson sent out his notes, he thought he ought to correct one statement. By Act of Parliament they were not permitted to spend the gas profits on the extension of the old works and the construction of new ones. They were obliged to go to Parliament for powers and borrow money.

Eventually the proposal to adjourn the discussion was agreed to; Alderman Gibson promising to supply copies of his notes to members of the Council.

The late Mr. John Blacket Gill, Chairman of the Commercial Gas Company, left personal estate of the value of £37,255.

## THE SINGAPORE MUNICIPALITY AND THE GAS-WORKS.

### The Purchase Decided Upon.

The "Singapore Free Press" for the 20th ult., a copy of which has just reached us, contains a report of the proceedings at a special meeting of the Municipal Commission, held on the previous day, at which the report of Mr. Corbet Woodall on the question of the acquisition of the undertaking of the Singapore Gas Company, to which reference has already been made in the "JOURNAL," was considered. The subject was introduced by Mr. Gentle, who stated that Mr. Woodall, in the report before the members, dealt frankly with the causes which had been felt for many years of the non-popularity and ill-success of the Gas Company in providing for the gas supply of the town. It was the old story of monopoly; but the Company had had a formidable competitor in the free introduction of petroleum, the consequence of which had been that petroleum was being used in almost all private houses. With regard to Mr. Woodall's reference to the introduction of penny-in-the-slot meters, he considered this would be a very good thing; but it was too early to say whether the system would take root in Singapore. Certainly these meters would save a good deal of time in collecting accounts. He (Mr. Gentle) had received documents showing that the monthly charge at St. Andrew's Cathedral, since it had been lit with Welsbach burners, had dropped from \$23.43 in 1898, for a place of darkness, to \$7.92 at the present time, for a place ablaze with light. Another matter to be considered was the position the Commissioners would occupy with regard to the ratepayers, if Mr. Woodall's report were adopted, and it was decided to acquire the gas-works and to provide for the public lighting in the future. By an amendment of the Municipal Ordinance, the Commissioners were allowed to spend municipal funds on private lighting; but the question was whether they should take their chance of collecting the money due to them by consumers, or whether they should apply to the Legislature for special powers such as those possessed with regard to a private water supply, under which they would be able to collect the money in the same way as the rates and taxes, and if people did not pay they would be sued. If it was decided to acquire the property, the Commissioners would have to borrow \$500,000, which would thus reduce their borrowing powers by this sum; but he did not think this would be a very material drawback, though, of course, they might have other works to execute in the future. They now had to consider whether those of the Gas Company should be bought, and at the price of \$41,200 put upon them by Mr. Woodall, or propose any other course that might be deemed expedient. In conclusion, he suggested that, in the event of the works being acquired, a loan of possibly \$1,000,000 should be obtained, as it would prove more attractive to investors than two or three small loans.

Mr. Gentle was followed by Mr. Jago, who confessed that, before it became his duty, as a Commissioner, to study the question of the lighting of Singapore, he had loosely formed two main ideas on the subject—first, that the only suitable light was the electric light; and, secondly, that the works and mains of the Gas Company were worth just their value as scrap iron, and no more. There were many persons in Singapore who held similar opinions—in fact, the great majority seemed to be of that way of thinking. But, as he studied the subject, he was compelled to abandon both of these theories; and the report of Mr. Woodall, supplemented by the information he had obtained, completed his conversion. Having started with a strong predilection for electric light, he had gradually worked round, until he was of opinion that gas was the only lighting suitable for Singapore. There were but two systems of illumination worth their consideration—acetylene and oil being out of the question—and these were electricity and gas. When the Commission consulted electrical experts, there was some idea that 32-candle glow lamps would do for the less important streets, while the principal thoroughfares should be lighted by arc lamps. They duly received an estimate of the first cost of an installation to supply 80 arc lamps and 800 32-candle power glow lamps, besides 20,000 8-candle lamps for private lighting, which amounted to £104,000 if low-speed engines were used, and £109,000 if they used high-speed ones. But, in the opinion of the best authorities, a 32-candle glow lamp was not nearly so efficient for street lighting as a 35-candle Welsbach, on account of the light not being so diffused. This left the arc lamp as the only rival of gas for public lighting; and it did not need any argument to prove that it would be the height of absurdity to replace all their lamps by arc lights at a fabulous cost for maintenance. The experts proposed that the 20,000 8-candle lamps for private consumers should be supplied with current at the rate of 1s. per Board of Trade unit, or just double the usual charge in England. They stated, however, that, as compared with Welsbach burners, taken at \$4 per 1000 cubic feet (also double the average price in England), the electric light would cost 5½ times as much as gas for the same candle power. The proposed installation made no provision for increasing the number of street-lamps; and seeing that there was no prospect of private consumers taking current at so high a cost as compared with gas, he thought most people would agree with him in thinking the scheme quite beyond the means of Singapore. He did not urge that electricity should not be tried; but, as Mr. Woodall had said in his report, the easiest way to bring electric light within their reach was to own the gas-works. It was easy to understand how people whose experience of gas lighting was confined to Singapore, or who had not particularly observed the lighting in Europe, had come to look upon gas as an effete and dying light. But it was far from being so. Mr. Woodall had told them that in his opinion, Berlin was the best-lighted city in Europe; and very few electric lights were used in the streets there, but the gas-lamps were placed close together, and were of the newest style. Glasgow was usually considered one of the most up-to-date cities in Great Britain, and the Corporation were laying scores of miles of electric tramways; but, notwithstanding this, the use of gas for street lighting was to be increased. These facts showed that other towns did not regard gas as "the light that failed." There seemed to him to be little doubt that the limit of improvement in incandescent lighting was not yet in sight, and they might see, in the future, changes as startling as those which had taken place during the past twenty years. There was no doubt that, for street lighting in Singapore, gas would be much better and cheaper than electricity; and, at the same time, gas was much more likely to be extensively used in shops and private houses than the more costly electric light. In this belief, he



was prepared to vote for the purchase of the Gas Company's works. He had no doubt that, if they considerably reduced the price of gas to private consumers, and continued that policy year by year, as they cheapened their cost of production, they could, in a few years, more than double the present private consumption. It might be a departure from municipal methods, but he was inclined to favour their obtaining a good gas engineer—preferably a young man—at a low salary, and giving him a commission upon every 1000 cubic feet of gas by which he increased the private consumption. There was little doubt that the gas supply could be made a great commercial success, if they put good business men on their Lighting Committee.

The next speaker was Mr. Maclaren, who said that personally he was prepared to vote for the purchase of the works, though he was not altogether satisfied with the price mentioned by Mr. Woodall. Their Engineer, in his report of last year, estimated the cost of new works (to produce 40 million cubic feet of gas per annum) at £50,000; but this estimate would have to be increased somewhat now, owing to the rise in the price of land, &c. He further told them in 1899 that the Gas Company would be very ill advised to refuse an offer of £35,000; and he added that the situation would not be unfavourable to the Commissioners if the Company refused such an offer. On the strength of these figures, he (Mr. Maclaren) must say he was surprised at the comparatively high figure put by Mr. Woodall as the value of the gas-works; and he could not help thinking that he had shown a bias, though a slight one, in favour of the Company, and had not taken into the fullest consideration the great advantages the Municipality possessed in treating with the Company. He (the speaker) was glad to be in perfect accord with Mr. Woodall in the closing paragraphs of his report; and it was also his strong opinion that no scheme for the general lighting of Singapore could be complete which left electricity out of the question. There was no denying that gas was suitable for street lighting; but in the climate of Singapore, where coolness was almost everything in the houses, they ought to have electric light. He therefore thought that, if this scheme went through, a sum should be added to the capital which it was proposed to raise, in order to put up an electric installation to be worked with the power derived from their gas-mains.

Mr. Barker, who spoke next, said the resolution had his hearty support; and he expressed the hope that it would be carried unanimously. He felt quite certain that any amendment which purposed offering the Gas Company less than Mr. Woodall's valuation would not be accepted by them, and would only lead to a renewal of the protracted and wearisome negotiations which they trusted had now come to a final issue. He added a few words on the purchase from a commercial point of view. He said it must not be forgotten that in buying this concern they had not the unanimous support of the ratepayers. They were taking this step because, in their deliberate judgment, they believed, having regard to the financial position of the Gas Company, and the necessity on their part of taking a forward step in the lighting of the town, that they were acting in the best interests of the ratepayers and for the future welfare of Singapore. Their success would be their justification. They were for the first time embarking in a commercial undertaking, and they must be careful to avoid the mistakes of the existing Company. As to the public lighting, directly the transfer was effected, they should abolish every naked light in the town, and substitute Welsbach burners. Further, in the principal thoroughfares they should utilize all the available standards they had for doubling the lights, and arrange for as many more as would be required for the purpose. Gas would also have to be gradually extended to districts in the suburbs, now in darkness. But their main chance of profit would come by nursing the business with private consumers. In this direction there was scope for enormous developments. The re-lighted streets would be an advertisement; but, in addition, he would light up, free of charge, for three months, a shop in every busy thoroughfare. It would awaken interest, and also be a capital advertisement. They should get a good stock of fittings suitable for shops and private houses, and make it worth the Manager's while to push the business with private consumers; fit up a show-room in the Municipal Offices, with a photometer, and have a capable person in charge to explain to callers the cost of any installation required, and show the relative merits of gas and oil; and replace the existing pipes in some streets where the pressure was worst, with cast-iron mains as recommended by Mr. Woodall. But, above all things, they should not be stingy with the public. They should abandon any idea of immediate profit, but should work for the future; and the business, if properly fostered, would surely come, and with the business their legitimate profit. By carefully working on business lines, they could justify the purchase to the public, vastly improve the lighting of the town, and save the ratepayers' money.

The following resolution was then put to the meeting, and carried, with two dissentients: "(1) That the Commissioners, having carefully considered the report of Mr. Corbet Woodall on the lighting of Singapore and on the proposed acquisition of the works of the Singapore Gas Company by the Corporation, are convinced that, under all the circumstances, it is desirable that these works should be acquired, at the price and on the conditions indicated by Mr. Woodall; and that, as the Gas Company have, by their resolution of the 26th of April last, agreed to sell to Mr. Woodall's valuation, application be made forthwith to the Governor in Council for sanction to the acquisition by the Corporation of the land, works, plant, mains, meters, tools, and all apparatus, fixed and loose, in Singapore belonging to the Gas Company, for the sum of £41,420 sterling, to be paid at the dollar rate for demand bills on London on the day of transfer—the stock and stores to be paid for in local currency at their value as assessed by valuers agreed upon between the parties; and that information to this effect be made to the Gas Company. (2) That application be further made to the Governor in Council, under section 271 of the Municipal Ordinance, for sanction to borrow a sum not exceeding \$500,000 for the purposes of the above acquisition, and for the improvement of the gas apparatus and plant."

The ratepayers of Wallasey gave their consent yesterday week to the General Bill of the District Council, who desire authority, *inter alia*, to construct a railway to the gas-works from the line of the Mersey Docks and Harbour Board. Mr. James Wright, who presided, stated that it would give much needed facilities for dealing with the supplies for the gas-works.

## THE CARBIDE OF CALCIUM AND ACETYLENE INDUSTRIES IN GERMANY.

(Continued from p. 1532.)

The history of artificial lighting shows that every new illuminant upon its introduction underwent a certain probationary period, during which many accidents occurred, until the experience necessary for its successful use had been obtained. Of the truth of this observation, petroleum, coal gas, and electricity give striking examples. There is no disputing the fact that at first a certain number of explosions were caused by acetylene, and that the accounts of the same—often unduly exaggerated—were instrumental in prejudicing the public and insurance companies against the new illuminant. In course of time, however, it was observed that only in a few cases had much damage been effected, and that cases in which loss of life had been caused were rare and comparatively not more numerous than those resulting daily from coal gas, benzene, petroleum, and other illuminants. Explosions from unknown causes, from the use of liquefied and compressed acetylene, and those produced by the experiments and manipulations of ignorant and unskilful persons, have not been taken into consideration, as they lie outside the scope of the present remarks.

The apparent great simplicity of the generation of acetylene from carbide by means of the simple chemical action of water, caused at the beginning a perfect mania of inventions for generators, lamps, and the various accessories of acetylene lighting. The Imperial Patent Office in Berlin has never before received so many applications for patents in one single class. A large number of these patented apparatuses emanated from utterly inefficient persons—amateurs, tinsmiths, blacksmiths, &c.; and their manufacture, installation, and management were often carried out by the same incompetent persons, who were utterly wanting in the necessary scientific knowledge and practical experience. The result was that many explosions occurred, that the public became prejudiced against the new illuminant, and that the police authorities issued most stringent regulations for the installation and use of acetylene apparatus. During the last two years, this state of things has gradually and entirely changed. Insecure, unpractical, and badly finished apparatus has been gradually eliminated; the proportion of accidents has to a great extent ceased, while the police restrictions have been correspondingly relaxed; and the public are showing a daily increasing interest in the new illuminant. At the present time, if the necessary care is observed, there is no greater element of danger in the use of acetylene for lighting and other purposes than in the use of coal gas or petroleum. The most convincing proof of this assertion is that the German public and private fire insurance companies, whose interests are most vitally affected by acetylene, have decided, if certain simple precautions are taken, not to exact any additional premium on the rates for insurance of buildings lighted by acetylene.

The official organs of the German public fire insurance companies published, in the June issue of this year, statistics regarding explosions and fires caused by acetylene and other illuminants during 1899. In spite of the large number of acetylene installations in Germany, the explosions and fires attributed to acetylene are only six in number; and they were, with one exception, caused by culpable neglect of the most ordinary precautions, and would have occurred had any other inflammable gas—for instance, coal gas or water gas—been used in place of acetylene for lighting purposes. The damage done to property was of a trifling description, except in one instance, where it amounted to about £225. The explosion and fire in this case resulted from the thawing of frozen pipes. The number of fires caused during the same period by electricity was 85. It is becoming daily more apparent that electricity does not possess the immunity from fire with which it is generally credited. In estimating the value of the above statistics, it must be remembered that they are issued by the public fire insurance companies themselves, and are therefore not open to the suspicion of partiality.

In those cases where cheap water or other power is available, acetylene has not been able to compete seriously with electricity. In the absence of favourable conditions for the generation of electricity, it has made remarkable progress in Germany, in spite of the competition of coal gas, for the lighting of small towns and villages. The three principal determining factors for the adoption of coal gas or acetylene are at present: (1) The cost of installation. (2) The quality of the light. (3) The cost of daily production.

With regard to the first, there is little doubt that the initial expenditure for the installation of acetylene lighting is much lower than that for coal gas. As far as the writer has been able to ascertain, this consideration has played an important part in the deliberations of the municipal authorities of small towns concerning the adoption of acetylene. The following reasons for the lower cost of an acetylene installation, compared with a coal-gas installation, are generally urged: (1) The simplicity of the generation of acetylene—action of water upon carbide—compared with the distillation of gas from coal. The production of coal gas requires an extensive plant and several workmen; acetylene is produced from water and carbide in small generators in so simple a manner that a gas-works for a small town can be attended to by one workman. (2) The fewer impurities present in acetylene permit of a more simple method of purification. This is shown by a comparison of the acetylene purifiers with the apparatus necessary for the elimination of the impurities of coal gas. (3) The fact that the hourly consumption of gas from an acetylene gas-works is only about one-fourth that of coal gas for the same time and number of jets, which enables the condensers, purifiers, and gasholders to be built of much smaller dimensions. This is a fact of some importance, especially with regard to the gasholder, which need only possess a capacity of about 25 to 30 per cent. of the daily maximum consumption, because, in case of need, acetylene gas can be much more quickly generated.

A brief comparison is here given of the cost of electric, coal gas, acetylene, and petroleum lighting in Germany, with special reference to acetylene and coal gas. The price of carbide at the beginning of the year—about 32 pf. (4d.) per kilo. for small quantities—has been taken as a basis, although the price for larger quantities was about 28 pf.



(3d.). Since then the prices of carbide have fallen; so that the present cost of acetylene is actually below the amount given hereunder.

One cubic metre of acetylene requires  $3\frac{1}{2}$  kilos. of carbide; adding another  $\frac{1}{2}$  kilo. for waste in feeding the generator, &c., and for leakage from piping, increases the total amount of carbide for 1 cubic metre to  $3\frac{3}{4}$  kilos., at a cost of 1 m. 17 pf. The expenditure for the gas-works installation—piping, renewal of purifying material, interest on capital, attendance, wear and tear, &c.—amounts to about one-fourth of the total sum expended on carbide; in very rare cases, perhaps, to about one-third. This raises the price of 1 cubic metre of acetylene to 1 m. 50 pf. The following quantities of the different illuminants, according to Professor Vogel, give the same illuminating effect as 1 cubic metre of acetylene, and cost the amounts stated:—

	Currency. m. pf.	Sterling. s. d.
1 cubic metre of acetylene . . . . .	1 50	1 6
6 litres of petroleum, at 25 pf. per litre . . . . .	1 50	1 6
16 cubic metres of coal gas burnt in open burners . . . . .	2 72	2 9
4 cubic metres coal gas burnt with incandescent mantle . . . . .	0 68	0 8 $\frac{1}{2}$
5 200-watt electric lights. . . . .	3 45	3 5 $\frac{1}{2}$

To the sum of 68 pf. for incandescent coal-gas light, about 10 per cent. ought to be added for mantles, glasses, and loss in illuminating power. The average for the price of coal gas in the above table (17 pf. per cubic metre) is taken from the following towns: Berlin, 16 pf.; Hamburg, 18 pf.; Breslau, 17.74 pf.; Darmstadt, 22 pf.; and Düsseldorf, 16 pf.

The table indicates that petroleum and acetylene are now about equal in price (the waste and incidental expenses of petroleum are greater, and its tendency is to rise in price, while acetylene tends to sink); that coal gas in an open burner is dearer than acetylene, but that incandescent coal gas is cheaper; and that electric lighting is more than twice as dear as acetylene. A few remarks are necessary with regard to the second point. Photometric measurements for the comparative determination of the illuminating power of the Welsbach mantle and acetylene are generally carried out in laboratories where the actual conditions are different from those of daily life. The light from the Welsbach mantle is measured horizontally; whereas in daily life the light falls, more or less, in a slanting direction upon the objects to be illumined, and thus loses considerably in candle power. The above figures do not lay claim to absolute accuracy, but endeavour to give an impartial idea of the present condition of affairs in the lighting industries.

The following list of the installations which have been erected, or are in process of erection, in Germany will show the progress acetylene has made in this direction:—

Name of Erecting Firm.	Town.	Number of Inhabitants.	Price of Gas per Cubic Metre.
			M. pf.
Schilling and Gutzzeit, Königsberg	Sensburg . . . . .	3562	..
	Bischofswerder . . . . .	1148	..
	Passenheim . . . . .	1967	..
	Johannisburg . . . . .	3000	..
	Frauenburg . . . . .	2458	..
	Saalfeld . . . . .	2517	..
	Guttstadt . . . . .	4504	2 50
	Ratzebuhr . . . . .	2298	..
	Pr. Friedland . . . . .	3518	..
	Arys . . . . .	1324	..
Welkoborski, Giessen . . . . .	Grossenlinden . . . . .	..	2 80
Keller and Knappich, Augsburg . . . . .	Hassfurt . . . . .	2500	2 40
Allgemeine Acetylen-und Carbide-Gesellschaft, Berlin	Oliva . . . . .	4212	..
	Schönsee . . . . .	1536	..
	Ellerbach . . . . .	4176	..
	Neunkirch . . . . .	..	..
	Strelitz . . . . .	5000	1 90
	Treptow . . . . .	4363	..
	Peiskretscham . . . . .	4500	..
Hera-Prometheus, Berlin-Leipzig	Sulzburg . . . . .	1111	..
	Allendorf und Bad Sooden . . . . .	6000	..
	Schlangenberg . . . . .	382	..
	Dürenburg . . . . .	..	..
	Achim . . . . .	3500	..
	Daaden . . . . .	1767	2 20
Welkoborski, Giessen . . . . .	Kirchenditmold . . . . .	..	..
Deutsche Acetylen-Gesellschaft, Berlin			

Works are projected in Sprendlingen, Grossbeeren, Darnenberg, and Trimmen.

In addition to these gas-works for small towns, there are more than 100 installations burning upwards of 500 jets.

In order to give a clear description of the generation and purification of the gas in an acetylene gas-works and the distribution of the gas to the consumers, the installation at Treptow has been selected from the above list.

The works lie about 300 yards from the railway station, and consist of a dwelling-house for the engineer, with office; a building for the generators, purifiers, &c.; a carbide-shed, having a storage capacity of 40,000 kilos.; two pits for lime sludge; and a well for the necessary water. The works were constructed for a daily production of 200 cubic metres, with an estimated consumption of 2000 jets of 32-candle power, burning simultaneously. The material used was strong boiler-plate, firmly riveted together. The generators are fed by hand according to the "carbide to water system"; the gasholder has a total capacity of 50 cubic metres; and the tank is of wrought iron. The purifying substance is "heratol"—Ulmann's system of purification by means of chromic acid dissolved in sulphuric or acetic acid.

After generation, the gas passes through the condensers into the washer, where the ammonia and, to a slight extent, the sulphuretted hydrogen are absorbed. The washer also serves, by virtue of its construction, as a safety-valve. If one of the generators is being cleaned or repaired, and the workman omits to close the valve, it is impossible

for the gas in the holder to return and escape. The gas now enters the holder, and thence passes through the purifiers. The purifying substance absorbs the sulphur and phosphorous compounds of the gas, which passes through the dryer, gas-meter, and pressure-regulator, and then enters the main-pipes. The works are heated by steam in winter, and are lighted by jets, with reflectors placed outside the windows.

The pipes were originally laid with a view to a possible total consumption of 2000 jets, in order to prevent expenditure for extension in the future. The main-pipes have a diameter of 2 and 3 inches, and are constructed of wrought iron. Cast-iron pipes have not given in all cases satisfactory results. It must be remembered that the leakage from acetylene pipes means a much greater loss than the leakage of the same amount of coal gas, and that therefore the greatest care must be observed to render the pipes as air-tight as possible. The piping possesses a total length of about 5 miles, and is carried over several bridges encased in sawdust wrapping.

In order to investigate whether the above-mentioned towns were satisfied with the new lighting, the German Acetylene Society issued a circular, asking them to express their opinions in this respect. Many of the towns responded; and although the answers contained many inaccuracies, they were unanimous in affirming their satisfaction. As a rule, the municipal authorities themselves manage the gas-works; but in some cases the management has devolved upon private companies. Only one disturbance in the system of lighting was reported. The price for 1 cubic metre of acetylene is 1s. 6d. to 2s. in towns with municipal management, and from 1s. 10 $\frac{1}{2}$ d. to 2s. 6d. in towns with private management. In most cases the total system of piping is not yet completely utilized, probably because it was purposely laid down in excess to meet future demands. The gas is used not only for lighting purposes, but also for cooking and driving gas-engines. The Ellerbeck Acetylene Gas Company sell acetylene for engines at 1s. 2 $\frac{1}{2}$ d. per cubic metre—a great reduction on the price for lighting purposes.

As will be seen from the above statistics and details, the almost unanimous verdict passed by gas engineers a few years ago in Germany with respect to the impossibility and undesirability of acetylene gas-works has been completely refuted. It is considered to be a matter for congratulation that such important installations are beyond the power of the untrained inexperienced mechanic, who is still felt to be mainly responsible for so much of the suspicion with which acetylene is yet regarded in many quarters, and can only be carried out by firms of repute with a theoretically and practically trained staff.

The increase in the production of carbide, and the reduction in price, seem to indicate that acetylene, instead of being used only for the lighting of small towns up to 8000 inhabitants, may come to be used for the lighting of larger ones. The greater demand for carbide which would result in this case will be probably supplied by the utilization of the waste gases of blast-furnaces. The amount of carbide consumed by acetylene works is not very great. It may be liberally computed at about 65 to 70 tons per annum for an installation with 2000 jets. Assuming that the 30 installations in Germany used this amount annually, which is certainly not the case, this would give a total annual consumption of 2100 tons for gas-works. Assuming further, according to the present method of carbide manufacture, that 1-horse power produces 1 ton annually, the total consumption of the 30 gas-works could be provided for by a carbide works of about 2100-horse power. This is by no means a large amount, as the German railways alone will consume 8000 tons of carbide this year.

Up to the year 1870, railway carriages in Germany were lighted by candles or oil-lamps. As this method of lighting was gradually found to be insufficient, and petroleum could not be used on account of the danger of fire, the attention of the authorities was directed to gas lighting. Coal gas, unfortunately, was found to be unsuitable, as its illuminating power decreases under pressure; and it is only in a compressed state that gas for lighting railway carriages can be carried, as the iron cylinders in which it is contained would otherwise attain too large dimensions. Experiments were then instituted with oil-gas manufactured from gas oil, a bye-product of the distillation of lignite coal. The results proved favourable, especially as it was found that oil gas could endure a pressure of 10 atmospheres without showing any appreciable diminution in lighting power, and could therefore be carried in small cylinders. The introduction of oil gas was accordingly decided upon; the wholly necessary installation—a simple one—consisting, in addition to the iron cylinders, of pressure-regulators, in order to reduce the pressure of 6 atmospheres in the cylinders to 1 $\frac{1}{2}$  inches water-gauge pressure at the burners. This new method of lighting railway carriages was carried out with great speed, especially in Prussia. One firm alone, that of Julius Pintsch, of Berlin, had fitted out 6000 carriages in 1880, 32,000 in 1890, and 89,000 in 1898.

In the meantime, however, the science of illumination had made further progress, especially in the improvement of electric lighting and the invention of the Auer incandescent mantle. The quality of oil gas, on the other hand, had considerably declined, owing to a deterioration in the properties of the gas oil. For instance, a jet consuming 27.5 litres (0.96 cubic foot), and giving originally 7 to 8 normal candle power, had decreased to 5 normal candle power. This defect was experienced so keenly that in 1895 several authorities were seriously considering the question of the introduction of electric light. About this time the discovery of the manufacture of calcium carbide on a large scale drew attention to acetylene, especially as it was soon observed that it could be used in carriages with oil-gas installations without any further necessary alterations. Even if the estimated expenditure for acetylene had been in excess of that for electric lighting, the important fact that the oil-gas installation could be utilized for its introduction would have decided the case in its favour. The Prussian railway authorities commenced experimenting with pure acetylene in 1896, and upon the occasion of the annual meeting of the German Railway Directors' Society, they exhibited with great success a train lighted throughout by acetylene, the only drawback being the formation of soot at the burners—a defect which was easily remedied by the adoption of a suitable new form of burner. A beginning was now decided upon, and an acetylene gas works erected at Berlin, near the oil-gas works.

In the autumn of the same year, several explosions caused by the compression of acetylene occurred, which caused the railway authorities



to pause for a time, and institute experiments on the liability to explosion of compressed acetylene. These were carried out at Fürstenwalde, and proved that the use of compressed acetylene, under the normal conditions of railway traffic, actually contained the elements of danger in addition to the possibility of explosion during the process of compression. Attempts were then made to avoid this danger by mixing acetylene with oil gas; and for this purpose mixtures of from 80 to 25 parts of oil gas with from 20 to 75 parts of acetylene were selected. It was found that a mixture containing as much as 50 per cent. of acetylene was as little liable to explosion as the ordinary pure oil gas hitherto used. Careful photometric measurements showed further that the illuminating power of oil gas was considerably increased by the addition of acetylene—a mixture of 75 parts of oil gas and 25 parts of acetylene giving no less than three times the illuminating power of 100 parts of pure oil gas. This gas mixture permitted further the use of the oil-gas burners, which cannot be used for pure acetylene, as they cause the jets to smoke and become choked through the formation of soot. These considerations were instrumental in determining the general adoption of the above-mentioned mixture. Should it be found necessary to increase the amount of acetylene to 50 parts, this can be effected without any change in the construction of the compressing machinery and gas-fittings.

After the first acetylene oil-gas works had been erected near Berlin, in September, 1897, the Berlin town and ring railways were supplied with the new system of lighting; and shortly afterwards the local and some long-distance lines. In October, 1899, all trains within the Berlin railway district had been fitted up, for which five acetylene oil-gas works were found necessary. The amount of carbide required for this purpose for the Prussian railways amounted to 980 tons for 1898, to 3000 tons for 1899, and is estimated at 4500 tons for 1900. The acetylene oil-gas system of lighting has now been in use for two years, and has proved completely satisfactory in every respect. The other German State railways are following suit; so that in 1900 about 8000 tons of carbide will be consumed in Germany for railway lighting purposes alone. The Bavarian railway authorities are devoting special attention to acetylene lighting, not only for railway carriages with the oil-gas mixture, but also for the lighting of stations with pure acetylene. A beginning was made with the stations at Hochzoll and Hergatz, as an experiment. This proved so satisfactory that it was followed by the introduction of acetylene gas at the stations of Hassfurt and Oberhausen.

The cost per cubic metre of oil gas, according to Railway Director Bork, compared with pure oil gas and acetylene, is shown for the year 1898, shortly after its adoption, by the following figures: Oil gas, 30 pf.; acetylene oil gas, 54 pf.; and acetylene, 1 m. 30 pf.

The cost of the gas consumption per jet is—

	Hourly Consumption.	Cost.	Normal Illuminating Power.
	Litres.	Pf.	Candles.
Oil gas . . . . .	27.5	0.825	5
Acetylene oil gas . . . . .	27.5	1.485	15
Acetylene . . . . .	12.0	1.560	15

To the cost as given above must be added the expenditure for wear and tear, maintenance, interest on capital, &c., which amounts to about 0.8 pf. per jet an hour; so that the following figures result: Oil gas, 1.625 pf.; acetylene oil gas, 2.285 pf.; acetylene, 2.36 pf. The cost for 1 normal candle power, with an hourly consumption of 27.5 litres for oil gas and acetylene oil gas, and 12 litres for acetylene, is—

Oil gas . . . . .	1.625 ÷ 5 = 0.325 pf.
Acetylene oil gas . . . . .	2.285 ÷ 15 = 0.152 pf.
Acetylene . . . . .	2.360 ÷ 15 = 0.158 pf.

These figures show that in 1898 the new system of lighting with acetylene oil gas cost per hour and candle power only half the former lighting by oil gas; further, that acetylene oil gas and acetylene were equal in price. Since that time the carbide prices have sunk considerably, and have correspondingly reduced the cost of lighting by acetylene and acetylene oil gas. In January, 1898, 1000 kilos. of carbide cost 400 marks; in June, 1900, the price for the same quantity stood at 270 marks.

At an early stage of the progress of acetylene lighting, it became evident that all the advantages accruing from the adoption of acetylene would be rendered illusory if the insurance companies were to refuse policies or exact premiums which would practically prove prohibitive. Bearing in view the great economical importance of this question, the Acetylene Society placed themselves in communication with the representatives of the German private insurance companies in order to facilitate a solution which would be satisfactory to both parties. After many meetings had been held, and concessions granted on both sides, a list of conditions was ultimately formulated and accepted. Great satisfaction is expressed that a basis has been formed which, on the one hand, places the German acetylene industry on a safe footing; and, on the other hand, secures ample guarantees for the insurance companies. . . . The broad and liberal standpoint adopted by the companies during the negotiations was most commendable. They asserted that there was no desire to take up an inimical or unfavourable attitude towards acetylene gas lighting; that every improvement in the methods of lighting represented an advance in culture and in refinement, which benefited, not only industries, but also private individuals; and that, finally, for this very public reason, less than for any personal aims, the greatest care was called for, even to the extent of precautions which might, at first sight, appear unnecessary.

With regard to the conditions themselves, they contain the following precautionary measures:—

- 1.—The gasholder must be provided with a safety-valve.
- 2.—The installation must be provided with a purifying apparatus.
- 3.—Generators and gasholders must be isolated by walls of non-inflammable materials.
- 4.—Inflammable substances must not be stored in the apparatus chambers, which must be always well ventilated.
- 5.—The preparation, storage, and use of compressed acetylene is not permissible. The expression "compressed" applies to acetylene under a pressure of more than one atmosphere.
- 6.—Further regulations regarding size of piping and storage and isolation of carbide.

In reviewing the progress and the present condition of the acetylene industry in Germany, it is impossible to overlook the valuable work done by the German Acetylene Society under the able direction of the President, Professor Dieffenbach, of the Darmstadt Polytechnic School. Founded in November, 1898, by the fusion of two smaller Societies, it was immediately joined by 110 members. The roll of membership at the present time counts 370 members, including almost all the principal acetylene chemists, engineers, directors, and owners of works in Germany, besides many from foreign countries.

A special and most important feature of this Society is the existence of Sub-Committees whose duty it is to discuss matters connected with the various branches of the acetylene industry. The General Committee consists of engineers, chemists, manufacturers, one patent agent, one lawyer, one director of an insurance company, and an inspector of buildings. The Chemical-Physical Committee consists exclusively of a small number of chemists and physicists. The Technical Committee consists principally of engineers and chemists. The Commercial Committee resembles the General Committee in its constitution, but contains fewer members. The organ of the Society is "Das Acetylen." In order to increase the efficiency of the Society, it has been decided to form sections in the different German States.

The following vital questions, whose satisfactory solution is of the greatest importance to the acetylene industry, have either been finally settled or are at the present time under the consideration of the various Committees:—

- The construction of generators: (a) Materials to be used and strength of the same; (b) methods of generation permissible.
- Calcium carbide: (a) Necessary average quality of the same, method of packing; (b) normal methods of analysis.
- Purification of acetylene: (a) Construction of purifier; (b) purifying materials.
- Negotiations with the competent authorities on the carriage of carbide (a) by rail, and (b) by water; and on (c) the storage of carbide in large and small quantities.
- Negotiations with fire insurance companies.
- Official investigation of all explosions asserted to have been caused by acetylene.
- Prevention of certain commercial abuses at present prevalent in the carbide trade.

The Society have also placed their services at the disposal of all State and Local Authorities who are in any respect interested in acetylene lighting; and they have experienced the gratification of seeing the offer in many cases thankfully accepted.

The pioneers of the German acetylene industry recognized at an early date the great value of annual and other meetings, where engineers, chemists, and owners and directors of works assemble together to survey the progress already made, to discuss disputed questions, and to decide upon normal regulations for the industry. The first congress was held in Berlin, in March, 1898; and the second in Nuremberg, in July, 1898. In October, 1898, a general meeting of the Calcium Carbide and Acetylene Society was held at Frankfurt-on-the-Main; and in May, 1899, the International Acetylene Congress, held at Buda Pesth, was attended by a large number of German acetylenists.

The German Acetylene Society held their first annual meeting at Nuremberg in October, 1899, and the second at Düsseldorf in September, 1900. In addition to these, the Sub-Committees have been most actively engaged upon the various questions submitted to their consideration, and have held, in the present year alone, no less than ten meetings. The Society have been most active in furthering the holding of acetylene exhibitions, which have greatly accelerated the progress of acetylene lighting. The importance of these periodical industrial reviews has been clearly recognized, and their opportunities fully utilized. The first exhibition was held at Charlottenburg in March, 1898, and was supported by about forty German firms, in addition to several from Austria-Hungary, Switzerland, France, the United Kingdom, Russia, and Denmark. The exhibits included generators, purifiers, mixed-gas apparatus, burners, acetylene gas-engines, carbide, electrical furnaces, and various machines used in different branches of the industry. The second, held at Nuremberg in June, 1898, was on a smaller scale. The exhibit at Cannstatt in May, 1899, attracted no less than 110 firms, several from the United Kingdom, France, and Germany being among the number. The Jury who awarded the gold and silver medals at this exhibition excluded from competition all generators working with a pressure of more than half an atmosphere, all generators in which the water drips on the carbide, and, finally, all those which were not shown in action. The German industry was represented at the London Exhibition in June, 1898, by three firms, and at the Buda Pesth Exhibition in May, 1899, by ten. The acetylene section of the Paris Exhibition was entirely neglected by the German industry for various reasons.

**Hartlepool Gas and Water Works Purchase Question.**—A statutory meeting of the ratepayers of West Hartlepool was held yesterday week for the purpose of passing a resolution confirming the promotion of a Bill authorizing the purchase of the Hartlepool Gas and Water Company's undertakings by the two local Corporations. The Mayor (Alderman Macfarlane) presided, and, in proposing the resolution, said the question of purchase had been, during the past three years, gradually forced on their attention; and the Corporations had, after thorough inquiry, considered it their duty in the interests of the public, to take this step. Alderman Furness, in seconding, said the Joint Committee of the two Corporations had unanimously recommended purchase. Until this time the Corporations had never been so united as to admit of the question being jointly dealt with. Mr. Loveridge, in urging the inopportune purchase just now, suggested that they should wait until the electric lighting system was put on a first-class footing, when, he contended, they would be able to buy the undertaking cheaper. Mr. Robinson held that delay would only mean that they would have to buy at an enhanced price. Mr. Furness supported this, and observed that, from the procedure that would have to be followed, he was fully convinced they would not have to pay more than the undertaking was worth. After some further discussion, the resolution was put and unanimously adopted.



**EXPLOSIONS OF GAS.**

A serious gas explosion, involving the loss of two lives, occurred at Dundee last Thursday night on the premises of Messrs. Smith Bros., tailors and outfitters, Murray Gate. A workman was engaged in searching for an escape of gas when an explosion took place in the basement, blowing out the front windows of the shop, and wrecking the greater part of the building. A porter named Allan Ferguson and an apprentice boy named Richard Cameron were killed; their bodies being found buried in the ruins. Thirteen girls (machinists) were injured more or less seriously; one of them having both her legs broken, while a second is believed to be fatally hurt. At Lynwood Villa, near Braintree Parish Church, on the morning of the above-named day, Elizabeth Cannon, a servant, entered the study with a lighted candle, and as she was about to light the gas a violent explosion occurred, completely wrecking the house. Windows were blown out, doors forced from their hinges, the outer walls of the house were bulged, and the chimney-stack was split. The girl was badly burnt about the head and hands, and was removed to Brentwood Hospital; while another servant was severely burnt. The other occupants of the house escaped injury. A correspondent has sent us the following account, from a local paper, of a gas explosion which recently occurred at Barnstaple: On the outside of the back-seat door of the Music Hall, and on the top of a flight of steps leading to the Oddfellows' Hall, is a gas-standard hanging from the ceiling. This had been taken away to be repaired; the man turning off the gas at the meter. He returned an hour afterwards and refixed the standard, turning on the gas. As a proof that no smell of gas was detected, he lit the two burners with safety. Then, standing on a pair of steps, he proceeded to apply a lighted match to the ball of the standard, close to the ceiling, to see if the fitting was right, when there followed a loud report, and the place was filled with flames. The man jumped off the steps, and ran down the long side passage of the Music Hall. There was no outlet for the ignited gas, and it descended to the bottom of the flight of steps, which abut on Boutport Street, and burst open the double doors, wrenching the locks and hinges, and splitting some of the wood into splinters, but not injuring the fan-light or the window at the top of the steps. The right hand and arm of the workman were slightly burnt.

**CHELSEA WATER-WORKS COMPANY.**

The Half-Yearly General Meeting of this Company was held at the Office, Commercial Road, Pimlico, last Thursday—Mr. F. S. CLAYTON in the chair.

The SECRETARY (Mr. G. H. Gill) read the notice convening the meeting, and subsequently the certificate of the Government Auditor and the report of the Company's Auditors.

The GOVERNOR, in moving the adoption of the report, stated that the gross income for the half year to Sept. 30 amounted to £89,121, including an increase of £1750 in the water-rental. The working

expenses had been £28,257, which was about £2000 more than for the corresponding period of the previous year. This was caused entirely by the higher price of coal and by the larger amount paid in the half year for law and parliamentary expenses. Nevertheless, the Directors were able to recommend the same dividend as on the previous occasion—viz., at the rate of 11 per cent. per annum—and carried forward £2753. Apart from the two items mentioned, the ordinary expenditure on maintenance and management had been quite normal. The increased amount of the law and parliamentary expenses had been caused chiefly in opposing Bills in Parliament affecting the Company's interests. One of these measures was an electric tramways Bill, to oppose which had been a very costly process, as the Directors had had to send an expert to Kingston, where the inquiry was held. In the result, the proposed measure was rejected. He might state, with regard to the question of electric tramways or light railways, that it was important for suppliers of water—and the same remark applied to those who supplied gas—to bear in mind the dangers which arose from electrolytic action on their mains. This matter had become so serious that the gas and water companies were uniting in order to bring pressure to bear on the Board of Trade to introduce some new regulations on the subject; it being manifestly unfair to companies and public authorities who supplied water and gas that the whole cost arising out of this new danger should be thrown upon them. The Company's new supplies in the half year numbered 398, which were estimated to produce a net annual addition to the water-rental of £1473; and 59 houses had been pulled down for improvements—representing a temporary loss of income of £68. To meet extensions in the district 1202 yards of service mains had been laid during the half year. The extension of the service reservoirs on Putney Heath was completed last June; and a scheme had been prepared, under the Act of 1899, for the purpose of establishing inter-communication between the systems of the different Water Companies. Revised regulations for the prevention of waste had been agreed upon by the respective Companies, and had been sent to the Local Government Board for confirmation. The London County Council had promoted a Bill for acquiring the interests of the Companies; and therefore he supposed that it would be necessary for them later on to incur the expense of protecting themselves, though they knew that the proposals of the Council would be opposed by the Government, who would probably introduce a Bill in the session of 1902. He believed he was correct in stating that, since their existence, the Council had introduced altogether 24 Bills relating to the Water Companies, and that not one of those measures had received the assent of Parliament—in fact, the Council had been defeated all along the line in dealing with the Companies. It was impossible to say what attitude the Government would take in 1902; but he thought there was good reason to suppose that they would carry out the recommendations contained in the report of the Royal Commission.

The DEPUTY-GOVERNOR (Mr. Jackson Hunt) seconded the motion; and it was carried unanimously.

A resolution was afterwards passed declaring the dividend recommended—5 per cent., with an additional  $\frac{1}{2}$  per cent. on account of arrears; and the proceedings closed with a vote of thanks to the Governor, Directors, and staff.

# JOSEPH AIRD

## GREAT-BRIDGE.

STAFFORDSHIRE.

# TUBES

AND

FITTINGS

GAS, STEAM, WATER GALVANIZED-TUBES, &c.

LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.



**ELECTRIC LIGHTING NOTES.**

The Local Government Board have declined to sanction the borrowing of £10,000 for the purposes of free wiring at Swansea. The National Free Wiring Company will now do the work.

The formal opening of the Stockton Corporation electric lighting works took place last Tuesday. For this undertaking the Local Government Board permitted the borrowing of £24,482; and in July, 1899, the ceremony of laying the foundation-stone was performed by Mrs. Ford. Unfortunately, through indisposition, the Manager of the gas and electrical works (Mr. W. Ford) was unable to be present on Tuesday, to see the practical consummation of the work which he has had the responsibility of constructing and supervising. However, there was a large attendance at the works, to see Alderman Hind set one of the engines in motion; and in commemoration of the event, he was presented by the Contractors with a beautiful bronze standard electric lamp. In an address, Alderman Hind stated that at the time the Corporation applied for an Electric Lighting Order, they were face to face with the fact that the consumption of gas was going up by leaps and bounds; and Mr. Ford reported to them that the gas-works, being at their utmost limits, would have to be extended at a cost of £30,000. The Committee, however, decided that, if it was necessary to expend this sum, it should be laid out in electric lighting plant. The speaker proceeded to laud the virtues of the electric light and disparage gas, when some of the polish was taken off the comparison by "darkness coming o'er the scene" for the space of a couple of minutes. Of course, as the Alderman said, such little incidents are inseparable from an opening day; and we may inform the Alderman that such incidents are not unknown after opening days. The Committee are happy in the extent of the demand they have had for the light. Customers to the number of 75 have applied for 5700 16-candle power lamps, exclusive of street lighting.

**ILKESTON AND HEANOR WATER SCHEME.****The Estimated Cost.**

A Special Meeting of the Ilkeston Town Council was held last Tuesday to consider and seal a petition for the Bill by which it is proposed to constitute a Joint Board representative of the Ilkeston Corporation and the Heanor District Council, with power to acquire the undertaking of the Meerbrook Sough Company, and to construct works for intercepting and distributing water from that source. The most important part of the proceedings was a statement by the Town Clerk (Mr. Wright Lissett) regarding the cost of the scheme. In the first place, he said, the payment to the Company for the sough would be £5000—£6000 altogether, because the Board would have to pay interest, &c. The total cost of the works to deliver water to Chadwick Nick reservoir—that was the reservoir it was proposed should be constructed in connection with the scheme

—would be £56,820. The two sums made £62,800; and this was the cost of the works and machinery necessary for putting the water into the reservoir. The outlay on land, easements, compensation, reservoir at Chadwick Nick, and pipe-line from Chadwick Nick to Heanor (and forward to Ilkeston) was estimated at £49,680; so that the total cost of the works to be constructed by the Joint Board would be £112,500. Then they had £9500 in the Bill for the reservoir at Ilkeston, and £12,000 for the reservoir at Loscoe and Codnor. These sums would have to be borne respectively by Ilkeston and Heanor. The Town Clerk then gave an estimate of what it would cost for repayments and interest on the sixty years they were asking for in the Bill. A resolution adopting the petition was passed. Last Thursday, the ratepayers of Heanor, in public meeting assembled, also consented to the promotion of the Bill.

**A LARGE ITALIAN WATER SCHEME.**

The Italian Government have just given orders for the execution of a scheme which had been under consideration for several years, with the object of supplying the provinces of Bari, Lecce, and Foggia (Apulia) with water. The total length of the aqueduct is about 1660 kilometres, 262 being for the principal aqueduct, 110 for the secondary branch conduits, and 1288 for those under pressure. The principal aqueduct will consist of 59 kilometres of tunnel and 188 kilometres of trench. The water will be obtained from the Caposele springs, situated at an altitude of 418 metres in the Apennine Mountains, where many of the peaks attain heights of 1600 to 1800 metres. The minimum utilizable discharge is 2.5 cubic metres (550 gallons) per second. The aqueduct is to supply 218 towns or important villages, the population of which will probably be 1,850,000 in 1911, the time estimated for the completion of the works. The scheme has been designed to furnish 150 litres (33 gallons) per head per day in localities of more than 40,000 inhabitants; 100 litres in those of 20,000 to 40,000; 75 litres in those of 10,000 to 20,000; 60 litres in those of less than 10,000; and 50 litres in those where pumps are needed. There are to be 89 reservoirs of a capacity of 121,500 cubic metres, or rather more than 2½ million gallons, along the line taken. Instead of the aqueduct being circular in section—a form which would have made it necessary to run off all the water for repairs, and to construct large reservoirs near each point supplied—it is arched, with a banquette wall running along the centre, so that when one half is being repaired water can flow through the other. Each of the channels thus formed suffices for a discharge of 220 gallons per second. The banquette serves as a road for inspection. The free space above it to the intrados of the vault is 5 ft. 8 in. The profile of the aqueduct varies with the ground. In clayey soils, where masonry is at times subjected to considerable pressure owing to slips and subsidence, the arches are oval; and in compact soils of great resistance projected piers with vertical interior facing are adopted. In very hot places, there are pillars and insulating air cushions on both sides to prevent heating of the water. The estimated cost of the aqueduct is £6,524,000.

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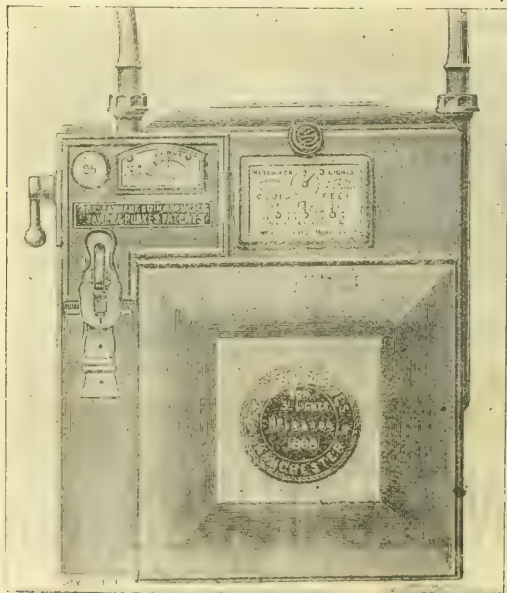
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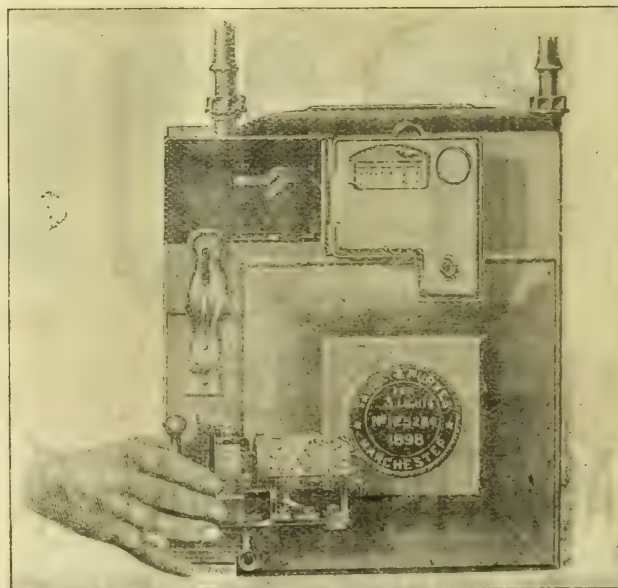
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## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Dumfries Gas Commissioners have lately had before them a report by Mr. T. M'Lintoch, of Glasgow, upon the defalcations of the late Cashier (Mr. J. Herries), who, when his system of defrauding was discovered, committed suicide. Dealing with the seven years from 1893 to 1900, Mr. M'Lintoch brought out a loss to the Commissioners by the defalcations of £989, to which there will fall to be added further sums, to be adjusted at the end of the current financial year. Mr. M'Lintoch recommended the adoption, in May next, of a set of books upon a different system. According to his report, the defalcations were carried through by the Cashier preparing false sheets showing the gas-rental to correspond with the cash, and presenting these to the Auditor instead of the gas-rental book. The presentation of the report was followed by a discussion, in which some speakers thought that the Auditor was to blame for not seeing the books, and others pointed out that the Auditor had only been in office for three years, and that it was he who, notwithstanding the subtlety of the defaulter, discovered that there was something wrong. In short, the great question of the rights and duties of auditors was raised. Much was made of the remark of Mr. M'Lintoch that he would not have accepted the rental-sheets which the Cashier produced, but that he was a man of much greater experience than the Auditor. This remark strikes at the bottom of the whole matter. An auditor should take nothing for granted. In this instance, the Auditor had made the remark that the books were obsolete; and he was met by the Cashier with the reply that they had satisfied previous auditors, and he did not see why they should not satisfy him. Such an observation should at once have aroused suspicion; and probably it did, because it was after this that the Auditor discovered the frauds. No one—not even the speakers who wished the subject further considered in committee—sought to throw the slightest blame on the Auditor, except for having erred in judgment. That he did so at first is undoubted; but it is equally true that he came to a right conclusion in the end, to the effect that there was something wrong. The difficulty he must have had in arriving at this conclusion is well exemplified by the remark of Provost Glover, to the effect that “Mr. Herries was held up as a phenomenon of integrity and probity.” An auditor newly appointed would scarcely dare to question the work of an immaculate man like that. Yet it was his duty to; and an auditor who fails to look into every nook and cranny in the workshop of a book-keeper fails in his duty. The Commission adopted Mr. M'Lintoch's report. So far as I can read, there still remains for decision the question of liability, if any exists, for the losses which have been incurred.

Power to supply electricity in bulk is sought in a Provisional Order which is about to be promoted by the Caledonian Electric Company, who propose to adopt as their field of operations the counties of Dumbarton, Ayr, and part of Lanark. The measure, it is understood, is to be opposed by the County Council of Lanark; and a circular has been issued by the Secretary of the Bellshill Gas Company suggesting a con-

ference of all the gas companies in the counties interested, to fully consider the matter and its probable effect on them. In such cases, the difficulty is to get someone to move first; there being a disposition for one to wait for the others.

At a meeting of the Gas Committee of Dundee Town Council last Tuesday, the Analyst reported that during the past month four firms supplying coal had sent supplies below the contract quality, and the Town Clerk was instructed to write them in the same terms as he did to the others against whom a similar allegation was made. Replies were received from three firms which had been previously communicated with. One of them repudiated liability in the matter, and stated that if the coal was below the contracted quality the depreciation must have been caused by the wet weather. The Analyst, however, stated that the coal was tested when it was perfectly dry. The other two firms expressed regret that there should have been complaints, and one of them suggested that the coal might not have been properly screened. Mr. High repeated his former statement, that a sum of £3000 was lost last year owing to defective coal. The Convener (Mr. Ballingall) replied that the statement was incorrect. He produced figures to show that the cost of extra coal was £1150 odd, and that of this sum £156 was accounted for by extra gas being produced; so that the loss through bad coal was about £1000. The remainder of the £3000 went in increase of wages.

The Perth Police Commission a short time ago received a letter from Sir Robert Moncreiffe asking on what terms the Commissioners might be disposed to take over the Bridge of Earn Gas Company and the lighting of the village. At a recent meeting of the Company, it was thought that before there could be any increase in the supply, a new holder would have to be erected, and that the Company and the Police Commissioners of Perth might be mutually benefited by the supply being obtained from Perth. The Gas Company at Bridge of Earn was formed in 1859, when the works were built at Sealsbridge. The pipes were then laid throughout the whole village, and to Moncreiffe and Kilgraston mansion-houses. Since then Dunbarney House and Drummonie House have been added to the list. The price of the gas originally was 10s. per 1000 cubic feet. It was ultimately reduced to 6s. 8d.; and the consumers are now paying 6s. 3d. per 1000 cubic feet. The present price is largely prohibitive to the people in the village and in Kintillo. The plant consists of a bench of three retorts—two fireclay and one iron; and there is a full equipment of condensers and lime purifiers. The yearly consumption is about 1,250,000 cubic feet; and of this quantity only about one-third is consumed in the village—the remainder going to the two large mansion-houses above mentioned. The village is lighted by an excellent arrangement of street lamps. The work was taken in hand a few years ago by Mr. J. Ellis, who, with a small Committee, year by year raise the necessary funds by subscription in the village. It is thought that if the gas could be had from Perth at a reduced rate, all the people in the district would use it, as every house is fitted with pipes. As Scone gets its supply from Perth, the villagers see no reason why Bridge of Earn should not have the same privilege; for with the erection of the new gas-works at the Friarton they are practically as near Perth as Scone is.



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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 21.

**Sulphate of Ammonia.**—There has been good demand throughout the week, and prices have improved about 1s. 3d. per ton all round—the closing quotation being £10 16s. 3d. per ton f.o.b. Hull, £10 18s. 9d. f.o.b. Liverpool, and £11 f.o.b. Leith. It will be observed that Scotland is still the best market. The bulk of the buying appears to be for covering purposes, direct orders being still scarce, and consumers being mainly interested in the forward position. It is reported that £11 5s. per ton has been paid for January-September delivery, f.o.b. Leith; but for January-March or January-June, the quotation remains £11 7s. 6d. per ton. Beckett terms is also quoted £11 7s. 6d. per ton.

**Nitrate of Soda** is steady at 8s. 3d. per cwt. for ordinary, and 8s. 6d. for fine, quality.

LONDON, Dec. 22.

**Tar Products.**—The contrast between the position of this market to-day and the corresponding period last year places tar distillers in an unenviable position. For some months past, there has been a continuous tendency to weakness, and lower prices in most of the products; and stocktaking will bring an unhappy issue to many works, especially those who entered into long contracts for tar at comparatively high prices. The serious factor at the moment is the low price and unsaleableness of creosote and other tar oils, which appear to be in over-production, though it is thought the greatly reduced value is largely due to the very low prices at which Scotch oils are being quoted. Pitch only just maintains its own, although the last day or two is marked by a little more inquiry. Benzols are moderately steady, naphthas in moderate request, and carbolic is doubtful, though there are sanguine expectations of better prices. Naphthalene is steady, anthracene neglected, and tar quoted lower.

The average values of the week are: Tar, 14s. to 18s. Pitch, East Coast, 30s. to 33s., according to port; west coast, 28s. to 30s. Benzol, 90's, 10d. to 1s.; 50's, 1s. 1d. Toluol, 1s. 3d. Solvent naphtha, 1s. 1½d. Crude naphtha, 4½d. Heavy naphtha, 1s. Creosote, nominal, 1½d. Heavy oils, 2½d. Carbolic, 60's, 2s. 5d. Naphthalene, 90s.; salts, 60s. Anthracene "A," 3½d.; "B," 2d.

**Sulphate of Ammonia** has displayed a greater activity during the week. A considerable business is reported; and the position is fairly firm, while for forward delivery buyers are plentiful. Value closes about £10 17s. 6d., less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The year is closing with a generally steady tone in prices for all descriptions of fuel—at any rate so far as current quotations are concerned. The Lancashire Coal Sales' Association have, in fact, had the question of prices under consideration during the past week; and a very strong view prevailed as to maintaining them at least on the present basis. The renewal of contracts for the ensuing year is, however, causing some anxiety in the district.

During the last couple of months, negotiations have been going on with the Alkali Union, who are perhaps the largest users of engine fuel in the district; but no definite result has been come to, and the Lancashire collieries have at last decided to practically suspend further negotiations unless the Union are prepared to pay their prices. In the meantime, the Union are endeavouring to obtain supplies in other districts; and inquiries have been put forward in Yorkshire. With regard to round coals the position is also much the same; and there are lively anticipations of the contention which is likely to arise when the larger contracts come up for renewal early next year. One thing is certain—that they will only be renewed by consumers at prices considerably lower than those that were paid this year. So far as current business is concerned, house coals are moving away readily, at the full list rates of 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-foot and seconds Arley, and 14s. to 14s. 6d. for common house coal. Steam and forge coals are also in steady demand, at about 12s. to 12s. 6d. per ton. For engine fuel there is a fairly active inquiry generally, with 10s. 6d. per ton at the pit about the average price for good medium sorts. Coalowners are moving away practically all they are raising, and consequently are in a position to hold to prices with firmness at present. Steam coals are readily obtainable at about 15s. to 15s. 3d. per ton delivered at the Mersey ports.

**Northern Coal Trade.**—Now that work has been fully resumed on the railways, there is a large output of coal, and the shipments are heavy. It is tolerably certain that this condition of the trade will go on until the holidays; for there is a little deficiency to overcome that the recent strike caused, the deliveries during that time having been much below the average. In the steam coal trade the demand is moderate. Best Northumbrian steam coals may now be quoted at from 13s. 6d. to 14s. per ton f.o.b.; while steam smalls are 7s. 9d. to 8s. Manufacturing and coking coals are quiet; and sales for next year are on a lower basis. In the gas coal trade there is a full demand; but it is well met, and is scarcely as large as was experienced a year ago, when the companies had much smaller stocks than they now have. Prices of gas coals are from 13s. to 13s. 6d. per ton f.o.b.; so that the fall is rather marked from the rates at which some of the current contracts were settled, about the middle of this year. Best Durham coke for blast-furnaces is in larger demand; the need of stocks for the holidays being felt. For export, business is slow at about 22s. to 24s. per ton f.o.b. Gas coke is in fuller production, and so far the quotation is 24s. per ton f.o.b.; but it seems to be undecided yet what next year's contracts may be.

**Scotch Coal Trade.**—The coal trade is in a parlous condition. With the prospect of holidays at this season the immediate demand is small, and forward inquiries are scarcely in existence. Prices are therefore still receding. The quotations are: Main, 11s. to 11s. 3d. per ton f.o.b. Glasgow, ell 12s. to 12s. 9d., and splint 12s. 6d. to 13s. The shipments for the week amounted to 183,705 tons—a decrease upon the previous week of 14,880 tons, but an increase upon the corresponding week of last year of 1608 tons. For the year to date, the total shipments have been 10,557,822 tons—an increase of 1,957,688 tons.

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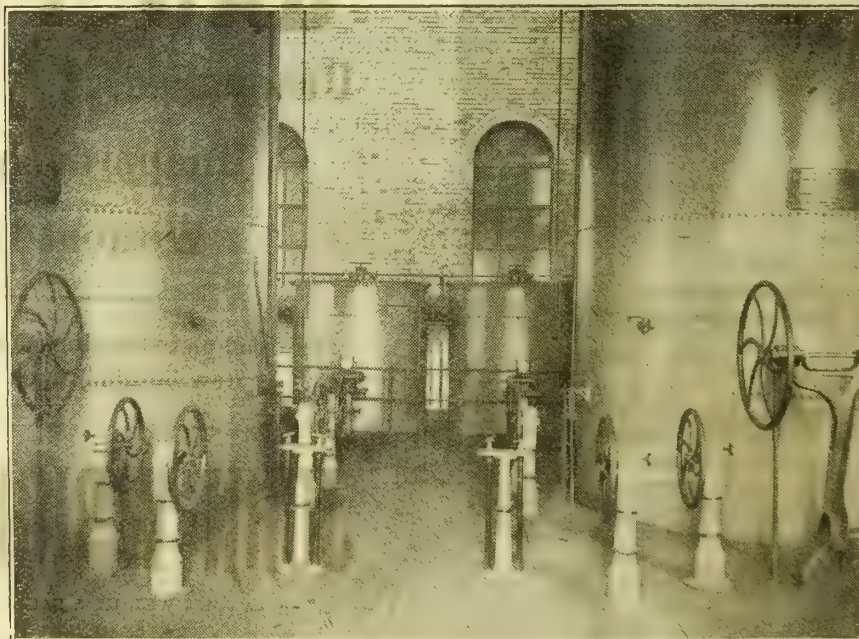
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**Dover Gas and Electricity Companies and the Corporation.**—We hear on good authority that the Dover Gas Company have removed from their Bill the clause to enable them to purchase the undertaking of the Dover Electricity Supply Company; and, as a consequence, the Corporation have withdrawn their Bill to acquire the Gas and Electricity Companies. Matters are therefore left precisely as they were.

**Fatal Gas Explosion at Malvern.**—An inquest was held last Tuesday on the body of Mrs. E. A. Joshua, of Malvern, who met with her death through an explosion of gas on the 13th inst. Dr. and Mrs. Joshua entered a new house on the 4th inst. In the breakfast room an old gas chandelier was fitted; and the gas-fitter had pronounced it safe. Dr. Joshua left it as usual with the bye-pass of the burner lighted and the pendant pulled down on the 12th inst., and went to bed at 11.30 p.m. An escape of gas was noticed next morning; and the servants threw up the windows. The bye-pass was still alight and the pendant pulled down. Mrs. Joshua, entering the room, pushed up the gas-pendant, when an explosion occurred, and she rushed out of the room in flames. She was severely burned, and died on Saturday evening. No blame was attachable to anyone. The Jury returned a verdict accordingly.

**Gas v. Electric Light at Wakefield.**—A little breeze occurred over the question of the public lighting of certain streets in Wakefield and the district of Alverthorpe at the last meeting of the Wakefield City Council. The Street Lighting Committee had received an offer from the Directors of the Gas Company, expressing their willingness to co-operate with the Committee in improving the lighting of the city by the introduction of Welsbach burners. They offered to alter the existing lanterns, &c., for the sum of £1 1s. 4d. per lamp. In the Alverthorpe area they would provide and fix them complete for £1 14s. 7d. each. Without prejudice, they would fix lamp-columns free of cost in streets where mains were already laid, provided the Corporation would undertake to use them for not less than five years. Mr. Ramsden, the Chairman of the Committee, moved that the minutes be approved, and that the offers of the Company be accepted. He remarked that in many large towns and cities incandescent burners had been adopted in preference to electric lighting, which had not been found so satisfactory as it was thought to be when first introduced. Mr. Wigham, the Chairman of the Electric Lighting Committee, complained that in this matter of improving the public lighting of the town his Committee had not been considered in any way. He was prepared to admit that up to now the arc lamps in the city had not covered themselves with glory. Still, during the time the undertaking had been running, the Committee had done all they could in the way of experimenting to find out which were the best systems to adopt to secure a type of arc lamp which would be a credit to Wakefield. They were anxious to make the electric light works a success; and he therefore moved, as an amendment, that the minutes be referred back for further consideration, so that the Electric Lighting Committee might have an opportunity of tendering. After some discussion, in which the electric lighting of the city was pronounced a failure, Mr. Ramsden consented to accept the amendment, which was eventually submitted as the substantive resolution and carried.

**Carmarthen Public Lighting.**—At the last meeting of the Carmarthen Town Council, the Lighting Committee presented a report in which they submitted a new scheme of public lighting, under which 48 lamps would be kept burning all night, as at present, but 184 would be extinguished. The change would, it was stated, result in a reduction of £207 in the annual gas bill; and, after deducting 12s. a week each for two men to extinguish the lamps, the net saving would be £144 12s. Mr. Spurrell moved that the scheme be tried for a year; remarking that it was a great waste of gas to keep it burning all night. Mr. Lloyd expressed disapproval of 80 per cent. of the public lamps being extinguished at midnight. He thought the Council ought to consider the question of convenience before that of expense. He moved, as an amendment, that only half the lights be dispensed with at midnight. After some discussion, the motion was carried.

**A Southport Lesson on How to Obtain New Business.**—The ratepayers of Banks, which is a village within the Southport gas-supply area, have been considering the question of adopting a present-day system of illumination; and they have been very much aided in coming to a decision by the politic steps taken by Mr. Trounson, the Chairman of the Corporation Gas Committee, and Mr. John Booth, the Engineer. A meeting of ratepayers was called to consider the question; but before the special business of the meeting commenced, Mr. Trounson and Mr. Booth occupied the platform, and both told their audience, in a short time and in an exceedingly entertaining manner, more about gas and its uses than those present had possibly heard or learnt in the whole of their lives before. Thus primed, the Banks ratepayers settled down to discuss the written conditions on which the Corporation Gas Committee had offered to supply the district, both privately and publicly; and 37 out of 43 ratepayers had no difficulty in coming to the conclusion that the "comfort, convenience, safety, and moral welfare" of the village would be improved by the introduction of gas lighting.

**Awards at the Lighting Industries Exhibition at Vienna.**—The list of awards to exhibitors at this exhibition, of which particulars have already been given in the "JOURNAL" (*ante*, p. 889), has now been published. We do not observe the name of any English firm in the long list of winners of distinctions; but it seems highly probable that no English firms were exhibiting. In the list of gold medallists, we notice the following names of firms, &c., connected with the gas industry: The Aërogen Gas Company of Vienna, for Aërogen gas plant; Brix, Kempler, and Co., of Vienna, for their "Millenium" light; the German Continental Gas Company, of Dessau, for the "Industria" lamp, and cooking and heating apparatus; S. Elster, of Vienna, for gas-meters, photometers, and cooking apparatus; Michaelis and Eichstädt, of Vienna, for gas cooking and lighting apparatus; Julius Pintsch, of Vienna, for gas-meters, prepayment meters, and lighting appliances; the "Sirius" air-gas apparatus; and the International Water-Gas Company, of Vienna, for Dr. Strache's patent water-gas plant and purifying scheme. Many of the firms named as of Vienna will be recognized as having their chief offices and works elsewhere. There were 17 gold medals, 16 silver medals, and 12 bronze medals awarded.

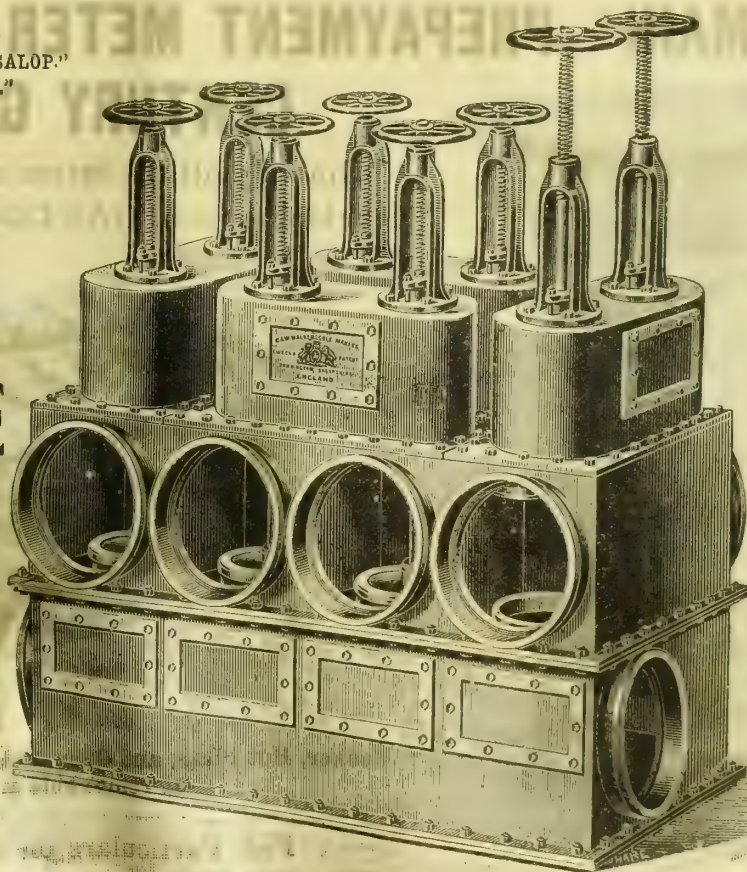
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**Softening the Wilmslow Water Supply.**—It has been decided to spend £4200 in the erection of new plant at the Wilmslow Water-Works. Many serious complaints have been received from all parts of the Wilmslow and Alderley Edge districts with regard to the extraordinary hardness of the water; and the authorities now propose to adopt the Archbitt-Deeley softening process.

**Fatality at a Gas-Works.**—Thomas Cook (aged 50), a Rawtenstall farmer, was killed on Monday last week by an explosion in a tar and liquor tank at the works of the Rossendale Union Gas Company, Cloughfold. Deceased went to the works with a horse and cart for a load of coke; and while he was there, the explosion occurred. It is supposed that he was standing on the cover of the tank, as his lifeless body was afterwards found in it. No one saw the explosion. At the inquest, a verdict of "Accidental death" was returned.

**Wells Water Supply.**—The campaign in connection with the poll of the city on the question of the purchase of the Wells Water Company's undertaking by the Corporation was conducted with much vigour. The result was that 650 votes were cast in favour of the scheme and 348 against it; giving a majority of 302 in favour. The Town Council have held a special meeting to advance their parliamentary procedure, at which a suggestion was thrown out that the Company should be again approached with the view of endeavouring to arrive at an amicable understanding, and so carry the Bill through unopposed. The question, however, was allowed to stand over for the present.

**Reduction in Price by the Wandsworth and Putney Gas Company.**—Our readers may remember that the above-named Company were among the last to raise their charge for gas in consequence of the great advance in the price of coal some months since. This evidence of the Company's desire to relieve the consumers as much as possible from the burden which extraordinary circumstances had placed upon them has now been further borne out by an announcement by the Secretary that, now that the coal market is easier, a reduction of 2d. per 1000 cubic feet (2s. 6d. to 2s. 4d.) is to be made after the turn of the quarter.

**Compensation for Damage to Gas-Mains at Carmarthen.**—As the result of the operations of the Carmarthen Corporation upon the roads of the town, much damage has been done from time to time to the mains of the Gas Company, with consequent loss of gas; and some eighteen months ago the matter came before the Town Council, and a Committee was eventually appointed to deal with it. As the result of a conference between them and the Directors of the Company, the Corporation have agreed to pay £50 in full satisfaction of all claims for broken pipes and loss of gas up to the end of the year 1899. The Committee recommended that in future the amount of damage should be assessed at the time of its occurrence by the Manager of the Company and the Surveyor of the Corporation; that the cost of renewing the pipes broken by the Corporation should be equally divided between them and the Company; that the Corporation should pay the actual estimated cost of the gas lost through the leakages; and that the Corporation should accept the Company's offer to defray half the cost of laying down the main in St. David's Street. These recommendations were agreed to.

The Felixstowe Water Company have decided to raise £3500 of additional capital in £10 shares.

The ratepayers of Birkdale last Thursday consented to the promotion of the Bill by which it is proposed to form a Joint Water Board for Southport and the surrounding district.

The Elland Gas Company have placed with Messrs. Jonas Drake and Son, of Ovenden, Halifax, an order for the erection of an inclined retort-bench of six arches, with all the necessary elevating and conveying machinery.

The Washington Bureau of Foreign Commerce has received a letter from Mr. J. P. Spanier, of No. 160, Corso Umberto I°, Rome, asking to be put in communication with responsible firms who can offer full cargoes of pitch, to be used in the manufacturing of patent fuel. Considerable business, he says, can be transacted if connections are made with the proper party.

The fact that the South Yorkshire coalowners have decided to offer railway companies coal at 14s. a ton—this being a reduction of 2s. per ton upon the average price of the contracts at present running and of 1s. upon the price demanded three weeks ago—is regarded by the "Financial News" as showing plainly that the bottom is out of the coal boom. Our contemporary points out that "Mr. Livesey's advice and prophecies have proved right, after all."

Our readers will see, by an announcement which appears elsewhere, that the Directors of the Gaslight and Coke Company have instructed Mr. Alfred Richards to offer for sale by auction, at the Mart, Tokenhouse Yard, on the 16th prox., £163,190 of ordinary stock of the Company. It is issued under the provisions of the Company's Act of 1898, and ranks for a standard dividend of 4 per cent. per annum, subject to the sliding-scale, under which, at the present price of gas, the authorized rate of dividend payable is £4 8s. per cent. per annum.

The death of Alderman A. Sinclair, of St. Helens, has brought strikingly before the ratepayers the fact that their water undertaking has enormously expanded during the last half century. Away back in the early fifties, Alderman Sinclair was a member of the old Board of Commissioners, and was one of the Committee who negotiated and signed the agreement for the purchase of the water undertaking for a yearly rental of £610. By the purchase, the Commissioners acquired the monopoly of the water supply in St. Helens; and since that time the sum of £160,000 has been expended on works extensions.

Our readers are aware that the Elland Gas Company have given notice of their intention to promote a Bill to enable them to raise additional capital, undertake the sale and hire of gas-fittings, gas-engines, &c., and obtain further powers in respect of the price and supply of gas. Under these circumstances, it is thought that the present is an opportune time to discuss the desirability of securing the gas-works for the benefit of the various districts interested; and, with the idea of coming to some basis of common action, the Elland District Council have decided to ask the Greetland and Stainland Councils to meet them in conference to discuss the whole question.

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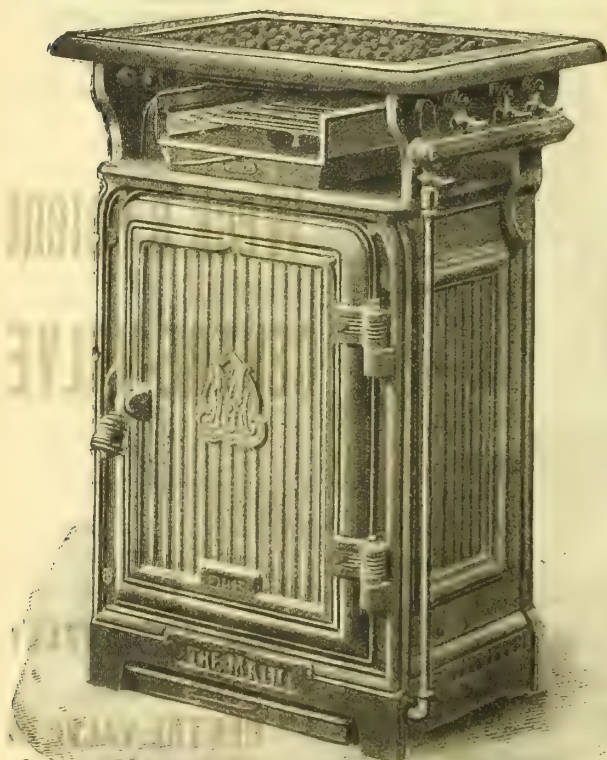
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